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Forum Linguisticum

Dafydd Gibbon

PERSPECTIVES
OF INTONATION
ANALYSIS

9

LANG

FORUM LINGUISTICUM

Herausgegeben von Professor Dr. Christoph Gutknecht

Band 9

Dafydd Gibbon

Perspectives
of Intonation Analysis



Herbert Lang Bern
Peter Lang Frankfurt/M. und München
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PREFACE

The aims of this study are threefold: to develop a coherent framework of analytic categories for the description of intonation; to chronicle in depth the major previous studies of intonation systems in English as sources of analytic insights and empirical observations; to develop a further perspective for the formulation of intonation functions in an explanation of received categories. Despite the upsurge of interest in intonation, documented by the accompanying wave of publications on the subject, there are still wide gaps in coverage; perhaps the most salient characteristic of the majority of recent studies is their a-historical stance, which the excellent surveys of Crystal (1969), Fry (1968), Lehiste (1970) and Léon (1972) have, for reasons not immediately apparent, so far been unable to correct. The third chapter of the present study, the lengthiest, is intended to fill a gap in the literature in handbook fashion, by looking at the details of previous descriptions and critically appraising them in the light of a set of analytic categories developed in the first two chapters. The fourth chapter takes up the relevant roles, or functions, of intonation, and in a highly selective manner suggests a number of ways out of apparent descriptive blind alleys, more by way of pointers to solutions than as the solutions themselves.

The methodological undercurrent of the present study has made it necessary to curtail more of the results of empirical analysis than was originally intended; one major selection which had to be made, for instance, was the excision of most of the wide field of accentuation. If this curtailment has enabled the degree of explicitness of the categories and perspectives of analysis to be increased, then this is all to the good; it is intended to prepare separate accounts of a number of the areas which could not be examined here, reference being made to these areas at the appropriate points in the text. There are a number of relatively recent publications in the field which could not be procured in time for analysis in the present study; one of these which I have in the meantime been able to obtain, and which I particularly regret not having been able to deal with, is G. S. A. N. (1974), *The Stress System of English*, as: *Acta Universitatis Upsaliensis, Studia Anglistica Upsaliensia* 19, Stockholm.

Without tangible and intangible assistance from many sources this study would not have been projected, let alone completed. Special thanks are due to Deate for a thousand things, the most relevant here being proof-reading and the compilation of the index of proper names; thanks, too, to Jan van de Vijver, for hours of discussion on phonology and semantics, and for examples (152) and (158), to Cinda, for cajoling me into taking up English studies, and to Dr. Ilse Graham, who taught me sensitivity to structuring. But the other member of my patient family, my other Erlangen friends and the Kingsmen, my friends, mentors and students in Göttingen have all contributed in their own ways towards the realisation of the improbable - particularly Professor Thomas Gardner who, by kicks and counsel, opened up new vistas.

Göttingen, Christmas Eve 1975.

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1. PRELIMINARIES

The last few decades have seen the appearance of increasing numbers of attempts to discover and describe details of the intonation systems of various languages. Originally in the form of teachers' handbooks containing highly selective approaches towards the universe of discourse of intonation descriptions, selective in the areas of style, grammar-intonation correspondence, the numbers and kinds of patterns treated, most of these studies did not aim at providing an explicit methodological framework, but concentrated rather on impressionistically sorted observations. The term 'impressionistic' is not intended here in a pejorative sense. On the contrary, it should be taken as a reference to the genuinely empirical efforts of the compilers of early intonation descriptions, the examination of which yields a wide variety of informative and subtle insights (cf. Ch. 3, below). More explicit methodologies have arisen in the meantime, partly as a necessary consequence of the expansion of experimental phonetics, and partly as the spin-off of theories of segmental phonology of diverse persuasions. The success which has been achieved in description, comprehensively documented by Léon (1972), has tended to stay within self-imposed limits, however, by concentration on relatively *ad hoc* and atomistic - though extensive - description on the one hand, and by the construction of elaborate partial methodologies on the other; these two poles have not yet, it seems, been brought into a fruitful working relationship.

By considering both of these angles on analysis, in their many varieties, and in conjunction with explicit phonetic descriptions on the one hand and explicit accounts of semantic and pragmatic issues on the other, it should be possible to find a way of bringing more method into observation, and more data into theory. It is discovery procedures, in fact, which are the underlying theme of the present study: neither naively inductive classifications, nor discovery algorithms, but procedures based on a range of aids to theory formation: observation, intuition, metatheoretical concern for existing analyses, explication of these, looking for questions in which, with perseverance, clear and useful analyses can be made, which will in turn point the way to further solutions in other cases. It is in this specific sense, in being a number of moves in an overall strategy, that the present study can claim to be non-fragmentary.

1.1. Three categories of linguistic description

In order to outline the course to be taken, it is necessary to introduce at this early stage a number of the basic concepts which will be involved later on. In this way their clarification can take place in context rather than piecemeal, though each will, owing to the exigencies of exposition, have to be clarified at a separate stage in the development of the study.

The basic particularity within the domain of discourse of a linguistic description are sounds or inscriptions used with varying degrees of regularity as utterances. This formulation covers the two essential and complementary kinds of fact on which language analysis is based: the coupling of physical perception with an interpretive process of understanding the sounds as playing a role within the institution of language. It is not always the case that these two components can be neatly separated; indeed,

linguistic experience reveals that they are fairly frequently confused. Because of the psychically and socially motivated intimacy of the relationship which people have with their language as a special endowment and a means of getting things done, the aspect of understanding dominates the aspect of perception to a considerable extent. It is a well-known fact that aberrances on the physical side of speech are often overlooked, or pass completely unnoticed, that the 'proof-correction' approach to reading texts is difficult to acquire, and so on. It is also the case that the metalinguistic vocabulary of what might be termed 'folk linguistics' is quite extensive on the side of the understanding of language functions, with countless readily available terms from 'true' to 'unbelievable', and from 'order' to 'sermon', while the side of perception is represented only in a highly impoverished manner with terms like 'speak', 'shout', 'whisper', 'husky', and the like. Many terms, like 'hail', straddle the two areas; a term like 'tone of voice' is also impossible to place on the side of perception in view of the epithets used with it: 'unpleasant', 'harsh', 'friendly', and the like; items like 'stress', too, have a foot in each camp, and Lieberman's investigation of what groups of linguists trained in different schools really perceived when they thought they were perceiving various intonational phenomena (1965) reveals non-phonetic influence on their perception.

Intonations, to anticipate for a moment the detailed definitions in the next section, are in fact more liable than most language devices to be understood, in the sense just sketched, rather than perceived in a physical sense. This has led to the widespread use of labels based on non-phonetic criteria in the description of intonation patterns; examples are not hard to find in the literature: 'question intonation', 'interrogative intonation', 'contrastive intonation', 'emphatic intonation', 'bored intonation', and so on. Since intonations have a more direct rapport with the institutional categories of language use than do the so-called segmental units of language, lacking in most analyses the organisational principle of double articulation (Martinet, 1960(1967:21)), such labels may have a certain justification. But, as Crystal in particular has insisted (1969: 127f., 179ff., 294ff.), if such semantic labels are used then their status must be kept explicit, since they say nothing whatsoever about the phonetic and phonological side of the matter; even their value as functional labels is dubious in view of their imprecision and subjectivity. There may indeed in some cases be a fairly direct, in some cases even one-to-one relation between functional and phonetic categories; this, however, is to be shown, not assumed, in a linguistic analysis: no easy matter.

It is in this dominance of the functional mode of understanding over the sensory mode of perception that the difficulty of linguistic analysis lies. The analyst of a language which he knows and uses is initially in the same position as any other user of the language in this respect; in the absence of linguistic schooling it is generally only with regard to unfamiliar languages that the sensory mode forces itself into the dominant position. Under such circumstances, of course, little relevant analysis can be made, and even so the phonological categories of his own language will tend to bias his perception (cf. esp. Fry, 1960). Various schools of linguistic analysis have been mindful of this situation and have, within differing, sometimes more and sometimes less extreme materialistic methodologies, attempted to direct the linguist's priorities towards the non-functional categories, in contrast to the layman's priorities, which lie

quite clearly on the other side. As corrective measures, such methodologies have had considerable value, and as a check on the soundness of data, this kind of emphasis is essential.

The functional categories, however, remain a *sine qua non* of linguistic analysis. In particular those schools of linguistic analysis which originated in or were heavily influenced by anthropological studies have always kept the context of language use very much in the forefront of their attention, though fashions elsewhere tend to fluctuate. The two most conspicuous examples are the school of Pike, influenced by Sapir, and the Firthian school in its various stages, influenced initially by Malinowski, and later, in the work of Halliday, by ideas from the Prague school, whose own conspicuous awareness of functional issues grew up in association with Bühler's (1934) version of gestalt psychology. One of the more influential of the pioneers, whose influence in his own field has continued parallel to his influence in Firthian linguistics and is re-entering linguistic study from different sources, was Malinowski (1923; 1935); he developed the idea that linguistic analysis must include "the analysis of the general conditions under which a language is spoken" (1923:306), conditions which he referred to as the 'context of situation' of an utterance. An essential part of the context of situation, the use of language in getting things done, is indicated in the following quotation (1923:316); the evolutionistic element of his formulation is not relevant to the present discussion:

To restate the main position arrived at in this section we can say that language in its primitive function and original form has an essentially pragmatic character; that it is a mode of behaviour, an indispensable element of concerted human action.

Freed from its somewhat diluted behaviourism, this might be described as the central position in the history of descriptive linguistics, in the sense that it makes explicit the necessity for keeping in mind the functions of language without placing the representational function on a pedestal, though without in turn blindly using the other functions, and, on the other hand, without drastically abstracting away from them in the direction of a phonetically based descriptivism or a pure structuralism. In contrast, too, to the methodology adopted by Chomsky for generative grammar, this kind of approach emphasises the centrality of syntagmatic judgments about roles, with reference to language spoken in particular kinds of circumstance, rather than paradigmatic 'cover judgments' about isolated linguistic forms (e.g. 'paraphrase-of', 'n-ways ambiguous') which take a metalinguistic short-cut through the jungle of language use. The various functionally oriented descriptive categories of language I shall refer to as roles; the later stages of the present study will clarify the precise senses in which the word is to be taken. The terms 'function', 'meaning', and 'use' will be avoided in all contexts where the theoretical status of the semantic term is important, an exception being the locution 'condition of use' (cf. §4.3. below). The reasons for the present usage are that 'function' is sometimes used in linguistic contexts with a different, more formal meaning; 'meaning' itself is best kept to informal usage (as in the present sentence) in view of its many different theory-bound connotations; 'use' is also avoided in view of its ambiguity: sometimes it is contrasted with 'meaning', sometimes with 'mention', sometimes with 'usage', and sometimes, in the meaning 'kind of use', approximates to part of the present usage of 'role'. The term 'role' labours under an almost equally heavy

psychological and sociological load; perhaps its only merit is its relative freshness in linguistics. Sounds of various types, then, will be said to play certain roles, the latter being expressed in the description in terms of statements of the conditions under which sounds of those types are used in verbal transactions, the nature of which will be discussed in the final stages of this study. This notion of role is the first of the three analytic categories under discussion.

The second analytic category, for the purposes of the analysis on an equal footing with the first, is that of the physical type, property, or feature, organised into qualitative dimensions. I shall restrict usage of this term to the perceptible and measurable phonetic characteristics of utterances, and to configurations of such characteristics. The second chapter of the present study will treat in greater detail the relevant types involved in the description of intonation; for the present it will suffice to point out that the different kinds of type perceptions, some instrumentally extended and being, essentially, techniques of measurement, each involve their own range of types: auditory, kinaesthetic, physiologically or acoustically measured, &c., and combinations of these different modes of analysis. Otherwise the phonetic types to which the sounds used in utterances belong need no further explanation at this stage.

The importance of these two basic analytic categories, role and type, lies in their coverage of the two poles of linguistic experience. While the language experience of everyday verbal transaction does not necessarily require awareness of these categories (though it may), the linguistic experience involved in language description starts out from an explicit recognition of these two categories of awareness about language and proceeds to detail the cases within each category, and to find means of expressing the relationships between the cases, both within each category and between each of the categories, according to subsections of a general 'explanatory' theory which are appropriate to each category. It goes without saying that roles and types are entirely different categories of experience; the criteria for the analysis of the one are not applicable to the analysis of the other, and there is no question of 'reducing' the one to the descriptive terms covered by the other and still retaining explanatory value (for instance by treating roles as features of utterances).

The third of the analytic categories does not have the fundamental empirical status of the other two; rather, it is a partly conventional means of representing and explaining the relations discovered to hold between the types to which sounds are assigned and the roles they may be made to play. The obvious term for this category is structure. Part of what is meant by a description of structure corresponds to Chomsky's syntactic and phonological components, which provides explications of some of the different kinds of relation observed to hold between (in the present terminology) types and certain roles (1965:16):

The syntactic component specifies an indefinite set of abstract formal objects, each of which incorporates all information relevant to a single interpretation of a particular sentence. Since I shall be concerned here only with the syntactic component, I shall use the term "sentence" to refer to strings of formatives rather than to strings of phones. It will be recalled that a string of formatives specifies a string of phones uniquely (up to free variation), but not conversely.

The Chomskyan school in particular tends to see the status of structures

as dominating all other aspects of linguistic theory, often to the neglect of the roles and types which contribute to their erection, leading to reductionistic views of the relations between different levels of linguistic analysis such as that between the level of formatives and that of phones, described in the above quotation, or that between the surface structure and the stress distribution and accentual structure of a sentence, discussed in Ch. 3 below. The present view tries to place structures within a broader perspective, as members of a derivative or secondary category within the complex cycle of theory formation. This approach is in agreement with Fry's criticism (1960) of attempts to divorce structures as statements of distribution from the phonetic types to which they are assigned, and requires attention to these matters for other levels of analysis, too. Postal has formulated the phonetic side of the issue as the 'naturalness condition' (1968:53ff.), and recently Lindblom (1972) has argued the centrality of an explanatory phonetic theory, rather than assigning it a peripheral, interpretive role. The broader perspective within which structures have to be seen includes, in addition to the analytic category of type, that of role. The structures, then, incorporate the information relevant to specifying the roles which sounds of a particular type (Chomsky's "strings of phones") may play. Depending on the criteria of analysis employed, other kinds of structure than the syntactic kinds can be formulated, such as those of the Chomskyan (or other) phonological components, or intonational structures, or paralinguistic structures, each interdependent or autonomous to the extent that the criteria used in their analysis are held to be interdependent or autonomous.

It will be readily seen that the notion of a semantic structure would have an entirely different theoretical status in relation to the present approach from that of such descriptive devices a syntactic or phonological structures. In terms of the present approach, it could be interpreted as covering the relations between the different conditions under which linguistic types are used, i.e. relations between roles, not relations between types and roles. It has been amply demonstrated that for specific purposes within syntax it is useful to postulate canonical structures assignable to canonical forms (see below) on the basis of the paraphrase relation (in fact a family of relations); Chomsky's approach has a linguistically motivated deep structure which in addition incorporates the criterion of automatic sequence, and which is related to more superficial structures by explicit correspondence rules, while others use a linguistically more opaque logical canonical language. Such structures have often been regarded as 'semantic' structures, though Chomsky has always assiduously avoided making this reductionistic claim for his own deep structures. The discussion of semantic deep structures is partly a terminological debate; the real issue is what criteria of analysis are used in determining the structures. In the present framework, they would fall under the category of structure, not that of role, and their association with the epithet 'semantic' would thus be rather unusual. These structures are reached by an extension of a process used, with other configurations of criteria, in phonological analysis (however remote the areas reached might seem): the phonetic types are reduced to a limited number of canonical forms on the basis of their relevance to the highly restricted kinds of role admitted in phonological analysis, these canonical forms (the 'phonemes', &c., of various theories) being structurally related to each other in ways which reflect the criteria of analysis used.

Each configuration of criteria of analysis determines a level of analysis, or, with the focus on the ensuing kind of structure, a level of representation or component (in the terms of Chomsky, 1957 and 1965 respectively). Each level of analysis gives the relationships between a particular brand of canonical form and the roles which utterances assignable to this form may play. Relations between the canonical forms of different levels are expressed, following Chomsky, in terms of the structures assigned to them at these levels and the principles of correspondence relating them; these relations reflect the relations between the criteria of analysis used at each level. A presentation of the notion of level of analysis which is in most respects the same as the present notion is given by Malmberg (esp. 1962), under the name 'level of abstraction'; cf. also Hirvonen (1967:23ff.), for application to intonation.

The issue of the reality, in particular the 'psychological' reality of the different levels, canonical forms and structures, has always been a subject of discussion in linguistics, one of the earliest systematic discussions being that of Twaddell (1935); it will be raised again at the end of the present chapter. Consideration of this point should be tempered, however, by the recognition that the criteria of analysis involved in establishing these descriptive devices are (in broad outline following Malmberg, esp. 1962(1971:245)), which is often overlooked, not solely the perception and the understanding of utterances, but also involve decisions about the selection of methods of investigation, which partly determine the types and roles formulated, as well as choices of written mathematical or non-mathematical models (notations) for these devices. And the last two factors do not necessarily have anything to do with the way language users work.

Much finer distinctions than those drawn in the present section are drawn by Miller. Basing his presentation on an informal hearer model, he posits a set of six different ways of perceiving speech "in order from the superficial to the inscrutable" (1964(1969:294)). These different aspects of perception are: hearing an auditory stimulus; matching with knowledge of phonological structure; accepting as a sentence on the basis of knowledge of grammar; semantic interpretation, understanding in context (e.g. filling in non-explicit information from independent knowledge of the speaker's situation); and belief that an utterance is valid in terms of relevance to the hearer's conduct. The first of these aspects corresponds approximately to type perception; the second, third, and possibly the fourth are related to the recognition of structure, while certain aspects of the fourth together with the fifth and the sixth are relatable to the awareness of different kinds of role. The last three are explicable in terms of current approaches to language use: Austin's 'linguistic phenomenology' and in particular his distinction (1962) between perlocution and other aspects of speech acts contributes towards the distinction between the last of the Miller categories and the others; Gunter's distinction (1966) between overt and covert context, or in a more specialised frame of reference Austin's distinction between primary and explicit performative utterances will cope with the distinction between categories four and five. The derivative second and third categories are relatable to the Chomsky & Miller (1963: 318f.) notion of a heuristic component in perceptual performance and to Bever's 'perceptual strategies' (1970:280ff.).

Although distinctions at least as fine as these, though not necessarily the same selection, must be drawn in a complete account, at the present

stage of the exposition the three-way distinction between type, role and structure is sufficiently adequate.

1.2. 'Intonation'

It will be useful to outline the domain of specifically intonational descriptions by considering various approaches to defining 'intonation' which have been offered in previous studies, using the analytic categories introduced above as principles of organisation, since the term is not adequately definable without reference to all three.

1.2.1. 'Intonation' and related terms

As a first step, 'intonation' can be related to, and distinguished from, a number of other terms pertaining roughly to the same patch within the domain of linguistic discourse, before being distinguished more finely with reference to the analytic categories of type, role and structure. Intonation, to revert for expository convenience to a material mode of speech, is located among the prosodic or suprasegmental features. Lehiste, discussing treatments of prosodic features in various schools of linguistics, remarks (1970:1) that in American linguistics, "the term is used more or less synonymously with suprasegmental features". There are slightly different connotations attached to the terms 'suprasegmental' and 'prosodic', however; the former presupposes segmental phonemic analysis, retaining Bloomfield's distinction between primary and secondary phonemes, whereas in the interpretations of other schools, prosodic features may be based in their own right on "observed general properties of auditory perception" (Pitche, 1968:97). The latter often applies in the actual practice of the 'suprasegmental' schools, most conspicuously, perhaps, in that of Pike (1945); indeed, the 'suprasegmentals' are among the primary and most conspicuous cues for phonological and other linguistic structures. The terminology 'suprasegmental' does obscure the fact that suprasegmental features are themselves organised into many different kinds of segments. On both these grounds, the relative independence of prosodic and phonemic analysis, and the terminological disadvantages, the term 'prosodic' will be preferred in this study, except in the immediate context of discussion of previous analyses of 'suprasegmentals'.

The prosodic types, apart from those associated with the intonation systems, are associated with the systems of tone, accent, stress and juncture, as well as the systems of rhythm and relative duration. They are to be distinguished from types as used paralinguistically, following Crystal (1969:177), which include tension (also used prosodically), voice quality and voice qualification. Both prosodic and paralinguistic uses of various phonetic types are to be distinguished from what Whorf (1938(1969:126)) called 'timbre phonemics', i.e. 'segmental phonemics'; 'timbre' corresponds to Jones' 'tamber' (1956), the auditory correlate of what Lehiste calls "phonetic quality (i.e. distribution of energy in the frequency dimension)" (1970:3). The essentials of this classification can be presented as in Figure 1, overlooking for the moment the cross-classification which takes place at the phonetic level, for instance the functioning of tension in all three major systems, and the disputes about whether features which

function in the one system, for instance pitch, may be special cases of those functioning in another, in this case voicing (cf. Bierwisch, 1966: 139; Halle, 1972:180).

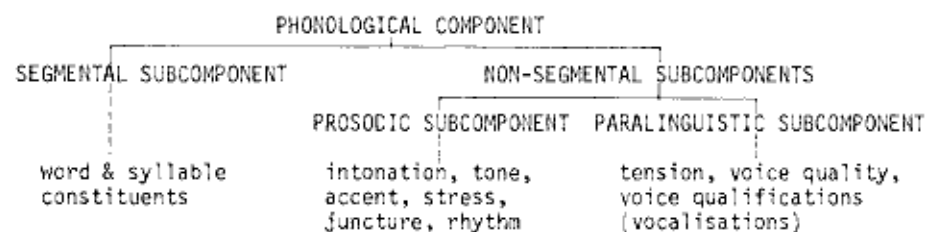


Figure 1: The status of intonation (adapted from Crystal, 1969:177)

Some of the difficulties of this kind of classification will be discussed in the section on structural definitions of intonation, below; the position of tone, for instance, is in many ways between the segmental and the prosodic subcomponents. For the sake of completeness, the kinesic (gestural) systems should be mentioned; these are not as 'non-linguistic' as is often supposed, the element 'non-vocal' in their definition being very unsatisfactory: vocal gestures, which is what articulations are, share in many of the roles which are played by non-vocal gestures, and there are a number of different areas in which non-vocal gestures may support or replace items from the more central areas of language (cf. Ch. 4 below).

The relation of the intonation levels of analysis to the others, particularly those within the prosodic levels, can be developed in terms of the three analytic categories; each of the items presented in Figure 1, like intonation itself, straddles all three of these categories.

1.2.2. 'Intonation' and type

The types which function within the prosodic systems are generally said to be "the features consisting of pitch, stress, and quantity" (Lehiste, 1970:1); these are auditory perceptual types, whose correlates in the other domains of phonetics will be sketched in the next chapter. There is a certain variation in terminology; Crystal, in his largely perceptually orientated standard work on the subject, takes "primary prosodic parameters, along which systems of linguistically contrastive features can be plotted" to be the "psychological attributes of sound described below as pitch, loudness and duration, which have a primary (but not an identifying) relationship with the physical dimensions of fundamental frequency, amplitude, and time respectively" (1969:5f.). Jakobson & Halle use related terminology (1956(1971:33)):

The three types of prosodic features, which, following Sweet, we term FORCE, QUANTITY, and TONE, correspond to the three main attributes of sensation - voice-loudness, relative subjective duration, and voice-pitch. The dimensions of intensity, time, and frequency are their closest physical correlates.

In an earlier definition, Jakobson, Fant & Halle (1952(1967:13)) distinguish between the inherent distinctive features, which do not require reference to two points in a time sequence, and the prosodic features, which do require reference to a time sequence; their restriction of the term 'prosodic' to the distinctive features proper will be discussed in the next section. This distinction does not appear to hold in all respects; for instance, the feature trajectories which characterise diphthongs, if the existence of diphthongs is recognised, can only be characterised with reference to the time axis; on the other hand, tonemic level pitches hardly require reference to a time sequence, any more than high, or low, or nasal vowels do. In the context of the 1956 definition, Jakobson & Halle introduce the time dimension in an entirely different, paradigmatic role, but with the same restriction to prosodic features (p. 37):

... both polar terms [of a prosodic feature] are fully recognizable only when both of them are present in the given sequence, so that the speaker effects and the listener perceives their contrast. Thus both alternatives of a prosodic feature co-exist in the code as two terms of an opposition and, moreover, co-occur and produce a contrast within the message. If the message is too brief to include both contrasting units, the feature may be inferred from the substitutive cues offered by the sequence; e.g., the quantity of a vowel in a monosyllabic message may be inferred from the relative duration of the surrounding consonants, and the register of a monophonic message, from the modulation span at the onset and/or decay of the vowel.

This formulation appears to suggest that every message either contains both terms of an opposition or else concomitant or substitute cues in each case indicating which member is present. This is surely going a little too far, however. On the other hand, it is a well-known fact that listeners require a brief period of orientation before being able to follow a stranger's speech confidently; this being the case, why should such a requirement be set up for the prosodically relevant types and not for others, such as vowel height or nasality? One aspect of this question is the old chestnut of whether absolute pitch levels, in any sense of the term 'absolute', may be said to play a role in intonation systems; the point will be discussed at the end of the next chapter; cf. §2.3.3.1.

In the various definitions of prosodic features which include a list of the associated phonetic types, the intonation systems are held to be associated with types within the perceptual dimension of pitch. Pitch values, and their variations in time, also cooperate with other types, however, in performing the functions of intonation, and conversely, pitch patterning is involved (primarily, in fact, in contradistinction to the traditional impressionistic view) in the accentual and rhythmic systems often associated with patternings of relative intensity in time. A useful notion for handling the relations between the different domains of the analysis is that of the 'major correlate'. It may be, and often is, the case that a given role may be played by sounds of a number of types, either independently by virtue of the mutual substitutability of these types, or else in configuration with each other. According to the functional criteria of analysis used, canonical forms based on these types will be postulated, with various structures associated with them, i.e. the intonational or accentual structures, and so on. One way of referring to these canonical forms is to select one of the types with which the canonical forms are

associated as its 'major correlate' in a different domain. The same applies to the relations between types from the different phonetic domains. The basis for such a selection is sometimes merely descriptive convenience: Crystal (1969:116n.) notes the discussion in Bolinger (1955) and O'Connor (1957a) about the utility for certain kinds of presentation of taking intensity as the "primary referent", as he calls it, for 'stress', despite the objectively more important role played by pitch in the 'stress' systems. Or there may be substantive reason for expecting, with Fry (1960; 1968), that "there may well be one perceptual dimension which carries more weight than others" (1968:371). Because of the ability of listeners to interpret a wide range of phonetic cues in a uniform way, regardless of which of them is greater in relative weight than the rest, it is a complicated matter to disentangle the wheat from the chaff. The notion of 'major correlate' is closely connected with the idea, developed in the Prague school, of the 'distinctive feature'; to speak of the distinctive feature is often an oversimplification: such a feature is generally the major correlate of some functional item in one of the senses just sketched, embedded in a configuration of phonetic types, the others of which are supporting 'cues' (Hill, 1961:460), or, in the Prague terminology, 'redundant features'. A terminological safeguard in referring to the various canonical forms at a particular level is to use a different term altogether; thus, a distinction in theoretical status is generally made between intonation and tone, two differently defined structural (here: phonological) terms, and pitch, frequency and rate of vibration, terms for what might be considered the major phonetic correlates of intonation and tone in the auditory, acoustic and articulatory (physiological) domains respectively. These examples represent something of an oversimplification; the question will be re-opened in the next chapter.

1.2.3. 'Intonation' and structure

The terms 'intonation' and 'tone', as used at the end of the preceding section, lead on to those types of definition of prosodic features which go beyond specifying the phonetic types involved, and incorporate references to the structural relations which hold between the various types to which an utterance may be assigned by virtue of the roles which these utterances may play. The relations referred to here are not so much those constituting the internal structure of intonation patterns, which are the product of the analytic criteria used for intonation, as those larger structurings into which prosodic systems enter with other language systems, based on more general criteria.

In this kind of definition, the canonical intonation forms, like other prosodic forms, are put into a relation with the canonical forms established at other levels of analysis; these are often, though not necessarily, associated with other phonetic types. Inevitably, such definitions involve pre-analysed forms which are to be used as *relata* for the prosodic forms. The kind of mapping between prosodic forms and the *relata* can be seen as a mapping on to a kind of structural metric for defining the relative length of the prosodic forms with reference to the others. The term 'relative' can also be taken to mean that the mapping is not on to the 'absolute' units of real time; though the structuring of phonological forms is likely to correspond to principles of temporal organisation (cf. Lehiste,

1970:39; 1970a); cf. §2.3.3. below. In particular the isochrony theory of rhythmical organisation, in which a mapping of prosodic sequences on to units of some kind of real or psychological time is postulated, will be taken here to be not proven (for discussion, cf. Crystal, 1969:161f.). The terms used for the *relata* of prosodic features vary. Harris (1944; 1951) uses the terms 'extension', 'stretch', 'length'; Pike (1945:24) uses the term 'distribution over phrases'; Wells (1945) uses the terms 'scope' and 'domain'; Halliday (1967) uses 'tonality' with respect to grammatical *relata*; Crystal (1969) uses 'length' and speaks of prosodic units being 'co-extensive' in varying degrees with other kinds of linguistic unit; Lehiste (1970) uses the term 'domain'. The term 'domain' will be used in the present study.

The kind of domain used in structural definitions of intonations varies according to whether the criteria of analysis utilised in establishing it incline more to the side of the phonetic types or more to the side of the functional roles. The two basic divisions in kind are between the grammatical and the phonological domains, and, within the phonological domain, between phonemes and other kinds of phonological unit.

Reference to the phoneme, generally in a negative context (in which the phoneme is said not to be the domain of prosodic features, is the source of the term 'suprasegmental' for these features, the phoneme being the minimal segment; Lehiste formulates this kind of definition in terms of "features whose domain extends over more than one segment" (1970:1); Fry (1968:365) gives a more expansive definition:

In the analysis of language structure it is generally convenient to consider the phonological level as being distinct from the prosodic level and to look upon the phoneme string in a given message as serving in some sense as a vehicle for the prosodic elements ... prosodic features would then be those features whose contrastive function embraces phoneme strings.

Similarly, Harris allowed that "in special cases a component (or its phonetic value) may extend over more than one phoneme" (1944(1957:127)); the following quotation from the same article shows the reliance on a pre-analysed *relatum* which is characteristic of one version of this approach, as well as the breadth of interpretation of the notion of 'suprasegmental', here as Harris' 'long components', which the approach allows (p. 128):

As a result of our past experience with languages, we may tend to scrutinize particularly the various stresses or pitches of each successive allophone in an utterance. However, we may also happen to note fixed patterns in the sequence of other features in successive allophones: e.g. a decrease in sharpness of articulatory movements from the beginning to the end of English utterances.

This kind of view of prosodic features is part of the Bloomfieldian heritage, in which the forms described within the prosodic systems are designated 'secondary phonemes', and are based on the phonetic types known as 'modifying features' (Bloomfield, 1933(1935:109)). Priority within the analytic category of type is given to timbre, and priority within the analytic category of structure is given to the primary or segmental phonemes of which timbre configurations are the major correlates. Assignment of this kind of priority has, no doubt, reasons which are to be found in the roles played by prosodic items; if priority were to be assigned on a

phonetic basis, it would be the reverse of that sketched here, since timbre is a function of an independently variable carrier frequency and its overtones, not vice versa.

Other views of the phonological domain of the prosodic features do not emphasise the phoneme, or the priority of non-prosodic items, to the same extent. Items such as the syllable, the phonological word, the phonological phrase, and so on, are taken in various theories to be the *relata* with which prosodic items are connected; frequently these *relata* are seen simultaneously as the points of reference for the description of the distribution of the variants of phonemes, as with Harris, and (though not without a certain amount of violence being done to his theory in the course of such an account) Firth, and sometimes these *relata* are seen as (potential) points of reference for the description of grammatical units (Pike, 1945 and elsewhere; Chomsky, Halle & Lukoff, 1955). For instance, Firth's conception of 'prosodies' and their relation to 'phonematic units' is based on the idea of a basic skeleton of consonant-vowel sequences, interpretable more as syllable-constituents than as rudimentary phonemes or even highly abstract archiphonemes, to which both the prosodies, as primary analytic units, and the phonematic units, as residues after the analysis of the prosodies, are related, and which in turn are often relatable to grammatical structure, at least in later developments of the theory. Harris' conception is superficially similar to Firth's, differing, however, in its analytic priorities and in certain theoretical assumptions (cf. below, §3.2.2.1.). Like Firth's, Harris' approach allows broader interpretations of what is meant by a prosodic feature or long component than is customary. Nevertheless, the flexibility of such broader conceptions is preferable to the more rigid kind of definition given by Trubetzkoy (1939(1958:127)):

Die prosodischen Eigenschaften kommen nicht den Vokalen als solchen, sondern den Silben zu.

Trubetzkoy himself later introduces more suppleness into his approach by allowing other kinds of unit to be the domain of prosodic features. The syllable, alternating from language to language with the mora, is then said to be the smallest domain of prosodic features; for the smallest domain he introduces a special term, Englished as 'prosodeme'. The term is introduced in the specific prosodic realm of timing (p. 179):

Mit Prosodem bezeichnen wir die kleinste prosodische Einheit der betreffenden Sprache, also die Silbe in silbenzählenden und die More in morenzählenden Sprachen.

In languages where the basic unit of timing, as well as of a number of other systems, is the phonological word, this definition would be taken to specify the word as prosodeme for those languages. One example of such a language is English. It should be noted that this definition of 'prosodeme' diverges from those which, analogous to the definitions of 'phoneme', make reference to the functions of particular phonological features; whether Trubetzkoy in fact intended the latter definition is a matter for Trubetzkoy exegesis, not for the present study.

Many attempts have been made to provide structural definitions of prosodic features which refer not to phonological items such as those discussed in the preceding paragraphs, but to grammatical items, which require a less restricted range of roles in their definition than do the phonological items. In view of the lack of double articulation involved

in prosodic systems (cf. p. 3 above), this kind of approach is perfectly understandable. Thus, the distinction between tone and intonation is not a phonetic one, and not simply a phonological one either; it is based on the specification of different prosodic structures with respect to different grammatical domains, namely: the word or morpheme, and domains larger than these such as the clause or the sentence, or even larger units. The definition of 'prosodic' given by Jakobson, Fant & Halle (1952) is narrower than the most widely accepted usage in that it is restricted to the domain of the morpheme; for Trubetzkoy (1939), for instance, it covers the whole range of non-vocally and non-consonantly employed features; Firth's broader conception has already been mentioned. For Jakobson, Fant & Halle, intonational systems would largely belong to the configurational features, and prosodic features such as tone and stress would be grouped with the 'inherent' features of timbre under the distinctive features, rather than with the other non-segmental features. Whorf's conception was very similar to this (1938(1969:126)): for him, phonemics consists of timbre phonemics (segmental phonemics) and prosodic phonemics, the latter involving "Syllabics, Length, Accent (stress, pitch), Tone", while intonation belongs to what he calls sentential semasiology, in particular the branch of it more conventionally known as grammar. Crystal, on the other hand, gives a definition which assigns the term 'prosodic' to precisely those features whose domains are not words (1969:5):

... we may define prosodic systems as sets of mutually defining phonological features which have an essentially variable relationship to the words selected, as opposed to those features (for example, the (segmental) phonemes, the lexical meaning) which have a direct and identifying relationship to such words.

The 'relationship' of which Crystal writes is a functional notion pertaining to the constitution of the double articulation of language; those features whose domain, in the structural sense under discussion here, is the word enter into this kind of relationship along with the segmental phonemes, namely: the 'prosodic' features of Whorf or of Jakobson, Fant & Halle, such as tone or stress. A system said by Wang (1971) to function within the scope of the word is that of contrastive stress, as opposed to emphatic stress, for instance, which is said to function within the scope of the sentence; the meaning of 'scope' as used by Wang cannot be the same as that generally used, however, whether the term 'contrastive stress' is meant in the sense of Bolinger's (1961) *explicata* 'contrastive accent' and 'contrastive stress', or in an entirely different (but not argued) phonetically characterisable sense. Contrastive stress, of the *PERsecution*, not *PROsecution* type can most adequately be seen as a special case of the contrastive use of accent involving a stress shift; but the contrastive use of accent is only describable with reference to domains at least as large as the sentence, and stress shift (i.e. the accenting of 'normally' unaccentable syllables) may also take place outside the domain of words (cf. the so-called 'weak forms' in English), though the item 'word' admittedly stands in need of further clarification.

It is very easy, as it turns out, for conflicting criteria to be adjoined in relating prosodic features to either phonological or grammatical domains. Just as phonetic types prove inadequate to define prosodic features since utterances may be assigned to particular types for different uses in different systems, the listing of the various varieties of domain,

phonological and grammatical, is inadequate also. Definitions incorporating phonological domains beg an essential part of the question, since these domains are frequently established as part of the analysis of the feature concerned; those involving grammatical domains are only valid to the extent that the same criteria of analysis are used for prosodic forms as were used in the establishment of the constructs based on 'timbre' forms which belong to grammar. In fact, however, the largely distributional criteria on which grammatical analyses are based, and even the roles, in this case the speech act types, with which grammatical forms and structures are associated in complex ways differ considerably from the criteria on which intonations, for instance, are established. It is therefore not surprising that what tendencies exist in the correlation between intonational forms and structures (e.g. contour types and intonation units) and syntactic forms and structures (e.g. sentence types and clauses, respectively) should only be very broad, and nothing like the correspondence often assumed in the literature (for evidence, cf. Fries, 1964; Crystal, 1969: 256ff.). The final criterion which Wells gives for the use of the term 'suprasegmental', over and above the phonetic and phonological criteria (that is "if, whatever their phonetic character, they [the phonemes] behave grammatically like a separate system" (1945(1972:137))) is only acceptable within the present approach if the word 'grammatically' is interpreted to refer not to the more central forms and structures of syntax but to the 'grammar' of the intonation, or suprasegmental, systems themselves. Martinet makes essentially the same point (1955:10):

If we indeed distinguish between two chapters called respectively 'phonemetics' and 'prosody', we do this, not because the substance of phonemes and that of prosodic features is objectively different, but because we get to them through two different analyses of the texts.

The criteria determining this difference are to be found in the different roles played by prosodically and non-prosodically used features, and there is no reason why structures established on the basis of different criteria should correspond in what Crystal refers to as an 'identifying relationship'. Essentially the same point is made by Bazell (1952), with regard to other areas of linguistic description, in his attack on what he terms the "correspondence fallacy" (cf. also §§2.4.3., 3.3.3.; Worth, 1964:698).

1.2.4. 'Intonation' and role

For a satisfactory definition of prosodic features, recourse must be had to the roles associated with these features, an essential subsection of the criteria of analysis which are used explicitly or implicitly in their description.

For many, if not most, analysts, the study of prosodic systems is one of the secondary concerns of linguistics. It was already mentioned in the previous section that some structural definitions of intonation involve a *relatum* for intonationally used features which is established on the basis of prior and more important criteria. This priority may in some cases be no more than a descriptive convenience; this appears to be the view taken by Bloomfield himself (1933(1935:109)), but for Harris (1944) this is clearly not the case. For Bloomfield, the 'modifying features' are the phonetic parameters involved in prosodic features, and correspond

to the three basic prosodic parameters. The same kind of terminological priority is given to the forms abstracted from these types, which are then known as 'secondary phonemes'; an indication, however, is given that the priority is rather more than a descriptive convenience, as the following excerpt shows (p. 109):

... most languages do recognize the distinction to this extent, that they use some of the modifying features as secondary phonemes - phonemes which are not part of the simplest linguistic forms, but merely mark combinations or particular uses of such forms.

This is indeed what they do, but the pejorative flourish obscures the fact that there is a great deal to be said on the score, and that they have other uses in their own right.

Another aspect of the same general line of attack is formulated by Hultzén (1962:658):

For the greatest part of intonation surely conveys no information whatever ... The tune that must accompany the words when spoken is merely appropriate, not informing. It is only when the intonation denies the straightforward meaning of the words that it can be said to have any function.

The problem here is again partly terminological; for if intonation can deny the "straightforward meaning of the words", then it must have meaning itself, and there is no reason why this meaning should disappear when it happens to be congruent with the meaning of other items embodied in the utterance, or when it happens to be used to underline or enhance these meanings. These matters will be dealt with under the rubric of 'normal' or 'congruent role' in §§1.2.5.3. and 4.2.2. below.

A more balanced view of the role of intonation is given in general terms by Wang. He discusses five ways in which prosodic parameters may be used with reference to the syntactic and lexical "levels of linguistic function", as he calls them; his view is therefore basically a 'structural' one such as those dealt with in the preceding section, but the way he formulates the role of intonation is of interest (1971:274):

For the expression of such notions as declarative statement, interrogation, hesitancy, irony, etc., the scope extends over the entire sentence. That is, the same set of rules assigns phonetic values to these parameters for the entire sentence. The term *intonation* is sometimes applied to this use of the parameters. In this sense, *intonation* provides the speaker with another channel of communication by means of which he can express a more personal commentary on the sentence he is producing. This use of the prosodic parameters is probably universal in human language.

Apart from the qualification already made regarding his strictly structural definition (cf. the *relatum* 'sentence'), and the necessity for clarifying the terminology, Wang's approach is in agreement, at this level of generality, with that of the present study. Another of the roles of prosodic parameters, one generally also ascribed to intonation, is described by Wang in the following terms on the same page:

Another function of prosodic parameters at the syntactic level is to configure speech into syntactic units of various sizes, e.g., words, phrases, clauses. Other phonetic parameters, usually laryngeal features such as glottal stop or aspiration, also correlate with the boundaries

of syntactic units, especially words.

Wang gives the distinction which may be made between appositive and restrictive clauses in English as an instance of this function; whether this marking is syntactic in the sense meant, or whether it marks a hiatus in the role structure of the utterance, is a debatable point. The other three uses of sounds assigned to types employed as prosodic features are describable within the systems of derivational morphology (subject vs. subject); contrastive stress (said by Wang to operate within the scope of the word, a view criticised in the previous section) as opposed to emphatic stress, said to operate within the scope of the sentence (symbolised on p. 13 above by capitals, rather than accents, without regard to the contrastive-emphatic distinction); and finally lexical stress (and presumably, though not for English, tone), which is not predictable from syntactic categories. A similar, though three-way, classification is given by Léon in his survey of the field (1972:124ff.), using both structural and functional definitions, albeit in different areas: on the one hand relating the functions of intonation to the levels of the 'monème' and the 'phrase' or 'syntagme', and on the other referring to the expressive function of intonation.

One of the most well-known classifications of phonological features, already referred to in passing at various points, is that of Jakobson, Fant & Halle (1952); their classification (presented in diagrammatic form in Figure 2) goes considerably beyond those already considered, but is also in its essentials structured according to functional criteria. The

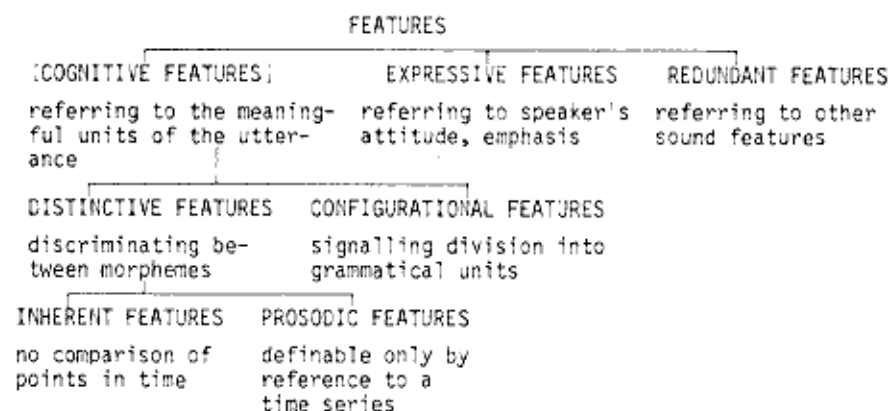


Figure 2: The feature classification of Jakobson, Fant & Halle (1952). [The term 'cognitive feature' is my ad hoc coinage to fill a terminological gap in the J.F.&H. system. DG] See text for clarification of arrangement.

authors give no more information about the interrelationships between these systems of features than is summarised in this diagram; it should be clear, however, that there is both overlap between categories, and cross-classification, which complicates the issue somewhat. The role of marking configurations is, for instance, in the light of Firth's views, one which the redundant features, apart from those in free variation, and

to some extent the inherent features, by virtue of their 'defective distribution', might be said to play. The expressive features overlap considerably with the configurational features, which include the intonational junctures. Nevertheless, the range of different functions which has been postulated at various times for phonological features is clearly in evidence. The central phonological function is to provide those features functioning within this category which are perceived in terms of a trajectory along the time dimension (with the qualifications mentioned above in §1.2.2.) are given special status as prosodic features (cf. also §2.2.5. below). The other main functions are configurative and expressive. The motivation for Jakobson, Fant & Halle's narrower use of the term 'prosodic' is, therefore, like that for Whorf's, functionally motivated, whereas the general tendency is otherwise to look for a phonetic basis.

This classification continues and reflects (although the relation is not one-to-one) the three-way distinction made in the Prague school between the distinctive, the culminative and the delimitative phonological features (e.g. Trubetzkoy, 1939(1958:29)), blended with the Bühlerian functions of language as a whole, i.e. expression, representation and appeal, which influenced the thinking of the Prague school. Although these three overall functions play a part in the analysis of language at all levels, the functions of expression and appeal are particularly important at the levels of intonational analysis; of the specifically phonological functions, culmination and delimitation are configurative, in the Jakobson, Fant & Halle terminology, though doubtless with expressive function, too. The association between the representative function and the 'central' areas of language, namely grammar and lexicon, which are associated with the distinctive features themselves is, though complex, not to be denied.

Daneš, of similar theoretical persuasion, introduces more detail into the description of the functions of intonation, one of the specific systems to which the preceding more general analyses pertain. Initially, he makes a binary division between the primary (or 'structural') functions of intonation and its secondary (or 'modal') functions; this division does not correspond exactly to the traditional one made in the pedagogical literature between the intellectual and the emotional functions (cf. e.g. Schubiger, 1935), though the two overlap considerably. A number of aspects of Daneš's analysis re-emerge in the work of Halliday (1967; 1966-8). The first of these subfunctions is characterised by Daneš in the following terms (1960:44):

A word or succession of words, in becoming an utterance, ends in a certain type of final intonation pattern. In regard to an utterance in isolation, intonation thus integrates the utterance; in regard to connected discourse the intonation delimits the utterances from each other and at the same time segments the connected discourse.

This is clearly a development of the configurative function. The second primary subfunction is outlined thus (p. 45):

The second function of intonation is to signal the integration of the two fundamental thematic parts of utterance, called the 'thème' (the thing already spoken about) and the 'propos' (what is said about the thème).

This function, also part of the configurative system, was not explicitly mentioned by Jakobson, Fant & Halle; it corresponds for the most part to the older notion of culminative function, particularly in the accentual

system.

The secondary functions, in general tallying with Jakobson, Fant & Halle's expressive functions, though incorporating aspects which would, for these scholars, be counted among the configurative functions, are characterised thus (p. 48f.):

The most important secondary function of intonation is to characterize the utterance according to its intention; this function may be labeled as the principal modal function. It is distinguished from the subsidiary modal function, which belongs to the sphere of expressiveness and indicates the so-called subjective modality, i.e. emotionality.

For Daneš, in common with a number of others in the Prague tradition, the secondary functions are organised dyadically, rather than triadically in the original Bühnerian manner (cf. the graphic representation in Figure 3). It is more than doubtful whether the more hyponymic categories of Figure

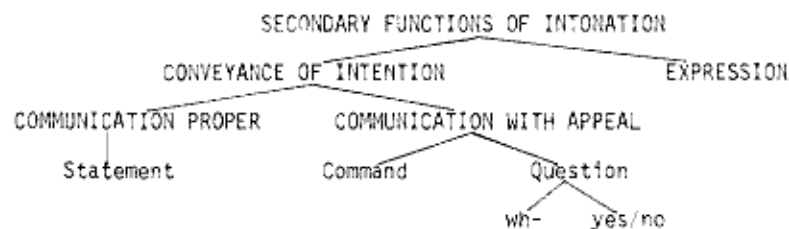


Figure 3: Representation of Daneš' classification (1960) of the secondary functions of intonation.

3 are conceived as genuinely functional rather than formal categories; the selection is more closely associatable with grammatical categories than with speech act types. It may also be queried whether expression and appeal are as distinct as the branching classification indicates; a more complicated network of mutually intersecting systems is necessary for an adequate description. The only indication which Daneš gives that this is likely to be the case is in the following remark (p. 52):

Expressive intonation may operate only in such a way as not to interfere with the basic communicative intonation.

How this kind of interaction is to take place is not discussed, however. In the present study, a different range of categories will be introduced in the discussion of these matters, some of which originate in recent developments in speech act theory. Nevertheless, Daneš' distinction between the structural and modal functions of intonation provides a useful basis for characterising one of the most important subdivisions of intonational systems: that between the accentual systems, and the systems which might, following Bolinger (esp. 1958), be reckoned as intonational in the narrower sense. The more comprehensive of these definitions of intonation will be followed in the present study, though most emphasis will be placed on the non-accentual aspects, and Bolinger's useful distinction will be used in the relevant sections.

Bolinger himself has, in a recent study, presented a summary of the functions of those prosodic systems in which pitch is used which differs

from many other accounts in that a basically dyadic classification principle is abandoned in favour of a more-or-less linear alignment of four basic kinds of role along a scale of grammaticisation. It is not quite clear whether 'grammaticisation' means 'correspondence to the syntactic systems' or simply 'regularity'; the former is perhaps the most likely. It is worth quoting his summary, in which each of the systems where pitch is used is referred to as a 'layer', in detail (1970:109):

Not only is pitch a layer that interacts in complex ways with the other layers of language; it is also layered internally. Four layers (according to this theory) can be distinguished.

1. A rather highly grammaticized layer, including accents (syllabic prominence per se), terminals (rise, fall), and levels (parentheses, paragraph and other discourse divisions).

2. A partially grammaticized layer, covering the behavior of accented syllables in relation to reference points (which may include other accents). This is the layer of "controlled" affective meanings: the speaker conveys his attitudes and along with them the information that they are part of his message.

3. An ostensibly ungrammaticized layer, that of the behavior of unaccented syllables. Here are the "uncontrolled" affective meanings: the speaker conveys his attitudes and along with them the information that they override his message ...

4. A genuinely ungrammaticized layer, that of levels dictated by emotion: wide or narrow range, extra-high pitch, etc. ...

In this classification, functional and structural aspects are combined in the definition of each system; the forms in each system have various manipulations of pitch as their major correlate. This particular analysis has influenced the basic orientation of the present study to no inconsiderable extent. It is not inconsistent with the other, dyadic, analyses, but provides in addition to any further structuring which may be made the important insight that the various intonation systems are closely interwoven, by virtue of their association with a single phonetic parameter, and that this texture is reflected in the relationship between the different kinds of role which utterances assigned to particular intonations are said to play.

Apart from those approaches to the description of intonation in terms of roles, and within the field of linguistics itself (though frequently under the influence of various schools of psychology, or of a vague psychologism, a number of relevant ideas have emanated from the recent philosophy of language. Philosophers of language have never been primarily concerned with intonation, but in the course of descriptions of roles associated with other language devices, functional parallels have sometimes been drawn between these devices and intonations. The following short survey of the views expressed by philosophers of ordinary language will be followed by an outline of some applications of semiotic categories to these problems.

Practically all the views to be found in the work of philosophers of ordinary language are directly relatable to received views on accent and intonation, and are more than covered by the accounts already discussed. Nevertheless, many of them differ from these in being embedded in more explicit accounts of the roles of utterances, though some remain at the 'tone of voice' stage. There are numerous instances of the latter in

Wittgenstein's *Philosophische Untersuchungen*, e.g. "in erfreutem Tone" (§541), "in lächelndem Ton" (Pt. II, 1), or the following allusion to styles of intonation (Pt. II, XIII):

Und wie wird er in Zukunft wieder wissen, wie erinnern tut?
(Dagegen könnte man vielleicht von einem Gefühle "Lang, lang ist's her" reden, denn es gibt einen Ton, eine Gebärde, die gewissen Erzählungen aus vergangenen Tagen angehören.)

This is false, if by "angehören" is meant an identifying relationship (cf. p. 20 above), though there is undoubtedly a complex relationship between intonations and styles (cf. Crystal & Davy, 1969). Other types of reference can be conveniently dealt with using the divisions introduced by Daneš and discussed above on pp. 27f.

Waismann (1965:281) points out the integrating function of intonation (to use the Daneš terminology) in his discussion of how propositions are expressed:

The first noticeable feature of sentences which we may consider, and one which certainly underlies our unanalysed concept, is the intonation with which they are spoken. Try reading a few longish English sentences backwards. It is immediately evident that they have lost their peculiar sentence-like characteristics - the rhythm, and the way in which the words support one another, as it were, like the stones of an arch. In this way we can quickly and easily distinguish a sentence from a mere mixture of words. (And this is probably also the reason why we speak of senseless or meaningless sentences.)

This use of intonation as a criterion for sentencehood has a long history, though it is not always clear what the status of 'sentence' is (cf. Karcevski, 1931; Nehring, 1946:201). One of the more recent instances is Chomsky (1957:16). In discussing his now well-known paradigm sentences for the grammaticality-meaningfulness distinction ("(1) Colorless green ideas sleep furiously. (2) Furiously sleep ideas green colorless", p. 15), Chomsky suggests that the two can be distinguished by means of psycholinguistic criteria, inter alia, and that "a speaker of English will read (1) with a normal sentence intonation, but he will read (2) with a falling intonation on each word; in fact, with just the intonation pattern given to any sequence of unrelated words." The Chomsky and Waismann examples are identical, though for Chomsky, in contrast to Waismann's view, the integrating function of intonation has less to do with collocational semantics than with 'grammaticality'; however, there is absolutely no reason why Chomsky's paradigm sentences should not be spoken with identical intonations, the first with the falling intonation on each item, the second with a single contour instead of the falling phrases which Chomsky postulates (rising phrases are more characteristic of this kind of list, incidentally). The contour depends on the role structures in which the utterance is embedded, which also affect the syntactic structure; they are not simply indicators of sentencehood, though they may coincide with grammatical arrangements.

The involvement of intonations (more precisely: of accentual structures) in the theme-rheme structuring of utterances is hinted at, though only in terms of the rheme (Pike's "center of selective attention", 1945: 44), by Wittgenstein in the course of describing an elementary teaching process (§145) involving mathematical series:

Ich führe ihn nun weiter in der Reihe und lenke seine Aufmerksamkeit auf die Wiederkehr der ersten Reihe in den Einern; dann auf diese Wiederkehr in den Zehnern. (Was nur heißt, daß ich gewisse Betonungen anwende, Zeichen unterstreiche, in der und der Weise untereinander schreibe, und dergleichen.)

Austin (1953(1970:141)) came extraordinarily close to providing a descriptive apparatus for this particular use of intonation, the second of Daneš' primary functions. Dealing with what he calls "direction of fit", Austin classifies "performances" or utterances of sentences according to whether the item is "given" in the speech act concerned and the predicate assigned to it is "produced", or vice versa (this brief account does a certain amount of violence to the subtlety of Austin's account, but the other distinctions with which he cross-classifies speech acts are not pertinent to the description of intonation). These terms are reminiscent of the terms 'given' and 'new' ('datum' and 'novum') traditionally used in this area of language description, and indeed his examples (p. 145) of the way a hearer might correct erroneous assertions, depending on their direction of fit, show the role of intonational pointing:

In another way, we might bring out the similarity between placing and stating on the one hand (where the item referred to by the subject is "given", and the predicate is "produced". DG) and between instancing and casting on the other (where the predicate is "given" and the item referred to by the subject is "produced". DG): to a misplacing or a misstatement we respond with 'But 1227 isn't a rhombus', but to a misinstance or a miscasting we respond with 'But 1227 isn't a rhombus'.

In the original version (a lecture) the underlined elements, as 'new information', would no doubt have been accented. This issue will be touched on again in more detail in Ch. 3; the interest of Austin's approach lies in the way in which he combines the roles of utterances which underlie their theme-rheme structure in a formal model with the other kinds of role which constitute speech acts.

The secondary functions of intonation have also received attention. Wittgenstein presents a language game (model of a particular kind of use of language) in the *Untersuchungen* in which he abstracts away from any putative role of intonation in signalling the differences between utterance types in the traditional sense, and rightly so (§21):

Was ist nun der Unterschied zwischen der Meldung, oder Behauptung, "Fünf Platten" und dem Befehl "Fünf Platten!"? - Nun, die Rolle, die das Aussprechen dieser Worte im Sprachspiel spielt. Aber es wird wohl auch der Ton, in dem sie ausgesprochen werden, ein anderer sein, und die Miene, und noch manches andere. Aber wir können uns auch denken, daß der Ton der gleiche ist, - denn ein Befehl und eine Meldung können in mancherlei Ton ausgesprochen werden und mit mancherlei Miene - und daß der Unterschied allein in der Verwendung liegt. (Freilich könnten wir auch die Worte "Behauptung" und "Befehl" zur Bezeichnung einer grammatischen Satzform und eines Tonfalls gebrauchen; wie wir ja "Ist das Wetter heute nicht herrlich?" eine Frage nennen, obwohl sie als Behauptung verwendet wird.) Wir könnten uns eine Sprache denken, in der alle Behauptungen die Form und den Ton rhetorischer Fragen hätten; oder jeder Befehl die Form der Frage: "Möchtest du das tun?"

The danger of false generalisations involved in naming intonations accord-

The view that intonations are used to mark what are traditionally known as the utterance types was held by Austin, who speaks of "primitive devices in speech" (1962:73) as having roles to play which are similar to those which may be played by the explicit performative formulae. He discusses six kinds of such devices: mood; tone of voice, cadence, emphasis; adverbs and adverbial phrases; connecting particles, titles, &c.; accompaniments of the utterance (i.e. gestures); and finally, the circumstances of the utterance. The latter can, however, hardly be regarded as "primitive devices in speech"; they belong to an entirely different category of analysis. Of the tone of voice, cadence and emphasis, Austin makes the following remarks (p. 74):

(Similar to this is the sophisticated device of using stage directions; for example, 'threateningly', &c.)

Examples of this are:

It's going to charge! (a warning);

It's going to charge? (a question);

It's going to charge! (a protest);

These features of spoken language are not reproducible readily in written language. For example we have tried to convey the tone of voice, cadence and emphasis of a protest by the use of an exclamation mark and a question mark (but this is very jejune). Punctuation, italics, and word order may help, but they are rather crude.

Austin rightly points out the imprecision involved in such an approach (note that the notation is that of Bloomfield, 1933; cf. §3.2. below); it is possible that he used this paradigm of speech acts as labels for the stock contours of English, falling, rising and falling-rising, of which it is well-known that they are neither characteristic of nor solely used in these speech acts. Though the intonation contribution towards constituting a speech act is clearly not to be denied, it cannot per se be held to mark illocutionary force.

Nevertheless, this view was taken up by Searle and has become an unquestioned commonplace of post-Austinian speech act theory. Searle, for instance, contrasts the proposition-indicating elements and the function-indicating devices, which mark the illocutionary force of the utterance, both of which combine in the structure of sentences. He then claims the following (1969:30):

Illocutionary force indicating devices in English include at least: word order, stress, intonation contour, punctuation, the mood of the verb, and the co-called performative verbs. ... Often, in actual speech situations, the context will make it clear what the illocutionary force of the utterance is, without its being necessary to invoke the appropriate explicit illocutionary force indicator.

No evidence is offered for this view, and the notion of force indication remains very vague; it appears to be simply adopted, though in a considerably more uncritical version, from Austin's presentation. A carica-

Still within the secondary or modal functions of intonation, in the terminology, and much nearer the truth than the 'illocutionary' view of the roles of intonation, is the observation made by Wollheim in discussing the "reduction of perceptual claims" made about material objects as to refer more and more to the sensory circumstances of perception. Wollheim makes three kinds of distinction between this kind of reduction and other ways of pairing speech acts. First, he distinguishes between the reduction of a claim and the correction of a claim (the former never being a contradiction); second, between the reduction of a claim, i.e. making a smaller claim, and making a claim about something smaller (e.g. a part, such as a branch rather than a tree); third, the following (1954(1967:54)):

Finally, we can, I think distinguish between reducing a claim and asserting the claim more tentatively or less emphatically. There are various ways in which we can, as it were, 'mute' a claim that we have made: either by the tone of voice or by prefacing it with expressions such as 'possibly', 'perhaps', 'I think that ...'

Austin had already made a similar point (1946(1970:91)), claiming that the distinction "can be brought out by italics, though it is not really so much a matter of emphasis as of tone and expression, of confidence and hesitancy". It is this kind of role, rather than the less elementary one of illocutionary force marking, which intonations play; via the analysis of illocutionary forces into more elementary components of this kind, a certain correlation of role and intonation such as the received views suggest might be made, though a direct correlation is, as implied in Wittgenstein's language game with the five flagstones (p. 33 above), to be excluded.

Where intonation is discussed in such contexts, it is regarded as being in a system close to that of grammar. In terms of the levels of analysis, as they really are, to which Austin assigns speech acts, intonations belong to the "phatic act", i.e. "noises of certain types belonging to and as belonging to a certain vocabulary, in a certain construction, i.e. conforming to and as conforming to a certain grammar, with a certain intonation, &c." (1962:92), rather than a "phonetic act" or a "rhetic act", the former relatable to the analytic category of type, the latter to certain aspects of the analytic category of role (the terminology appears to be derived from Peirce, though Bloomfield also has similar terms). Likewise, Ryle, in the context of distinguishing between 'language' and 'speech', makes the following remark (1961(1968:109)):

A Language, such as the French language, is a stock, fund or deposit of words, constructions, intonations, cliché phrases and so on.

In the context of his discussion of verbal slips, he makes a similar classification (p. 112). This approach (though outdated as an overall model of language - cf. Chomsky, 1965:4, referring to de Saussure) is one of the standard ways of looking at intonation, of which many instances were given in §1.2.3. above; an approach in which intonation is regarded as part of the same system as grammar is a special case of one in which the forms of

intonational systems are defined with reference to a domain of grammatical forms.

Attempts have also been made to refer intonations to semiotic categories; this is the third main approach, after the Prague approach and the family of approaches found in the philosophy of ordinary language. Apart from Peirce's "indefinite significant character such as the tone of voice" which "can neither be called a type nor a token" (cf. 1923:280), where such matters are excluded from his general doctrine of signs, many of the categories used in the description of intonation are related to those used in establishing the basic Peircean distinction between index, icon and symbol. A very useful distinction in these terms is given by Huttar (1968), for instance, who distinguishes between the uses of intonations as symbols and indices. He illustrates the distinction with reference to a possible utterance of *It's real exciting* in order to convey excitement (1968:233):

The increases in fundamental frequency and intensity are used as symbols of the speaker's excitement, just as are the adjective *exciting* and the intensifier *real*. If the same increases occur because the speaker's excitement induces physiological changes which are reflected in these increases, on the other hand, then the higher fundamental frequency and greater intensity are functioning as indices of the speaker's emotional state.

In this way, Huttar relates the old distinction between the natural and the arbitrary uses of intonation to an explicit semiotic framework; Trojan (among others) had previously used such distinctions in his work, writing (1957:439) that

intonation, which seems to be primarily dependent upon the vegetative reactions and the mode and strength of muscular tensions, in language becomes to a certain extent autonomous (e.g. in the pitches of the tone languages or in the different forms of prosodic features)

in this connexion. Huttar goes on to use the distinction to pare down the domain of linguistic analysis of intonation by excluding the indices from this domain on the following grounds (p. 235):

Inasmuch as these indexical features of speech are derived from psychological and physiological factors assumed to be universal among humans, they are non-conventional, and non-linguistic.

The grounds for the exclusion are somewhat arbitrary, however, for a number of reasons. First, every description of language makes its *a priori* assumptions about what kinds of fact and what kinds of method are likely to be useful; these have been taken to be hypotheses about "psychological and physiological factors assumed to be universal among humans", but their categories are no less linguistic for that: cf. Chomsky's discussion of "a theory of language, regarded as a hypothesis about the innate 'language-forming capacity' of humans" (1965:30). Second, there is likely to be a scale of functions of intonation varying from indexical to symbolic uses, as Bolinger's theory suggests (cf. p. 19 above). Third, the association of conventionality with the single dimension of indexicality and non-indexicality, and of universality with the same dimension, is a rather limiting view. There are a number of further distinctions to be made in this connexion.

First, it is not clear why the third member of Peirce's trilogy, the

icon, is not invoked alongside the index and the symbol. It seems obvious that all the conditions for the status of intonational signs as icons are fulfilled in those cases where emotive symbols are said to refer to emotive indices as "a prosodic sort of onomatopoeia" (p. 238), or where it is maintained "that emotive symbols tend to reflect the gradient nature of the referents which they symbolize, namely, emotive indices" (p. 238), bearing in mind that icons are signs which are qualitatively or structurally similar to their referents. It goes without saying that many indices are also iconic in this sense, and that many, if not all icons are to some extent conventional. It would seem useful in the present context to reanalyse Peirce's trilogy in terms of two mutually cross-classifying dimensions, as represented in Figure 4. A footprint, for instance, would

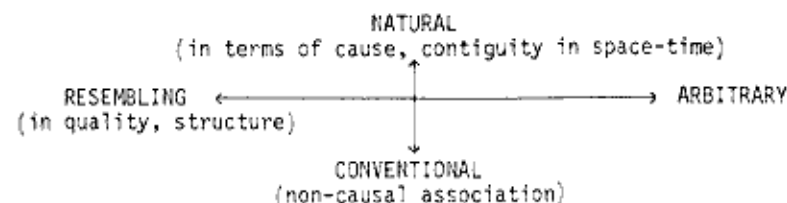


Figure 4: Proposal for a reanalysis of the icon, index, symbol trilogy.

simultaneously have the values 'natural' and 'resembling', being positioned in the top left-hand corner of this elementary quality space. An icon would be positioned towards the bottom left, on the other hand, and a symbol at the bottom right. What is frequently known as a 'symptom' will vary in position from top left to top right according to the degree of resemblance between sign and signified, e.g. between the rise and fall of a barometer or other measuring instrument and what it measures, on the one hand, and between, say, a lighted window and someone's being at home, on the other (Waismann's example, 1965:127f.). Figure 4 abstracts away from many important subdistinctions, of course; there are many possible subvarieties of natural relationships, and many possible kinds of resemblance, a number of which operate in the accentual and more narrowly intonational systems of language.

Second, and very closely associated with the first set of distinctions, is the issue of whether linguistics is only concerned with discrete structurings, not with continua. This issue, which is inevitably raised by the study of intonation, has been made most explicit by Bolinger (1961), and resolved by him in favour of dealing with 'gradience' as well as the 'all-or-none' in linguistics. The particular type of gradient found in the area of intonation is closely connected with the aspect of resemblance between sign and signified: though discrete structurings may have 'iconic' aspects (cf. Chomsky, 1965:11, 225), it is the gradient areas which have a particularly close connexion with iconicity. A striking instance of the combination of iconic with gradient structure is to be found in the following fact on the fringe of the accentual system of German, described by Trim (1964:378):

The height of the prominent syllable of a minor tone-group in German, like the height of the head in English, appears to be a clear case of

the representation of some kind of semantic continuum by a parallel phonetic continuum established in a particular phonetic dimension.

Though Trim draws a parallel to the functioning of measuring instruments, thus emphasising the indexical, not the iconic element, the kind of relationship between the pitch height and the degree of relative thematic importance can hardly be regarded as 'natural' in the sense of 'causal', &c. (cf. Figure 4); it is not so much a speaker-based causality as a hearer-orientated creation of relative prominence which is involved. This is a very special kind of 'naturalness' which will be seen to hold in many areas of intonation; since, however, relative 'depth' may also pattern in a similar way (cf., for instance, Bolinger, 1970:115), the relation is not entirely natural in the simple sense of 'increased pitch, associated with increased acoustic energy, signalling increased importance. It seems more appropriate to regard the iconic element as the major aspect of this kind of role structuring, rather than the indexical. It is of interest, but not so far noted in the literature, that strictly indexical signalling, in the sense under discussion here, tends to be associated with a physicalistic mode of perception, as opposed to the phenomenistic mode associated with the analytic category of type, or the hermeneutic mode associated with the analytic category of role. One might say, for instance, that one perceives an excited individual, much as one might say one perceives an aeroplane, rather than an excited utterance or a particular kind of drone, respectively. This is far from being an iron rule, but studies on linguistic topics show time and again (pace Grice) that the more conventional kind of utterance tends to be seen phenomenistically or hermeneutically as some kind of disembodied entity associated with a message, and abstracted from its originator.

All of the models of intonational role structure which have been presented here formulate some of the truth; a more comprehensive account than any of them taken individually will have to extend the model with maximal methodological explicitness to cover the insights of the model with maximal empirical content. An attempt to utilise some of the methods of post-Austinian speech-act theory, coupled with close observation of the way in which phonetic types are to be assigned to roles will form part of the final chapter of the present study. A prior examination of structural definitions will be made for their heuristic value, but the main emphasis will be on the establishment of criteria for intonation analysis which are not a priori dependent on those set up for syntactic analysis.

1.2.5. 'Normal intonation'

The literature of linguistics and its neighbouring disciplines contains abundant references to a descriptive category known as 'normal intonation'; all too often, the references show a sloppy lack of concern with the status of this category, both with regard to the term 'intonation' and with regard to the term 'normal'. The range of the first of these terms has been sufficiently sketched in the preceding sections; the range of the second, and of the complete locution, is still in need of analysis. There is, to judge from the extensive reliance of linguists on the category of normal intonation even as a criterion of analysis in syntax, a widely held conviction that such a category has some kind of basis in experience; indeed, whole projects of analysis have been based on the

assumed ability of native speakers to supply a predicate "having normal intonation", and to produce such utterances on command (e.g. Wade, 1966). The notion of a norm is so complex, however, as to warrant some suspicion about the validity of approaches which treat the category as an unanalysed, simple predicate; for this reason, an outline of an approach which is sufficiently detailed for present purposes will be developed here. The degree of consensus concerning the category is not necessarily an absolute criterion for its descriptive utility, but it does warrant the provision of a more detailed analysis. The position maintained will be that of a cautious acceptance of the notion, and the analysis will have the status of a set of clarifications (as a preliminary step to explication) of 'normal intonation' based on the three major analytic categories of role, structure and type.

First of all it is necessary to make a coarse distinction between the prescriptive norms employed in various quarters, and the descriptive norms relevant to the present task. The distinction has often been belaboured in studies of language, and has become something of a cliché; it is perhaps not as clear-cut as the cliché would have it, however, since some kinds of prescriptive norm fall within the domain of linguistic discourse, contrary to received opinion. It is possible, for instance, to distinguish between the pragmatic prescriptive norm, which provides the basic motivation for learning any new language or dialect, as a means to an (often only vaguely specified) end, and which is a major component of many branches of applied linguistics, and the more naive kind of prescriptive norm on the other hand which may conveniently be referred to as 'ethical'. This kind of norm is a basic category in naive or 'folk' linguistics, and involves judgments about 'good' and 'bad' ways of speaking, about the U and non-U or insider and outsider dimensions on the one hand, and the more restricted dimensions of 'clean' and 'foul' (i.e. taboo) language on the other. It might be held that the ethical variety of prescriptive norm includes the pragmatic variety; this seems intuitively plausible. All of these varieties and subvarieties of prescriptive norm are, of course, to be found in judgments about intonations as well as in judgments about other aspects of language (cf. the paralinguistic folk linguistic judgment 'dirty laugh!'); basically, they are naive characterisations of certain complexes of roles which sounds may be made to play in utterances and can be dealt with alongside other characterisations of, for instance, stylistic or aesthetic norms and those norms against which the humorous use of language is measured, as explicanda for linguistic investigations (cf., e.g., Labov, 1966, who compares such folk linguistic judgments with actual performance).

The kinds of norm which are meant by users of the term 'normal intonation' are, however, descriptive norms which are in general only accessible to fairly sophisticated linguistic machinery and thus determined in part by methodological decisions; in my experience they do not play the slightest role in folk linguistics (with the possible exception of judgments on foreign accents, or dialect pronunciations which diverge from the received system of a speech community), unlike ethical norms, though they do of course play a significant role in applied linguistics. Here it is often difficult to sort out the descriptive from the prescriptive norms, however, for reasons connected with the motivations (often distinct!) for language learning and language teaching; for instance, many of the pedagogical textbooks on the market show principles of selection which are

strongly influenced by their deference to particular restricted styles such as that of reading aloud, or that of academic small-talk, without regard for the communicational needs of their addressees, which are rarely orientated towards this kind of stylised or prestigious behaviour. The main descriptive norms will be clarified in the following subsections; in order to illustrate, and at the same time avoid, the common but erroneous tendency to infer simple correspondences between roles and types in using the term 'normal intonation', advantage will be taken of the distinction already introduced between the analytic categories of type, role and structure; the domain of discourse will be split three ways, into an area covered by the term 'normal type', one covered by the term 'normal structure', and one covered by the term 'normal role'.

1.2.5.1. 'Normal type'

One possible interpretation of the term 'normal type' with reference to intonation is the quality of speech-likeness which is important in studies of speech perception and in particular in analytic methods which make use of speech synthesisers (in connexion with pitch, cf. Lehiste, 1970:81; also, congress discussion following Isačenko, 1967). A second, and in the present context more appropriate interpretation (despite the methodological importance of the first) is a designated or reference value of a phonetic variable. A phonetic variable (the terms 'parameter', 'feature', 'dimension' might just as well be used) is a paradigmatic mode of organisation of types; the following definition of natural variables (as the more general term) and their variants is given by Cohen (1970: 36f.):

... any set of observationally identifiable kinds, characteristics or circumstances of which the descriptions are either contrary or contradictory to one another. ... The kinds, characteristics or circumstances constituting a natural variable may conveniently be termed its 'variants'.

Natural variables have, in various terminological guises, always been recognised within the conceptual apparatus of linguistics, as in other disciplines; the term 'natural variable', rather than 'feature', for instance, is perhaps more suited to the present discussion because of its relative neutrality (though it should not be confused with the logical or mathematical term 'variable'): 'feature' has a whole series of closely related, but slightly different interpretations associated with it which could obscure the present discussion. Those natural variables which are postulated for the paradigmatic organisation of phonetic types can conveniently be referred to as 'phonetic variables', and, analogously, empirical variables at other levels of analysis will receive the name appropriate to that level.

The descriptive device of the phonetic variable can be used fruitfully to clarify the notion of normal type. Of all the types which are the variants of a phonetic variable, one may be designated as the normal type; this designation may proceed, of course, according to any of a number of criteria. This construction, involving phonetic variables with one variant designated as 'normal', corresponds to those parts of phonetic and phonological theories which deal with the notion of markedness: the criteria of analysis determine what kind of markedness is involved, i.e.

on what basis the normal, unmarked variant of a variable is selected, after an antecedent analyses has established the relevant variables and variants. This interpretation of the construction illustrates the neutrality of the term 'variable' as against the term 'feature': in some versions of the Prague school, the normal variant is referred to as the 'absence of a feature' and the abnormal variant (binarity is assumed) is referred to as the 'presence of a feature'; in others, particularly in generative phonology, the variable itself is known as the 'feature', whose 'specifications' denote the variants. There is no *a priori* reason why the model should only make provision for one (or any) designated variants, or why there should not be degrees of normality according to the position of variants along a continuum (as a particular kind of ordering of the variants), or why a variable should be assigned to two variants, i.e. a pair of contradictories, rather than three or more, i.e. a set of contraries; only some of these possibilities were entertained by Trubetzkoy (1939). Any decision on these matters requires the use of empirical criteria if it is not to be an arbitrary codification of the facts.

Many kinds of criterion have been used to designate normal, or unmarked types; as Bazell (1952) shows, there are as many kinds of markedness as there are kinds of criterion used. Some of these kinds of criterion are listed by Postal (1968:169ff.): (1) relative generality of distribution among all languages; (2) relative frequency and differential predictability within particular languages; (3) appearance in position of neutralisation (the original criterion given by Trubetzkoy); (4) diachronic and diatopic facts concerning the merger of non-normal types with normal types; (5) evidence from first language learning and language pathology; (6) evidence from physiological and perceptual investigations. A similar compilation is given by Fromkin (1970:31), omitting the fourth of Postal's series. Crystal (1969:141n) mentions the frequency criterion as well as (7) relative morphological complexity; (8) semantic neutrality (of the dog vs. bitch type, where one of the variants denotes both a genus and one of the species, while the other denotes just the other species); and (9) notational markedness, i.e. a decision to represent certain variants and leave one not explicitly represented in a transcription. The last of these is sometimes taken to reflect one of the other types of markedness, as in the transcription theory of Chomsky & Halle (1968:400ff.), where the principle forms part of a metatheoretical evaluation measure. The account which has the greatest methodological clarity is Bazell's (1952(1966:277)):

But there are many ways in which a form may be unmarked. The more frequent form is unmarked in respect of frequency; the form which serves as simplest starting-point for derivations is unmarked derivationally. The shorter form is unmarked in respect of length; the paradigmatically more highly differentiated form (e.g. the gender which permits most distinctions of case) is unmarked in another respect. When all relations of "markedness" (or the vast majority) coincide, then indeed we may talk of the unmarked form; ...

There are of course systematic connexions between the various kinds of criterion; Lindblom (1972) emphasises the explanatory primacy of the principles of maximal perceptual contrast and least effort (in articulation), related to the sixth of Postal's list, and develops a quantitative model which integrates these two principles, and elsewhere (Gibbon, 1973), I have similarly emphasised the importance of phonetic criteria in a study

of the way articulation and perception interact in the establishment of marked and unmarked types. The phonological criteria, though historically and systematically primary, are presumably based on facts which are aetiologically secondary to the phonetic facts.

Since the variants of a phonetic variable are in general seen as serially ordered along a continuum, a notion basically derived from articulatory phonetics and its spatial continua, it is but a small step to suggest that the variants be plotted along a metric whose reference point is associated with the normal variant; the reference point may, according to the available evidence, be one end of the series or some mid-point. Lindblom (1972:83) incorporates "a completely neutral lip and tongue shape" into his model, which may be regarded as an attempt to explicate the traditional notion of articulatory base (cf. Honikman, 1964; Chomsky & Halle, 1968:295); this notion can be seen as a point in articulatory quality space where the normal variants or types coincide. This conception also finds expression in the interlinear or baseline systems of notation for pitch patterns (cf. §2.4.4., & Ch. 3 below), and leads to the problem of whether the notion of 'absolute' pitch levels has any validity, and, if not, what the 'relative' pitch levels are in fact relative to. This is an old problem, and will be discussed in §2.3.3. below; Crystal, in particular, has found evidence that the first accent of a series ('onset' in his terminology) tends to be pitched at a fairly constant level for each individual speaker (1969:111, & *passim*; 1971).

With other kinds of variable, the situation can be more complicated. The prosodic features in particular involve the consideration of a trajectory through particular variables, such as pitch, which is not static, but extended in time (cf. §1.2.2.). Lieberman (1967:26) offers the following treatment of contour-types:

It is a universal of human speech that, except for certain predictable cases, the fundamental frequency of phonation and the acoustic amplitude fall at the end of a sentence. The physiological basis of this phenomenon may be a condition of at least articulatory control. If the tension of the laryngeal muscles is not deliberately increased at the end of expiration when the subglottal air pressure falls, the fundamental frequency of phonation will also fall. One can see that, in some sense, less "effort" is expended in the articulatory control problem if the laryngeal tension is not deliberately increased precisely when the subglottal air pressure falls. The speaker simply maintains about the same laryngeal tension throughout the entire expiration.

On this basis, and with supporting evidence of other kinds, he postulates a distinction between unmarked breath-groups, with falling contours, and marked breath-groups, in which the contour is not allowed to fall with advancing expiration. Although Lieberman's claim about the relation of these phonetic categories to functional categories is false as it stands (for criticism, cf. Crystal, 1969:198n.; Wode, 1970), Lieberman's treatment is in principle plausible; it is supported by frequency counts (the second kind of criterion in Postal's series), at least for some styles and dialects of English (Fries, 1964; Crystal, 1969:225), which show falling contours to occur considerably more frequently than others, whatever the linguistic categories involved.

Phonetic considerations of this kind are of the utmost importance in establishing the status of the more abstract phonological forms, 'normal'

(in a different sense of the word) or 'canonical' forms constructed with the aid of criteria which involve judgments about roles as well as judgments about types. Malmberg (1962) shows how the analysis of Swedish tones can proceed in steps which preserve the natural relationship between the phonologically marked and unmarked tones and their phonetic correlates; this kind of relation has been explicitly discussed by Postal (1968), in the context of segmental phonology, as the *naturalness condition* on linguistic descriptions, and amounts to a requirement that the features which constitute phonological forms correspond as closely as possible in their paradigmatic and syntagmatic organisation to the phonetic types on which the analysis is based. Maximal naturalness would be isomorphism between the two levels of analysis, presumably; no adequate description of a natural language can require this degree of naturalness, but of two analyses equal in other respects, the more natural is to be preferred. It is by virtue of the naturalness condition that distributional oddities at other levels of analysis, such as neutralisation phenomena, can be given an explanation in terms of empirically anchored constraints: there appears to be a general tendency for trajectories in phonetic quality space to keep close to the normal variant, particularly towards the end of any given organisational unit; compare Lieberman's remarks on the gradual relaxation of laryngeal tension throughout the breath-group in British English (1967:27f.), and the widespread tendency to neutralise voicing towards the end of phonological words.

One final remark is necessary before the notion of normal type can be left, and other kinds of descriptive norm dealt with. As Chomsky & Halle (1968:403ff.) have shown, the normal type is not necessarily a constant, but is dependent on the overall position which it occupies in phonetic quality space, or, in other words, on the overall configuration of types in which it occurs. The status of the variants of the variable of voicing, for instance, depends on selections made from other variables, the normal variant in a sonorant configuration being voiced, and in a non-sonorant configuration not so (cf. also Fromkin, 1970:31ff.). It is possible, though conjectural, that similar complexities may affect the interaction of accentual and intonational variables too; this is a matter for further investigation.

1.2.5.2. 'Normal structure'

One way of viewing the construction of linguistic forms and structures is to see the process as a progressive reduction of the mass of phonetic data towards canonical transcriptions of various kinds, dependent on the use of different kinds of criteria of analysis; how literally the term 'progressive' is to be taken depends on the kinds of interdependence between the chosen criteria. These criteria are invariably criteria for establishing the identity or equivalence at a particular level of analysis of items antecedently established at another level; on the basis of such equivalence classes, more complex kinds of interlevel mapping can be defined. The classical case in phonology is the set of functional, distributional and phonetic criteria used in establishing phonemes; more complex kinds of mapping, such as phonemic overlapping, can then be derivatively defined. In syntax, the classical case is Chomsky's abstraction of underlying canonical forms and structures using various criteria of equi-

valence such as automatic sequencing (in the analysis of the auxiliary verb; cf. Harris, 1944, for an application of this principle to the analysis of 'long components'), or equivalence of co-occurrence restrictions (in the analysis of the passive), or as the initial term for recursive definitions of complex and compound sentences. Sentences showing the greatest isomorphism with canonical forms answering to these various requirements, and additional requirements of systematic simplicity, are known as 'kernel sentences' (Chomsky, 1957). These clear methodological foundations have to a certain extent been lost sight of in later formulations of transformational generative grammar. The question of which canonical forms and structures are to be established for intonations is a complex one, which has received a range of different answers according to which phonetic, distributional and functional criteria have been employed, and depending on the extent to which the tendency to infer simple role-type correspondences has been kept in check by the naturalness condition; the most important of these attempts will be discussed in Ch. 3 and Ch. 4 below.

One important conception of normal intonation structure is reductionistic in the strict sense of the term (i.e. deriving the descriptions at one level of analysis from more fundamental or more general descriptions at another), though not, as with the naturalness condition, with regard to the fundamental character of the phonetic levels. The roots of this conception lie in the Trager & Smith (1951) approach to the description of language; Chomsky, Halle & Lukoff (1956) introduced a theory of transcription (the basic starting point for generative grammar) which incorporated a reductionistic test of the validity of transcriptions: if phonological boundaries largely correspond to independently established morphological boundaries, this constitutes confirmatory evidence for the validity of the transcription; the empirical data were adopted from the Trager & Smith description, of which Chomsky, Halle & Lukoff's account is intended as an explication. In the later theory of generative transcription (up to and after Chomsky & Halle, 1968), this methodological background was dropped in favour of an entirely reductionistic system of transcription in which a normal intonation (specifically: accentual structure) is developed by a set of correspondence rules from an antecedently given syntactic structure. These interpretive rules themselves embody a number of assumptions about the accentual and stress systems, the underlying criteria for which are not made explicit. Some of the assumptions made are that the stress and accentual systems (cf. Bolinger, 1961) are homogeneous; that the relative prominence of 'stresses' is determined by syntactic constituent structure, i.e. by syntactic relations; that there is only one 'primary stress' pro (matrix) sentence; that there is no relation between primary accents in different positions; that the rightmost lexical item in a sentence carries primary stress. Chomsky (1957:71, 90) and Stockwell (1960) extend the reductionist principle to the relation between contour types and indicative and interrogative sentence types; no empirical criteria are given, however, for the definition of normal intonation in syntactic terms of this kind. If there is any affinity between particular intonation structures and forms, and syntactic structures and forms, this must be shown, not assumed; in view of the methodologically derivative status of the analytic category of structure, any such affinity is likely to take the form of what Cruttenden (1970:187) calls the "harmony between the meaning of a tune and the meaning of a syntactic pattern", i.e. a complex relational notion, rather than a quasi-property of normality assumed to exist

somehow *in vitro*. Collier (1974:25) has the sensible injunction:

In short, generative phonologists who are starting to take an interest in intonation should be patient enough not to write explanatory intonation rules until it has been reliably decided which pitch phenomena need to be explained. In that respect the writings of their predecessors may be of little help.

The last remark is not entirely justified (cf. the discussion in Ch. 3, below), but as a reminder to clarify an explicandum before providing an explicatum (cf. Carnap, 1950:3ff.) it is salutary. These matters will be further discussed in §§2.4.3. & 3.3.3. (but cf. also §§3.1.1.3., 3.2.2.4.) below.

1.2.5.3. 'Normal role'

Much of the time, the term 'normal intonation' is to be interpreted as meaning 'an intonation pattern in its normal role', though the normality of the role tends to be transferred to the type. Terms which reveal that the role, rather than the type, is implicitly or explicitly the primary criterion are the following, which are too common in the literature to require detailed documentation: 'semantically neutral', 'colourless', 'unemphatic', 'non-contrastive'; terms which are explicitly concerned with normal roles are 'neutral', 'unmarked' in the accounts of Daneš (1960) and Halliday (1967; 1966-8), and the 'normal vs. pathological dialogue' of Gunter (1966), and Chomsky's 'natural response', both of the latter concerned with theories of accent placement. It is the term 'contrastive stress' (in various guises; cf. e.g. Halliday's two placement categories of tonicity and tonality, marked and unmarked), in particular, which has often led linguists to think they are speaking of something identifiable in terms of phonetic types, when the criterion they are actually working with has more to do with roles; the tendency to infer the existence of a simple mapping from roles to types is particularly strong, and particularly difficult to bring to a level of awareness in this case. Bolinger, citing Pike (1945:45) and Haugen (1949:278), and criticising Chomsky, Halle & Lukoff (1956), gives a lucid statement of the issue (1961(1965:102f.)):

But a question remains, which is whether contrastive accent is really a special kind of accent or only a particular way in which a more general kind of pitch contrast happens to be used at the moment. Kenneth Pike stated flatly in 1945 that 'there is no contrastive [accent] ... as such.' Einar Haugen asserted that the only thing special about a contrastive accent is its location. Yet contemporary writers continue to refer to it as if it were a thing to itself.

And, further:

The popularity [of the notion of contrastive accent, DG] and the errors incurred by it are to be traced, I think, to a phonetic illusion created by the linguist's interference with his own data. Our main business is establishing contrasts at all levels. Ordinarily we can do this without distorting our material; the opposition between two vowels, for example, can be studied without warping any of the distinctive features of either vowel. But we no sooner begin to contrast accents than we are tripped up by the fact that one of the functions of accent is to MEAN

contrast, and in the act of performing the comparison we introduce one of the items to be compared.

Bolinger goes on to illustrate his point that contrastive accent is not phonetically definable, by means of a wide range of examples. His distinction between accent and the contrastive use of accent has been ignored in many quarters, however; indeed, it has become something of a hackneyed criterion for demarcating central from non-central syntactic facts, and as such it often figures prominently in prefatory declarations to the effect that contrastive 'stress' (for the accent-stress distinction, cf. the same Bolinger paper) will be ignored. Similarly, it has become customary to speak of normal declarative intonation, for instance, as if, first, the notion of a declarative sentence or utterance were not in need of further analysis, and, second, there were a simple assignment of contour types to such role complexes.

It is essential to keep the distinction between 'normal role' and 'normal type' explicit in any discussion in which 'normal intonation' is involved, in order to avoid the kind of pitfall sketched above. Since the establishment of structures and forms is dependent on both these types of criterion, it is equally important to keep the distinction in mind in setting up normal intonation structures and forms. Perhaps one reason for the popularity of this category shift is the difficulty of specifying the roles of linguistic items in sufficient detail to provide plausible grounds for grading roles as 'normal' or 'abnormal', 'contrastive', 'emphatic', and so on. If the notion of normal role has any validity (and the pretheoretical evidence available suggests that it is not *prima facie* implausible), then an attempt at explication must be made. A number of useful contributions towards an initial clarification have been made by philosophers of the ordinary language school, the most important of which will be discussed in the following.

In the case of words, the normal role is, roughly, the "chief meaning" (Alston, 1963(1968:155)), that is, one designated meaning of an ambiguous word; or, as with certain transformational analyses of adjectives, it may be seen in terms of one designated syntactic position, such as the predicative position, which is taken as characterising the normal role of an adjective in contrast to abnormal or derived roles such as those associated with the attributive position. Among closed set words, there is perhaps the most notorious in respect of the wide range of roles it may play. Some of these affect the status of whole expressions and even discourses; Strawson (1950(1968:72)) distinguished between one kind of "genuine" use and various related, but "spurious" uses: the genuine use is to refer, spurious uses are ostensibly to refer, but actually not to, as in mendacious or fictional contexts, and thus, in more linguistic terms, to depart from the standard semantic interpretation of the morphological, syntactic and intonational theme-rheme systems. Similarly, Austin (1962:22) notes that in play-acting, for instance, language is "used not seriously, but in ways parasitic upon its normal use - ways which fall under the doctrine of the etiologies of language." In the received manner, he goes on "All this we are excluding from consideration"; this is a traditional demarcative device, used, for instance, by Bloomfield (1939:28): "Irony, jest, mendacity, and the like represent derived types of speech and response; they need not here concern us." Grice (1957(1967:48)) presumably has the same kind of distinction in mind when he maintains "An utterer is held to intend to convey what is normally conveyed (or normally intended

to be conveyed), and we require a good reason for accepting that a particular use diverges from the general usage"; many other related evaluations of roles of utterances, such as Searle's (1969:136) "characteristic illocutionary force", could be adduced which use, and in some cases partially explicate what is meant by, 'normal role' and similar expressions. In each of these cases, it is by virtue of locating an utterance in a particular kind of specifiable context of utterance that the utterance can be associated, by means of various criteria, with a 'normal role'; cf. also Searle's locution "normal input and output conditions" (1969:61; cf. the discussion in §4.3.2.) as a contribution to an explication. One special case of the pairing of utterances of particular lexico-grammatical and accentual forms with certain types of context of utterance is Lakoff's notion of "relative well-formedness" (1970), involving non-linguistic culture-bound or idiosyncratic identity criteria which link linguistic forms paradigmatically, leading to explanations for oddities such as *Moshe told Golda she was beautiful, and SHE insulted HIM*. It is difficult to see what this kind of oddity has to do with well-formedness, if the analytic criteria are borne in mind; Austin would have said it was etiolated, Bloomfield would have called it a jest.

The difficulty of applying the various kinds of conception of normality of role sketched in the preceding paragraph to intonations and accentual patterns themselves is illustrated by the example of relative ill-formedness given above: the roles played by intonation and accentual patterns are only specifiable in relation to the complex overall patterning of roles in verbal transactions, and one element of this network is the lexico-syntactic part. Mention has been made so far of the tendency to reduce roles to types, and of the tendency to reduce intonational to syntactic structures; the latter tendency is underpinned by the somewhat unequal partnership into which intonations and lexico-syntactic forms enter, these last being incomparably more intricate and conspicuous than intonation, a fact which tends to obscure the subtle contributions of intonation to the partnership. Gunter (1966) was well-advised to relate intonation patterns with the overall role structures of verbal transactions, and only indirectly with the lexico-syntactic systems, a procedure further applied in Gunter (1972).

Even so, however, a purely relational conception of intonation role normality as appropriateness in context is not an adequate one: presumably any utterance, however whimsical, can be assigned some appropriate role, however far-fetched. A notion such as that of relative well-formedness, specialised for intonation, or at least with the specific contributions of intonation and accent made explicit, will not do as an explication of 'normal role', though it may do service as a part of such an explication. Some point of anchorage is needed to limit the flexibility of a purely relational notion.

One kind of solution is to designate - by fiat, as it were - particular kinds of context as normal, a procedure which appears to have become accepted practice: the abstraction away from such abnormalities as 'emotional', 'contrastive', &c., intonations is cemented by implicit claims that the intonation of items uttered 'in isolation' is an identifiable norm. Far from being isolated, however, such expressions operate within a complex of roles, and the decision about which expressions to assign to such roles is subtly influenced by a living linguistic tradition. The formulaic intonations and accents of proverbs and hackneyed phrases play a

part in the decision, being crudely characterisable as 'citation forms' (cf. also Schmerling, 1973:59ff.; 1974:70); closely related are the styles of (non-acted) reading out loud, which are, perhaps owing to the exigencies of the medium, grossly overrepresented in intonation teaching manuals. The written text, like (and often, in descriptive practice, identical with) the citation form, reduces the pragmatics to a bare minimum, thus allowing the syntax and lexical distributions in the text to dominate as a cue for the choice of intonation, or accent placement, and favouring reductionistic theories of syntactic intonation. A further characteristic of such isolated, metalinguistically used forms is their association with discourse-final intonation patternings, explicable by way of the relative independence of such forms.

A different way of approaching the matter is to use a criterion of explicitness; Austin's standard formulae for making performative roles explicit are cases in point (cf. §4.3.2. below). Intonations are not readily amenable to paraphrase, however, and the contribution of the intonation to an utterance and its roles can easily be overestimated or otherwise distorted; a problem is also created by the fact that explicitness also varies in appropriateness from context to context (Austin, 1956(1970:189ff.)), a point taken up again in Ch. 4 below, in the distinction between paradigmatic and syntagmatic role criteria.

Some form of simplicity criterion can also be entertained, e.g. the most economically specifiable role; to avoid charges of arbitrariness, this could only be considered as a reflexion of other criteria.

For these reasons, an empirically much more fundamental kind of criterion is needed, and one which appears to fit the bill is that of functional naturalness, in the sense of §1.2.4., sketched in Figure 4. It is particularly appropriate to the assignment of normal roles to prosodic types: the accentual role of attention-getting to a sudden pitch change, particularly a rise; the role of a rising contour as a mark of a hitch in the proceedings (cf. Bolinger's "unsatisfied" attitude associated with such contours, 1968:32). The notion of 'normal type' can then, via this semiologically natural relation, influence the notion of 'normal role' (note that the usual direction of influence is quite the opposite; in this direction, however, the ground beneath the analyst's feet is somewhat firmer than in the usual direction): the less extreme departures from the base-line of the type correspond to less extreme departures from the normal role. Having previously clarified the notion of 'normal type', the danger of types being overridden by roles, which would otherwise, in view of the close natural bonds, be quite great, is much lessened. In particular, there is no reason to suppose that the association of intonations and accentual configurations with lexico-syntactic forms can be directly accounted for in a reductionistic manner. The association, which is not to be denied, is open to description in terms of "semantic harmony" (cf. Cruttenden, 1970), a notion which has already been mentioned in connexion with reductionistic theories of intonation structure (§1.2.5.2.). Where the roles played by an intonation and the associated lexico-syntactic form are congruent or semantically "harmonious", the term 'normal intonation' takes on a further shade of meaning; similarly, in the field of accentual configurations as well as in the field of intonation contours, the congruent use of accentuation and syntactic devices or lexical items can also be seen as a normal role, in this sense. These two conceptions of normal role are different, and, owing to their dependence on different

criteria, can easily lead to conflicting analyses; a case in point would be when given and new sequencing (in that natural order) is reflected in both the accentuation and the syntax and thus both conceptions of normality hold, in contrast to a non-natural given and new sequencing where accentuation and syntax can, nevertheless, still be congruent (though they do not have to be).

If one of these two senses of 'normal role' with regard to intonation is to be regarded as the fundamental one, it is the sense of functional naturalness. This view of normal roles is very closely related to Ryle's notion of the "stock use" of types of objects. Ryle illustrates as follows (1953(1963:109)):

The stock use of a fish-knife is to cut up fish with; but it might be used for cutting seed-potatoes or as a heliograph.

He goes on (p. 110):

If I want to talk about a non-stock use of a word or fish-knife, it is not enough to try to refer to it by the phrase 'the non-stock use of it', for there may be any number of such non-stock uses. To call my hearer's attention to a particular non-stock use of it, I have to give some description of it, for example, to cite a special context in which the word is known to be used in a non-stock way.

Conventions of prandial culture aside, a fish-knife has its stock use for natural reasons: it is designed for a particular job, like a hammer or a mirror. For a gamut of reasons, it may be assigned other roles, *ad hoc* (cf. cartwheels as pub decorations) or systematically. It is the natural connexion which makes it possible to dispense in many cases with a further contextualisation in a description of the stock use, one aspect of Ryle's account. It is the same kind of natural connexion, in principle, which may be said to underlie the notion of normal intonation; indeed, intonations are more like fish-knives in this respect than words are, since (apart from the phonaesthetic and synaesthetic outskirts of morphology - cf. Bolinger, 1950) words do not have a natural link with their uses in this sense - a point where Ryle's analogy breaks down. Sentences, for that matter, might also be said to be more like fish-knives than words are, on similar grounds to those given for intonation: a matter with which Ryle would be in vehement disagreement (p. 119); it is just as absurd to suggest that words have roles to play and sentences do not, as it is (Ryle's own example) to suggest that salt, sugar, flour, beans and bacon have roles to play, but not the pie they are used to make (cf. Chomsky, 1965:8, for criticisms, and Halliday, 1961:227f.; Pike, 1967:Ch.1 *passim*, for delightful illustrations).

1.3. Methods and goals

In the preceding sections, those aspects of the domain of discourse of intonation studies which are most in need of clarification have been discussed; it is not sufficient, however, to consider the intonational aspects of utterances simply as given in the domain of discourse and waiting for collection: this very domain of discourse is determined to a considerable extent by the methods of investigation used, and the models they incorporate. The methods and techniques of experimental phonetics, for in-

stance, have led to an extension of the domain of discourse of linguistic descriptions which would not have been possible without them; likewise, the formal models for linguistic description which Chomsky introduced have made it possible to recognise much finer detail in various parts of the domain of linguistic discourse than would have been possible without them. These two aspects of analysis determine the criteria of analysis, within the analytic categories of type, structure and role, at each level of the analysis, and thereby determine the primitive terms, in particular the kinds of variable and variant postulated, at each of these levels. They lead, too, to a pair of problems, the problem of data and the problem of adequacy, respectively, which can, in view of the explicit or implicit embodiment of assumptions about the nature of the model used in analyses, and in view of the inevitable use, explicitly or implicitly, of methods of analysis in the application of a model, be seen as two sides of the same coin.

1.3.1. The problem of data

The question of which kinds of data a linguist can most profitably use in preparing his analyses has many facets, but its kernel lies in the old empiricist problem of the investigator's own interference with what he thinks he sees as a neutral observer, which is particularly apparent in the non-natural sciences. In the case of the study of language, the analyst, whose job it is to identify his criteria of analysis and keep them apart, is at the same time a member of the vast body of language users, who are as a rule quite unconcerned with distinctions of this kind and, except within the limits of folk linguistics, pay far more attention to roles than types; this preference, quite understandable on a pragmatic view of the functions of language, has been emphasised repeatedly in preceding sections. The problem is a double one: the linguist is, as an analyst, also one of the language users whose verbal behaviour and actions he is studying, and his use of a metalanguage is, at the same time, the use of a language. The restriction of linguistic activity to the linguistic metalanguage runs parallel to similar restrictions in folk linguistics (cf. Labov, 1966), and is in danger of sharing the influences at work on folk linguistic judgments, such as the various kinds of factor which Labov has perceptively isolated and termed "linguistic insecurity". Furthermore, these restrictions tend to involve, consciously or unconsciously, the style and dialect preferences which the metalanguage itself is subject to: the styles of 'public' speaking, of academic small-talk, of reading aloud, of citation forms (cf. pp. 27, 35f. above); in consequence, many subtle features of language use in other contexts will tend to escape notice. Finally, the context of the metalanguage tends to swamp cited utterances of the object language in many respects, from the exaggeration of the general clarity of enunciation to the superimposition of metalinguistically appropriate intonations, rather than the intonations of non-metalinguistic use. This problem of the naturalness of citation forms is not only central in linguistics, but also - and, indeed, particularly - of the utmost importance in language pedagogy, where specialised forms of metalinguistic activity, such as play-acting, querying of the correctness of answers, interfere both with each other and the use of the language concerned in non-metalinguistic situations. A case in point, which will no doubt be familiar to anyone who has tried to teach a language, is the in-

tonational chopping up of utterances by non-proficient speakers, or the use of inappropriate rising intonations as a sign of lack of confidence in performance.

On the one hand, therefore, stands a requirement for natural, interference-free utterances and analyses of them; on the other, a requirement for immediate accessibility and maximum control of the conditions of analysis. Lehiste, writing of data problems in experimental phonetics, makes the following, somewhat pessimistic remark (1963:353):

The two requirements of naturalness and rigourousness appear to occupy the opposite ends of a continuous scale of gradual mutual exclusion. At one extreme end we find complete naturalness coupled with complete lack of control; at the other end, complete control over the experimental design at the expense of naturalness and linguistic relevance.

Close introspective control has the distorting effects mentioned in the preceding paragraph; the experimental conditions discussed by Lehiste add further dimensions of possible distortion as well as bringing the advantages of quantitative methods. In this kind of situation, the classic empiricist advice has generally been to "glean up our experiments in this science from a cautious observation of human life, and take them as they appear in the common course of the world, by men's behaviour in company, in affairs, and in their pleasures" (Hume, *Introduction to A Treatise of Human Nature*), that is, to err in the direction of naturalness. Apart from the fact that empiricists have often failed to follow their own advice and (Hume included) have often indulged in the kind of mental experiment which Hume so distrusted, in theory if not in practice, there are difficulties involved in consistently following this course. The first is the enormity of the task and, as Lehiste points out in the same place, the unlikelihood that even the most extensive collection would contain "enough comparable examples of each utterance type" to satisfy the rigorous conditions of quantitative experimental analysis. Tibbitts, replying to a modern version of the classic empiricist advice, made a more specific version of the same point (1972:1051):

This Congress has noted that truly spontaneous utterances in emotionally charged interactions are virtually unobtainable in representative sample over a wide range.

It is indeed the case that the most extensive corpora used in intonational analysis are of the restricted styles and dialects already mentioned. Further, the ethical aspects of monitoring spontaneous speech, a procedure which would have to be clandestine to avoid unnaturalness, is one which has troubled workers who have attempted to obtain such spontaneous corpora (cf. Fries, 1952; Lehiste, 1963). The argument, which derives from Chomsky's dismissal of corpus examination alone as a basis for establishing grammaticality (1957:15), that the extensive study of corpora is unnecessary because a language may be seen as an infinite set of sentences and corpora are finite, therefore no corpus, however large, can represent a language, is not an argument which has any particular relevance to the issue: linguistics is not unique in having to cope with the problem of extrapolation from a finite body of data - on the contrary. A genuine theoretical problem is that of the completeness of any record, and of the desirability of completeness in the physical sense. Lehiste (1963:353) points out that some editing of the material appears inevitable, and that once the prin-

ciple of complete naturalness is compromised, the matter of introducing further controls becomes one of degree rather than principle. This is precisely the point; the whole process of analysis of utterances is analogous to the apparently innocuous process of editing. Like editing, it takes place according to various criteria; whereas editing in general is not an attempt at producing a description and explanation of what is edited, analysis is such an attempt with regard to what is analysed; both, however, often presuppose the use of very similar criteria of analysis. The whole process of abstracting the relevant aspects of the text by means of criteria of analysis associated with the analytic categories of type, structure and role is one which, in the final analysis at a metatheoretical level, always requires an interpreter, his interpretation, and his notions of what his subject matter looks like. A copybook version of this approach to analysis is Chomsky (1957), whose application of the principles of explication and Popperian concept formation reaches an unusual lucidity in linguistic analysis. The process of selection involved is inevitable; it is not even peculiar to linguistics, but is shared by linguistics with all other kinds of descriptive science. In the selection, from the point of view of one who commends the extreme naturalness position, lies a source of 'distortion' by idealisation; it is surely more sensible, in view of the inevitable, to recognise that the extreme position of complete naturalness is untenable, and indeed dangerous in its lack of awareness of the analyst's contribution to analysis, and to recognise that a major determining factor of the universe of linguistic discourse is the bundle of methods and models which enables us to conceive of it.

This view is not necessarily committed to the acceptance of theoretical subjectivism; it is simply a statement of the interdependence of data and the methods and criteria of analysis used in handling data, an interdependence which holds whether the criteria of analysis concern roles or types, whether utterances are treated in natura or in vitro, with or without support from quantitative methods. It is in this interdependence, which necessitates selection in analysis and which has its counterpart in the notion of idealisation in the discussion of problems of adequacy, which makes it advisable to be wary of making over-optimistic claims about the 'reality', psychological or physical, of linguistic theories.

1.3.2. The problem of adequacy

The methods used in linguistic analysis bring with them problems concerning the status and relevance of linguistic data; the goals of linguistic analysis have always been regarded, where explicitly formulated, in the light of the problem of providing criteria for establishing the relative adequacy of theories, and the descriptions they underlie. Hockett (1948(1957:280)), in his discussion of the epistemological status of linguistic structure, mentions two criteria "by which to judge the relative merits of one analysis versus another", namely: "accuracy of prediction beyond one's corpus, and communicability of the basis for such prediction to others". Later, he distinguishes between criteria for the evaluation of a grammar and criteria for the evaluation of models (1954(1957:398)). The former include aesthetic and stylistic considerations and applicability to pedagogy, but the main criteria are heuristic utility and the predictive ability "to generate any number of utterances in the language,

above and beyond those observed in advance by the analyst - new utterances most, if not all, of which will pass the test of casual acceptance by a native speaker". The criteria for the analysis of models are in part more fundamental, and in part parallel to those for grammatical descriptions: models must be general (i.e. applicable to any language); specific (i.e. explicit and determinate); inclusive (i.e. the applications of models in description must cover all observed data as well as new data - corresponding to the criterion of heuristic utility for particular descriptions); productive (corresponding to the criterion of predictive ability in the evaluation of particular descriptions); and finally, efficient (i.e. "its application to any given language should achieve the necessary results with a minimum of machinery"). Of Hockett's 1948 criteria, the first is clearly the central criterion for evaluating particular descriptions, and the second corresponds to the requirement that a general theory, or, to use Hockett's term, a model, should be specific, i.e. explicit.

There are many obvious parallels between these criteria and those which Chomsky later sets up (cf., for instance, the "casual acceptance" test for acceptability with Chomsky's "utterances that are perfectly natural and immediately comprehensible without paper-and-pencil analysis, and in no way bizarre or outlandish", 1965:10 - to isolate the most empirical of the similar points). Chomsky, working with the same deductive-nomological framework of general theory and particular description, systematised and refined the statement of criteria for judging the merits of theories and descriptions in linguistics. The criterion of inclusivity, which determines the heuristic utility of descriptions, was more tautly formulated in terms of a requirement that the general theory specify a practical and mechanical discovery procedure; the criterion of productivity, underlying the predictive ability of a description, was also more tautly formulated in terms of a requirement that the general theory specify a practical and mechanical decision procedure for comparing descriptions with data; the simplicity criterion is reformulated in the wider context of a requirement that the general theory provide a practical procedure (here Chomsky avoids the term "mechanical") for evaluating the relative merits of two descriptions referred to the data (1957:50ff.). Within these possibilities, Chomsky makes a selection (p. 52):

The point of view adopted here is that it is unreasonable to demand of linguistic theory that it provide anything more than a practical evaluation procedure for grammars.

On the following pages, he adds the term 'mechanical' to the requirement at one point, and notes of the term 'practical' (p. 53): "This vague qualification is crucial for an empirical science". Chomsky does not neglect the other tasks entirely; as he says: "In the preceding sections of this study we have been concerned with the second of these three tasks". The use of a hypothetico-deductive process of discovery is also apparent in the study. The rather vague terminology used by Chomsky at this point, and the relations between the three procedures, require some clarification.

Carnap (1950:193, 197f.) has a distinction between effective and practically effective procedures; the former have to be "based on rules which determine uniquely each step of the procedure" and it has to be the case that "in every case of application the procedure leads to the solution in a finite number of steps" (p. 193), while the latter are not defined but shown by example, as in the case of proof-checking: "we are not

left entirely to guessing, to a trial-and-error method ...; instead, we know practically how to proceed and we expect that, under normal conditions, we shall reach a result in a finite number of operations, viz., the examinations of the steps of the given proof". The former concept appears to be what Chomsky means by 'mechanical', the latter what he means by 'practical'. It is interesting to note that Carnap uses the locution "a result" rather than "the result"; using this characterisation, it is difficult to see why Chomsky requires a discovery procedure to come up with the grammar of a language - and presumably Chomsky knew practically how to proceed in setting up a grammar, and, since he has actually set up a grammar, several in fact, he must clearly have reached his result in a finite number of operations. This argument is based, of course, on an equivocation with the term 'practical' (or 'practically'), for Carnap has an example analogous to a discovery procedure (finding a suitable hypothesis) as well as one analogous to a decision procedure in Chomsky's sense (examining whether a given hypothesis is suitable), for neither of which he allows that the procedure is effective or practically effective. There is no reason to suppose, however, that Chomsky's evaluation procedure is in any way analogous to the problem which Carnap allows as practically effective though not effective: the examination of a given mathematical proof. Chomsky's aim actually goes beyond even this (p. 56):

Our ultimate aim is to provide an objective, non-intuitive way to evaluate a grammar once presented, and to compare it with other proposed grammars. We are thus interested in describing the form of grammars (equivalently, the nature of linguistic structure) and investigating the empirical consequences of adopting a certain model for linguistic structure, rather than in showing how, in principle, one might have arrived at the grammar of a language.

The first part of the claim appears to involve the 'mechanical' or 'effective' aspect, while the second part is difficult to associate even with the 'practical' or 'practically effective' aspect. In view of the problems which are associated with the notion of systematic simplicity, and the heated debates among philosophers of science, from Goodman via Quine to Popper, which it occasions, it is difficult to conceive of an empirically significant evaluation procedure of the kind Chomsky wants (later embodied in Halle's discussions of abbreviation conventions in phonology) which is either effective or practically effective. An arbitrary numerical procedure, counting symbols, or even working on several levels, with a hierarchy of items weighted in different ways in their contribution to the complexity or simplicity of a theory, can be formulated as an algorithm, to be sure; such a procedure cannot be regarded as more than a pale formal shadow of what Chomsky is looking for, however. And as soon as the "empirical consequences" (spelled out in later works in more detail) are admitted, the attainability of either an effective or a practically effective evaluation procedure becomes indistinguishable from the attainability of an effective or practically effective decision procedure or discovery procedure. Since Chomsky does not spell out in detail what he means by 'practical' and 'mechanical', it may be that he means something different from what has been explicated in the present section; the onus is on him.

In addition to the points just made on the assumed special status of evaluation procedures, it should be noted that Chomsky's linear ranking of discovery, decision and evaluation procedures in order of unattainability

is an interesting reflection of the inclusion relation which might be postulated for these three kinds of procedure: discovery procedures are not simply inductive generalisations, but also involve decision and evaluation procedures - this is a point at which Chomsky's own practice outstrips his formulation of the theory. And there are many aspects of discovery procedures which are communicable, at least, to revert to Hockett's 1948 terminology, if not effective or practically effective, and thus practical in a sense no vaguer than that of Chomsky's term.

For particular descriptions, in contradistinction to general theories as dealt with in the preceding paragraphs, Chomsky suggests two kinds of "conditions of adequacy" (1957:49f.): a condition of generality (i.e. the deductive-nomological condition that the particular description be constructed in accordance with an explicit general theory - cf. Hockett's criteria of generality and specificity), and a series of "external conditions of adequacy" (e.g. acceptability of utterances corresponding to sentences in the description - p. 49; ambiguity of utterances corresponding to homonymy of construction - p. 86; "similarity of understanding" corresponding to constructional similarity - p. 87).

Later (1964:28f.), Chomsky reformulates the condition of generality as the "level of success" of "explanatory adequacy", and replaces the notion of "external conditions of adequacy" by the two goals of "observational adequacy" and "descriptive adequacy". Observational adequacy is not given a clear definition, and in fact only occurs in Chomsky (1964), so far as I can tell; it appears to have been dropped from the theoretical armoury in Chomsky (1965). To judge by Chomsky's 1964 examples, it is concerned with establishing transcriptions for forms at various different levels of analysis (by no means only at the phonetic level, or by means of a non-generative theory - it is, after all, to all intents and purposes a theoretical term of generative theory), i.e. the problem of defining well-formedness. Descriptive adequacy is concerned with the problem of establishing linguistically relevant generalisations about the relations between well-formed sequences, and corresponds to the requirement that a grammar describe similarity and ambiguity. Observational and descriptive adequacy are to be understood within the framework of Chomsky's theory of generative transcription: the first is concerned with the representation of linguistic forms as terminal strings at various levels of analysis; the second is concerned with the assignment of structural descriptions to these strings at these levels. The property of a system of generative transcription which partly determines its observational adequacy is its weak generative capacity; the property related to descriptive adequacy is its strong generative capacity.

At various times, parallels have been drawn between the results of linguistic theorising and linguistic analysis, and the abilities of language learners and language users, respectively, to learn and use language. In the first of the two articles cited above, Hockett draws the first of these parallels (1948(1957:279)):

The analytical process thus parallels what goes on in the nervous system of a language learner, particularly, perhaps, that of a child learning his first language.

In the second article, he draws the second parallel (1954(1957:390)):

A grammatical description built according to the plan outlined in II [the item and arrangement model - DG] sets forth principles by which one

can generate any number of utterances in the language; in this sense, it is operationally comparable to the structure of that portion of a human being which enables him to produce utterances in a language; i.e. to speak.

There are limits to the analogy, however; Hockett points out that the child comes to behave the language, for instance, whereas the linguist must come to state it: the problems connected with the linguist's own involvement in the process of theorising and, in particular, analysis have already been stated in the preceding section on the problem of data. Notwithstanding these problems, Chomsky raises this analogy to a somewhat precarious status as the primary concern of linguistic theory; his formulation of this position takes a somewhat reckless short-cut through the quarry of linguistic methodology (1965:3):

Linguistic theory is concerned primarily with an ideal speaker-listener, in a completely homogeneous speech-community, who knows its language perfectly and is unaffected by such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest, and errors (random or characteristic) in applying his knowledge of the language in actual performance.

Knowledge of the language, in this sense, which is ascribed to an ideal speaker-listener, is termed 'competence'.

This is not the place for a detailed critique of the competence theory; it will be sufficient to distinguish its main traits from the approach developed in the present study. Likewise, the complementary notion of 'performance', which covers all the possible contraries of 'competence' along the various dimensions of the universe of linguistic discourse, particularly those mentioned in the quotation, will not be dealt with: it stands or falls with the notion of 'competence', and as Chomsky formulates it, it is too inclusive to be of much descriptive utility.

The concerns of linguistic theory have been extensively covered in the discussion above; the question here is, simply, what the notion of competence adds to the picture, or how it changes the picture. Stated somewhat baldly, a linguistic theory (however adequate at its own level) is required to specify an adequate description of certain kinds of data, that is: to provide the means of expressing the facts obtained by applying various kinds of criteria of analysis to utterances. The notion of competence gives these facts a kind of separate Platonic existence in which their dependence on particular criteria of analysis is obscured; this mode of existence is then transferred from the forms and structures of the analysis to the descriptive device which generates these forms and structures, namely the grammar. As a result, the particular kind of configuration of facts which is covered by the term 'competence' has the appearance of delineating a particular area of the universe of linguistic discourse; this is not the case of course in a naive sense of 'universe of discourse' as a collection of items awaiting analysis, though many of those who have taken the term into their linguistic and psycholinguistic toolbox seem to think of competence and its partner performance in this way. But, as Chomsky was no doubt aware, the 'ideal speaker-listener' is a Platonic projection of the end-product of the process of selection, abstraction and hypothesising involved in analysis, much like the ideal rods or the ideal transformers of physics.

The notion of competence, then, can be explicated as a cover term for

a particular selection of hypotheses about linguistic structure and a particular selection of criteria of analysis. As such, it clearly means a particular kind of methodology, namely that practised by Chomsky; that it is also in a sense an account of a particular segment of linguistic discourse is an indirect, highly derivative matter. The criteria which constitute the linguistic description of which competence is a function are to be found in Chomsky's statements of the goals of linguistic theory: he emphasises the importance of three kinds of criterion - those involved in judgments of acceptability (various combinations of criteria from the analytic categories of role and type), and those involved in judgments of ambiguity and paraphrase (also involving various combinations of criteria from the analytic categories of role and type). He also uses other kinds of judgment, such as that of automatic sequencing (cf. p. 32 above), which is a special case of the judgments of acceptability.

It has already been indicated in §1.2. that paradigmatic metalinguistic judgments, particularly those of paraphrase and ambiguity, are cover judgments for a whole range of syntagmatic judgments about the roles which utterances of various types may play (cf. also §4.1. below). Although these kinds of judgment at the various levels of analysis have been especially favoured in linguistic analyses, they only tell part of the story, a part which is insufficient to characterise, for instance, the roles which intonations play and the way these roles are played. They also lead to an extremely opaque notion of what the term 'normal' means, since they silently presuppose that its meaning is known; as was shown in §1.2.5. above, a clarification of the meaning of the term requires a more supple conception of roles than purely paradigmatic judgments allow. It is clear, in the light of such limitations, that a competence theory is inadequate for the provision of a comprehensive account of intonation; in Chomsky's own terminology, it allows a far too limited conception of descriptive adequacy. This does not mean that it is meaningful or justified to refer to the present conception as a theory of performance; since a theory of performance is any theory which does not use the methodology of competence theories (i.e. in simple terms, non-statistical study based on introspective judgments of acceptability, paraphrase and ambiguity and their analogues at various levels of analysis), the assertion would be too vague to be a useful description. One might, at a metatheoretical level, claim that competence theories have a certain hallowed status as 'normal' linguistic theories, just as certain types, structures and roles may be said to be 'normal' at the next level down. But empirical evidence should be provided for this special status, just as empirical evidence must be given for the normality of other categories. The provision of such evidence is perhaps a matter for the chroniclers of linguistic history; the onus does not lie on those who consider the notion opaque.

Crystal (1969:30) makes an interesting remark in this respect:

One trusts that intonation, etc. would be covered by a theory of competence, and not just relegated to performance, but the theoretical distinction between the two concepts at the moment is not clear, and this specific point has not to my knowledge been raised.

While agreeing in general with the final remarks (though presumably the generative theory of accent and stress is to be added to the other components of 'competence'), I consider the first misguided, because of the marginal relevance of the special theory of competence and performance,

as characterised above, within the overall terms of reference of linguistic analysis in general and intonation analysis in particular. Competence is simply a reflection of a particular selection of methods and criteria of analysis; as such it reflects the linguist's own metalinguistic ability as much as the 'knowledge' of native speakers (cf. the discussion of this confusion in §1.3.1. above), and if the linguist chooses a different constellation of methods and criteria it is only blurring the issue to insist on preserving the terminology of the special theory of competence and performance, rather than going back to the broader range of possibilities offered by linguistics as a whole.

The methodological considerations outlined so far will be applied, to the extent allowed by the present state of the art of intonation analysis (which is a science to the extent that its results are in some sense reproducible), in the following sections of this study to the analysis of the types, structures and roles of intonation and related language systems.

2. PHONETIC TYPES IN INTONATION ANALYSIS

The description of the phonetic types used in intonation systems is perhaps the most basic part of the analyst's task. Experience has shown that it is not easy to keep the criteria involved in analysing phonetic types separate from those involved in analysing the roles played by utterances assigned to these types, and to avoid the tendency found in native description to allow the latter to dominate the former; the main aspects of this problem were discussed at length in the first chapter. The analytic category of type is itself, however, by no means simple; it is a complex web of perspectives on the acts of speaking and hearing, each of which is determined by a particular methodological constellation of procedures, models, systems of measurement and criteria of analysis. There is generally no simple correlation between these various perspectives, but certain unifying principles can be derived from knowledge of the domain and subdomains of discourse of phonetics, together with knowledge of the way in which the various methods are interrelated. It is with these matters, and with a description of the phonetic types relevant to intonation, that the present chapter is concerned.

2.1. Domains and methods

The question of how the domains and methods of linguistic analysis are known is not one of sketching a simple dichotomy; the domains are given only in a very rudimentary sense: knowledge of them is determined right from the start by a particular way of looking at them. There is one pre-theoretical structuring of the phonetic domain which is intuitively given, and, indeed, which proves to be a fruitful model for the description of certain aspects of role structure as well as certain physical and psychological views of the communication process: the triple distinction between production, transmission and reception. The different criteria used in applying the model to each of these areas illuminate the three aspects of utterance in such different ways, however, that it is difficult to reconcile the various analyses in terms of a single common triply structured domain. To take two extremes: it is hardly credible that semiotics and experimental phonetics have the same universe of discourse - but in a real sense they do, though they illuminate it from vastly different angles and in vastly different colours. For the purposes of analysis, however, the domain cannot be regarded apart from these different ways of looking at it, and the common features, as well as the different features, of these various views can not be defined independently of the criteria of analysis which lead to them. The history of modern linguistics is largely the history of attempts to find new and useful ways of looking at the domain given by the intuitive notion of 'utterance', and to distinguish carefully between different combinations of criteria of analysis: the distinction between phonetics and phonology ('practical' or 'functional' phonetics, in the early terminology of Jones and Bloomfield), between different ways of doing phonetics, e.g. between perceptual and experimental phonetics, between different ways of doing phonology, syntax, and so on, can be seen most profitably in this way in terms of a gradual growth of awareness of the kinds of analysis which can contribute to our knowledge of language.

The fundamental criteria of analysis are perceptual; each of the

relevant senses with which perceptual analysis is performed has its own selection of parameters, or natural variables, which provide the criteria of analysis characteristic of that particular sense, and which determine the structure of the quality space of that sense; the 'measurements' made with these criteria are comparative judgments of variants of particular variables using different utterances, either 'relative' (between two utterances contiguous in time) or 'absolute' (from memory); cf. Carnap (1950:8ff.), for the term 'comparative' in this sense. The judgments are ultimately of sameness or difference, sometimes quantitatively presented, with respect to a particular variable. The relevant senses are the aural, kinaesthetic, tactile and visual senses. None of these senses can be applied without limitation to every one of the three subdomains: there are natural restrictions which mean that any comprehensive view of the whole domain is going to have to cope with differences due to the different criteria of analysis operating in each area. The kinaesthetic, the tactile and the visual senses are appropriate for the perceptual analysis of sound production; they are not available, however, for the other subdomains. The act of hearing, indeed cannot, in a physiological sense, be observed at all with the instrumentally unaided senses; in this it is no different from any other kind of sensory reception. The aural sense is appropriate for the perceptual analysis of sounds as they are transmitted; there may, if the motor theory of perception is valid, be a relevant link with the kinaesthetic sense. Considerations like these make it clear that the constellation of perceptual approaches and the domains accessible to each of them is a highly asymmetrical one; the reason is, first, that the three subdomains are quite dissimilar, and second, that the observer is, particularly with the kinaesthetic and aural senses, bound to put himself and his tools, i.e. the senses at his disposal, right into the middle of the very phenomena he is studying. This problem is the phonetic variant of the general problem of distinguishing between the general verbal behaviour of the linguist and his linguistic or metalinguistic behaviour, which, strictly speaking, is a special case of his general verbal behaviour. There is a considerable danger, therefore, of question-begging in analysis in terms of any one of the senses alone.

There are a number of ways in which this circularity is avoided. Remaining within the overall framework of the perceptual method, the perceptions made by means of the kinaesthetic and tactile senses, for instance, can be given a firmer anchorage by being mapped on to an essentially visual frame of reference in order to characterise positions of articulation: the notions of 'space' involved are very similar. In like manner, articulatory and aural impressions can be correlated, a procedure of great importance in the analysis of vowels and manner of articulation. The syncretism involved in the perceptual analysis of utterances is quite legitimate: the first kind mentioned here owes the correlation to a high degree of isomorphism in the pictures of articulation provided by different senses; the second is due to the function naturally mapping the states of a source of energy on to the structure of the energy produced. The establishment of such correlations is not a *sine qua non* of perceptual analysis, however. Ladefoged (1960) discusses Jones' theory of cardinal vowels, for instance, i.e. a theory which is commonly supposed to be based on investigations of the articulatory domain or on a combination of these and aural investigations of the nature of vowel sounds, and states (1960:390) that:

despite constant use by both Jones and his followers ... of articulatory terminology, Jones's system is a true auditory one, employing eight precisely determined auditory reference points.

This is a more limited statement of the theory than Jones himself would presumably have allowed, however (cf. 1964:26, "The finer adjustments of the tongue have to be done by means of sensory control from the ear."). If correlations can be established between patternings in quality spaces which are essentially independent, and justified in their own right, the margin of error in analysis is reduced. There is not always a simple correlation, however (cf. Gibbon, 1973:66f.).

Another way of shoring up perceptual analyses is to go beyond the unaided senses and introduce instrumental assistance. This step has far-reaching consequences, since instruments, however rudimentary, are always associated with theories about phenomena and their interrelations; further, the introduction of mechanical, quantitative measurements according to a fixed metric embodies a further methodological difference from the perceptual method. This means that instrumentally aided analyses tend to be further away from linguistic truth than purely perceptual analyses, in that further sources of 'distortion' of the domain of discourse are introduced and that they can yield discriminations beyond the abilities of the senses which are thus presumably irrelevant to linguistic analysis. Instrumental analyses are just as much in need of a balanced relationship between type and role criteria in initiating the analysis: phonetics is not simply concerned with sounds, but with utterances. The secondary status of instrumental analyses has been emphasised repeatedly; compare Sapir (1925(1967:25)), Bloomfield (1933(1935:85)), Zwirner (1952:11), Malmberg (1962(1971:232)) as evidence for the constancy of this view. There are a number of ways in which instruments may be used to assist linguistically orientated perceptual judgments, all of which have been used at various times. The simplest class of devices, methodologically speaking, are those which record utterances in order to allow perceptual re-examination under conditions. For aural examination, utterances can be repeated at will, or can be recorded electromechanically; for visual examination, films, X-ray photography, and mechanical recording devices of various kinds allow re-examination of the spatial configurations of the articulatory organs. Such recording devices can perhaps best be regarded as extensions of the senses in a fairly limited way. Methodologically more sophisticated are those devices which, to some more or less restricted degree, can be regarded as providing models of one sense in terms of another and, ultimately, in terms of mathematical calculi. In a purely physical sense, spectrographs, oscilloscopes and related instruments provide a visual model of aural perceptions, via physical theories; similarly, and again in a purely physical sense, electromyography, air-pressure measurement and so on can be regarded as providing visual models of kinaesthetic sensations. The devices which provide these models can, in a crude sense, be regarded in turn as models of the organs of perception (cf. the discussion of competence in the preceding chapter). As with the purely perceptual methods, the utility of having several different approaches lies in the fact that the results of these analyses can be correlated with each other; such correlations can form the basis for manipulations of the items in the domain of phonetic discourse under experimental conditions: 'utterances' indistinguishable from natural utterances can be synthesised and modified step by step to examine the relation between aural perception and instrumental models

of it, or utterances can be systematically distorted for the same purpose; portions of one utterance can be substituted for portions of another and subjected to perceptual comparison, and so on. In this way, the elusive criteria of perceptual analysis can be modelled on the criteria used in the various kinds of quantitative instrumental analyses. Crystal (1969) uses different terms for the variables used with the different kinds of method: 'dimension' for physical variables, 'attribute' for perceptual variables, and 'feature' for the variables of phonological systems. This kind of terminological distinction is a useful reminder of the methodological state of affairs, and will be made in the present study where there is any danger of ambiguity.

Instrumental analyses can, in the ways sketched above, be used to account for aspects of the domain of phonetics which perceptual analysis alone leaves untouched, and to provide more detail to supplement perceptual analyses. This is not only important in connexion with the systematic gaps in perceptual analysis, but also in those areas where individual senses are unable to provide sufficiently fine or consistent information within a particular subdomain. Pike (1943:19ff.) points out that there is a difference in the variables associated with prosodic features and the variables associated with non-prosodic features: it is far more convenient to describe prosodic features in terms of the acoustic subdomain than in articulatory terms, and for the non-prosodic features the opposite holds true; Pike puts the matter picturesquely (p. 19):

Not even the most ardent advocate of articulatory methods in phonetic instruction would attempt to teach a voice student to raise a note an octave by saying, "Make the vocal cords open and close just twice as fast".

In such areas, where the possibilities of perceptual analysis are restricted, instrumental methods are a useful guard against mistaking metaphorical or semantic terminology for a perceptual descriptive framework (cf. above, §1.1.).

Despite their utility in providing additional evidence for linguistic and perceptual analyses, the physical models which instrumental analyses employ are inevitable sources of distortion, like all models (Braithwaite, 1953(1968:93ff.)). In particular, attempts to correlate the instrumental measurements with perceptual judgments by means of manipulated speech, whether synthetic, or distorted natural speech, suffer from the unlikeness of the physical and the perceptual worlds: the ability of listeners to re-interpret different physical cues as contributing to perceptual patterns in the absence of the main cue or cues is considerable (Lehiste, 1970:passim). A number of models of intonation have been subjected to criticism on the grounds that the degree of distortion which they introduce is too high. The tone-switch model of Isačenko & Schädlich (1966 &c.) has laid itself open to this kind of criticism (Heike, 1969:11; cf. also the discussion following Isačenko, 1967), and indeed it does not appear to be adequately safeguarded by prior linguistic and perceptual analysis. Wade (1967) has criticised Bolinger (1951) on similar grounds, but in this case the perceptual and linguistic precautions taken are much more extensive (indeed, the former model can be seen as a special case of the latter model; cf. §3.3. below). With restrictions of this sort in mind, the phonetic variables associated with the perceptual and instrumental methods in their various domains will be outlined in the following sections and related to

each other.

2.2. Pitch and its correlates

The phonetic variables in different domains, and as determined by different methods, do not enter into simple correlations; to prepare the way for an account of the correlates of pitch, it will therefore be helpful to summarise the major correlates of the main attributes of sensation (cf. §1.2.2.) before concentrating on pitch.

2.2.1. Correlates of the simple attributes

Tone and intonation are, roughly speaking, ways of employing pitch; this aural attribute (i.e. pitch height, abstracted from the time dimension) coarsely tallies with instrumentally measured frequency and, in the articulatory domain, with phonation rate. This is an oversimplification: not only does the correlation with frequency change at the extremes of the pitch (i.e. audible frequency) range, but pitch perception of speech-like sounds tends to be affected by more fundamental articulatory factors than rate of phonation, the latter being a rather complex function (cf. Ladefoged, 1967).

Stress and accent are often considered to correlate with the attribute of loudness; this relates, in the acoustic domain, to intensity, and intensity is a variable which, in turn, is determined in part by the amplitude and in part by the frequency (Lehiste, 1970:112ff.). However, there is abundant evidence (Bolinger, 1958; Fry, 1960) that these functional variables are much more closely correlated with disturbances in the pitch trajectory, and even, though to a lesser extent, with increases in duration, than with loudness increases; this holds in particular when the various cues are in competition. In the articulatory domain, initiatory effort, in some sense of that term, appears to be the major correlate (Ladefoged, 1967:40; Catford, 1968:312ff.; Lehiste, 1970:106ff.); Lieberman (1967) has attempted to identify increases in subglottal pressure as the essential ingredient, but the hypothesis is somewhat controversial (Lehiste, 1970:98). In addition, as Bolinger (1958(1965:34)) has pointed out, the notion of 'effort' also has a psychological component (cf. also Crystal, 1969:115), which may complicate perceptual judgments.

The correlates of 'segmental' functional variables, in particular timbre, are not so well understood as the correlates of prosodic variables (cf. Ladefoged, 1967:56); in the acoustic domain, timbre can be thought of as correlating with the distribution of energy in the frequency dimension (Lehiste, 1970:3), but this, in turn, is a function of a wide range of parameters which are still the subject of much research (cf. esp. Lindblom, 1972); the same complexity is found in the physiological configurations which generate these patterns, whether in terms of individual articulations or in terms of the shape of the vocal tract as a whole. There are a number of ways in which timbre and pitch interrelate, but they are of little consequence for the study of intonation (cf. Lehiste, 1970:74-77).

The major correlate of subjective duration and rhythm is the distribution of phonetic trajectories along the time dimension. Duration interacts with the perception of both pitch and loudness, and probably with

the perception of timbre; there is a complex relation of similarity between [i] and [e], for instance, of which duration is one component, differences in which affect the perception of differences in timbre. Apart from the microscopic level of the perception of simple, static trajectories, where very short pitch trajectories tend to be indeterminate in level, and, up to a certain limit, trajectory lengthening effects an increase in perceived loudness, there are more macroscopic areas in which temporal considerations are important. Prosodic features, in particular, are generally defined with reference to the time dimension (cf. §1.2.2.), which leads to the vexed question of the linguistic relevance of static trajectories or points in trajectories (e.g. pitch levels) compared with dynamic trajectories (e.g. pitch levels) compared with dynamic trajectories (e.g. pitch contours); in the non-prosodic field, the same question affects studies of consonant and diphthong perception. In view of its importance to intonation, this problem will be given particular attention in the following sections. Even more macroscopic, and even less understood, is the problem of the organisation of maxima and minima in trajectories into rhythmic patterns (cf. Lehiste, 1970:155f. and sparse comments *passim*). This problem will only be touched in passing at a few points in the following exposition, but cf. the phonological approaches in Chapter 3.

2.2.2. Perceptual analysis of pitch

Bachem, in a very original article (1950), attempted to identify two distinct ways of perceiving pitch (quite apart from the functional influences on the perception of tones and intonations, or articulatory influences in the perception of speech-like sounds): under certain circumstances the attribute of pitch height is taken to be the relevant criterion, while under different circumstances an attribute which Bachem calls pitch chroma is perceived. The former is straightforward enough to characterise: pitches with static trajectories are assigned to points on a scale from high to low, either in consecutive pairs (relative, or discriminatory judgments) or from memory (absolute, or categorial judgments - cf. Lieberman, 1967:159f.; Crystal, 1971:27). The notion of chroma, which is not to be confused with sound timbre (but cf. Jakobson & Halle, 1956 (1971:45)), is not so easy to characterise; it appears to be a more abstract perceptual frame in which the cycle of musical pitch intervals is used. It is, according to Bachem (p. 80), "best introduced by the terms C-ness, D-ness, etc., as a quality, which contains all its variations within one octave, and then recurs in every successive octave", and may underlie the ability to judge so-called 'perfect' or 'absolute' pitch, as contrasted with the normal, differential perception of pitch height. It is conceivable that Ogden's notion of 'octave quality' (1924), mentioned by Crystal (1969:106), relates to a similar kind of attribute. In support of the distinction, in regard to which he also cites older handbooks on the psychology of perception, Bachem adduces eight different ways in which judgments of height differ from judgments of chroma, and suggests a physiological basis for the distinction: chroma depends on details of the disturbance along the basilar membrane, while height is a coarser judgment based on the mean position of the pattern of disturbance on the membrane. Both the attribute of pitch height and the attribute of pitch chroma seem to be differential, i.e. relative, judgments, despite the association of

chroma with perfect pitch: the musical intervals are themselves relations, and are not restricted to absolute pitch or frequency levels. Bachem's ideas have not, to my knowledge, been given further attention in the literature, apart from bibliographical notes, but in the study of intonation and tone there are phenomena which may possibly be due to the attribute of chroma, such as the proximity of Norwegian tone intervals to musical intervals (Lehiste, 1970:81) and the intonational types discussed below in Ch. 4, esp. §4.3.

It is possible that there is a link, for speech-like sounds, between judgments of pitch and kinaesthetic judgments of laryngeal tension or initiatory effort; although direct measurement of these parameters is difficult, the approaches of Ladefoged (1967) in constructing an abstract parameter which he calls 'tension of the vocal cords' and Lieberman (1967) are promising (cf. also Léon, 1972 for a review of recent work); Ladefoged's construct, in particular, may well relate closely to perceived pitch. Tactile judgments of a very crude sort can be made by placing a finger on the depression between the cricoid and thyroid cartilages; as might be predicted from the function of the crico-thyroid muscles, the variation in width of this depression follows pitch rise and fall, but in view of the coarseness of the judgment, which - perhaps not surprisingly - is not referred to in the literature, it is of no value as part of a scientific procedure.

2.2.3. Instrumental analysis of pitch

Most studies of pitch perception have consisted in establishing correlations between instrumentally measured frequencies and perceptual judgments of pitch height. It is possible to relate pitch judgments and frequency fairly simply; it is only when functional patterns of tone and intonation interfere that the basic relation is destroyed. The function relating pitch height and frequency is, roughly, the natural logarithm; that is, pitch height "varies closely with the logarithm of the frequency (except for extremely low and high frequencies)" (Bachem, 1950:80); apart from the flattening of the curve at the extremes of the perceptual range, pitch judgments are also affected by variations in loudness and trajectories of very low duration (below 25 msec); cf. Lehiste (1970:67). As Lehiste points out, there is a natural way of relating pitch intervals (cf. the notion of chroma in the preceding section) to differences in frequency: they correspond to differences between consecutive harmonics. The most concordant musical intervals are the simplest ratios: octave - 1:2; fifth - 2:3; fourth - 3:4; major third - 4:5; minor third - 5:6. The second, or whole tone, corresponds to the ratio 8:9; the other two main intervals of the diatonic scale are the sixth, with the ratio 3:5, and the seventh, with 8:15, both being considerably more indirect and less concordant ratios and intervals respectively. Many folk music scales are pentatonic, making use of the more consonant intervals; others make use of more intervals, e.g. the Arabian 17-tone scale (this information compiled, e.g., in Károlyi, 1965; Kuchling, 1969). The question of whether intervals of this kind are relevant categories in intonation analysis has been mentioned above in connexion with Bachem's theory of the pitch attribute of chroma. The question of how pitch is perceived in non-static trajectories along the time dimension will be dealt with separately below.

2.2.4. Inter-domain correlations

The main correlate of pitch in the articulatory domain is the rate of vibration of the vocal folds, though there are many factors influencing this rate which may in turn be conditioned by a whole range of other articulatory gestures with their own roles in sound production. Lehiste lists five factors which determine the rate of phonation (1970:55ff.):

- (1) The mass of the vibrating part of the vocal folds;
- (2) Tension in the vibrating part of the vocal folds occasioned by activity of the intrinsic and extrinsic laryngeal musculature; via the hyoid bone, different vowels can interfere to different extents with laryngeal tension depending on the tension of various tongue muscles (cf. Bethge, 1952; and various American studies from 1952 on, reported in Lehiste, 1970:68ff.);
- (3) The area of the glottis, which varies with different types of phonation and determines resistance to the air-flow, thus affecting the pressure difference across the glottis and thereby the aerodynamic influences on phonation;
- (4) The sub-glottal pressure, determined by the muscles of the chest-wall and by resistances to air flow, for which Ladefoged (1967:13) lists four contributory factors -
 - i. in inspiration, pressure fall via external intercostal muscles and diaphragm;
 - ii. in expiration, pressure rise via internal intercostals and other muscles which decrease the size of the thoracic cavity;
 - iii. in expiration, pressure rise via the relaxation pressure of the lungs and the inspiratory musculature;
 - iv. in expiration, pressure variation via resistance at the glottis and elsewhere in the vocal tract, as in consonant articulation;
- (5) The damping of the vocal folds by coupling with other parts of the vocal tract, both sub-glottal and supra-glottal: when the fundamental frequency approaches a resonance, phonation is difficult (cf. also Lieberman, 1967:33f.); this factor will enter into the discussion of 'relative pitch' in §2.3.3. below.

In practice it appears to be impossible to make comprehensive measurements of all these factors at once; the reconstruction of an underlying motor pattern which can be compared with pitch judgments is clearly a complex operation, though the task is one which, in an operational sense, the speaker is capable of performing. Ladefoged (1967) has suggested that a plausible approximation to the essential factor of laryngeal tension can be deduced from a number of more accessible factors. Subglottal and oral pressure are compared, yielding the pressure drop across the glottis; from a comparison of this pressure drop and its variations with the frequency curve, the rate of vibration corresponding to a constant pressure drop is obtained. After smoothing out the additional effects of sudden changes in the rate of air flow, Ladefoged obtains a construct which he labels "tension of the vocal cords" (p. 49), suggesting that "it may correspond to the sum of the physiological factors affecting the adjustment of the larynx". The net effect of this deduction is to smooth out the actual perturbations of the complex phonation rate curve, leading Ladefoged to make the following proposal:

The simplicity of the curve showing 'vocal cord tension' suggests once more that it might be profitable to characterize speech in terms of physiological parameters of this kind, rather than in terms of acoustic

parameters such as fundamental frequency.

In this reconstruction, Ladefoged utilised the acoustic correlate of the phonation rate, the fundamental frequency of the sound produced. Since measurements of fundamental frequency for speech-like sounds do not necessarily tally with judgments of pitch, particularly within an intonational or tonal framework (cf. Hadding-Koch & Studdert-Kennedy, 1964, on the different perception of the same stimuli by Americans and Swedes), it is at least possible that Ladefoged's approach can provide a basis for reconciling pitch judgments with frequency measurements in terms of a motor theory of pitch perception; evidence on this point is lacking, however. If there should prove to be a correlation, it would not stand alone; Léon (1972:115) and Ladefoged (1967:40) both find ancestors of a motor theory of perception as far back as 1932, Léon in the work of Jespersen and Ladefoged in the work of S. Jones, both in connexion with stress or accent. Lehiste (1970:119) refers to the views of Daniel Jones on stress, mentioning the 1940 edition of his standard *Outline*, as anticipating the motor theory of stress perception.

The role of analogy, i.e. modelling, in the arguments for a motor theory of perception, with the strengths and weaknesses of this kind of argument, should not be overlooked: it is at least conceivable that the acoustic domain itself has been inadequately explored. At present, however, it is undeniable that the strongest correlations, both for timbre and for the other attributes, are not so much between perceptual and instrumental results within the acoustic domain, as between perceptual results in the acoustic domain and instrumental results in the articulatory domain, though the acoustic domain does have a range of autonomous characteristics.

Finally, mention should be made of attempts to establish quantitative modelling techniques of various kinds for the analysis and synthesis of sounds and investigating inter-domain correlations (cf. Fant, 1968: esp. p. 218 on the work of Schroeder and Heinz). Lindblom's work on the inter-domain correlations for timbre (1972) is particularly interesting; work on prosodic features has been done by Uhman (1967), Bakis & al. (1970); it will not be possible to deal with these studies within the present framework, however.

2.2.5. The time dimension

Although pitch perception is never a momentaneous process, requiring at least 20-25 msec even for static trajectories (Fry, 1968:375; Lehiste, 1970:67), the nature of pitch percepts have been presented above and in much of the literature as if they could be abstracted from the time dimension. This is a highly idealised conception of pitch, of course. Fay (1966:16) insists on the importance of the time dimension:

Time ... is extensively involved in the many phases of the total auditory process, be it in the phase and frequency variations, duration of input signal, periodicity of neural excitation, segmentation of the sound stream into elements, or the time of maximum stimulation of cerebral space patterns.

Jakobson, Fant & Halle (cf. §1.2. above) declared that prosodic features could only be defined in terms of the relation of two points in a time series, and some variant of this conception has dominated most views of

prosodic features. A wide range of problems arises from consideration of the time dimension: the problem of segmentation, the problem of which variables (if any) operate in time in terms of static trajectories and which in terms of dynamic trajectories; the problem of whether the relation (configurations) or the relata (levels) are to be regarded as perceptually and, beyond that, phonologically primary. Since these are also central phonological themes, the present section will simply introduce the main themes, leaving more linguistically relevant discussions to the following sections.

The main approaches to the sequential ordering of speech have been placed by Fay (1966) into three main categories: studies of temporal organisation within the acoustic domain; studies influenced by quantitative information theory after Shannon; and studies of the physiological (sensory and motor) organisation, after Lashley. Studies in the last two categories in particular have stimulated the development of linguistic and related aspects of psycholinguistic theory: compare Hockett (1955) and the reaction of Chomsky (1957) with regard to the second category, and Johnson (1968) with regard to the third. Many of these impulses have been in the areas 'above' phonetics, e.g. syntax and phonology, and linguistic phonetics itself has not benefited a great deal from them; indeed, Crystal (1969) and Lehiste (1970), in their reviews of the correlates of prosodic features, have nothing to say about the perception of dynamic trajectories of pitch or the other attributes, while the perception of static trajectories, which in a sense are simply special cases of trajectories, dynamic trajectories being the more general cases, are dealt with in some detail.

There are quite a number of areas which have received some attention, however. Not all of these have to do with prosodic features; although customary terminology sometimes diverts attention from the fact (e.g. Jakobson, Fant & Halle's 'intrinsic features'), the non-prosodic aspects of utterances are also perceived as a function of time. One such area is the role of formant transitions in the perception of consonants (cf. Fry, 1960). Rhythm is one form of prosodic organisation which has received attention, in particular by Jassem (1952) and Fry (1960); Crystal (1969) reviews some of the received theories and criticises the often cited notion of the isochronous nature of rhythm in English on the grounds of lack of evidence; Lehiste (1970) reports work on the neurophysiological basis of rhythm; much work has been done on the internal organisation of the units of rhythm, i.e. syllables or words (cf. Ladefoged, 1967:170; Lehiste, 1970a). Certain aspects of the perception of dynamic pitch trajectories, which are more germane to the present study, have also been investigated. Bolinger (1951) has compared the relations within pitch trajectories with the relata in terms of their phonological relevance in American English; Bolinger (1958) and Fry (1960) have compared dynamic pitch trajectories with other, simpler variables in terms of relative perceptual 'weight'; Bolinger (1958) also factorised pitch contours from the point of view of linguistic function into accentuation and intonation, in an attack on the dominant contemporary view of stress as simply loudness. Lieberman (1967) makes the same kind of factorisation in principle, though not with Bolinger's linguistic detail, and with an interesting twist: his factorisation is in articulatory terms, and he claims that listeners perceive intonations in terms of deviations from an 'archetypal' natural physiological sequence with two components, intonation (the breath group, varied by means of laryngeal tension) and accentuation (varied by means of changes in sub-glottal pressure). Lehiste (1970:102ff.) reports that Ohman's syn-

thesis model has, in addition to two components analogous to those of Lieberman's model, a further word-level tonal component for Swedish word accent, which involves inhibition of the crico-thyroid muscles.

All of these approaches examine the ways in which linguistic units are correlated with various kinds of sequential organisation on the phonetic level; they clearly rely on the decisions imposed by particular languages, one of the most fruitful sources of information about these matters, and indeed ultimately the final test of any theory. It is always difficult, however, to decide what criteria are operating in any given judgment on linguistically analysable items, and the need for more research on perception in this area is particularly obvious. One instance of a difficulty in this kind of question is to be found in Lieberman's discussion of the difference between categorical and discriminatory judgments of utterances. He asserts (1967:160): "Linguistic decisions are categorical." By 'categorical' he means that variants of a variable are recognised from memory, while 'discriminatory' judgments involve the comparison of consecutive variants of a variable in the same trajectory (cf. p. 48 above). But what are, in terms of perception and recognition, 'linguistic decisions'? Many (some would say all) linguistic categories are discretely structured; this problem will be discussed in the following section. But there is some doubt about the perceptual relevance of discrete structuring, especially at the level of the smallest units of phonological analysis (cf. Ladefoged, 1967:170); it seems that these are to be regarded as a function of the temporal organisation of dynamic trajectories, as far as the phonetic criteria of analysis are concerned. Here lies the problem: one obvious way of seeing the perception of dynamic trajectories is in terms of discriminatory rather than categorical judgments. A pitch change is, seen from the point of view of the trajectory of a simple attribute, a continuous shifting of the trajectory through adjacent variants in time; only a very small change of about 5 Hz (Fry, 1960) is sufficient. Transcriptions of pitch trajectories which emphasise the relata in the trajectory rather than the relation (cf. §2.4.) can be regarded as means of capturing this emphasis; pitch phoneme theories do not, of course, qualify for this category without certain restrictions, unlike, e.g., the transcription of Bierwisch (1966). However, Fry also pointed out that, from the point of view of perceptual weight, the minimal change was the decisive change, and that larger shifts made little difference in the way the trajectory was judged. This appears to be an indication that, in a different respect, categorical judgments are made; the constant is not the pitch height variant, however, i.e. the relatum, but the pitch change relation itself, whether a sudden step or a gradual glide. On this view, the dynamic trajectories can be variables in their own right, complex variables which are not derivative from the simple perceptual attributes, but which have autonomous characteristics. On this view, the static trajectories can be seen as special cases in which the variants are kept constant along the time dimension; this point of view receives some phonological support from the analysis of level terminal contours in English, which are sometimes seen as positional variants of some other contour, usually a rising contour, or as a neutralisation of other dynamic contours, both rising and falling (cf. Crystal, 1969:203, 215f.; and below, §4). This does not preclude the possibility that level contours may on occasion have a different status, which depends on categorical rather than discriminatory judgments of variants of a simple attribute for its identifica-

tion; there is evidence that this is possible (cf. §2.3.3.1. below), and that this kind of perceptual judgment is the natural phonetic basis for pitch level tonemes, certain kinds of accentual patterning and the notion of intonation base-line, either alone or as the initial member of a series which also involves discriminatory judgment.

It is not easy to relate the linguistic categories developed in the course of describing utterances to perceptual principles, however. Bolinger (1951) used the term 'gestalt' for the relational constants he had in mind, though more as a favourable association than as a systematic connexion with gestalt psychology; the term is also used semi-technically in the writings of the Prague school, where the influence of gestalt psychology may be greater, though the term does not have such specific connotations in German as it does in English. It is likely, it seems to me, that the problem of segmentation, of which this is one aspect, is not only a phonological problem, as is generally maintained, but has a natural basis in the range of phonetic variables in terms of which the physical aspects of utterances are described. Maxima and minima in dynamic trajectories, points of abrupt change and even interruption, reinforced by coincidences with similar variation in other trajectories, can presumably be seen as complex cues for segmentation, justifying phonetically the postulation of discrete units along the time dimension. It cannot be said, however, that there exists a theory within phonetic linguistics which comprehensively covers the field of organisation along the time dimension. Lehiste (1970:154ff.) suggests that

there is a close correlation between units of performance and phonological units on the one hand, and units of competence and morphological-lexical-syntactic units, on the other hand (p. 156).

Whether the competence-performance distinction is a useful one to make in this connexion may be doubted, in view of the methodological status of the distinction (cf. §1.3.2.). However, she associates the distinction further with the time dimension, maintaining (p. 155): "A competence model can be a static model; a performance model must be a dynamic model." This would mean that competence models would, apparently, be a-temporal models of lexico-syntax, while performance models would be models of phonology and phonetics which take the time dimension into account. The relation between the three categories of performance, phonology and time, and their complements competence, lexico-syntax and a-temporal organisation is only to be resolved by seeing the notion of competence as a set of methodological principles: the theory of phonemes, the theory of morphophonemes, and the like, are candidates for a theory of phonological competence since their methodology relates closely to that applied in describing syntactic competence, for instance. And, in the other direction, many theories of syntax, from traditional theories to information theoretical models and models of production (cf. Johnson, 1968), have conceived of syntax as arrangement in the time dimension. Furthermore, even Chomskyan competence theories have a relation to the time dimension, though the relation is in many respects more abstract than that of other approaches to syntax: the operation of concatenation is nothing more than a formal analogue within the calculus of the temporal relation between segments; the theory is therefore by no means a-temporal. Even the simplicity criteria for the selection of canonical deep structures (cf. above, §1.2.5.2.) are inconceivable without the possibility of different 'surface' orderings, the re-

flexes of temporal ordering. Lehiste's formulation does not take these matters into account.

As was indicated above (p. 82), linguistic theories can be used as part of a heuristic for arriving at a more comprehensive analysis; by 'linguistic theories' is meant 'competence theories', i.e. linguistic theories with certain methodological restrictions of particular kinds. Indeed, theories using this kind of methodology, either with (as with Chomsky) or without explicit mathematically based models, are clearly an essential ingredient in any linguistic description, since they select some of the most central criteria of analysis for utterances. Since the problems introduced in this section lead far into phonological territory, where such criteria are made explicit, further discussion will be given a framework of phonological categories. This will be complemented, in Ch. 3, by a survey of various important views of the phonology of intonation.

2.3. Phonetic types and phonological forms

At the beginning of the present chapter, the priority of perceptual criteria in analysis was emphasised; the priority of functional criteria over both perceptual and instrumental criteria governs analyses of utterances, since even the phonetician must know whether or not he is dealing with speech, and this is only in part a phonetic question. The use of functional criteria goes beyond this minimal judgment, however; not only does naturalness, in the sense of speech-likeness, form an important part of phonetic analysis, particularly where speech synthesis is involved (cf. Lieberman, 1967:36, on pitch perturbations by consonants), but also the language-specific 'gravitational field' of favoured variants in that a language tends to attract those variants which are in immediate proximity to the favoured variants towards these variants and thus 'bends' the lines of discrimination in particular areas of phonetic quality space (cf. Fry, 1960; Gibbon, 1973). The bases for this distortion of phonetic quality space will be discussed below; further, the main problems which arise, such as the problem of discreteness and continuity, the problem of levels and contours, the problem of relative and absolute variants, some of which were introduced in the preceding section, will be given further attention in the light of additional phonological criteria. These problems all have to do with the phonetic nature of phonological forms, with the way phonological forms are related in terms of natural similarities and differences, and with the ways in which the phonetic shapes of utterances are factorised for phonological purposes into segments and trajectories.

2.3.1. Some studies

Most of the studies cited already have incorporated, implicitly or explicitly, criteria of analysis which go beyond the criteria required for phonetic analysis. Other studies have emphasised the intercorrelations of phonetic parameters, not only among the various phonetic levels, but between these and the phonological levels. By far the most comprehensive survey of this kind has been made by Crystal (1969), with his 'parametric' approach; Crystal & Quirk (1964), Quirk & al. (1964) and Quirk & Crystal (1966) report related work, all of which covers much more

than intonation. The relevant observations of these investigators will be covered at the appropriate points in the next chapter.

Of particular interest are the studies which investigate the complex phonological relations which hold between intonation or tone and various kind of phonetic parameter. There is an intricate relationship, for instance, between the mode of phonation (Catford, 1964), various kinds of laryngealisation, and the rate of phonation as manifested in pitch patterning. In English, creak (Catford, 1964:32) commonly occurs as a variant of low pitch (cf. Crystal, 1969:137, and references there); the same variation, with class dialect and speaker-identification functions, can also be observed in German. Lehiste (1970:104) reports on interesting evidence from Ohman (1967) that the phonetic correlate of Swedish word tone is a consonant-like laryngeal modification:

The author proposes the hypothesis that the Scandinavian tonal accents are a sort of laryngeal consonants, not unlike glottal stops, that are co-articulated with the sentence intonation as well as with the segmental gestures of stressed syllables.

In Danish, the phonetic correlate of *stød*, the Danish cognate of tones in the other Scandinavian languages, is laryngeal; the Ohman proposal suggests a natural phonetic basis for relating the Danish *stød* with, for instance, the Swedish tones. Lehiste (1970:89-90) also mentions the association of laryngealisations with tone in Latvian, and with two of the Vietnamese tones, as well as the role of various kinds of laryngealisation (one could add pitch variation to this) in providing boundary signals. This delimitative role can be observed in various kinds of context; at the word level, word-initial function with vowels occurs in some German dialects, and in English, word or syllable final position is often signalled by laryngealisations of various kinds; paralinguistically, a glottal stop or similar laryngealisation often accompanies a hesitation vocalisation or an arrested utterance. Interaction in the larynx would appear, therefore, to be one source of relationships between pitch patterning and other kinds of phonetic configuration within phonological systems. Mulder (1968:213) refers to the Tibetan high-low tone correlation as a reflex of an original fortis-lenis correlation, and mentions that this kind of process, as well as segmental influences of other kinds (which he does not specify), contributed to the development of the tone systems of other South-East-Asian languages. It is conceivable that this kind of historical relationship has its phonetic explanation in phenomena like the pitch perturbations which consonants cause; Lehiste (1970:71) reports quite large pitch differences, and observed that

higher fundamental frequencies occurred after a voiceless consonant and considerably lower fundamental frequencies occurred after a voiced consonant.

It is no accident, it seems to me, that the voicing dimension and the fortis-lenis dimension often function hand in hand; this is the case in English as well as in many other languages, including Serbo-Croatian, the language for which Lehiste's study was made. There is an obvious reason for this: voicing produces a lower rate of air-flow, which leads to lower supra-glottal pressure, and consequently the pressure of the articulators necessary to form an obstruent can be reduced. But the pressure fall after consonant release will be lower if the pressure build-up is

lower, therefore the effect on the trans-glottal pressure differential, which aerodynamically determines the phonation rate, will be less, leading to a lower post-consonantal frequency peak; hence the relationship with pitch patterning. It is by no means unknown for concomitant features to take over the role of major correlate of a phonological opposition; on the contrary, such initially 'extra-phonological change' is a major process in the history of languages. Interaction via the dynamics of speech production would appear, therefore, to be another source of relationships between pitch patterning and other kinds of phonetic configuration in phonological systems. Finally, "other factors being kept constant, higher vowels have higher fundamental frequency" (Lehiste, 1970:68); this intrinsic pitch of vowels could well provide the phonetic basis for Indo-European apophony, and other similar phonological relationships.

Most of the interactions just discussed occurred at the word level; however, intonation systems, too, have an important part to play in the determination of the precarious balance of phonological systems, to the extent that they affect the phonetic realisation of tones and word accents; Lehiste (1970:100ff.) has outlined a number of ways in which such interactions can take place. Though English lacks the elaborate tonal and word-accentual systems in which influences between prosodically used variables from various systems on each other and on non-prosodically used variables can best be demonstrated, there are intricate connexions between the vowel system (cf. vowel reduction) and the word stress system (Karcevskij, 1931a; Halliday, 1967:14; Chomsky & Halle, 1968); Bolinger (1961) has shown how sentence-accentual and intonational systems can, in turn, interact especially on functional grounds with some aspects of the stress system, a matter which will be dealt with below (§3.3.).

Just as important as studies of the ways in which different phonetic variables may be used by one phonological system are studies of the ways in which particular phonetic variables and their variants are used by different phonological systems. Hadding-Koch & Studdert-Kennedy (1964), in the course of a study of how accent can affect the perception of intonation, not only showed that the two systems interact, but that their American and Swedish subjects in some cases perceived the same synthesised patterns differently according to the intonational and accentual configurations of their own languages. Lieberman (1967) has interpreted both of these results in terms of an analysis-by-synthesis procedure, in which percepts are interpreted in terms of archetypal articulatory patterns; the accent-intonation interaction is seen against the background of putatively universal phonetic constraints, while the language-specific differences in interpretation are ascribed to different uses of laryngeal tension in American English and Swedish. A similar language-specific model has been constructed for German by Isačenko & Schädlich (1966, &c.); the similarity lies in the suggestion that the tone-switch feature postulated by Isačenko & Schädlich has the status of an input command to the articulatory organs (Isačenko, 1967:24), but since the model is constructed purely on the basis of functional judgments, the suggestion is no more than a hunch. The tone-switch model will be discussed further in the next chapter. The Lieberman model has been criticised on phonetic grounds (Ohala & Hirano, 1967; Lehiste, 1970:97f.; Léon, 1972:115f.) and on phonological grounds by Bierwisch (1966:131f., 191), and Crystal (1969:198n). While the phonetic controversy is unresolved, the phonological criticism that the forms in particular languages are not to be associated directly with

Lieberman's breath-group and pressure features cannot be taken as counter-evidence, since Lieberman has nothing to say about the way in which these 'normal types' (cf. §1.2.5.1.) are actually used in verbal transactions; often, variations which at first glance might appear to contradict Lieberman's hypothesis if the normal role of his normal types is taken to be the indication of statements (as Crystal's remark appears to assume) turn out on further consideration to have highly specific functions within the speech act as a whole. Malmberg (1971:225) points out such a function in Swedish, where a terminal rise apparently has a role similar to *isn't it*, &c. in English, for a number of dialects. Similar functions of intonation can be observed in German, with or without the speech act idiom *nicht wahr*, and in English, with or without the *isn't it* or *you know* idioms. Whatever the 'ultimate truth' may turn out to be with regard to Lieberman's hypothesis, it points the way towards a theory of universal constraints on the phonetic variables used in intonation systems. Isolated observations are not sufficient to controvert the hypothesis, particularly when they are not further analysed; nor can perceptual evidence alone, such as that which Bierwisch uncritically adopts from v. Essen's account of the rhetorical style of German intonation, controvert the hypothesis.

In the following sections, some of the problems involved in relating phonological forms to phonetic configurations will be discussed; the natural phonetic basis for intonations (not to be confused with the natural functional basis, cf. §1.2.5.3.) will be the main theme, and will be taken up again in the specific analyses of the following chapter.

2.3.2. The segmentation problem

In linguistic analysis, the forms which are postulated are held to be both syntagmatically and paradigmatically discrete; the phonetic variables, on the other hand, are generally held to be continuous, both paradigmatically (variants) and syntagmatically (trajectories). The variables themselves, however, are presumably discrete at any given level, though between levels they will undoubtedly overlap (cf. the many influences on the supposedly articulatory category of phonation rate, §2.2.4.). In the following sections it will be argued that segmentation is not arbitrary, from the phonetic point of view, but is an important part of the naturalness condition on phonological analyses and has a natural phonetic basis.

2.3.2.1. Phonetic aspects

The criteria of analysis at the phonetic levels are types, organised paradigmatically as variants of phonetic variables. In perceptual phonetics it is not easy to discover which in fact are the variables; sometimes an utterance can be assigned to a number of static trajectories through the simple variables outlined in the preceding sections, sometimes dynamic trajectories through the simple variables are the relevant variants, and the variables are of a more complex nature, ranging over gestalts of various kinds; these problems were introduced in the discussion of the time dimension above. Sometimes the perceptual variants are more complex functions of the simple attributes, involving the co-ordination of variants from more than one of these attributes, or the synchronisation of trajectories

from more than one attribute.

It is practically a truism that the phonetic variants to which utterances are assigned are arranged along paradigmatic continua, and that the trajectories through these continua are themselves continua in time. Like many truisms, this one is not as true as it seems. Whereas the methods of instrumental phonetics yield continuous variables, in which any quantification is in terms of an arbitrary metric, the situation with perceptual analysis is somewhat different (though it is said that experts in reading spectrograms can also go considerably further in their interpretation than the quantitative nature of such analyses might seem to permit). In any record of the phonetic types of utterances, there are abrupt changes and even interruptions in the course of any given trajectory. This applies even in instrumental records, allowing the identification of certain discrete temporal segments; in perceptual phonetics, and in the interpretation of instrumental record in perceptual terms, the degree to which segmentation can be made on such grounds is greater. It is no accident that the most widely used systems of phonetic transcription are to a considerable extent alphabetic and therefore embody decisions about segmentation even at the earliest stage of analysis. This applies both to prosodic and non-prosodic transcriptions. Since these decisions are based on maxima and minima in trajectories, segmentation is easiest to perform when maxima or minima are at their most extreme. Maxima identification is further supported by concurrently developing maxima in different variables. Bolinger, in his outline of the substantive and methodological differences between analysis of intonation and phonemic analysis, points out the following (1949:249):

The phonemes comprise numerous variables, each of which depends upon a different and special function of the articulatory organs. ... Tone, on the other hand, is but one variable, which is smooth-running through its entire gamut; furthermore, the articulatory organs, with minor exceptions, (as in the shift from chest tones to falsetto), are the same, and function in the same way, for the whole of intonation.

Prosodic features thus differ from non-prosodic features in this respect. This explains why Pike could observe differences in the degree of mutual relativity (cf. below, §2.3.3.) between vowels and consonants on the one hand, and pitch patternings on the other (1963:99f.); pitch, he points out, is, among the various phonetic variables, "the most abstract of them all, in reference to relativity in the system". Haas (1957:143) points to a further distinction, which relates to the articulatory inaccessibility of pitch (§2.1. above) and its correlates; it is generally possible to relate vowels and consonants to fairly exact locations in the vocal tract, whereas pitch changes are all at the same place.

The main problem, as far as phonetic aspects of segmentation are concerned, is to find boundaries for likely segments. Although some boundaries can be given, such boundaries are not the rule, and, as with arrested utterances, do not have much direct relevance to the central aspects of language; the breaks which stops engender are not always associatable with linguistically important forms. This leads directly to the phonological aspects of the segmentation problem.

2.3.2.2. Phonological aspects

There is of course not necessarily a one-to-one relation between seg-

ments in the phonetic sense just discussed and segments in the ordinary phonological sense; nor is the relation necessarily one-to-many or many-to-one. It is presumably for this reason that Harris (1951:25) describes the process of phonological segmentation as he does:

The points of division of these segments are arbitrary here, since we have as yet no way of enabling the analyst to make the cuts at precisely those points in the flow of speech which will later be represented by inter-phonemic division. Later procedures will change these segmentations until their boundaries coincide with those of the eventual phonemes.

The object of the preceding section was to point out grounds on which the initial segmentation can be said to have a phonetic basis; the initial decisions are not quite as arbitrary (except in a functional sense) as Harris asserts. If the reason for calling the initial decisions arbitrary is that the boundaries cannot be put "at precisely those points in the flow of speech which will later be represented by inter-phonemic divisions", then this is a different matter. The problem of boundaries was already mentioned at the end of the preceding section; the question of the precision with which boundaries can be identified is often thought to have particular importance in phonology.

Crystal, for instance, gives the identification of boundaries a certain priority in his intonation analysis (1969:205):

To analyse English speech into a sequence of non-overlapping tone-units means in effect to define their boundaries.

In addition to boundary-identification, Crystal refers to other evidence for the analysis of linguistic forms in the area of intonation, such as "internal structures" and "external function, i.e. distribution of tone-units as wholes", but priority is accorded to boundary-identification. Halliday takes up a somewhat similar position, but makes no mention of segmentation as an analytic problem (1967:9):

For the purposes of the analysis, the selection can be regarded as discrete on both axes, both syntagmatically and paradigmatically: we can make a good description, that is, if we postulate that each tone group begins where the previous one ends, with no overlap and no hiatus, and that each tone group can be unambiguously assigned to one tone, this assignment thereby excluding all the other tones.

But the boundary problem, as the necessity for finding the precise points where segments end and other segments begin, has a somewhat artificial character. If the tone-unit, for example, is to be a valid abstraction from the data, it must first and foremost be identified in the positive terms of what it is, rather than in the more negative terms of where it starts and finishes. When the segment has been positively characterised or perceived in terms of coherent patterns through the phonetic variables, the boundaries can enter into the discussion and play a valuable role as part of a decision procedure to decide between alternative analyses. For, although there is something of a phonetic basis for a naturalness condition on segmentation, attempts to provide a naturalness condition for the positioning of boundaries are not likely to meet with the same degree of success. In fact, in the discussion of possible phonetic grounds for segmentation in the previous subsection, the implicit assumption was made

that the configurations form the basis for identifying segments, and next to nothing was said about the nature of boundaries. For the boundaries are rarely phonetically determinate; if they were more determinate, there would have been no need for the controversy between Pike and the orthodox neo-Bloomfieldians at the end of the 1940s, for instance, or for Crystal's additional functional criteria. The functional units of the lexicon and syntax are, at their own levels of analysis, certainly totally discrete items; this is no reason why they should map on to discrete sections of an utterance in the time dimension, any more than the clarity of a pen and ink drawing reflects clarity in its subject. The question "How does one say where one tune ends and another begins?", which Sledd (1960:177) put, in criticism of Kingdon (1958), is not entirely relevant if the answer is required to detail phonetic criteria. Intonation patterns, like the phonological and morphological forms of grammar and lexicon, are abstractions of a particular kind, based on the way configurations of phonetic types map on to configurations of roles, and as abstractions they do not necessarily reflect precisely the detail of the structures found at other levels of analysis with their own criteria. To take an example: it would be absurd to ask for the boundaries of an accent. The correlates of accents are maxima, i.e. pitch configurations, loudness patterning, and changes in the temporal patterning, and not stretches of utterance defined by precise beginning points and precise ending points. To adapt Trim's convenient functional terminology for metalinguistic use, accents are described by "characterisation", not "delimitation" (1959:26). There does not appear to be a necessary reason for giving definable phonetic boundaries to other kinds of unit, such as the tonetic tone group, for instance; this is a special kind of sequence of accents (in Bolingerian terminology), and as such is subject to the same kind of phonetic correlations as the individual accents of which it is composed, together with additional characterising features (cf. the discussion of Bolinger's "relative height", §3.3.1. below). Crystal's tonetic analysis, in contrast to the analyses of Abercrombie (1964) or Halliday (1967), does not include the category of foot as a prosodic segment; although he does not argue the point, Crystal's omission of the foot is defensible: the foot is essentially the temporal stretch surrounding a single accent and, as pointed out above, there is no reason to attach borderline fringes to accents. This does not mean that no such segment can be found (e.g. using syntactic and semantic criteria); it simply means that the notion of foot conveys no more than the notion of accent alone (taking into account its various relations with word stress). Similar considerations might - to push the analysis somewhat - apply to tone groups (cf. Lee, 1956c:367ff., and §3.3.2. below), demoting them to the status of a particular kind of accentual and intonational patterning, perhaps in some sense 'normal' or canonical (cf. §1.2.5. above). A more general statement of this kind of view for phonological units, with "delimitation" in its original sense, is Trubetzkoy's (1939(1958:241f.)):

Die distinktive Funktion ist für die Sprache als solche unentbehrlich: die einzelnen Schallkomplexe, die den Bedeutungseinheiten entsprechen, müssen unbedingt verschieden sein, damit sie nicht verwechselt werden ... Dagegen ist die äußere Abgrenzung der bedeutungsgeladenen Schallkomplexe gar nicht unbedingt notwendig.

Boundary identification should thus be kept distinct from unit characterisation of definition. Crystal's two delimitation criteria turn out, in

fact, to be optional and thus not defining. The first, a "pitch-change following a nuclear tone" (1969:206) has three kinds of exception: ambiguity can occur with a high onset after a rise, low onset after fall, or with a long tail followed by a long pre-head. The second criterion, "the presence of junctural features" such as pause, length variations, aspiration, makes it "safe to infer from the presence of a pause after the nucleus that the end of the tone-unit has come"; however, even if there is statistical evidence that it is rare for junctural features to occur in other positions, there is no guarantee that junctural features will occur at all. In one kind of case, with pauses in the nuclear tail, not after it, the pitch configuration overrides the quasi-junctural items and is thus shown to have a different status; Crystal remarks (p. 206) that

of the tone-units which did have nuclear tails in my data (about 1 in 10), it was extremely rare to find pauses, and on those occasions when they did occur (1 in 500 cases), the pitch continued steadily downwards, so that there was no risk of confusion with the pre-head of the next tone-unit.

Here, as elsewhere, the internal configuration is the decisive factor. It makes little difference, for the purpose of phonological segmentation, whether the configuration is simple, i.e. a trajectory which is not further analysed, or whether it is compound, i.e. consisting of a number of sub-trajectories whose distribution gives them a delimitative function in addition to whatever other functions they may have (cf. §1.2.4., p. 16 above, on multiple functions). Conversely, criteria for smaller units may derive from configurations which constitute larger units, as with the rhythmic determination of the relative lengths of accented and unaccented syllables in English (cf. Lehiste, 1970a) and other aspects of the timing system. The foot, mentioned above, is similar in status, though more of a construct in the absence of explicit conceptions of 'clitic' items (cf. e.g. Bierwisch, 1966); Abercrombie states, simply (1964:217):

Each foot starts with a stress and contains everything that follows that stress up to, but not including, the next stress.

The unit characterised in terms of timing is rather different from this; Abercrombie's definition has more to do with pitch configurations (interpreting Abercrombie's "stress" as accent).

The issue of boundaries, then, is a secondary issue as far as the problem of segmentation is concerned; the delimitative function of certain configurations is important, but in other respects, some of which will be discussed in the final chapter of the present study. The items which served as a medium for the preceding discussion will be dealt with in the context of particular approaches to intonation analysis in the next chapter. The primary criteria for segmentation are not the boundary signals, but the type criteria which are associated with the positive identification of linguistic forms, and the role criteria used at the level of analysis concerned.

The role criteria for phonological analysis go beyond the basic knowledge that the objects of the analysis are utterances: they involve judgments of whether two utterances could be held to have different roles in the language or not. Phonological forms are then set up to capture the regularities in type configurations which correspond to similarities and differences in roles, particularly the latter at this level. It is not

easy to define the relationship between phonological forms and phonetic configurations; Chomsky has characterised one possible view, which he calls the "taxonomic" approach (1964), as one in which the matrix representing the distinctive segments and variants which constitute phonological forms is a submatrix of the matrix representing the phonetic configurations, a view which he rejects. The taxonomic point of view can be formulated in terms of a set of conditions which determine the relation between the phonological representations and the phonetic representations, all of which follow from the notion of a submatrix: the linearity condition, the invariance condition, the biuniqueness condition (for this, cf. also Postal, 1968:8), and the local determinacy condition (cf. Chomsky, 1964: 78ff.). Other possible kinds of approach can then be defined in terms of deviations from these extremely strong conditions on phonological representation, and expressed in terms of the employment of different rule types and rule orderings. It should be remembered, however, that all of these conditions presuppose the existence of reliable phonetic criteria of analysis; without knowledge of types and their arrangements, any postulation of conditions like the four given above, as specific versions of the general naturalness condition on phonological representations, is vacuous. This empirical condition Chomsky refers to as the "condition of phonetic specifiability" (1964:67). It should be clear that the nature of the phonetic criteria of analysis, the phonetic substantive universals, which are postulated is a crucial point in any theory, one on which the empirical content of the theory depends. This is where Ladefoged and his associates, for example, have seen weaknesses in the approach of Chomsky & Halle (1968); the question of the phonetic reality of Chomskyan 'stress' patterns will be discussed in §3.3.3. below, as well as in §2.4.3. in this chapter.

Other kinds of role criteria can be used, of course, leading to different kinds of levels of analysis. Morphophonemic criteria, for instance, involve the recognition of elementary kinds of functional identity as well as the functional difference involved in the more basic forms of phonological analysis. One characteristic of the phonology of Chomsky and Halle is the priority which such criteria are given over the simpler criteria, and the (justified) scepticism with which the criterion of 'contrast' is regarded (cf. Chomsky, 1957:97n; 1964:83n). Whatever the merits and drawbacks of a contrast criterion (whether semantic or formal) for non-prosodic phonology, it is certainly impossible to use it as the basic criterion in prosodic analysis. The reason for this is not obvious, or the notion of intonation phonemes and morphemes would never have arisen (cf. §3.2.); it is quite simple, however, and has been formulated explicitly by Bolinger (1951) and Gunter (1966). It only makes sense to restrict attention to the contrast criterion if there are grounds for believing that all differences are equal in status, and that differences in type do not correspond regularly to differences in role. In the area of non-prosodic phonology, this kind of arbitrariness is, and always has been, a guiding principle in linguistics; in effect, it means that phonetic and phonological considerations are quite independent of any functional (e.g. syntactic, morphological) relations which might hold between various utterances. If every difference has the same status as every other difference, there is no reason to think that there is such a thing as a problem of segmentation in phonology: differences between forms are discrete, and therefore the phonological level of representation, while being a generalisation over continua using non-phonetic criteria, is itself independent of such con-

tinua. If, however, it is recognised that role variation and phonetic variation go hand in hand to some extent, then the contrast criterion alone will not do. In morphophonemics this is true, though the additional criteria of similarity are not used to the exclusion of 'contrast' criteria, so that differences between one morphophonemic pattern and another are just as discrete as those between other morphophonemic patterns. Sometimes there are morphological series, however, where differences and similarities are by no means arbitrary; Bolinger (1958(1965:82)) gives the following series, for instance: *trashman, milkman, mailman, postman, workman*, where the scale between full and reduced vowels in the second syllable parallels a scale of fusion within a word, from compound to "virtual suffix". This kind of paradigmatic continuity is not difficult to find in the prosodic area; in fact, it is a basic principle. Pike (1945:96ff.) and Bolinger (1961) give numerous examples; the matter will receive much more attention in the next section. Syntagmatic continuity, which goes against the basic phonemic principle of segmentation, can be seen as a principle underlying trajectories through such continuous variables. Some examples will be discussed in Ch. 4 below; when a sustained calling intonation tapers off or even rises towards the end, this involves a change in the trajectory, and a change in the role, of the utterance without segmentation being possible. The linearity condition between the phonological representation and the phonetic representation will therefore, in cases like this, have to be understood in a different manner from that in which it is understood in the taxonomic model formulated by Chomsky, since the abstract trajectory will be continuous (as it is co-determined by a role continuum) and not a sequence of segments. There are trajectories, for instance the pitch contours of English intonation which belong to the better known systems, which are equally impossible to segment, but for a different reason: they do not reflect a continuous change of role, but are functional units with a single overall tendency, such as the falling or rising terminal contours. It has already been mentioned (p. 57 above) that there is evidence for the view that the type constants which form a basis for segmentation in English are related between points in a trajectory, rather than the actual values of variants at those points; the most well known account of pitch related as 'gestalts' is Bolinger (1951); supporting evidence comes from Fry (1960). If this is the case, it does not make sense to segment these contours further, since they are functional units; this, however, is precisely what a number of studies of intonations as sequences of pitch level phonemes try to do (cf. the following chapter).

The problem of segmentation in intonation analysis can be seen to have a number of facets, which have been outlined above. First, there is the question of whether there is a basis for segmentation within the continuous phonetic variation of utterances; the suggestion was made that there is indeed such a basis. Second, the problem of specifying the boundaries of segments within a phonological analysis was discussed and adjudged secondary in importance. Third, the influence of non-phonetic criteria on segmentation was described, and questions of where continua, both paradigmatic and syntagmatic, affect phonological analysis rather than phonetic alone (this is a matter which does not affect the more clean-cut areas of non-prosodic analysis in which phonological variants are discretely different and phonetic variants are continuously different - Chomsky & Halle, 1968:297n), were outlined.

All through the discussion, a kind of interplay between two basic

principles of analysis was operative; these principles were termed by Wells (1945(1972:135)) the principles of segmentation and of phonetic similarity. For Wells, as for other phonemists, the phonetic similarity principle presupposed the segmentation principle, but this is not a necessary standpoint, as the present discussion has shown. Haas (1957:121) has referred to the distinction as that between segments and features, and criticised the tendency to relegate features, the basis of Wells' "phonetic similarity", to a subordinate position. Abercrombie (1964(1965:121f.)) has described approaches which give segments priority as "building block" approaches and those which give features the priority as "parametric" approaches (a term taken up by Crystal, 1969). The former approach parcels off sections of trajectories through phonetic variables in terms of fictions such as points in a trajectory or such as static trajectories (on the fictionality of static trajectories see the discussion of absoluteness and relativity in the next section). The latter approach sees configurations of trajectories as the starting point. Most linguistic schools emphasise one or other of these basic points of view; phonemic theories emphasise the segmental principle, whereas prosodic phonology in the Firthian sense, for instance, emphasises the complementary feature principle. Even within basically 'parametric' approaches, there is often uncertainty about the most useful way to componentialise a given trajectory, which shows that the feature versus segment conflict is simply a special case of the more general problem of which phonetic criteria of analysis are to be used in phonological descriptions. Crystal's discussion of monosyllabic pitch contours ("glides", in his terminology) will serve to illustrate the point. He discusses two ways of dealing with glides (1969:214): the first is that of Trim (1970), in terms of a direction, a variable beginning point and a variable end-point; the second is his own, in terms of a direction, a beginning point and the width of the glide (i.e. the pitch range covered by it). Crystal prefers the latter, since it allows him to generalise between this situation and others where width appears to be a relevant variable, with a similar role; it might be added that this analysis may have a certain plausibility on phonetic grounds, too: the tendency of the "onset" (Crystal's term for the first accent of a particular kind of series) to occur at a constant pitch level for a given speaker indicates a special status for the beginning point of a contour (of which a solitary nuclear glide would be a minimal form) while the final point has no such status. On the other hand, it would appear to be something of a tour de force to try to accommodate both the high-mid contour used in non-committal idioms of agreement (Crystal, 1969:214f.) and the high-mid contour used in calls (p. 214) in the same intonational type-category by virtue of their similarity in width; in the former case, the relatively narrow width would appear to be a regular case of the general width parameter, whose meaning is not given in Crystal's discussion at this point, but later turns out in a semantic judgment experiment to approximate to 'bored, grim' (p. 305), while in the latter case, the narrow width would appear to be a derived property, resulting from the setting of a non-low, non-fading end-point. It may be necessary, therefore, to take both systems of variables into account, rather than administering a smooth shave with Occam's razor which fails to take the whole intonational visage into account.

2.3.3. The relativity problem

Crystal introduces his study of some of the problems connected with the relativity of intonation in the following way (1971:17):

Most intonation analysts would consider it a truism to insist that any model of the formal properties of a language's intonation system has to be relativistic in character. By this one would mean that the linguistic constants in the system are the contrasts between the features involved (pitch, loudness, or whatever) and not the values of the features themselves, as defined in any absolute, physical way.

This aspect of the relativity problem is the most basic one, and is a form of what might be termed 'paradigmatic relativity'; there are other aspects, both within the area of paradigmatic relativity and in the complementary area of syntagmatic relativity, introduced above in the section on the time dimension. Paradigmatic and syntagmatic relativity will be dealt with separately.

2.3.3.1. Paradigmatic relativity

The problem as formulated by Crystal has a structural similarity to the problem of segmentation: whereas the problem involved here is paradigmatic, the relation involved in segmentation is syntagmatic, but the main question of whether the constant is the relation between the variants of a parameter or each of the relata contributes in its own way to the system is the same in both cases. The standard position on paradigmatic relativity in phonology, as opposed to phonetics, is that the relational criterion of contrast is the constant and that the variants have no independent contribution to make to the system. This is true as a general principle; the functional criteria are all relational in character. However, as the discussion of 'normal types' (§1.2.5.1.) has shown, there are grounds for believing that phonetic factors do affect the analysis at the phonological level. Markedness theory in neo-Praguean phonology, for instance, is one kind of approach in which asymmetries in the phonological system are given an explanation in terms of articulatory and perceptual constraints. The present approach has relied heavily on the notion of a naturalness condition which constrains the phonological representation in such a way as to prevent it from differing too radically from the phonetic representation; the question of whether the variants of a phonological variable are in some sense anchored to specific variants of phonetic variables can be regarded as one further aspect of the naturalness problem. The problem of paradigmatic relativity in phonology can also be seen as a special case of a more general problem: that of the extent to which variants at one level of analysis are correlated with variants at another; it is a problem which not only affects the relations between the various phonetic levels, but also those between different levels in syntax (e.g. in the specification of 'deep structures' of different degrees of abstractness).

As an illustration, the notion of absolute pitch ('perfect pitch') may be considered: for a person with perfect pitch, a given pitch level always correlates with a particular independently measurable frequency (but cf. §2.2.2. above). The relevant variable does not have to be a vari-

ant of a simple attribute; the notion of chroma, for instance, depends on the correlation between a pitch interval, or relation between two height variants, and a frequency relation which is independently ascertainable (§2.2.2.). Nor does the correlation have to be precise; it can presumably vary within the threshold of discrimination over a range of contiguous values in the counter-domain of the relation.

A question which is important in discussing the relation between phonological and phonetic variants is that of overlapping, i.e. whether the phonetic range associated with one phonological variant is disjunct from the phonetic range associated with the other or others within the same variable. The fact that this question was not satisfactorily dealt with formed the basis of Bolinger's critique of the pitch level phoneme theory (1951), since it turns out to be practically impossible to assign non-overlapping ranges to such phonemes. Haas formulates the question in the following way (1957:139):

What we need to decide here primarily is, whether those limits of variation need to be defined absolutely, i.e. exclusively by reference to an extralingual measure, such as the physiological frame-work of articulation; or whether they may be determined differently for different linguistic contexts.

There are two problems involved here: the first is whether any kind of absolute definition is possible for the phonetic correlate of a phonological variant in several kinds of phonological context; the second is whether such an absolute definition, if it is not possible for generalised contexts, can be restricted to particular kinds of context, whether phonological or non-phonological, and thus retained in a relativistic framework. These two aspects of the paradigmatic relativity problem will be dealt with separately, and in the order given, since a positive answer to the first question could make the second redundant, at least with respect to the variants of some variables.

Crystal (1971:22) argues that it is not possible to have a purely relative system; there must be some basis in phonetic reality for anchoring paradigmatic relations to identifiable relata. This position is similar to that of Fry (1960), who points out that it is impossible to make judgments about distribution without having some prior idea about what is in fact thus distributed. Haas' formulation suggests that he would take up a related position. Jakobson, Fant & Halle (1952:37) appear to have a somewhat different standpoint when they claim, in a passage already quoted (p. 9 above), that

both polar terms are fully recognizable only when both of them are present in the given sequence, so that the speaker effects and the listener perceives their contrast.

While the claim obviously holds good for a language learner, it is probably a little too relativistic to be completely plausible when applied to a straightforward listening situation. There are informal arguments for and against this position: on the one hand, a listener often requires a short orientation period before being able to follow a stranger's speech confidently; on the other, it is frequently possible to identify a language and even an individual phonological form in a fraction of a second when (to give the most striking situation) tuning along a radio dial. There appears to have been a surprisingly small amount of experimental work done on this

aspect of paradigmatic relativity, unfortunately. Crystal (1971:27) has conducted a pilot study which indicates that people are able to use two, ranges of pitch height in giving accurate categorical judgments (cf. p. 57 above) on isolated and randomly arranged syllables from attitudinally non-extreme utterances spoken by six different (male and female) speakers; the judgments relate quite consistently to perceptual judgments of the pitch height in context. Lieberman reports a marginally more detailed range of categorical judgments with pure tones and, under optimum conditions, with the variable of loudness (1967:161). Crystal (1971:22) also notes that the question of the invariance of phonological variants affects other phonological variables than those associated with the simple attributes; it affects the ability to identify categorically differences between dynamic trajectories no less than static trajectories. There is a small amount of evidence (Fry, 1960 - cf. p. 57 above) about the threshold of discrimination for judgments about when changes in a trajectory are perceived as dynamic rather than static, but further information on other kinds of judgment about utterances which might be relevant to the problem does not appear to be available. There are isolated remarks about pitch memory, an essential factor in categorical judgments, such as that by Pike (1945:1) to the effect that "it is difficult to retain long phrases in pitch memory", an indication that long trajectories, if systematic at all, might tend to be perceived not categorically as wholes, but in terms of syntagmatic relations between their constituent parts (cf. the next subsection); there is, however, nothing approaching a coherent theory within which the problem of paradigmatic relativity within particular contexts could be handled, whether in terms of articulation, or perception, or both.

If variants are in fact associated with phonetic constants, then these constants will be highly complex; the case of positions of consonant articulation cited by Haas is likely to be a rare exception, even in the area of non-prosodic phonology (cf. Lindblom, 1972, on problems of vowel identification) where the situation is likely to be more favourable than in prosodic phonology, as Pike points out (1963:99f.):

Vowels and consonants were in some degree relative to one another, but pitch seemed to be the most abstract of all, in reference to the relativity in the system.

Crystal (1971:18f.) moots the following:

One could for instance hypothesise that a voice-type (and thus a pitch-level), in any given individual, is the result of a basic neurological pattern, common to all speakers, which can only manifest itself through a set of obligatory "hormonal" transformations. The point is undemonstrable, at present, but theoretically possible.

A solution will not be forthcoming without extensive research on the lines reported here; it is even more likely that the notion of the invariance of phonetic types correlated with phonological forms will have to be treated in a more abstract fashion, perhaps in the direction suggested by Crystal, with the phonetic variants as related to a natural relation, the "basic neurological pattern".

The view that phonetic variants can be identified in absolute terms irrespective of context can be termed the 'absolute invariance' position (cf. Chomsky, 1964:79); the corresponding term for the view that such identification can only be given relative to particular kinds of context is

'relative invariance'. Earlier investigators, such as Bloomfield, had held that the phonetic correlates of phonological variants contained a constant factor from context to context (for discussion, cf. Twaddell, 1935); later approaches have incorporated the weaker claim, starting with Twaddell himself, and maintaining that what constancy there is may be restricted to particular kinds of context and not generalisable between contexts. Such generalisations Twaddell referred to as "fictions". The weaker position suffers from the same dearth of relevant evidence as the first, but probably stands a better chance of receiving a solution.

The first question to ask with respect to the weaker claim concerns the kinds of context which are the determinants of relative invariance, assuming for the moment that there are grounds for such a notion. A basic distinction can be made between phonological and non-phonological contexts. There is a slight terminological difficulty here: the notion of absolute pitch used, with some justification, by Crystal (1971) in his discussion of invariance relative to a non-phonological context goes somewhat counter to the present usage. For this reason, the term 'constancy' will be used for invariance relative to a non-phonological context. The term 'relative invariance', used by Chomsky in the tradition of Jakobson, Fant and Halle, has a technical sense pertaining to phonological contexts, and will be restricted to that sense in the present discussion.

There are a number of kinds of non-phonological context which could affect the issue of constancy. The most obvious contextual type is that of individual speakers. Crystal (1969:227; 1971:25) refers to a 'natural speaking level' of pitch, which is said by Pronovost (1942) to be 25% of the way up a person's total singing range. This notion, or a similar one, is presumed by any phonetic or phonological theory whose transcription involves the use of base-lines, a common device especially in European schools. Klinghardt & de Fourmestraux (1911), in explaining their linear notation, remark (p. 35):

Die horizontale Linie, welche durch jedes Intonationsbild gelegt ist, soll zunächst nur als Meßlinie dienen, d.h. es dem Auge erleichtern, in raschem Blick die Höhenlage der einzelnen Punkte abzumessen. Zugleich soll sie allerdings auch ungefähr die mittlere Stimmhöhe der Rede darstellen, aber nur ganz ungefähr ...

Other writers take different positions in the pitch range as anchoring points. Wells (1945(1972:137)) refers to the whole range, presumably meaning the limits of the range:

The distinctive feature of the segments assigned to the pitch phonemes is pitch relative to the speaking range of the speaker's voice.

Kingdon (1958:2) relativises this kind of approach even further, postulating three speaking ranges, the normal range and the emphatic and emotional ranges, which extend both above and below the normal range. Jassem (1952:57) even defines some aspects of intonation patterns in terms of the bottom of the pitch range:

Tunes which are defined in terms of the directions of the tone movement and their relation to the bottom pitch of the speaker's voice are nuclear.

This is a representative selection of the possible stand-points; the evidence, such as there is, points to the greatest validity for a mid base-line, though the notion of terminal fading may support Jassem's view,

albeit only with regard to falling tones. In a more abstract sense, theories of accentuation which, like that of Bolinger, regard accent as pitch prominence, i.e. "a rapid and relatively wide departure from a smooth or undulating contour" (1958(1965:20)) also involve the notion of reference line, but this has more to do with syntagmatic relativity (cf. the next subsection) than with a physically constant base-line. It is possible that the archetype theory of unmarked breath groups and unmarked accentuation may provide a natural link between the two concepts (cf. §2.2.5., p. 56, on Lieberman).

There is a certain amount of empirical evidence bearing on the notion of an individually determined base-line. Crystal (1969:143 & passim) has developed an interesting perceptually based hypothesis about the constancy of the onset, a particular kind of accent:

For any speaker, the first prominent syllable of a tone-unit is articulated at or around a stable pitch-level for the majority of his tone-units.

He notes (p. 144) that "only 1 tone-unit in 200 involved onset variation". In his 1971 paper, Crystal notes that the question of whether this perceptual norm has a basis in instrumentally measurable terms is still open, but surmises (p. 26) that

most speakers (within a voice type) on most occasions produce most onset syllables within a narrow band of frequencies, which can be considered an absolute physical norm.

As he points out, research on this point is lacking. But work has been done which has a bearing on the physical absoluteness of levels relative to a particular speaker, though not on English onset levels. Lehiste (1970:99) reports on one interesting finding of Hadding-Koch (1961) in the following manner:

... all speakers had certain "favorite" frequency regions that were used recurrently in similar circumstances. There were one or, more often, two main concentrations of items at higher frequencies, one intermediate area with few occurrences, and one or two concentrations on frequencies below this comparatively empty area. The pitch levels discovered by this procedure seemed to have absolute rather than merely relative significance: the pitch levels established in this manner for two of the speakers remained more or less the same when the experiment was repeated after a lapse of 18 months.

Lieberman offers an explanation for these findings in terms of what he calls "the sub-glottal interaction theory" (1967:35; cf. also p. 78 above):

Normal speakers tend to avoid phonation at certain fundamental frequencies that seem to correspond to the resonances of the subglottal system.

In this particular case, he points out (p. 33) that the speakers apparently avoided phonation at frequencies that would excite the 300 Hz subglottal resonance. Lehiste and Lieberman interpret these findings somewhat differently. While Lehiste appears to see them as a tentative basis for the postulation of pitch levels as phonological variants, Lieberman tends to see them as a means of explaining away such theories in that "they may merely reflect the phonetic effect of discontinuities caused by the coupling of the subglottal system to the larynx" (p. 35). It seems likely, however,

that source constraints like this, together with other kinds of physiological constraints on production, such as Lieberman's own archetype theory, and possibly combined with aural preferences, can contribute towards supporting the concept of a constant reference level for individual speakers, either as a continuous factor during utterances, or at least as an initial constant, as in Crystal's suggestion. As further support of this concept of a normal level, Crystal also notes organic disorders of the vocal folds and therapies which attempt to restore 'normal' habits of speech (1971:25).

There are kinds of context which are pertinent to the specification of normal pitch levels besides the make-up of individual speakers. Kingdon's suggestion that there are three kinds of range, with the more extreme including the less extreme, was quoted above. Some are more conventionally determined, and others are more related to the physical situation. Crystal lists (1971:23) the speaker's voice-range, voice-type, and overall voice-quality; the basic emotional state of a speaker; the ability of a listener to hear pitch differences (this point is not quite clear); the nature of the participation situation (monologue or dialogue, number of people involved if the latter); voice-type of addressee - referring to Lieberman, 1967:45f., on variation in absolute intonation of infants relative to mother's or father's intonation); the variety of language used (style constraints from occupation, status, purpose); possibly interlanguage or inter-dialect differences in norm conventions; the non-linguistic context (size of room, temperature, location of frequency stimulus - cf. Ch. 4.3. below); and, finally, constant variants associated by listeners with learned semantically based vocal stereotypes (of person, race, occupation, personality traits). Some of these may have a certain, albeit distant, natural basis, e.g. public speakers and the non-linguistic context, emotional labels and personality (cf. Crystal's own experiment, 1969:296ff.; Uldall, 1964; Coates, 1975); it is not necessarily the case that such stereotypes hold for different communities.

In all of the cases discussed so far, the plausibility of associating phonological variants with constant phonetic variants has been discussed. There appears to be a certain amount of preliminary evidence concerning the variable of pitch level, pointing to the existence of certain 'normal types' (cf. §1.2.5.1. above) for that variable with respect to particular individuals. The idea of constant phonetic correlates for phonological variables is not, of course, restricted to the height or level variable, but this variable has always held a particular fascination for intonation analysts because of its apparently non-discrete character. Other variables, such as those over dynamic trajectories, are also subject to similar considerations; in fact, the problem of pitch height is very closely related to the question of the status of the slope and width of contours. The lack of evidence on these questions as applied to dynamic trajectories has already been mentioned (§2.2.5.).

The concept of relativity in intonation analysis has generally been conceived as the complement of the concept of absolute invariance or non-phonological constancy. In other areas of phonology, however, a somewhat different interpretation is to be found, one which has more to do with the relational character of the functional criteria of analysis used. This interpretation is, as has already been indicated, associated with the term 'relative invariance'. On this view, the phonological variants are seen primarily as the relata of a paradigmatic relation of contrast ('opposition')

in Saussurean and Praguean terminology) which is held to be the constant, remaining invariant from context to context. The phonetic values of the relata can consequently alter from one context to another without affecting the functional relation; it is generally held that they preserve their relative position within the variable, i.e. the polarity of an opposition does not change if the opposition itself is preserved (cf. esp. Jakobson, Fant & Halle, 1952). The doctrine, presupposing the Saussurean relational view of language, received its first clear statement by Twaddell (1935), who sees the phonological forms as generalised constructs based on isomorphisms between different positional sets of allophones. He uses different terminology, but this is the nucleus of his position. Bloch (1941) discusses the analytic problems associated with the principle of 'phonemic overlapping'; the principle of absolute invariance would not allow the correlate of a phonological variant in one position to be the correlate of its contradictory or one of its contraries or one of its contraries in another syntagmatic position, the correlate of the first variant in that position having shifted towards the extreme of the range of the variable. Relative invariance, on the other hand, would allow this kind of 'partial overlapping', in Bloch's terminology, where (1941(1957:93)) "under a different set of conditions" it is possible for "a given sound" belonging to one phoneme to belong to another in the same dialect. In phonemic theory the phonological variants are phonemes, phonetically more complex than most of the variants that have been dealt with in the present study. Jakobson, Fant & Halle (1952(1967:4ff.)) give a clear statement of the position of relative invariance, which they discuss in terms of 'redundant variation' or 'redundant shift'. Haas (1957) deals with a number of kinds of variation which might be termed 'relative invariance'; they have precisely the same structure as phonological relative invariance, in that they deal with the shift in correlates of a particular variant at another level in different positions, but both his notion of 'relative grade' (= 'relative variant') and his notion of 'relative category' (assignment of a transcription symbol to different phonetic or phonological categories in different environments - e.g. [h] as prevocalic fricative, post-consonantal aspiration, post-vocalic length) are only indirectly involved in phonological relative invariance (1957:144). Chomsky (1964:79f., 88) discusses both absolute and relative invariance, picking out one of Bloch's examples to show how both kinds of principle fail. What he does not point out is the nature of the contexts in which these principles fail, a key factor in understanding how the principles work in the first place. The principle of absolute invariance fails of course when any kind of overlapping is found; the principle of relative invariance only fails, however, when neutralisations occur. The examples which Bloch gives under complete overlapping are, apart from his last, somewhat dubious example, cases of vowel reduction (amounting to a special kind of neutralisation) in unstressed syllables; the example of partial overlapping which Chomsky selects for his criticism is a case of neutralisation of a different kind, namely the 'defective' distribution of the one phoneme under consideration (Betty : berry :: *throw : throw). In such cases it is perfectly clear why the principle fails: since the principle asserts the invariance of a phonological opposition from context to context, it will clearly only hold for those contexts where the opposition is in fact attested - by definition. Since neutralisation means the absence of a particular opposition in one or more contexts, it follows that the principle of relative invariance cannot hold

for these contexts: the 'invariant' relation is absent. This is a fact which Twaddell had already recognised in principle; he states his position as follows (1935(1957:74)):

The stop of a "pill" and the stop of a "spill" cannot correspond to the same macro-phoneme [i.e. 'phoneme' - OG], for the corresponding micro-phonemes [i.e. 'positional allophone classes' - OG] are not similarly ordered.

Twaddell thus refuses to generalise over different positions in such cases, a characteristic of later Firthian phonology, and thus excludes the problem of invariance from these cases. Prague phonologists refused in a different way to generalise over such cases, introducing the notion of neutralisation and the archiphoneme for such positions; in Chomsky's neo-Praguean phonology, a generalisation is made over archiphonemes and other phonemes in terms of natural classes of segments (in terms of their shared variants) and, since the opposition relation holds between natural classes of different kinds in different positions, and between different numbers of natural classes in different positions, the notion of relative invariance has a rather obscure status in respect of the theory.

Despite the difficulties with the notion of relative invariance which have been discussed in the preceding paragraph, and which are rather easily explainable, the notion does have validity for sets of contexts where a given opposition is preserved. It is possible that a phonetic basis for generalisations over neutralised and non-neutralised positions may be found, which would enable generalisations of the throw : berry kind to be made on a principled basis. Until this kind of problem is solved (cf. §1.2.5.1., esp. on privative, or marked/unmarked oppositions), the "unresolved conceptual difficulties" which Chomsky has in another respect will remain (1964:80): is the context with respect to which the variants change their phonetic correlates a phonological or a phonetic one? Presumably the context will be a phonetic one, in one of the senses of the term as discussed in §2.2. If a phonetic basis cannot be found, then the relative invariance condition is likely to be meaningless; like the other conditions which define Chomsky's explication of the 'taxonomic' model of phonology, it presupposes the fulfilment of the 'condition of phonetic specifiability' (cf. §2.3.2.2. above), i.e. a reliable means of specifying phonetic variants in terms of a phonetic theory. Bloch's conception of the "given sound" is not quite sufficient for this; Haas makes an apt criticism of this point of view, anticipating demands for a comprehensive phonetic theory (1957:145):

An 'overlap' appears only when we shift our ground - the shift being from one frame of reference to another; not, as some seem to have thought, from phonological interpretation (or phonemic classification) to some 'pure', uninterpreted and unclassified, phonetic fact.

Until the phonetic "frame of reference" is explicit and fully investigated in this respect, the problem of when variants are constant and when they shift, in their relations to variants of other levels of analysis, will remain accessible only to informal discussion and solution.

There are a number of aspects of intonation where the notion of relative invariance is important, some of which have already been mentioned and some of which will be discussed in the next chapter. The variable of pitch height can be affected, for instance, by the natural tendency of

the pitch level trajectory to fall throughout an utterance; from the point of view of accentual contrasts, for instance, this falling or downdrifting tendency is abstracted away from, so that accents may be regarded as having the same status even when one is phonetically lower, at a level where the previous accent, had it been at that level, would have had a different status. Similar variation, though probably not in general phonologically significant (but cf. §2.3.1.), are caused by the simultaneous consonantal or vocalic context. Jassem (1952:68) applies the term 'tonal sandhi', already well known in the study of morphological tone (cf. the account of relative invariance in the tone sandhi of Amoy Hokkien given by Wang, 1967), to certain alternations of terminal contours with respect to the kind of boundary and the syllabic environment (see §3.1.3. below). Halliday (1967:15n) also refers to sandhi in which "a tone 1 tone group [i.e. with a falling tone - DG] usually rises in pitch at the end of the tonic if the first salient syllable in the next tone group (tonic or pretonic) is high". It will be recalled that this is one of Crystal's instances of ambiguous tone-unit boundaries (cf. 2.3.2.2., p. 66 above), where the assimilatory influence of a following accent not only obscures the precise boundary placement, but, in Halliday's decision on boundary placement, influences the preceding terminal contour. Yet another instance is the analysis of high-mid contours given by Crystal (cf. p. 69 above), and the related case of the many possible interpretations of monotonies where, at one level of analysis, or in terms of a particular limited number of criteria of analysis, special forms of homonymy in the phonological sense, i.e. complete overlapping of phonological forms in terms of phonetic correlates, are found.

2.3.3.2. Syntagmatic relativity

Some of the phonetic problems which surround the notion of syntagmatic relativity have already been introduced in the contexts of the time dimension and the segmentation problem. The basic problem in the area of intonation is that the phonetic variable of pitch operates practically on its own (cf. Bolinger, 1949), rather than in co-operation with other variables like the non-prosodically used variables, and is therefore dependent on its own extension in time for perception and discrimination and cannot generally rely on coincidences between trajectories to make temporal structurings more conspicuous.

Very frequently, the notion of relative pitch has been understood in this, syntagmatic, sense rather than in one of the paradigmatic senses sketched in the preceding section. Pike (1945:25) makes the following claim:

The significance of pitches is determined by their height relative to one another.

This refers to the relativity of pitch as used in intonation, but the same, in a more explicit formulation, is claimed by Pike with respect to tone (1948:4):

The important feature is the relative height of a syllable in relation to the preceding or following syllable.

Schachter (1961) develops this standpoint with respect to tones in greater detail, finding three categories of relativity, one essentially paradigmatic in the sense of relative invariance (the "fixed contrastive rela-

tion"), one syntagmatic (the "fixed sequential relation") and one mixed (the "fixed change relation"). Jakobson, Fant & Halle (1952(1967:13)) state:

Prosodic features, on the other hand, can be defined only with reference to a time series.

In this connexion, they quote Pike with approval (cf. also §1.2.2.2. above). Jassem (1952) has already been mentioned in connexion with non-phonological paradigmatic relativity (cf. p. 73 above); he characterises nuclear contours with reference to a base-line representing the bottom of an individual's pitch range. His pre-nuclear tones, however, are defined syntagmatically (p. 61); they are defined in terms of their tone-movement and

not their relative pitch as compared with the bottom of the speaker's voice, but the relation of the final tone of the tone to the initial tone of the following tone.

This definition is somewhat unusual in that the temporal relation is here retrogressive. Crystal's theory of the relativity of accent height to a constant onset (cf. p. 74 above) uses a similar approach, but temporally progressive. Bolinger's theory of relative height in accent series (cf. 1958(1965:54); 1970) also involves the comparison of different points in one of the vectors which constitute the complex pitch trajectory, though without reference to any constant anchoring position. The constitution of individual accents, on one of the other vectors which constitute the pitch trajectory, takes place in terms of syntagmatic relativity (1958(1965:20)):

The experiments that I shall report suggest that it is not pitch RISE, but rather pitch PROMINENCE, that is essential to what we react to as stress. By prominence I mean a rapid and relatively wide departure from a smooth or undulating contour. A rise is only one kind of pitch prominence, though it is certainly the commonest kind.

A rise, or a fall, would in itself be perceived, like all dynamic trajectories, in temporal, syntagmatic terms; Bolinger generalises here over all abrupt dynamic trajectories, whether up or down.

Haas (1957) uses similar considerations in his discussion of the levels versus contours issue (cf. also §4.2.1. below), and gives two reasons "why it is undesirable to try to replace a contour by an ordered sequence of grades" (p. 156), in terms of the relativity of position in syntagmatic terms, and the relativity of the variant assigned to a particular syntagmatic position to other variants:

First, as regards relative position, what matters in any ordered sequence of elements is the position of each in relation to each, i.e. the whole syntagmatic arrangement. ... It is clearly irrelevant, for instance, to say that a pitch-grade marked '2' has the same position in You are?

/jɔ̃ 2̃/ as in You are. /jɔ̃ 2̃/; its position with regard to the other grades is different in the two cases, and what counts is the whole pattern of mutual relations. Similar considerations apply to the determination of the relative grades themselves. ... What matters is the grade ('position' on a gradation-scale) of each in relation to each, i.e. the whole pattern of intervals. ... We wish to say, for instance, that the

same 'intonation', You are?, recurs in /jɔ̃ 2̃, jɔ̃ 3̃, jɔ̃ 4̃, jɔ̃ 5̃, jɔ̃ 6̃,

etc./ but not in the many samples of You are. /j³ a¹, j² a¹, j³ a¹, j² a¹, j³ a², etc./.

Figures of this kind have only a secondary, notational value; they do not necessarily express any value of a variant of pitch height as measured against some kind of metric, but are simply convenient notational devices for indexing the relata of a temporal relation, such that the relation is a rising contour if the second integer is numerically (in this case) higher than the first. One place where this state of affairs is made fairly explicit is in Bierwisch (1966:133f.). The notational problem itself will be discussed in the next section. It is, however, presumably possible to decide, when the evidence warrants it (cf. the preceding section), that one of the integers has, for the purposes of phonetic interpretation, a special designated role as a constant (e.g. as a notational equivalent to a base-line) within the network of non-phonological determining factors.

2.4. The representation problem

In his review of some of the problems of intonation, Stockwell (1972: 89ff.) lists and treats four kinds of question which can, in his opinion, be asked in intonation analysis. These are the "representation question", the "nuclear-stress question", the "boundary question", and the "meaning question". The last of these was introduced in the first chapter of the present study (and will be taken up again in Ch. 4), the penultimate has been introduced in §2.3.2., the second has also been mentioned in the present chapter (cf. also §1.2.5.2., p. 32 above; §§2.4.3., 3.3.3. below); the first will, in its essentials, be treated in the present section.

In respect of the representation question, Stockwell takes up the following position (pp. 92f.):

I think there are not many issues of great moment left under the representation question, because so much convincing work was accomplished between Pike (1945) and Vanderslice (1970).

This is a vastly over-optimistic position. The representation question has two main sides, and a third which does not have the same rank for most investigators. First, there is the 'semantic' side, in the logical sense of what the representation, as part of a formal object language constituted in the metalanguage of linguistics (by virtue of its subject matter also a metalanguage, of course, unlike, say, the formal object language of physics, which is not a metalanguage), actually represents; second, there is the 'syntactic side', in the logical sense, i.e. how the representation is constituted in the linguistic metalanguage; and third, there is a 'pragmatic' (perhaps the term 'metapragmatic' would make the relation more perspicuous) side to the question, again in the technical sense, i.e. the way the transcription, the formal object language, relates to its users (such as linguists, language teachers, schoolchildren, speech therapists and others). For such scholars as Abercrombie (1954), Chao (1968), Jones (1956: Appendix A), Mackey (1965:52), the pragmatic (or in the informal manner of speaking, metapragmatic) issues play a significant role in their transcription typologies (cf. §2.4.2. below), where practical value does not rank below theoretical precision. None of these three sub-questions pertaining to transcriptions has, however, been definitively answered.

In fact, there is a wide range of transcriptions available, each of which has its own implications about the nature of intonation, the forms and structures which constitute intonations, and each of which has its own kind of utility; there are practically no criteria which have been explicitly formulated, for evaluating these transcriptions relative to each other. One might, with considerable justification, say that the representation question is the central question in any linguistic description, since any such description must remain the private property of the investigator unless a form of representing both its domain of discourse and its own categories is offered.

2.4.1. Transcriptions in linguistic descriptions

Although the role of transcriptions in linguistic descriptions often appears to be a peripheral one, closer examination shows that this is not the case. Intonation transcriptions, in particular, tend to lull their users into a sense of false security: Lieberman (1965) has demonstrated experimentally that different accounts may be given of a set of 'facts' about intonation simply because of the inherent properties of the transcription systems used (in this case, pitch phoneme systems versus tonetic systems - cf. Ch. 3); the pitch phoneme system appeared to lack a "reasonable relationship to those attributes of the physical signal which it supposedly is transcribing" (1965:53).

Postal, not without justification, has gone so far as to maintain (1968:6) that

modern linguistics has, at least since Bloomfield's time, been tortured with a kind of intellectual schizophrenia by phonetic representation.

Phonetic representation is the kind which is perhaps dominant, for historical and various different methodological reasons, in the minds of most linguists; this does not mean that they all understand the term in the same way, however. Postal's allusion is to an aspect of the problem of what constitutes admissible data for the linguist, and in particular to the question of how one reconciles discretely structured representations with the quantitative, continuous characteristics of utterances analysed in physical terms. Bloomfield took an uncompromising stance which disallowed all records apart from instrumental and phonemic records, excluding in particular impressionistic phonetic transcription (1933(1935:85)):

Only two kinds of linguistic records are scientifically relevant. One is a mechanical record of the gross acoustic features, such as is produced in the phonetics laboratory. The other is a record in terms of phonemes, ignoring all features that are not distinctive in the language. Until our knowledge of acoustics has progressed far beyond its present state, only the latter kind of record can be used for any study that takes into consideration the meaning of what is spoken.

Some kind of non-phonemic, but derivatively phonetic representation is acknowledged to precede laboratory analysis, however (cf. §2.1., p. 49 above); immediately after the section just quoted, Bloomfield goes on to state the following:

In fact, the laboratory phonetician usually knows, from other sources, the phonemic character of the speech-sounds he is studying; he usually

phonemes" (pp. 93ff.); it is clearly absurd to expect a 'phonological' account of sounds in which reference is not consistently made to particular languages. The non-phonological, non-instrumental kinds of phonetic transcription which record all the distinctions the phonetician has learned to discriminate (p. 84) involve inconsistency and subjectivity, and the use of such transcriptions appears to be at best an irrelevant pastime and at worst misleading. Nevertheless, even in Bloomfieldian linguistics, such transcriptions are used.

A solution of the paradox is offered by Postal in the same place as he makes his criticism:

The obvious solution to this problem, namely the traditional realization ... that phonetic representation is not a direct description of speech signal or articulation but rather part of a theory about the instructions sent from the central nervous system to the speech apparatus is, of course, intolerable to the modern linguist because it is mentalistic.

In support of this solution, he refers to de Saussure; it is by no means obvious, however, that de Saussure's approach harmonises with Postal's solution. In fact it is rather surprising that Postal should see a resemblance at all, except in terms of a vague 'mentalism', in view of the facts that for de Saussure the major kind of phonological category was the "image acoustique" (1916:28 & *passim*); that the unit he called "phonème" was simply "la somme des impressions acoustiques et des mouvements articulatoires, de l'unité entendue et de l'unité parlée, l'une conditionnant l'autre"; and that he had very little to say about phonetic transcription (in his terminology "l'écriture phonologique"), which was not clearly distinguished from what would later have been called a phonological or phonemic transcription, beyond a call for "un moyen de représenter les sons articulés qui supprime toute équivoque". De Saussure's view was in fact (pp. 56f.) not too far from Bloomfield's in respect of the relevance of phonetic transcription to linguistics, though he was not as pessimistic about its systematic status.

An even more obvious solution than Postal's is that the phonetic transcription, like other transcriptions at non-phonetic levels of analysis, is simply "not a simple record of an utterance; it is a generalization about an utterance" (Abercrombie, 1954(1965:109)) and as such it is a product of a number of implicit and explicit criteria of analysis deriving from the way in which utterances are perceived by the analyst. Whether the transcription is, over and above that, a model for speech production, as Postal would appear to claim, is a matter which is not to be decided lightly; it seems likely that conventional alphabetic transcriptions and their offshoots are perceptual abstractions at a considerable remove from neurophysiological systems (Ladefoged, 1967:143ff.). It is better to regard them, initially, simply as products of a particular kind of analysis.

For Pike, this kind of analysis is clearly seen as relatively autonomous; a phonetic alphabet is defined as (1947:246):

A series of symbols serving as formulas to represent the articulatory movements which produce sounds, or to represent the sounds so produced.

senting pronunciation by means of writing, the basic principle being to assign one and only one letter to each phoneme of the language.

The IPA, however, and thus presumably Jones himself, recognises a further principle, the theory of the "cardinal sounds", as having equal status to the phonemic principle (1949:2); this second principle is in effect an affirmation that there is room for a universal phonetic theory which is conceptually distinct from phonemic theory. It is these two principles which function at the ends of the scale of transcriptions from "broad" to "narrow" (cf. §2.4.3. below), the one supplying the criteria for a phonological analysis and the other supplying the criteria for a phonetic analysis. These different kinds of criterion are reflected in the descriptive symbols and their arrangements at different levels of analysis which are consequently, to use Chomsky's term, different levels of representation. Phonetic representation is just one kind of model for the properties of utterances; others are related to utterances in respect of different criteria.

Representations of utterances are not ends in themselves; they are embedded in a net of assumptions about the properties of utterances and relations between utterances. They are, in fact, part of a theory about language. As such, they embody the decisions about relevant criteria of analysis which any theory involves. Crystal rightly warns against forgetting that this is the case (1971a:122f.):

The danger, of course, is obvious: that the notation comes to be treated as if it had a reality of its own - as if the symbols were the language, instead of merely an attempt to reflect it abstractly... it is extremely easy, if we are not careful, to find ourselves arguing about an issue which is purely an artefact of our notation, and which has no theoretical or descriptive validity at all.

This is an application to linguistic description of a general principle which has been formulated in many places in the philosophy of science; Morris (1946:23) describes the matter thus:

One of the dangers of the use of models in science, for instance, arises out of the temptation to ascribe to the subject matter of a theory properties of the model illustrating the theory which are not involved in the theory itself.

The point has already been made in passing (cf. §1.3., and §2.1., p. 50); the present discussion requires a little more comment, however. Morris goes further than Crystal in distinguishing between the theory, its subject matter, and the illustrative model; in linguistic description, these relations are complicated immensely by the dual function of metalanguage as object language (cf. p. 80 above), and by the possibility of various combinations of criteria of analysis of two quite distinct categories of analysis (cf. Ch. 1 above), as well as by the difficulty of deciding on which of the three subdomains of the linguistic universe of discourse, if any, is to be dominant. One aspect of a model in linguistic description, at least, in Morris' sense, is the notation used in transcription within

the model. Some varieties of notation may well be equivalent; however, as Braithwaite has pointed out in a similar context (1953(1968:24)):

Whatever may be the case with less precise forms of thought, deductive thinking is not independent of the possibility of its expression.

There is no need to detail the progress made in formal logic, for instance, as a result of the adoption of an explicit symbolic notation rather than natural language formulations; this is not only true of deductive thinking, however. As Toulmin stresses, techniques of representation are also an integral part of precise theories (1953:131):

In formalised sciences such as physics ... the terminology is not fixed beforehand ... Theories, techniques of representation and terminologies are introduced together, at one swoop.

It is odd, in view of this, that Chomsky & Halle should make such an issue of a distinction they make between a generative description and "a system of transcription" (1968:ix):

One of the best reasons for presenting a theory of a particular language in the precise form of a generative grammar, or for presenting a hypothesis concerning general linguistic theory in very explicit terms, is that only such precise and explicit formulation can lead to the discovery of serious inadequacies and to an understanding of how they can be remedied. In contrast, a system of transcription or terminology, a list of examples, or a rearrangement of the data in a corpus is not 'refutable' by evidence (apart from inadvertence - errors that are on the level of proofreading mistakes).

Generative theory itself started out as an attempt to provide a theory of transcriptions, and characterised various systems of transcription (Chomsky, Halle & Lukoff, 1956:78; cf. esp. §2.4.3. below). The distinction is, in more explicit terms, presumably that between more exact approaches in which "Theories, techniques of representation and terminologies are introduced together" and less exact approaches in which the theory is largely lacking, and which can in a sense be regarded as the explicanda for generative theories of transcription. A generative transcription without explicit criteria of analysis relating it to utterances would, of course, be just as inadequate as an imprecisely formulated system; cf. §3.3.3. below.

In the following sections, the main attempts to provide systematic accounts of transcriptions will be summarised, first in terms of more traditional transcription typologies, then in an account of the generative position. Finally, a survey of different transcription types will be given in preparation for the discussion of different models of intonation structure in the next chapter.

2.4.2. Transcription typologies

Jones (1956:Appendix A) gives an outline of the main dimensions along which the transcriptions in his tradition of phonetic analysis may differ.

(1) Broad vs. narrow. There are four ways in which broad transcriptions may differ from narrow transcriptions: i. linguistically ('narrow' = 'allophonic'); ii. for the purpose of showing specific differences in phonetic value ('narrow' = 'comparative'); iii. prosodically, when non-lexically

significant or non-significant prosodic distinctions are recorded; iv. typographically, when avoidable non-Roman letters are used (e.g. for allophonic or comparative purposes), a distinction referred to as "simple" vs. "complex". The definition of the broad transcription includes all of these facets together with the next dimension:

A 'broad' transcription may be defined precisely as one which represents only the phonemes of a language, using for this purpose the minimum of letter shapes of simplest Roman form (consistently with the avoidance of undesirable digraphs for 'single sounds') together with such prosodic marks as may be necessary for the avoidance of lexical ambiguity (p. 332, attributed to Trim).

An interesting remark, which will be taken up at the beginning of the next section is made about the relation between broad and narrow transcriptions: "The extra symbols needed for narrowing a transcription can always be dispensed with by assuming conventions" (p. 333).

(2) Uniliteral vs. multiliteral. Each symbol, the functional item of an alphabet, to which values in phonetic terms are assigned, may consist of one or more letters (e.g. digraphs). In uniliteral systems, the minimum of letters possible is used; if special letters are introduced for allophones, or if digraphs contain letters not employed elsewhere.

(3) Inclusive vs. exclusive. Inclusive transcriptions allow of several phonetic interpretations "to cover (within limits) certain deviations from what may be considered as the 'average' values for the particular language transcribed - 'diaphonic' variants as they may be called" (p. 339). It seems obvious that an allophonic transcription becomes less and less inclusive, the 'narrower' it is made by the incorporation of further phonetic specification. It is perhaps because of this open-endedness of the narrow extreme of the broad vs. narrow dimension that Jones remarks that all transcriptions are to a certain extent both inclusive and exclusive. Explicitly inclusive transcriptions are said to be those where alternative representations of diaphonic variants are provided for; it might have been better, since this kind of inclusiveness is theoretically different, simply to refer to alternative representations, which could be made available for diaphonic, allophonic, or comparative purposes.

(4) Systematic vs. impressionistic. Systematic transcriptions are constructed to suit the phonetic structure of a particular language, and "always have to be accompanied by sets of conventions, an understanding of which is necessary to their correct interpretation" (p. 349). Impressionistic transcriptions, on the other hand, are made "on a general phonetic basis", as in initial contact with unknown languages, and require no language specific conventions. It appears that impressionistic transcriptions would, for instance, use the symbols of a universal phonetic alphabet such as the IPA, based on the notion of cardinal sounds defined independently of particular languages, as it stands; comparative transcriptions, and probably allophonic transcriptions, as well as exclusive transcriptions would be to some extent 'impressionistic', in this technical sense.

The Jones classification deals to a large extent with typographical matters; the 'syntax' of transcriptions, apart from the symbol-letter distinction, is left to the interpretive conventions linking phonetic and phonological ("systematic") descriptions. Syntactically speaking, only the general descriptive terms, i.e. just one aspect of the alphabet of a full syntax, are discussed. With respect to these descriptive terms, the symbols

of the phonetic alphabet, a wide range of 'semantic' (in the logical sense) issues is covered, however. The initial condition, which has already been mentioned, is that ambiguity of phonetic value should be excluded from transcriptions; it might be added that equivalence of symbols in phonetic value is also excluded if a one-to-one relation between symbols and sound type is claimed. A further semantic issue, different from that of ambiguity, is the explicit possibility of including vagueness of reference for some purposes (cf. Quine, 1960:125ff.); this is covered by the inclusive vs. exclusive dimension. In addition, different domains of discourse, definable with reference to different kinds of criteria of analysis, fall under the idea of various dimensions associated with the broad vs. narrow terminology, and the systematic vs. impressionistic dimension. A number of 'pragmatic' considerations are associated with the typological matters raised, though these clearly have semantic consequences too.

For present purposes, the most interesting point is the brief note (p. 333) that:

A transcription must also be called 'narrow' if it gives indications of non-significant degrees of length or of any other 'prosodic' distinctions which do not serve to differentiate words.

This is a clear decision on the criteria of analysis for intonation, in effect; in a broad transcription the segmental phonemes, tones, accent or stress as word distinguishing items are permitted, since their criteria of analysis, as hinted at in the phrase "to differentiate words", are functionally the same. The criteria of analysis for intonation, on the other hand, are not simply those of discrete contrast (cf. §2.3.), and to include intonation within the scope of broad transcription would obviously destroy the coherence of this transcription. Sometimes the question is raised whether intonation should be incorporated into such transcriptions in the interests of greater naturalness, &c.; the answer is obviously, on the basis of the empirical criteria just stated, no. The intonational equivalent of a broad transcription would presuppose a formulation of the relevant criteria of analysis at a similar level of comprehensiveness and precision to that which Jones established on the basis of the phonemic criteria. This is no easy task; not only are the criteria for intonation different in kind, they also require more than the information given in orthographic texts to yield an adequate result and thus differ from broad transcriptions in their explicandum. In practice, this means that before intonation transcriptions can be given the same kind of application, for instance in language teaching, as normal broad transcriptions, a number of decisions about restricting criteria have to be made; this is, in effect, a requirement that an acceptable definition of 'normal intonation' be given. That this is no simple matter has already been shown (cf. §1.2.5.). The lack of explicit criteria on which a broad transcription of intonation could be based, apart from the restriction to phonemic criteria in the pitch phoneme school, and with the possible exception of Bolinger's analysis of intonation and accent, is accurately reflected in the Jones typology; in the European contour approaches there have, of course, been restrictions of criteria (e.g. in the Armstrong and Ward two-tune approach), but the motivations for these restrictions have seldom been explicit, either with respect to functional criteria or with regard to phonetic criteria.

Mackey, in his comprehensive survey (1965:52), lists eight "principles of an efficient notation": (1) analytical adequacy (ability "to represent

the results of the analysis"); (2) clarity ("the relation between parts must be self-evident, for example, the relation between syllable, tone and stress"); (3) legibility; (4) produceability; (5) concision ("economy in the use of configurations"); (6) visual suggestions; (7) range ("while expressing the analytical minimum, the notation should also be capable of recording the perceptible maximum, for example, the regional variations needed for the description dialects" [sic]); (8) synthesis ("it should be capable of appearing again in a synthesis which constitutes a reflection of the utterance as a whole; for example, it should be possible to read the whole utterance at once, not one level at a time, starting with the phonemes, then adding the stress, then the intonation, then the features of catenation").

In this set of requirements, 'pragmatic', or practical considerations are dominant, as the tenor of the book dictates. The second, third, fourth, sixth and eighth principles are dictated by considerations of utility in language teaching, though they also reflect other considerations to some extent. The first is an obvious requirement, essentially the requirement of explicitness. The second and the fifth refer to 'syntactic' considerations, in this respect introducing aspects which Jones (except, perhaps, for digraphs &c.) did not ascribe to transcriptions. The seventh principle relates to the systematic vs. impressionistic dimension, and to the various dimensions of narrowness in so far as they are affected by that dimension; the emphasis is clearly laid on the impressionistic end, rather than, as with Jones, on the systematic end of the dimension. The eighth point clearly reflects one of the traditional 'pragmatic' aspects of broad transcription as "a technique for reducing languages to writing" (cf. Pike, 1947: subtitle, & pp. 57ff.; also p. 86 above) to the extent that it is based on phonemic criteria. It ignores, however, the problem of the heterogeneity of criteria which led to Jones' restricted conception of broad transcription and which would be involved in such a "synthetic" transcription; if this kind of transcription is not regarded as embodying assumptions about how the criteria of analysis applied at various levels relate to each other, but simply as a useful expository device in teaching, the problem can be shelved.

With respect to intonation, Mackey notes the following (p. 57):

In examining current notations, we are first struck by the lack of uniformity in symbols used for rhythm and intonation in comparison with those used for isolated speech sounds. This should not be surprising, however, since the units are not so obvious and much less attention has been given to the standardization of symbols for them.

This is quite in harmony with the Jones view that prosodic notations should be excluded from broad transcription. In Mackey's own summary of intonation notations (§2.4.4. below), he classifies several different notational types, bringing out clearly the "lack of uniformity"; he employs some of his own principles in discussing certain common characteristics of the notations. This heterogeneity of notations for intonation is aptly commented by Postal in a remark which takes up a standpoint quite contrary to that of Stockwell (cf. p. 80 above), as follows (1968:6):

It is surely no accident that in just those areas where the phonetic representation of the facts is most undeveloped and most controversial, as with intonation, there is least agreement about phonological inter-

pretation, even among those who accept similar theoretical views of phonology.

The 'semantics' of intonation transcription, the existence of criteria for intonation analysis, is the problem of which the diversity of transcription systems is a symptom.

Chao, in a more semiotic approach (1968:212ff.), lists and elucidates "ten requirements for good symbols" which overlap to some extent with the categories already discussed, but which introduce a number of other requirements from the framework of semiotics:

- (1) simplicity (a typographical consideration here, stipulating that a symbol should have the minimum of detail in its internal structure compatible with distinctness from other symbols);
- (2) elegance (basically an aesthetic consideration but related to "simplicity, economy in the number of elements, the relative sizes of simple symbols and symbol complexes, etc.", i.e. systematic aspects);
- (3) ease of production, reproduction, repetition and transmission (as with words or tables, rather than iconic representations which have a close structural or qualitative resemblance to their domains, such as figures and graphs or photographs);
- (4) suitability of size (the consideration that "a good size for a symbol or a symbol complex is one that fills a substantial part of the field of attention", p. 216, weighed against the necessity within complexes of symbols "for each symbol to be small, in order to put as many related things as possible together" to ensure "a greater grasp or span of complexity of relationships"; this consideration is not to be confused with information-theoretical notions of the amount of information conveyed by a symbol, though it may be useful to suggest a relation between the two notions);
- (5) balance between number of symbols and size of symbol complexes (this appears to relate, in the main, to the question of abbreviatory definition; it relates to some extent to empirical questions in connexion with the number of primitive categories postulated for the transcription);
- (6) clearness of relation between symbol and object ("symbols used in science are usually non-iconic (non-pictorial) and should contain as few irrelevant iconic features as possible", p. 219);
- (7) relevance of the structure of symbol complexes to the structure of objects ("although symbols need not be iconic, symbol complexes in iconic relations with object complexes will have certain advantages", p. 221);
- (8) discrimination between symbols (the "fineness of discrimination between different symbols should be suited to the conditions of use", p. 222, i.e. it should provide sufficient detail to account for distinctions in the domain, and sufficient redundancy to avoid misunderstanding in use);
- (9) suitability of operational synonyms ("the requirement of noise-resisting redundancy has to be balanced against the desirability of the richness of information in each chunk of a symbol", p. 223, which appears to be the 'semantic' counterpart to the fifth requirement);
- (10) universality.

The main emphasis of Chao's requirements is also on the 'pragmatic' side; indeed, the list is clearly conceived as a reference list of value-judgments to help in the construction of any symbolic system, not just linguistic transcriptions. A clear indication of this aim is found in the explanation of the tenth requirement (p. 225):

While universality of symbolism among possible users is obviously a

great social desideratum for good symbols, the cost of learning of symbols or relearning of new symbols is often a major factor to consider.

Chao mentions, in particular, the conversion of one writing system to another more universally used system, and the difficulties involved. His example is the move to replace the non-phonologically based Chinese system with the phonologically based Roman orthography. The same applies to other kinds of symbol alteration, from minor spelling reforms and innovations in linguistic notations to non-linguistic, but in principle related, kinds of change in symbolisation of physical metrics. Chao touches 'syntactic' points only in passing, in the fifth and seventh requirements. More important are clearly the 'semantic' considerations. The fifth and ninth requirements, which can best be interpreted as motivating procedures of abbreviatory definition and recoding, introduce an aspect which is not mentioned in the typologies dealt with above; for certain purposes it is necessary, or useful, to agree on definitions which abbreviate descriptions in various respects, as in the agreement to operate with orthographic forms in discussion of phonological matter, purely for the pragmatic purpose of expository convenience (cf., e.g., Chomsky & Halle, 1968:10, "Using letters of the alphabet as informal abbreviations for certain complexes of features ..."). The 'semantic' dimension of vagueness vs. precision, given above as an interpretation of Jones' dimension of inclusive vs. exclusive transcriptions, is pertinent to those of Chao's requirements which deal with the discriminatory function of symbols, particularly in the 'semantic' consequences of this function; this is made most explicit in the eighth requirement. It is difficult to see the reason for separating some of the categories in the way that Chao does; the relation between the first, the eighth and the ninth categories is much closer than their separate treatment appears to warrant. It is possible that this is a result of attempting to incorporate aspects of quantitative information theory into an essentially semiotically based outline; the operative dimensions would seem to be: symbols with detailed/non-detailed internal structure; precise/vague correspondence of structure of symbol with structure of domain; high/low information content of symbol. The third of these dimensions, in so far as it can be given a qualitative interpretation at all, can be regarded as derivative from the first two.

The interesting section from the point of view of intonation transcription, apart from general 'semantic' considerations, is the specification of the relation between the symbol and its domain in more detail. What Mackey had simply suggested as a principle of visual suggestion (his sixth principle) is analysed by Chao into two parts, in his sixth and seventh requirements. The principle of iconic representation has played an important role both in the description of intonation and in the notation of music; on some occasions requirement six has been fulfilled, as in tonetic transcription, and on some occasions requirement seven, as with line notation, or both six and seven, as with most tonetic notation and with tune notation, and, to a lesser extent, with musical stave notation. Other notations have been non-iconic, as with the notations used by the pitch phoneme schools, or with Bolinger's letter notation for accents. These will be outlined in more detail in §2.4.4. The following subsection will be concerned with the generative conception of transcription, which, unlike those dealt with in the preceding paragraphs, pays far more attention to the 'syntax' of transcription systems.

2.4.3. The generative position

The origins of generative theory in transcription theory have already been mentioned (p. 84). Chomsky, Halle & Lukoff (1966:67) define a transcription *T* such as they aim to set up as "a system of symbols and an associated system of rules which assign a value to each sequence of these symbols". Further (p. 78), "*T* should appear as one of the set of transcriptions that constitute a linguistic grammar". A transcription, on this view is a formal semantic system, i.e. a formal language together with the rules for a formal interpretation; a grammar of a language is a set of such interpreted calculi. This notion of transcriptions as formal semantic systems can be regarded as an explication of the more informally conceived notion of transcription presented in the previous sections of the present study. There are a few significant differences between the formal and the informal conceptions, however, which can be clarified by means of the following convenient formulation of Chomsky's theory of linguistic levels (Chomsky, 1966:54):

On each level, markers are constructed that represent a sentence. ... Each level is a system of representation in terms of certain primes (elementary atomic symbols of this level). ... A marker is a string of primes or a set of such strings. ... Levels are organized in a hierarchy, and we may think of the markers of each level as being mapped into the markers of the next lowest level and as representing the lowest level marker (that is, the phonetic representation which is the marker on the lowest, phonetic level - the primes on this level being sets of features), which is associated directly with an actual signal.

Each transcription involves two levels of representation, which are related by a set of rules of interpretation; since the output representation serves as the input for the next set of interpretation rules, the various levels, ordered by the principle of interpretation, are arranged in a linear order, with the phonetic representation as the final interpretation. Within the framework of a formal semantic system (where 'semantic' corresponds to the designated form "semantic" in the preceding subsection of this study, a designation intended to distinguish between the normal linguistic use of the term and the technical, logical use of the term), each input to the rules of interpretation can be said, in a logical sense, to represent the output; in Chomsky's presentation, the term 'represent' is apparently transitive, since all markers, or representations at various levels are said to "represent" the phonetic representations, or sentences (for this conception of 'sentence', cf. also Chomsky, 1965:30ff.). The phonetic representation, on the other hand, is not a representation at all in this strictly formal sense of interpreted calculus, since it does not serve as the input to a set of interpretation rules (note the directionality of Chomsky's notion of representation); it is simply "associated directly with an actual signal".

This, however, is the sense in which 'represent' is customarily used in linguistics: the relation between the transcription as part of a formal object language, and the (informally speaking) object language to which it refers qua linguistic (rather than, say, physical) object language, i.e. (informally speaking) qua metalanguage, is a relation of representation. It would be possible to try to preserve the notion of formal representation by postulating further levels, to which phonetic representations do have

the formal representation relation; this has in fact been done (cf. Postal, 1968:6, quoted above on p. 82; Chomsky & Halle, 1968:65, see below). The discussion of the distinction between the two senses of 'represent' has thereby only been postponed, however, and not very far at that, since the further levels represented by the phonetic level are purely hypothetical and, as was pointed out in the context of the Postal quotation, the relation between these levels is empirically implausible. The distinction between the formal and the informal senses of 'represent' is not difficult to state, however; while the representation relation in the formal sense is explicitly statable in all respects, and the representation and its domain are completely specified, this is clearly not so with the representation which is "associated directly with an actual signal": this kind of representation involves abstraction from an incompletely specified domain, as discussed above (cf. §1.3., and criticism of Chomsky & Halle on p. 84 above), whose individuals are utterances.

Despite this difference, the generative 'levels of representation' can be regarded as an attempt to formulate explicitly the older notion of 'levels of analysis (abstraction, description, interpretation, &c.)'. Like the levels of analysis, levels of representation are also products of certain selections of criteria of analysis in terms of type and role; hypotheses about the interrelations between levels of representation in terms of transcription theory as just sketched are therefore at the same time hypotheses about the interrelations between the criteria of analysis which provide the empirical foundations for each of these levels. The claim made by Chomsky's theory of transcription is determined by the linear ordering of all levels of representation; this ordering implies that there is a similar ordering between adjacent sets of criteria of analysis, from the end of the line which is more detailed in terms of role criteria to the end which is more detailed in terms of phonetic criteria. Whether this assumption is empirically justifiable or not is a matter which, implicitly or explicitly, has determined much of the discussion in the history of generative transcription theory and its Platonistic offshoots. Theories of this kind can, with considerable justification, be termed 'reductionistic'; in precisely the same sense as reductionistic theories of the relation between the perception of phenomena and the perception of objects use the term, reductionistic theories of linguistic levels postulate that there is a direct relation between one kind of awareness of a domain and another, and that there is a relation of logical precedence (deduction) between the two. There is an empirical difference in the claims made by generative theory and reductionistic perception theory about the directionality of the precedence relation with respect to phenomena. Nevertheless, the principle of reduction is structurally the same in each case. Further, the Chomskyan formulation can be termed a 'fully ordered reductionistic theory', in the sense that several levels in linear order are postulated (1957; modifications are made in 1965, 1971). This is not a necessary requirement for a reductionistic transcription theory, though it is the strongest requirement: it is possible to conceive of linguistic levels as sets of representations entering into relations of partial ordering. Other approaches to the description of language have in fact proposed other types of ordering (including Chomsky, 1965; 1971), each type embodying different kinds of hypothesis about the interrelations between the criteria of analysis used to establish the various linguistic levels. Figure 5 illustrates three orderings which have been suggested for lingu-

istic description (other than Chomskyan full ordering), by means of Hasse diagrams. It would be out of place to discuss the (mainly non-phonological) interpretations of the schemata of Figure 5 in detail and argue their respective empirical merits; it should be clear, however, from the preceding

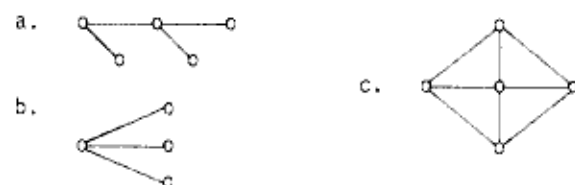


Figure 5: Partial orderings of levels of analysis: a. Chomskyan partial ordering (1971); b. Halliday's partial ordering (1966-8); c. Schmid's partial ordering (1972:408).

discussion of the criteria of analysis for intonation that the full or simple ordering is not adequate for representing the status of intonation in a linguistic description, and that some form of partial ordering is necessary, for the simple reason that intonational criteria of analysis are in many respects incompatible with the criteria used at the levels incorporated in Chomsky's competence grammar. The discussion in the present section shows that the notion of a competence grammar, as conceived by Chomsky, is not only based on a strict selection of paradigmatic criteria of analysis (cf. also §§1.3.2., 4.1.) but that it also embodies hypotheses about the ordering relations between the criteria of analysis employed at different levels; in these two respects, therefore, it can be regarded as an attempt to explicate a special case of linguistic descriptions which incorporate several levels of analysis. In both of these respects, its strengths lie in the rigidity of the principles of selection and the rigour of formulation of the explication; here, too, lie its weaknesses. Without these two heuristic principles of selection and explicitness, of course, it would be impossible to detect empirically relevant strengths and weaknesses; only these principles make it possible to find out how far a particular conception of linguistic representation can be taken. Chomsky, Halle & Lukoff, as well as Chomsky & Halle, and others, have attempted to incorporate a level of transcription into the linguistic grammar which is subject to the same principles as govern the other transcriptions in the grammar, and which represents 'stress' patterning at and above word level. Some attempts have been made to incorporate other aspects of intonation into this kind of model (cf. §§1.2.5.2., 3.1.1.3., 3.2.2.4.). A discussion of the important general points follows this introductory account.

In Chomsky & Halle (1968), little is said about the theory of transcription in general, though a considerable formalism is developed for phonological levels of representation and the rules of interpretation which link them; some hypotheses are presented concerning the domain represented (in the informal sense) by phonetic representations, and about the ontological status of more abstract formal items and the epistemological status of generative grammars (including phonology). Three levels of representation are discussed: a lexical level, a phonological level, and a phonetic level. The lexical level, which is in fact the syntax, is the 'highest'; its out-

put (lexical representations) represents, in the formal sense, via a set of interpretation rules called 'readjustment rules', a lower-level set of phonological representations and ultimately, via a further set of interpretive rules, the phonological rules, the set of phonetic representations.

The first block of interpretation rules, the readjustment rules, is a rather heterogeneous collection, including rules for rephrasing syntactic structure as well as certain morphophonemic rules; the second block is also somewhat heterogeneous, containing an ordered set of rules which apply cyclically to the readjusted phonological representations to generate a representation of phonetic stress values, and which include a block of rules which do not apply cyclically but only in linear order when a particular kind of rephrased structure known as the 'word' is reached in the cycle. These various rules make the relation between the phonological and the phonetic representations rather indirect (cf. p. 67 above); the phonological representation "is abstract in the sense that the phonological representation is not necessarily a submatrix of the phonetic representation" (p. 297); this applies both to 'stress' and to segmental word phonology.

The phonetic representation itself, the main principles of its construction, and the empirical claims made in connexion with it are of particular interest. Chomsky & Halle state (1968:5) that

a phonetic representation has the form of a two-dimensional matrix in which the rows stand for particular phonetic features; the columns stand for the consecutive segments of the utterance generated; and the entries in the matrix determine the status of each segment with respect to the features.

The representation generated by the phonetic level (not the "utterance" which, as an individual in the domain of phonetic representations, is only generated in a secondary, metaphorical way) embodies a number of decisions about the criteria of analysis for utterances. The entries in the rows specify the variants of the phonetic variables (features, universal phonetic categories); one variant per segment is given for each variable. A row of such entries therefore constitutes a trajectory through one of these variables (cf. §2.3.2. above on such segmentation problems). In the course of discussing the differences between phonetic and phonological representations, it is maintained (p. 166) that

an important difference between phonological and phonetic matrices is that the latter are fully specified while the former are not.

This amounts to a claim that no interruptions in trajectories occur (but cf. markedness theory). The phonetic constellation thus envisaged is quite simple: the system is arranged to cater for those trajectories which show a high rate of coincidence in their maxima and minima, specifically those trajectories which are particularly relevant to the description of non-prosodic systems. There is no provision in this system for the phonetic description of trajectories which do not operate syntactically within a framework of unit segments, i.e. the prosodically relevant trajectories, and, in particular, accentual and intonational trajectories in terms of the phonetic correlates of pitch, relative length, &c. The letters of conventional phonetic alphabets are related to the columns of the two-dimensional matrices: they "are simply informal abbreviations for certain feature complexes; each such symbol, then, stands for a column of a matrix of

the sort just described" (p. 5). This, as has already been mentioned above (p. 82), is roughly the view of Pike, the IPA, &c. In their own practice, Chomsky & Halle use other kinds of informal abbreviation for matrices at various levels of representation; sometimes they use conventional orthography, and sometimes a form of alphabetic transcription as abbreviations of this kind (both are used, for instance, on p. 11). Occasionally, the nature of phonetic theory is described as involving "a universal phonetic alphabet" (Chomsky, 1964:67), but this manner of speaking has apparently been dropped in Chomsky & Halle (1968), presumably because of the ambiguity of the term 'alphabet' in this context; the letters of a phonetic alphabet such as that of the IPA stand for particular complexes of variants of the relevant phonetic variables, whereas Chomsky and Halle apparently do not claim that specific variants should be the basic categories of the theory, but rather the variables (unspecified features). Phonetic types are only specified secondarily as variants of 'universal' phonetic variables; it is the latter which are the 'substantive universals' of generative theory, while variants are relativised to their contexts (p. 164n; cf. also Sampson, 1974).

In addition to this system of descriptive terms at the phonetic level of representation, a number of 'syntactic' remarks are made about possible combinations of these terms: "the simultaneous and sequential combinations of these features are subject to a set of specific constraints" (p. 5); some of these constraints are part of general phonetic theory and are incorporated in the interpretation rules; others are specific to individual languages and are part of the redundancy rules which specify the limits in possible entries in the lexicon for this language. This arrangement is modified in the theory of markedness, a later development (p. 400ff.), in which universal phonetic constraints are represented as markedness conventions for lexical entries and the interpretation rules for specific languages in effect define exceptions to these; since markedness theory has not been applied to prosodic theories either in the immediate context of generative grammar, there is no reason to discuss it further here.

There is one kind of trajectory which is postulated, and which is generally regarded as prosodic, which calls for comment. This is the phonetic variable of 'stress', which differs from other variables in that its variants are assigned by a simple cyclical principle, leading to trajectories composed of a wide range of numerically specified variants. This treatment of stress has some interesting 'semantic' consequences. Since there is no evidence that it is possible to perceive more than two degrees of stress in any sense of 'perceive' which can be correlated with physical analyses (Lieberman, 1965; 1967:161; Chomsky & Halle, 1968:26n), Chomsky & Halle suggest a domain of perceptual reality to which their detailed transcriptions correspond (cf. p. 82 above; 1968:26):

To summarize this discussion of phonetic representation, we do not doubt that representations of stress contours and similar predictable phenomena correspond, up to a point, to some perceptual reality that can be brought to consciousness with training and care.

The listener, it is said (p. 24) "will 'hear' the phonetic shape determined by the postulated syntactic structure and the internalized rules" rather than any kind of phonetic reality; furthermore, the impressionistic phonetician is said to be in the same position as the speaker in this respect as well as being influenced by "arbitrary convention or irrelevant cogni-

tive limitations" after a certain degree of complexity is reached" (p. 26) and consequently

it is impossible to expect (and, for purposes of investigating linguistic structures, unnecessary to attain) a complete correspondence between the records of the impressionistic phonetician and what is predicted by a systematic theory that seeks to account for the perceptual facts that underlie these records.

In particular, in view of the detail of the systematic transcription (p. 25), the following admission is made:

There may be no empirical sense to the question of whether the resulting representation is correct in full detail.

The postulate of an intangible perceptual reality which has little relation to other kinds of observable facts is used as an explanatory principle to explain the discreteness of phonetic representations (p. 294):

Thus it is no longer a problem that the transcription is composed of discrete symbols whereas the signal is quasi-continuous, or that the transcription provides information only about some properties of the signal and not about others, or, finally, that physically identical signals may have distinct phonetic transcriptions.

But this is a very odd kind of interpretation to give the notion of phonetic transcription; Chomsky & Halle owe the *Ohrenphonetiker*, to whom they too belong, evidence for the inadequacies of their transcriptions, for whereas it is a linguistic truism that native speakers perceive non-phonetically (cf. above, Ch. 1, *passim*), it is a somewhat impertinent exaggeration of their point to throw the impressionistic phonetician into the same boat. While not denying the influence of methodological assumptions and familiar patterns on perception, the present approach emphasises that perceptual criteria may be used with considerable autonomy in the analysis of utterances, for the identification of phonetic perceptual types; the Chomsky & Halle approach denies this degree of autonomy and accords perceptual criteria of analysis a secondary status after the criteria for syntactic analysis (p. 293):

Given the surface structure of a sentence, the phonological rules of the language interact with certain universal phonetic constraints to derive all grammatically determined facts about the production and perception of a sentence.

The term "grammatically determined" is ambiguous, suggesting "syntactically determined" in the context, but possibly meaning only "systematic", in view of the generality of the term "grammar" in the generative framework.

There are a number of points which should be made in this connexion. First, the motivation for this approach to 'semantic' interpretation of phonetic representations needs to be kept in mind. It is made fairly clear by Chomsky and Halle, and the present report has outlined their claims in such a way as to bring out this motivation even more clearly: the motivation is simply to provide a plausible explanation for a phonetic representation of stress which was developed fairly directly from that given by Chomsky, Halle & Lukoff (1956), this in turn having been expressly developed as an explication of the system of Trager & Smith (1951), a system which Lieberman (1965) has shown to have more than shaky foundations.

Instead of conceding the empirical shakiness of this transcription, Chomsky & Halle quote Lieberman's results with evident approval (p. 26), and then proceed to develop their elaborate non-empirical defence, instead of noting the danger of seduction when faced with an attractive, symmetrical notation. Second, it should be remembered that there is a precedent for 'non-phonetic' conceptions of stress, which does not necessarily lead to the difficulties of the Chomsky & Halle system. Lehiste (1970:150) outlines the views of Chomsky & Halle, and points out the following in her comment:

There is probably a very good reason why these fine gradations in stress cannot be expressed in phonetic terms. It appears probable that word-level stress is in a very real sense an abstract quality: a potential for being stressed. Word-level stress is the capacity of a syllable within a word to receive sentence stress when the word is realized as part of the sentence. The degrees of stress of other syllables within the word are usually predictable by rules and are therefore noncontrastive.

She points out that Weinreich (1954) held this view. Bolinger, too, in his well-known distinction between stress and accent, based his conception of stress (word stress, potential for accent) on Weinreich's view (cf. 1958 (1965:21)). As Bolinger (1972a) has pointed out, Chomsky & Halle do not restrict their conception of abstract stress to the word level, but include larger accentual patterns within the same conception, thus merging two distinct levels of analysis and creating a pseudo-problem. Third, this approach to the 'semantics' of phonetic representation is accompanied by a further conception, whose relation to the first is not discussed (p. 65):

As phonetic parameters, the distinctive features provide a representation of an utterance which can be interpreted as a set of instructions to the physical articulatory system, or as a refined level of perceptual representation.

This other conception, which has already been referred to in connexion with Postal's related conception (p. 82 above), is, as was pointed out in the previous context, also empirically implausible. It is not clear why two presumably distinct conceptions of the semantics of phonetic representations, one for stress and the other, apparently, for other trajectories, should be presented with such scant support. Fourth, no clarification is given of what is meant by the term "perceptual reality"; in §1.1., and indeed throughout Ch. 1, it was pointed out that there are many possible interpretations, some having more to do with the roles which utterances play, some having more to do with the types (though already on the phonemic level) to which utterances may be assigned. In view of the tendency of listeners to give criteria of the former kind priority, and with the largely non-phonetic nature of the stress values of Chomsky and Halle in mind, it would not be going too far, I suggest, to regard their stress cycle, in so far as it goes beyond the word level, not as phonological interpretation at all, but primarily as a principle of semantic interpretation (in the linguistic, not the formal, sense); this semantic interpretation defines the contribution of the syntax towards the notion of the relative communicative weight of the various parts of the utterance, and it would correspond to a phonological interpretation only to the extent that a natural type-role relation (cf. §1.2.5.3. above) holds. This re-interpretation, which will be discussed again in Ch. 3. below, will not be defended much further than Chomsky & Halle defend their own interpretations; it may be thought of as

an explication of the Prague school notion of communicative dynamism or functional sentence perspective, in respect of its syntactic factor. It might be possible to extend it to certain word-level configurations involving long compounds, but this, too, is a matter for discussion elsewhere (Gibbon, in preparation). It is very illuminating, in this context, to note Lieberman's gloss on his experiment with the performance of linguists using different transcriptions, which he gave in reply to a paper by Crystal on the occasion of a colloquium on prosodic features, in which he made one of his conclusions more explicit (Crystal, 1970:89):

... my view was that the Trager-Smith pitch notation was essentially a gloss for semantic information which was derived from the underlying deep phrase marker; in fact many of these so-called morphemes had no physical basis in the acoustic signal.

It is difficult to disentangle the role of pitch in intonation from its role in accentuation; since Lieberman's results on the Trager-Smith stress notation were comparable, a similar interpretation could be justified. Whether the deep structure is the decisive factor or not is irrelevant here; many factors are involved (Bresnan, 1971). What is really necessary is to find an answer to the question of what kind of perceptual reality is involved in the stress notation used by Chomsky and Halle if it is not phonetic and if, as seems likely, there are grounds for supposing that there is such a perceptual reality. It is at least plausible to suggest that it is a semantic interpretation.

2.4.4. Intonation transcription

In the approaches to transcription theory which were outlined in the previous two sections, a number of aspects which affect the transcription of intonation were discussed; most of these were of a somewhat general nature, but some, such as Chao's requirements for some degree of correspondence between symbol and object, are of more specific relevance. Mackey has, as was mentioned, gone further than this and provided a list of different kinds of intonation transcription with some comment on their relative merits. He classifies intonation and rhythm notations into three main categories: numerical, linear, and accentual (1965:58ff.), and in each of the three categories he lists a number of varieties.

The numerical types involve the marking of relative pitch levels at points in the pitch trajectory. He adduces three sub-types, the scale type, the level type, and the frequency type. The scale type is analogous to the tonic sol-fa notation for music, and involves similar assumptions about absolute intervals between pitch levels. The level type has four phonemically significant levels in terms of which phonological patterns are transcribed; Mackey notes that "the notation does not distinguish between moving tones and fixed ones, and there is no visual suggestion of what the forms stand for" (p. 60). There is a non-phonemic version of the level type which Mackey does not mention: Coleman (1914) has such a notation, as does Harris (1944), which are not claimed to involve phonemic criteria; cf. Harris' 01223333456 (for You're not going over to Philadelphia?). Another non-phonemic version, which has sixteen non-numerical diacritical symbols, stands for the stress-conditioned allophonic variants of pitch phonemes in Trager & Smith (1951), indicated by [- ° ° °] (from high to low) under-

neath the phonemic level integer. Bierwisch (1966) also uses a non-phonemic numerical transcription, initially in a form similar to that of Harris, with the integers over the vowels: 4325111 (for *Schon der Versuch ist strafbar*, p. 133), and then in the framework of a feature transcription system like that of Chomsky & Halle, where the integers represent the relative height of two adjacent vowels along a pitch trajectory with no implications as to actual pitch height (syntagmatic relativity in the sense of §2.3.3.2. above). Any numerical transcription can clearly be conceived as entries in a one-row, two-dimensional matrix which specify the position of a variant of the variable assigned to the one row in this variable; unlike the Chomsky & Halle system, in which the values appear to be determined by a paradigmatic conception of relativity, the Bierwisch transcription contains values which represent the relata of a syntagmatic pitch relation. Mackey's third sub-type, the frequency type, is only relevant to instrumental transcripts; the integers give the value of the frequency (not pitch) variants in Hz. Of this type, he says, "But it is difficult, if not impossible, to read aloud" (p. 60); there is surely no "if" about the impossibility.

The linear types have five sub-types, four of these with two minor variations each. Three of the five sub-types differ, basically, only in using dots, dashes or both to represent the two parameters of pitch height (relative to range-extremity lines, mid base-line or both) and presence or absence of accent (thickness or shape of dot, use of dash rather than dot). The fourth sub-type, called "line type" is written superimposed, rather than superscribed, over the running orthographic text, with a variant in which accented syllables are offset from the rest of the trajectory by means of a continuous rather than a dotted line; this type is clearly not so flexible as the other linear types. The fifth linear type given is musical stave notation. Bierwisch (1966:133), in connexion with the example mentioned above, shows that linear notations using segmented markings (such as the dots or dashes of Mackey's first three sub-types, but not the continuous line notation of the fourth type) can easily be represented as numerical transcriptions, with the numbers representing vertical positions in the more graphic notation. Since the numerical and the linear notation types are intertranslatable, there can be no serious consequences of using the one or the other, apart from 'pragmatic' typographical differences, one might think. This is possibly true; however, the numerical notation, being more abstract, is perhaps more likely to tempt the analyst to ascribe properties to his domain of discourse which are imported in fact by his notation: to see the numbers as representing values on some perceptual metric rather than simply the relata of a syntagmatic pitch relation and their relative positions along the pitch variable (cf. Lieberman, 1965). Because of this built in 'semantic' bias, such notations need to be carefully handled. This is not to say that there is no justification for using them, or that there is no justification for postulating the relevance of levels (cf. §§2.3.3., 3.2.); it is simply a statement of a property of a notation of which the analyst should beware (cf. pp. 83ff. above). In more precise terms, it might be said that the numerical notations give the impression of being metrically specifiable quantitative concepts, whereas they are, in fact, generally better construed as an indirect notation for comparative concepts, or relational classificatory concepts (cf. Carnap, 1950:8ff).

The third main category of notations for rhythm and intonation is the accentual category. Such notations are characterised by Mackey as follows (p. 61):

These include all those types of notation which indicate rhythm and intonation by use of diacritic marks of any sort, whether they be arrows, dots, or grave, acute or circumflex accents, written with the body of the text.

The term "accent" is meant typographically here. Mackey distinguished between the head-nucleus type, in which the head is written with a dash and the nucleus with an arrow (for these terms, designating constituents of tone-groups, cf. Ch. 3, esp. the account of British approaches), and the tonetic type, in which static tones are written with a vertical accent, and kinetic tones are written with various combinations of the slanting accents; Mackey notes the typographic convenience of the latter, but the two are not equivalent since the former is interpreted structurally, the latter by type (equivalence must be shown via the tendency of static types, say, to occur in heads, &c.).

There are other kinds of transcription, which Mackey does not mention; in the main these are closely related to his three main types. One instance has already been mentioned, the non-phonemic numerical type; for its offshoot, the notation of features and their numerical (or +/-) specifications, only a small extension of the numerical principle is required. Another kind, a variant of linear notations, makes the orthographic line of type follow the pitch curve; this is used, for instance, by Bolinger, and has a particularly important status in the context of his theory of pitch as the major correlate of both accentuation and intonation proper. Yet another kind is used by Bolinger, with letters to indicate accent types and other kinds of pitch pattern. Halliday uses numbers at the beginning of an orthographic sequence, which stand for sorts of nucleus ("tonic", in his terminology). Crystal has a complex tonetic type of transcription supplemented by marginal notes related to the main text by designated parentheses (quotes, &c.) for features which cover a stretch of the text. Not to be forgotten, and still unfortunately in use in theoretical rather than merely illustrative roles, are those accent transcriptions which capitalise or underline the accented syllables without discrimination between different accent types.

An adequate intonation transcription will play a specific part in an overall theory of intonation. The criteria, principles and requirements for establishing transcriptions and choosing notations have been outlined in some detail above; these are obviously only some of the requirements which can be established for intonation descriptions, since they do not go beyond the specific contribution which representations of utterances make in such a description. This specific contribution is to provide descriptive terms for the variables and their variants which are used as the criteria of analysis in setting up an intonation description. This is a particular kind of 'semantic' contribution, in the main; several 'semantic' issues connected with the relation of such descriptive terms to what they signify were outlined. One of the most important was the question of the relation of the symbols, the descriptive terms, to the structure of trajectories through the pitch variable: whether static or dynamic trajectories are to be represented, and if the latter, how they are to be represented, iconically or in a more abstract manner (cf. the tonetic notation and the numerical notation as two poles in this respect, or Bolinger's letter notation and Halliday's number plus tonetic notation). This issue is not as superficial as might seem; a decision to use non-iconic notation generally embodies a decision on the paradigmatic discreteness of intonation variables, a matter which is not to be lightly decided; a number of aspects of the problem will be

taken up again in Ch. 4 below.

Other 'semantic' issues pertained to the kind of domain which a representation relates to; this is another aspect of the nature and particular selection of criteria of analysis made in any description. Very few of the requirements given in the account of transcription typologies went beyond specifying symbols for the minimal segments of the relevant trajectories; it should not need arguing that longer segments are not necessarily simply functions of the shorter segments but are, rather, subject to independent structuring. The problems associated with longer segments, and the interrelations of longer and shorter segments, and the interrelations of longer and shorter segments, which is one of the major difficulties in formulating some parts of accentuation theory, for instance, has received scant attention. Chao referred to the iconic properties of symbol complexes, but nothing was said about the way in which symbols and symbol complexes relate. This is, of course, partly a 'syntactic' question; nevertheless, larger structurings also require rules of interpretation. The approach which has handled these matters most explicitly, the generative approach, has not dealt with matters of intonation patterning to any considerable extent, and faces great 'semantic' difficulties. Since the criteria of analysis, particularly on the role side, have still to be formulated for intonation and accentuation patterning in many respects, in particular with regard to the interrelations between different possible sets of criteria of analysis used at different levels of analysis, this is not surprising. The contribution of generative theory has nevertheless been considerably greater, as far as theoretical and methodological awareness is concerned, than most other approaches together; to this contribution must be reckoned such non-Chomskyan generative essays as that of Reich (1969), based on Yngve (1961), who develops a reductionistic placement theory for rising and falling tones within a more restricted type of grammar. Generative approaches have provided a useful framework of tools and concepts within which questions about language, and thus also about intonation patterning, can be put more precisely than before, and to which the answers are expected to be equally precise. The present approach, though differing in 'semantic' matters and in the emphasis on criteria of analysis, owes a great deal to generative analyses.

In the following chapter, a wide range of descriptions of intonation systems (English, in the main) will be reported and commented on; some of the more detailed generative attempts at explication of earlier descriptions (esp. Bierwisch, 1966; Stockwell, 1960; Chomsky, Halle & Lukoff, 1956) will be discussed in the same context as their explicanda. The search will be more for the clearly formulated questions than for the answers, however, for the clarification of the possible explicanda (Carnap, 1950: 3ff.) rather than an over-hasty explication.

3. APPROACHES TO ENGLISH INTONATION STRUCTURE

Descriptions of the structure of utterances were said in the first chapter to be a particular way of presenting relations between the types to be a particular way of presenting relations between the types to which utterances may be assigned and the roles which utterances may be made to play. In general, they may be said to involve paradigmatic judgments about roles (in terms of functional equivalence or identity of various kinds) rather than syntagmatic judgments (about the contexts in which utterances of specific types may be used. In this sense, the paradigmatic kind of judgment may be regarded as a short cut, involving a language user's opinion of when two types are to be related to a single norm, in some sense of that word which is not always made precise, of use. This is a standard procedure in structuralistic analyses, a point which has been made particularly strongly. There are dangers in soliciting only paradigmatic judgments and only incorporating mechanisms for displaying these in a description, but the method has considerable utility in providing accounts of the 'clear cases' (Chomsky, 1957:14) of role assignment. In this respect, accounts of the structure of intonation in English are no exception.

In the present chapter, a survey will be made of the main developments in the description of English (and, where relevant, related languages) with respect to intonation patterns. A number of aims will be followed: first, the criteria of analysis developed for the analysis of intonation structure will be sought; second, the most interesting empirical and theoretical results will be extracted for further examination; third, evidence for the establishment of different levels of analysis will be pointed out; finally, and by no means the least motivation, a certain degree of historical perspective to the study of intonation, often ignored, will be provided.

3.1. Prosodic approaches

The first of the two major approaches to the analysis of intonation can conveniently be referred to as the 'prosodic approach', to distinguish it from the 'phonemic approach'. There is some danger of heterogeneity in the first category, since it is characterised simply by the view that intonation patterns are best analysed by means of criteria of analysis which are not entirely compatible with those used for the more lexically relevant areas of phonology. The second category, on the other hand, is more uniformly characterised by the view that the criteria of analysis used in phonemics can be transferred to the analysis of intonation. The first clear formulation of the distinction between the two categories was made by Bolinger (1949), who aimed (p. 248)

to consider the extension of current phonemics to intonation, from two points of view: (a) the resemblance, or lack of it, between the two fields, affecting the assumption that the same technique would work for both; (b) the success of sample attempts to extrapolate.

Some of the motivations for assuming that extrapolation in this way is not possible have already been outlined (cf. esp. §2.3.2.); a discussion of specific points will be given again in the next chapter.

The category of prosodic approaches contains mainly European studies, just as the phonemic approaches are mainly American. Bolinger's approach

bears a number of resemblances to the prosodic approaches, but is so closely bound up with his conception of pitch accent that it seems advisable to handle pitch accent approaches and their associated intonation analyses separately; since Bolinger developed his theory in some measure as a reaction against phonemic analyses, it will be dealt with after the latter have been treated. It has often been said that the European analysts were or are, after all, primarily language teachers with a strong practical leaning and considerable observational gifts, but with the implication that their work is relatively unsystematic and unscientific. The former opinion holds true, it should be noted, for Pike's work within the Michigan language teaching program, and for many other related studies. As the following account will show, an unwillingness to utilise a special metalanguage, beyond a very few terms, is not necessarily a sign of unsystematic work. The differences are in reality more fundamental: they lie in differing hypotheses about applicable criteria of analysis, as well as in certain dialect differences.

3.1.1. Tunes

A division can be made within the prosodic approaches between 'tune' analysts and 'tonetic' analysts, the latter analysing tunes further into shorter prosodic segments. This formulation of the distinction is considerably over-simplified, as the following discussion will show; not only are the differences more subtle, the similarities are considerable: the tune approaches contain traces of internal structuring of the tunes, and in the tonetic approaches the overall larger structuring is also preserved.

Sweet (1900) stands at the end of a long line of attempts to describe intonation patterns (cf. Pike, 1945:3ff.; Crystal, 1969:20ff. for surveys), and at the beginning of a period during which intonation analyses became more and more detailed. It will be useful to quote what he has to say about English intonation, since it sets the scene for a whole tradition of prosodic analysis. He has essentially only the following to say (1900:3):

The tones are level (''); rising ('), as in 'what 'what?'; falling ('), as in 'now 'no!'; falling-rising or compound rise, as in 'take 'care!'; rising-falling or compound fall, as in 'ou 'Oh!' as an expression of sarcasm. The tone-marks are put before the word they modify; if they modify a whole sentence, they are put at the end of it. The greater the interval of these tones, the more emphatic their meaning.

Of the functional criteria of analysis involved, in addition to emphasis, Sweet mentions two basic functions, and comments on the internal structure of compound tones (p. 32):

Of the two simple tones, the rising (and the level) is interrogative or expectant (suspensive), the falling affirmative or conclusive. ... In the compound tones the second element determines the general meaning of the whole tone, and the first element only modifies it: the compound rise expresses doubt of some implied statement, expresses caution, warning, contrast, etc., while the compound fall hints at a doubt and disposes of it by a dogmatic assertion, and so expresses obstinacy, sarcasm, contempt, etc.

The following are particularly conspicuous aspects of his account which enter into later discussion: first, the identity of rising and level tones

according to functional criteria; second, the 'suspensive' and 'conclusive' interpretations of the two poles of the simple tone variable with regard to function; fourth, the phonologically compound tones being compound with respect to both type and role, and the first element of the compound subordinate to the second. Most of these views are preserved pretty much as they stand in later analyses. There are some analyses which do not even have this amount of detail, but which were offered at a point in time when intonation analysis had progressed considerably further than Sweet's sketch; Bloomfield (1933) and Trager & Bloch (1941) list similar sets of tones, and, without Sweet's care to avoid mixing categories and his further comments on function and internal structure, they associate with the tones specific grammatical functions, and represent the tones by means of punctuation signs (cf. also p. 22 above, §3.2. below). There are still those who consider this an adequate account of intonation patterning (§1.2. above).

Analyses of this kind select the most conspicuous aspect of intonation, namely the 'intonation turn', and regard everything else as irrelevant; the selection is, of course, implicit, since nothing shows that other intonational properties of utterances were noticed. Just over a decade later than Sweet's account, Klinghardt started a series of intonation descriptions, together with various associates, which influenced a long chain of intonation analyses down to Bierwisch (1966); in the later stages his influence was no longer remembered. It is his analysis of intonation which forms the nucleus of the following sections on intonation tunes.

3.1.1.1. The Klinghardt analyses

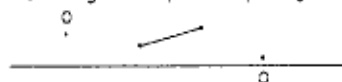
In the first of Klinghardt's analyses, an account of French intonation with de Fourmestiaux (1911), the status of the description is basically that of an ad hoc phonetic notation, with which individual utterances can be indiscriminately described in terms of their pitch trajectories; there is some evidence of an awareness of regular patternings in intonation, distinguishing the account from the intonation curves of Jones (1909), and there is considerably more phonetic detail than in the Sweet account. The baseline transcription used is commented as follows (pp. 34f.):

Jeder punkt vertritt eine silbe. Seine höhenlage im vergleich zu der des vorhergehenden oder folgenden punktes deutet die musikalische höhenlage der betreffenden silbe im vergleich zu der der benachbarten silben an. Ein fester punkt bezeichnet die schlußsilbe eines taktes und drückt gleichzeitig aus, daß diese silbe mit ein wenig gesteigertem nachdruck zu sprechen ist. ... Der die schlußsilbe eines steigenden taktes anzeigende fette punkt wird darum senkrecht über den vorhergehenden punkt gesetzt, weil so die schroffe hebung der schlußsilbe über die vorhergehende deutlicher hervortritt, als wenn er sich nur in stark gesteigertem schräge an die vorangehende reihe anschliesse. Um der analogie willen hierzu findet sich der den schluß eines satzes bezeichnende und die tiefste lage einnehmende (fette) punkt ebenfalls senkrecht unter den vorhergehenden gesetzt. ... Ein kleiner ring ... an stelle eines fetten punktes hebt die höchst gelegene silbe (point culminant) einer ganzen gruppe von takten nachdrücklicher für das auge hervor.

It has already been mentioned (§2.3.3.1., p. 107 above) that the function

of the baseline for Klinghardt in this description was primarily to be a visual aid in reading, though he did toy with the possibility of associating the baseline with some kind of phonetic reality. The same 'pragmatic' emphasis is evident in other aspects of his notation, as in the device of printing accented syllables immediately above or below the preceding unaccented syllable in order to emphasise the sudden pitch change; within the framework of an iconic notation (cf. Chao's requirement 7), the device may be thought of as a kind of iconic caricature. Also, the distinction between bold dot and ring corresponds to a distinction in structural category, and also includes an iconic element relating to the hierarchy in which the two categories are situated. A further notational device, not mentioned in the extract, is to connect individual syllables in a bar by means of a line if they are not the last two syllables in a bar group (i.e. already subject to the notational convention of printing in vertical pairs). The following example illustrates the main aspects of these notational conventions with a characteristically French intonation (p. 35):

(1) Je mange cinq fois par jour



Delattre (1966-7) also notes this pattern in his description; it is one which differs considerably from those common in English. In Delattre's terms, the sequence of three bars (*takte*) divided into two bar groups (*taktgruppen*) would be termed 'sense group with major continuation followed by one with minor continuation and a closing sense group with finality'; it might perhaps be suggested that a similar structure would be obtainable in English by means of different forms. This matter will be discussed later in connexion with Klinghardt's description of English intonation.

A number of structural categories are proposed: syllable, bar, and bar group; a semantic criterion is given for the fusion of bar sequences into two and three part bars, but no phonetic criteria are mentioned. The syllable is not, as such, a relevant category, a fact duly acknowledged by the convention of using lines to represent bars, rather than dots to represent syllables. This notation also has implications for the intonations postulated: dynamic trajectories, rather than individual height values are the basic relevant types. The status of the culmination point is not made entirely clear; since the ring in the iconic notation, introduced for the culmination point, is also used for the lowest point, whereas the culmination point is said to be the highest point in the pitch trajectory, it is possible that it is simply intended to have a position within the bar group analogous to that of the category symbolised by the bold dot within the bar, i.e. the final syllable. The special status of the final syllable is probably specific to the structure of French intonation; in English, the trajectories are marked by a more conspicuous accentual structure, which makes the trajectory-final syllable much less important. It is interesting that dynamic trajectories postulated for bars, and symbolised by continuous lines, differ from the kind of temporal pitch relation postulated for the ends of bar groups: here a pitch step, symbolised by the printing of vertical pairs, rather than a gradual change or even a glide on one syllable is postulated. Again, this may be specific to French in-

tonations.

In a later study of English intonation, written together with Klemm (1920), Klinghardt presents a somewhat different picture; many of the differences are undoubtedly due to the differences between English and French intonation, but it is possible that some are due to refinements in the descriptive categories available. A theoretical advance is made from a relatively inexplicit system suitable for representing particular utterances at an indeterminate level of analysis to a description whose inherent idealisations are recognised, and the prescriptive nature of whose applications in practical teaching are relatively explicitly stated and also claimed in retrospect for the earlier study (p. vii):

Um aber Mißverständnissen bzw. Mißtrauen anderer art zu begegnen, sei bei dieser Gelegenheit (Discussion of the speech of an informant from Manchester. - DG) aufmerksam gemacht, daß der tonfall in diesem buche, ebenso wie der in seinem französischen vorgänger, stilisierter tonfall ist. Ein stilisiertes weinblatt findet in der ganzen natur vielleicht nicht ein genaues gegenstück, aber jeder, der es sieht, wird doch sofort sagen: dies ist ein weinblatt. Ähnlich werden gewiß sehr viele Engländer einen nicht geringen teil unserer sätze und texte anders intonieren, als wir vorschreiben. Aber spricht man sie ihnen in der von uns empfohlenen weise vor, und stellt man die frage: klingt das englisch? dann, so ist allerdings unsere zuversicht, werden sie ohne bedenken bejahend antworten. Solches liegt in der natur aller ähnlichen lehraufgaben: mit der unendlichen mannigfaltigkeit der dinge kann man gar nichts lehren, immer nur mit festen typen.

One could hardly hope for a more explicit statement at this early date of the relation between a description as a model, especially a model intended for practical use, and its object (cf. §§1.3., 2.4.1.); the ability of learners to cope with 'infinite variety' is rather underplayed, but this is a matter which requires treatment elsewhere.

In the description of English, Klinghardt also uses a baseline notation, supplemented by a line indicating the upper limit of the pitch range; the baseline has the same status as in the description of French intonation. The structural categories which are displayed on this graph are somewhat different, however (for illustration cf. (4) & (5) below). Five structural categories go to make up a full bar (*sprechtakt*), arranged in the following order: *anacrusis* (*auftakt*, later known in English as 'prehead'); *head* (*taktkopf* or *hochton*); *upward break* (*neuhebung*); *low tone* (*tieftone*, later termed 'nucleus' in English); *coda* (*abtakt*, by analogy with *auftakt*, later known as 'tail' in English). Only three of these mixed formal and structural categories have independent status, namely those which are associated with accented syllables, the head, the break and the nucleus; the prehead and the tail, both unaccented, are predictable, the former in relation to the head, the latter to the nucleus. In this they are no different, in this description, from other unaccented syllables. The three important categories are relatable in the following way to other phonological which are more generally definable.

From the basic sequence of syllables a number are selected and designated as accented; from these, three are selected and given a special structural status in the intonation pattern whereby the break might possibly recur within the same pattern or be omitted altogether, and when only one accent occurs the head would also be omitted. The category of syllable is

not structurally important, though of course it has a place in a full description; the category of accent is subordinated to the three intonationally relevant categories. The 'bar' is thus not divided into three contiguous sections of a trajectory, but is a further abstraction constituted by brief, particularly prominent subtrajectories which may, at other levels of analysis, be separated by stretches of less prominent accented and unaccented syllables. The prehead and the tail are also to be seen at a different level of analysis from the other categories. The system can be informally represented as in Figure 6, where the three levels of analysis and the rudiments of their interrelations are outlined. In this sketch,

Levels of analysis	Structures postulated at each level
1. Major accentual pattern, 'bar':	{head - (break(s))} - nucleus
2. Accentual sequencing:	
3. Syllabic sequencing:	$s_1 \dots s_g \dots s_{j_1} \dots s_{j_0} \dots s_k \dots s_p$

Figure 6: The structure of Klinghardt's intonation description (with Klemm, 1920)

nothing is intended to be implied about analytic priorities of other orderings among the levels of analysis, or about the details of mapping between the levels, as such information was not given by Klinghardt; he was possibly not fully aware of the structural relations sketched here, either. The bracketing at the first level is intended to abbreviate informally the three structures (indefinitely many more if iteration of breaks - indicated by a bracketed plural ending - is permitted); no internal structuring is intended to be conveyed by the brackets: they are to be interpreted purely as abbreviatory conventions, since all three categories are syntagmatically equipollent. This is not to say, of course, that no such structuring could be established.

Each of the structural categories at level 1 is associated with one or more phonological variables, and with one or more variants of each of these variables. The head is assigned to a relatively high position on the pitch height variable (the longer the 'bar', the higher is said to be the height of the head; this implies a structuring which goes beyond a simple sequencing, since items considerably later in the accentual sequence 'depend' on the first, rather than the immediately preceding item); since the high level is the only type associated with the head which distinguishes it from other kinds of accent, no contrastive system is possible at this position. The category of break is assigned two forms, both syntagmatically relative to the height of the head, the second to a height above that of the head. The presence of a break, like the height of the head, depends at least in part on the overall length of the 'bar' (the 'length' being presumably measured in terms of the accentual or syllabic levels of analysis as reference levels, though a physiological constraint rather like Lieberman's breath groups may be intended). The simplest phonetic explanation

for this category is that with long trajectories an increase in height must take place somewhere in order to leave sufficient height for a possible downward pitch glide at the end. There must also be non-phonetic explanations for this category, however, as for variations in head height, since the break and, under some circumstances, an increase in head height, has a marked accentual effect. The category of nucleus is associated with a low position on the height variable, syntagmatically relative to the head or the break. In addition to this low level at the initial point of the nucleus, there is a choice of pitch glide (*verschleifung*) on the nuclear syllable starting at the low point: either upwards or downwards. Bars ending in an upglide are referred to, in functional terms, as incomplete or continuation-marking (*weiterweisend*) and downglide endings are referred to as complete or closing (*abschließend*).

These are not the only forms associated with the intonation system, however; there are also two variables associated with the bar as a whole. The first is the pitch range variable, with the two variants narrow range (for normal speech) and broad range (for excited speech or public speaking). The second is the pitch height variable, with a higher overall level for the incomplete than for the complete bars.

Level 3, the syllabic level of analysis, can then be assigned pitch values on the basis of this more general structuring. The prehead (i.e. $s_1 \dots s_{g-1}$ in Figure 6) sometimes assimilates to the head pitch level, but is generally on a static trajectory; from Klinghardt's examples it is obvious that he only recognises a low level prehead. The tail (i.e. $s_{k+1} \dots s_p$ in Figure 6) is a simple continuation of the nuclear glide: with an upglide, the upward trajectory is continued, a fairly simple function even if a limit on maximum height is set; with a downglide, the trajectory 'bottoms', i.e. the glide reaches the lowest level quite rapidly and the tail remains roughly at this level, again a fairly simple matter. The syllables intervening between the head, or the last break, and the nucleus are on the same falling trajectory as the head or break and the nucleus. It is simply a question of filling in trajectories which commence at s_g and all s_j associated with an a_i (there is a minor ambiguity in Figure 6 here) and continue to the s_{j+1} , where s_{j+1} is associated with the a_{i+1} in each case, or else to s_k . At these end points, new pitch relations are introduced: in the former cases, a new trajectory starting at a break, and in the latter case a new terminal trajectory. A generalisation might be made to allow assimilation of intervening syllables to following breaks as well as of preheads to heads, but Klinghardt only mentions the latter possibility. It should be noted that there may well be a one-to-one relation between the first and third levels of analysis in a given case: there do not have to be syllables preceding, following, or intervening between those syllables which are assigned to the main categories. There may, indeed be only one syllable, in a given bar. The status of the second level of analysis will be discussed below.

The forms postulated at level 1, and their interpretation at level 3, can be informally summarised in tabular form using a notation based on the well-known feature notation of generative phonology, a notation which can easily be read in terms of phonetic variables and their variants. Two kinds of condition on variant selection are also given in the following tables: first, specifying dependencies and priorities between variants; second, specifying the status of variants either as independent forms or as relata of a trajectory, or pitch relation (cf. Table 1 and Table 2).

Level	Category	Variant & Variable	Conditions on selection
1	bar	[narrow Range]	<'normal' speech context>
		[wide Range]	<emotive/public speech>
		[α P-level]	<bar dominates [down Glide]>
		[β P-level]	<bar dominates [up Glide]>
			& for both values $\alpha < \beta$
	head	[high+ α P-level]	<in the context [α M], where M is a measure of the length of the trajectory of which the head is the left relatum>
	break	[α P-level] [γ P-level]	<in the context [β P-level(h,b)], where 'h,b' means 'head or break', $\alpha = \beta$, $\gamma < \beta$ >
	nucleus	i. [α P-level]	<in the context [β P-level(h,b)], $\alpha < \beta$ >
		ii. [up Glide] [down Glide]	<from starting point at [α P-level]>

Table 1: Intonation forms at level 1 in Klinghardt's description (read: '[α P-level(h,b)]' as 'the pitch assigned to head or break').

There are a number of resemblances to Bierwisch's feature notation (see below) which are not fortuitous: the reason lies partly in some common theoretical ground, and partly in the fact that Bierwisch uses the notation to explicate the linear transcriptions of v. Essen, which derive from the Klinghardt analyses fairly directly, with the intervening stage of Armstrong & Ward's description of English intonation. The most important facts about level 1 come out clearly in the summary in Table 1. First, the distinction between relative variants and 'constant' variants (cf. §2.3.3. above) is clearly reflected in the use of the Greek letter notation for variables and in the use of words: the variables are used in the conditions on selection of variants in order to indicate the status of variants as related to pitch trajectories (note that the term 'variable' here is used in its logical sense as an areferential identity marker, and should not be confused with its use in 'natural variable' - which would be 'Range', &c. unspecified by variable or word; cf. §1.2.5.1. above); those variants specified by words, on the other hand, are 'constant'.

By examining the dependencies between variants in this summary and tracing them back to 'constant' variants in each case, it can be seen that three systems of forms are operating: that of range, for the bar category; that of level for the other three categories; and that of glide direction for the nucleus. It is possible that the variant high level may not be intended by Klinghardt to be 'constant' in the sense operative here, but his tentative remarks on the status of the base-line may point towards some

Level	Category	Conditions on trajectory interpretation
3	Prehead syllables s_i	For all s_i in context $X[\beta$ P-level(h)] : α P-level(s_i) & [γ P-level(s_{i+1})] & $\alpha < \beta$ & $\alpha < \gamma$
	Syllables s_i following head or break	<For all s_i in context [β P-level(h,b)]X : [α P-level(s_i) & [γ P-level(s_{i+1})] & $\alpha < \beta$ & $\alpha < \gamma$ >
	Tail syllables s_i	a. i. [up Glide(n)] ends at [$\beta + \epsilon$ P-level(n)] where β = starting point of n & $\epsilon = a/p - k$ & a = the width constant of the trajectory & p, k have the values of Fig. 6 & ii. For all s_i in context [up Glide(n)]X : [α P-level(s_i) & [γ P-level(s_{i+1})] & $\alpha > (\beta + \epsilon)$ & $\alpha < (\beta + a)$ & $i \neq k$ & $\alpha = (\beta + a) \equiv i = k$ & $\alpha < \gamma$
		b. <i. [down Glide(n)] ends at [$\beta - \epsilon$ P-level(n)] where β = starting point of n & $\epsilon = a$, & a = the width constant of the trajectory & ii. For all s_i in context [down Glide(n)]X : [α P-level(s_i) & [γ P-level(s_{i+1})] & $\alpha = (\beta - \epsilon) = \gamma$ >

Table 2: Conditions interpreting levels and trajectories at level 3 from levels and trajectories at level 1 in Klinghardt's description.

such interpretation; it would not be too drastic a step to replace 'high' by a Greek letter variable, however: the consequence would simply be that nothing would then be claimed about possible constraints which phonetically anchor trajectories at certain points to specific simple variants (cf. §2.3.3.1. above). The distinction made in the previous chapter between paradigmatic and syntagmatic relativity, the source of the second variable involved in a relation is the immediate context, whereas there is no contextual source with paradigmatic relativity. One aspect of Klinghardt's system is not accounted for in the summary, namely the condition that no break is present unless the overall length of the bar is such as to make it necessary to regain pitch height before the nucleus is reached. This is a rather 'fuzzy' kind of condition, but it could well be linked to the condition on the height of the head (Table 1), linking the pitch height variant selected for the head with the overall length, on some unspecified metric, of the bar.

The summary of conditions on pitch trajectory interpretation given in Table 2 would perhaps have greater value if the generalisations over the

various sections of the complex pitch trajectory were made more explicit; this would no longer be a clarifying summary of Klinghardt's system, however, but a more thoroughgoing kind of explication. It is doubtful, too, in the light of later descriptions, whether the factual basis given by Klinghardt is sturdy enough to support such an explicatory edifice; an instance of such an explication on a sandy foundation is Bierwisch (1966), an explication of von Essen (1966) cf. §3.1.1.3. below). In the absence of further generalisations, of course, the cost-benefit ratio of such summaries is rather on the low side, since a considerable symbolism is introduced which then has to be heavily constrained to limit its applicability. The possibility of a number of generalisations is, it should be pointed out, indicated by parallelisms especially in those conditions which contain relational terms whose fields have Greek variables ranging over them. The individuals of the third level of analysis, which are assigned pitch variants by the mechanisms summarised in Table 2, are not necessarily dependent on interpretation from the first level of analysis in other respects; they are syllables, and are described in terms of their own criteria of analysis which cover factors other than pitch, and thus fall outside the scope both of Klinghardt's description and the present study.

The second level of analysis, that of accentual sequences, is one which might have been expected to receive more attention. However, the phonetic criteria of analysis for accents were taken for granted by Klinghardt, as by many other investigators, and not clearly stated. They are assumed not to have any specific relationship with the criteria needed for the analysis of pitch patterning, an assumption which is in part false. As far as the description of pitch patterning is concerned, therefore, Klinghardt bypasses this level. Presumably, he sees the phonetic correlates of accent in terms of 'stress', intensity, &c. It is also possible, though conjectural, that this level may be more abstract than level 1, involving lexical or potential stresses (as in Bolinger's later theory and in generative phonology), to which accents of specialised kinds (head, break, nucleus) are assignable by virtue of semantic and syntactic criteria.

It will be seen that this analysis of English intonation by Klinghardt is the forerunner of a large number of later European analyses in the kind of structure proposed for accentual sequences. The number of choices observed for forms associated with each sub-structure is highly restricted, of course, and later analyses added considerably to the fund of observed patterns, but, so far as this kind of framework goes, most of the Klinghardt analysis tallies with subsections of later analyses.

3.1.1.2. Armstrong and Ward

At this point, the traditional distinction between the 'tune' approaches and the 'tonetic' approaches to intonation description clash with a straightforward chronological account of intonation studies; on chronological grounds, Palmer's description (1922) would merit attention before that of Armstrong & Ward (1926), but both the received views on the relative achievements of the two studies and Armstrong & Ward's own disavowal of any indebtedness to previous studies would appear to make this chronological dislocation unimportant, at least at first glance.

The description of intonation by Armstrong & Ward is one of the most well-known early pedagogical studies of English intonation and is still in

widespread use. Although in their preface Armstrong & Ward claim to have made their analysis "from personal observations only" (p. iv) and without reliance on previous studies, they do acknowledge using a modified version of Klinghardt's interlinear system of notation. In fact, their description bears a rather close resemblance to that of Klinghardt, as well as having a number of the traits of Palmer's earlier description, in the observations made as well as in the notational system; certain minor details apart, the Klinghardt observations can be seen as a subset of those made by Armstrong & Ward. It is difficult to tell how much of the field of inquiry was pre-established by the Klinghardt study; both studies treat the intonation of a rather formal style of utterance, but if details beyond this were in fact independently established, as Armstrong & Ward claim, the parallelisms could be seen as corroboration of Klinghardt's findings.

One conspicuous difference between the Armstrong and Ward description and that of Klinghardt is that the former did not introduce names for the internal structural categories of the two basic trunks, while Klinghardt named quite a number of such categories, as reported above. Instead, they rely on descriptions such as "initial unstressed syllables", "last stressed syllable" of the tune, and so on. This has often misled investigators into thinking of the Armstrong & Ward analysis as a rather simplistic two-tune affair with little internal differentiation. This is not the case, however. The same kinds of substructure are described as in the Klinghardt analysis, but with a considerably wider range of choices between forms for the various substructures than Klinghardt gave. A certain amount of flexibility in description is gained by this refusal to categorise, especially with regard to "emphatic" patterning, but it is a little cumbersome to have to rely on descriptions rather than names in exposition and so the Armstrong & Ward descriptions will be related to the Klinghardt categories and correspondingly named where convenient.

The "intonation group" (p. 2), corresponding to Klinghardt's *sprech-takt* or bar, has one of two "tunes". As in Klinghardt's analysis, the "stressed" syllables "form a descending scale" (p. 4) in each tune, the difference being centred on the last syllable of the stressed series, Klinghardt's *tiefton* or nucleus. In tune I, a downglide occurs here, with the same interpretation as far as following unstressed syllables are concerned as with Klinghardt, but with tune II a minor phonetic difference is to be noted: on a monosyllable (i.e. in the absence of a tail) an upglide occurs, as with Klinghardt, but if a tail is present, the nucleus is said to be on a low level (rather than upgliding) tone, followed by a rising sequence of unstressed syllables; if any of these are slightly stressed, or long, they may be upglides (represented by a line in the notation, as with stressed syllables) rather than at an indeterminate height in a series (which would be represented by a dot).

The treatment of unstressed syllables allows more freedom of choice than in the Klinghardt system. The prehead may be either mid (not in the Klinghardt description) or low level, or assimilated upwards to the height of the first stressed syllable, Klinghardt's *hochton* or head. Of the other unstressed syllables occurring between the stresses matters little, so long as it is not far removed from that of the previous stressed syllable" (pp. 4f.), but they do describe a number of possible choices, four in all. The most usual, particularly for the unstressed syllables between the last two stressed syllables, is a gradual descent between the stressed syllables; this is the version which Klinghardt described. The other choices are that

the unstressed syllables "remain level, be on a slightly higher or a slightly lower level" (p. 5). It is mentioned that if the stressed syllables rise, "there seems to be an element of surprise, cheerfulness, enthusiasm or more interest introduced" (p. 5), but it is not clear whether this is the same as the "slightly higher" category. In the case of the rising series of unstressed syllables, the stressed syllables themselves may be on a lower pitch, so that the head, in such a case, may even be lower in pitch than the prehead. One essential point is not made clear: whether in any given intonation group all of the intervening unstressed syllables behave uniformly, or whether consecutive series have a free choice of low, high, level, gradually descending or rising configurations. As far as the final unstressed series is concerned, the tail, little needs to be noted except that Armstrong & Ward allow that the tail following a falling nucleus may, starting at a very low level, continue the fall rather than stay at that level.

The observations made about the intervening unstressed syllables, particularly the choice of a rising series, have repercussions for the description of the overall configurations of intonation groups. It turns out that there is not simply one line along which the stressed syllables are arranged, but that the non-nuclear stressed syllables may either be arranged along a descending line, together with the nucleus, or kept at a lower level if the intervening unstressed syllables rise. There are a number of uncertainties about this choice. It is not made clear whether the choice is made at the level of analysis specific to unstressed syllables, or whether it is made at the level of the stressed syllables (accented syllables); no example is given of a series of stressed syllables associated with rises but without intervening syllables, which would have decided the issue. Nor is it made clear whether the lower pitch of stressed syllables is an isolated characteristic of individual stressed syllables or characteristic of sequences: the examples given only contain one non-nuclear stress, which allows no decision. In their discussion of tune II, Armstrong and Ward note that a third kind of trajectory is available for sequences of stressed syllables with this tune "in which the pitch of all the syllables preceding the final stress is lowered to a more or less level note" (p. 21), and which underscores the effect of tune II. It may be possible to generalise the sequencing observed in the first and third choices to the second, taking the co-variants of this phonological variable as circumstantial evidence.

Klinghardt's category of *neuanhebung* or break is also dealt with by Armstrong & Ward; they introduce a vertical upward-pointing arrow to symbolise the category in the text, though they refer to the category only as a "change of pitch" or a "method of treating long groups". The role of semantic criteria in identifying this category is treated in a somewhat question-begging manner. The main phonetic correlation is said to be with long "sentences" but the category is introduced in the following way (p. 18):

If a long sentence has so many stressed syllables that a gradual descent would bring the voice to its lowest limit too soon, at a convenient place, i.e. on an important word, the pitch is moved up so that the long descent is broken.

A note on the same page mentions "a slight effect of emphasis to the word on which the pitch is lifted up" which the break produces; a more systematic account would couple these two disparate remarks within an account of emphasis and accent in general, a matter which Armstrong & Ward discuss

separately. The accentual basis of this category is made clear by a further note on the same page: "If the subject-matter is considered important enough, the sentence is broken up into two (or more) separate groups". These generalisations are not made, however. Armstrong & Ward see the phonetic nature of the break rather differently from Klinghardt: whereas Klinghardt gave a choice of either equal height to the head or greater height than the head, Armstrong & Ward note that the pitch of the break "is generally not so high as that of the first stressed syllable" (p. 18).

The area where Armstrong & Ward go considerably beyond the Klinghardt description is that of what they refer to as "emphatic sentences". They distinguish two kinds of emphasis, initially on the basis of different role criteria. The first is called "intensity", and it "adds intensity to the meaning already contained in a word or sentence" (p. 43); the second is called "special prominence", and it "is used to bring one or more words into special prominence" (p. 44). As far as pitch patterning is concerned, both types of prominence are similar in involving an increase in the width of pitch contours; the mechanisms involved appear to be somewhat different, however.

In the case of "intensity", a number of devices are available on the side of types, some phonetic, some non-phonetic. In all examples given, except the first, if one stressed syllable is emphasised, then all are; the interlinear notation for the first example does not differ from that for the others in this respect, though emphasis is marked only for one stressed syllable in the text. The main phonetic characteristic is an increase in "stress", which the authors had previously discussed in cautious terms, stating that it was "customary to consider stress as the breath force which we use in speaking", adding that the connexion between "stress" and "intonation" is so close "that it is often difficult to decide whether stress or intonation or a combination of the two is responsible for certain effects" (p. 3), a view supported by later studies (§2.2. above). The intensified word may, in addition be raised in pitch, thus affecting the pattern of the whole "sentence", or of the whole subsequent section thereof; the possibility of a generalisation to include the category of break at this point is obvious. Since emphasis can thus affect the pitch pattern of the whole sentence, it might be said from the point of view of a description of speech production, that other syllables could easily be influenced by this sweeping effect, resulting in the sympathetic intensification of all stressed syllables. This would explain the tendency in Armstrong & Ward's examples to intensify all stressed syllables if any at all are intensified. No mention is made of the intensification of items which the authors would normally represent as unstressed; the examples contain many such cases, however, where the blanketing effect of intensity covers (or even starts from) secondary stresses, normally reduced middle stresses in phrasal three-stress sequences, &c. Two examples are (pp. 45ff.):

- (2) I "won't "stand it "any "longer.

and

(3) "Why on "earth did you "inter"fere?"

The sign ' ' ' indicates the occurrence of emphasis; the original transcription has been rendered into orthography. Armstrong & Ward give a second variant in pitch patterning: lowering and narrowing of pitch patterns while retaining extra "stress", with a tendency for low final pitch to be replaced by "whisper" (p. 46). Ancillary types involved in intensity are simply listed as follows (p. 47):

Other devices include the lengthening of sounds, the shortening of sounds, the use of the glottal stop, repetition, gesture, facial expression, special kind of voice.

The second variety of emphasis, "special prominence" at particular points, is apparently the only variety of emphasis observed by Armstrong & Ward to occur with tune II; it functions quite differently from the first variety of emphasis. A nuclear downglide starts higher; a non-nuclear stress, otherwise apparently on a level tone, becomes a downglide; non-prominent syllables, even stressed syllables, are kept at a low pitch, the stressed syllables becoming destressed and joining the line of pitch assigned to the unstressed syllables. There may be more than one prominent syllable in a given group, and there may be height differentiation between prominent syllables, greater height reflecting greater prominence (cf. Bolinger on relative height, below, §3.3.1.). The cooccurrence of special prominence with a terminal upglide can produce an interesting effect: there is no difference in principle in the nuclear and the non-nuclear stressed syllables in tune II as far as special prominence is concerned, all stressed syllables with special prominence having a downglide. If the downglide is on the nucleus, as it is likely to be, the tail rises in the normal fashion; if there is no tail, then the nuclear syllable rises again after the fall. This means that, in effect, a fall-rise terminal contour is introduced, and regarded as a special case of prominence. This interesting generalisation about the fall-rise terminal contour as a product of two quite separate, but very general constructions, was lost in later descriptions.

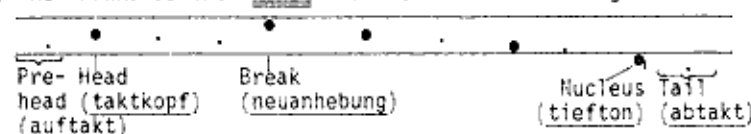
It is clearly possible for both of these varieties of emphasis to result in the same pitch patterning where only one emphatic syllable is present. It is therefore important to remember that "emphasis", like its two species of "intensity" and "special prominence", is an equivalence class of forms based to a great extent on role criteria rather than on type criteria; there is no phonetic definition of "emphasis".

There is a further pitch form which Armstrong & Ward describe as being involved in "additional emphasis": this is "a rise in pitch prefixed to the intonation of an already emphatic syllable and occurring within that syllable" (p. 70). Although Armstrong & Ward do not say so, this device is, as their examples show, associated with intensity, not special prominence. Prefixed to a non-nuclear stressed syllable, it produces a rise-level tone; prefixed to a downglide it produces a rise-fall contour; prefixed to a fall-rise it produces a rise-fall-rise contour (with tune II, the presence of a fall-prefix is clearly pre-supposed; thus, the device is apparently not excluded from figuring in special prominence in such cases). The rise-prefix is an interesting way of generalising over rise-fall-rise contours and

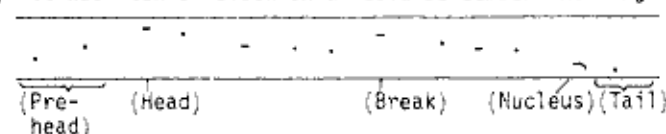
other kinds of contour, a generalisation which disappeared in later descriptions. It would be possible to regard the rise-prefix, the break, and the added pitch height of "emphasis" as special cases of the same basic intonational (or, more precisely: accentual) form; the generalisation was not made by Armstrong & Ward, in fact it was not made (and then only in part, in the course of other observations) until Quirk & Crystal's study (1966) of certain intonational contrasts and equivalences.

For a number of reasons it is not necessary to make the kind of tabular summary of Armstrong & Ward's description of English intonation which was made for that of Klinghardt. The first reason is that apart from minor omissions and extensions, and the treatment of emphasis, it would repeat the Klinghardt summary. Second, the Armstrong & Ward account is practically devoid of named structural categories and thus enjoys a greater degree of flexibility (or perhaps vagueness) than the Klinghardt analysis and makes the kind of summary clarification given for Klinghardt somewhat dubious. Third, the complication of the description by the inclusion of emphatic structures, coupled with theoretical inexplicitness, makes the kind of simple analysis into levels given for the Klinghardt description inapplicable. Finally, at a number of places, generalisations between substructures of intonation groups and sequences of intonation groups (e.g. parentheses, pp. 27ff.; sequences of tunes I - II, II - I, pp. 25ff.) are hinted at, which calls for a rather different kind of approach with more abstract descriptive categories and a coherent theory of accent; examples are: (1) the break within an intonation group, and the boundary between a tune II, tune I sequence are placed on the same scale of contrast, p. 18; (2) where parenthetical items are concerned, there appears to be a scale between complete subsumption, e.g. of *verba dicendi* and their accompanying locutions, to the unstressed syllables of the tail, and the use of a second intonation group, possibly with reduced width, p. 28). It will be useful to illustrate the main features of the Klinghardt and Armstrong & Ward descriptions of English intonation together, before proceeding to a summary of a number of further applications of the approach in the description of German intonation. The first example is an abbreviated version of one of Klinghardt's (Klinghardt & Klemm, 1920:xv), and the second is from Armstrong & Ward (1926:19), the latter rendered into orthography. They differ in text, but were chosen for the essential similarity of their intonation patterning.

(4) he 'ranks as the 'first 'builder of 'Prussian 'greatness



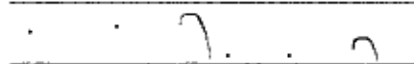
(5) it was 'ten o'clock on a 'cold De'cember 'morning



The terms for the structural categories underneath the Armstrong & Ward

example are parenthesised, since the authors give no explicit terms, though they make the structuring itself explicit. The third example gives the Armstrong & Ward tune II with a monosyllabic nucleus and both emphasis and additional emphasis (in this case, special prominence with additional rise-prefix; cf. p. 73); this example contains the main features of the Armstrong

(6) it's the "trifles that" count



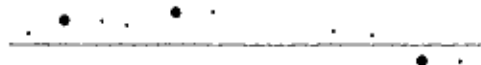
& Ward description which are not present in the Klinghardt description.

3.1.1.3. The 'tune' approach in the description of German

Apart from a few relatively isolated observations in the work of earlier phoneticians, the first descriptions of German intonation came at about the same time as the descriptions of English intonation summarised and commented above. Klinghardt, for instance, applied the basic features of his analysis of English to the analysis of German both in scattered observations in a number of places, and in a handbook (1927), of which I have not been able to trace a copy. Two years previously, a handbook of German intonation had already been published by an adherent of Klinghardt's system, Barker, who had translated the Klinghardt and de Fourmestraux outline into English.

Barker (1925) retained the main features of the Klinghardt notation, and used an additional notational device, a spatially inflected line of type conveying both text and intonation; this device was later used by a number of investigators, the most prominent of whom is Bolinger. An interesting feature of Barker's analysis is that she does not recognise a glide on the nucleus in German (no claim to completeness is made for her analysis, of course), but records a step down, or a step up, at the nuclear syllable. The following example illustrates the two characteristic tunes which she recognises for German, in an appropriate sequence, and transcribed in Barker's base-line notation. The tunes are termed "suspensive" and "final", respectively.

(7) Am anderen Morgen kam er wieder



These contours are conspicuously different from those which had so far been observed for English; although the "final" tune can be heard as a variant of a downgliding nucleus in English, the suspensive or upstepping tune with pitch suspension is not a characteristic pattern in British English, though it has often been recorded for American English dialects; there are level configurations in British English, of course, and probably in all dialects, but they have a different status. The problems of level tunes will be discussed below (§4.2.1.).

The Barker description of German intonation has vanished into bibliographical oblivion as far as later studies are concerned. More well known

is the handbook of von Essen (1956). The work of Klinghardt (though not his descriptions of English and German) and of Armstrong & Ward is favourably mentioned in the preface to von Essen's handbook, and indeed the observations and structural analyses offered for German intonation parallel the earlier descriptions of English to a quite remarkable extent. Von Essen does not mention the Barker analysis.

One of the main features of the handbook is that it embodies an attempt to incorporate the description of intonation into a more general rhetorical framework than had been used hitherto. The first indication of this is in the statement of the aim of von Essen's account, touching on the matter of intonation and stylistic level (Vorwort, no page.):

Sie [die vorgelegte Schrift - DG] will eine Klärung der Intonationsfragen des Hochdeutschen erstreben und besonders dem Studierenden, der Deutsch als Fremdsprache lernt, eine Hilfe zur Erlernung der auf Bühne und Kanzel, in Vortrag und Rede landesüblichen Sprechmelodie bieten.

Von Essen is thus concerned with the intonation of a highly formal style, a rather specialised style to teach to foreigners, to be sure, but one which is clearly also the concern of Klinghardt's description and of some of the Armstrong & Ward description. The earlier descriptions, however, do not make this domain explicit. The formal stylistic level thus introduced is used by von Essen on several occasions throughout the handbook as the basis for prescriptive value judgments about intonation variants and their admissibility.

The second indication of von Essen's interest in providing a more general rhetorical framework lies in his interpretation of the notational system which he took over from Armstrong & Ward; he omits the upper line of the earlier description (as do Armstrong & Ward on occasion), retaining the bottom line as what he calls a "Normal-Null" level, interpreted in quasi-physiological terms as "die völlig spannungslose Tiefe der Stimme" (p. 14). The overall structure of the (falling) tune, from the pre-head through the line of accented syllables in the body of the tune to the nucleus and tail, is interpreted in terms which utilise this concept of an ambivalently mental and physiological tension (pp. 16ff.):

Der melodische Verlauf eines Ausspruchs spiegelt den psychischen Spannungsverlauf, er projiziert ihn gleichsam nach außen in das Sinnfällige. Der Spannungshöhepunkt bildet darin zugleich den Einsatz der Lösung und liegt regelmäßig in der Haupthervorhebungssilbe des Ausspruchs, die eben dadurch Schwerpunktsilbe wird. Der Vorlauf erzeugt das Einsetzen der Spannung, er baut das Spannungsfeld auf. Der Nachlauf vollendet die Lösung und führt in die völlige, harmonische Gleichgewichtslage zurück.

Underlying this view is clearly the conception of a natural relationship of some kind between intonation and mental processes (cf. §1.2.4. above). As to the actual patterning of intonations, von Essen uses the same system as the previous investigators: his terms Vorlauf ("eine Art Auftakt", p. 16), Nachlauf, Schwerpunkt, rhythmischer Körper, rhetorisches Syntagma correspond exactly to the Klinghardt terms aufakt, abakt, tiefton, "der eigentliche takt" (1920:50; cf. p. 105 above), respectively. Not named is the Klinghardt category of hochton (or taktkopf); not present at all is the category of neuanhebung: a category of Neuanfang (re-start) is used, but has a different status.

The forms associated with the prehead are low or mid falling sequences

of unstressed syllables; falling preheads had been represented by Barker, but not by analysts of English. The unstressed syllables intervening between the stressed syllables are held to be level of falling sequences: rising trains of unstressed syllables are proscribed as being not characteristic of "good" speakers, and "dialectal" (p. 25), though such patterns are in fact common in formal speech. The stressed syllables themselves, referred to as the *Führtöne*, a term of Sievers', are held to be aligned along a falling trajectory, as with the earlier analyses of English; no choice of pattern is given. At the nucleus there is a choice of three main forms: rising, suspended, and falling. The nuclear syllable is level in pitch, like the other stressed syllables, unless there is no tail, in which case there is a rather abrupt glide (differing from the glide in English, which is accompanied by a lengthening of the nuclear syllable). If a tail is present, it carries the movement upwards or downwards, either bottoming immediately in the case of the falling tune or gradually continuing. An unexplained variant of the rising ("interrogative") intonation is for the nucleus to be located at a high level and there to be a step down to the rising tail; another variant, said to be associated with interrogatives containing a negative, levels off and even falls slightly. A variant of the falling ("terminal") tune occurs in some examples (pp. 35f. & *passim*) without explanation in the text; in this variant the nucleus is already at the lowest level and the tail remains at this level. The pattern is identical to that given by Barker for the falling tune. The suspended ("progradient") tune is either held level or may rise slightly; no variant is given corresponding to Barker's upstepping tune, and Bierwisch found it necessary to cater for this variant in his explication of von Essen's description (1966:148, rule Aiv; see below in the present subsection).

Two new structural categories are introduced into the tune approach to the description of German intonation by von Essen: the *Zäsur* (pause - "ein pausenähnliches Absetzen", p. 29) which in the examples occurs at practically every structural position without prejudice to the continuation of the overall pattern, and the *Neuansatz* (re-start), which may be used on its own or in conjunction with a caesura, and is simply an interruption of the body of an intonation group before the occurrence of a nucleus, and the beginning (on the intonational level, not as a brand of hesitation phenomenon) of a new tune with prehead, &c. The re-start and the caesura are each, independently, coupled with the suspended intonation tune: the pattern of accented syllables, with or without following unaccented syllables, which occurs within the body of the tune is progradient when forced into a quasi-tune-final position by a re-start or a caesura. No mention is made of accompanying signs of the nuclear status of this configuration, so, in the von Essen account, this form must be held to be purely distributionally defined, relative to following patterns. Heike (1969:27) makes the following remarks on the progradient intonation, in the context of descriptions such as that of von Essen:

Der progradienten Intonation kann im Gegensatz zu den anderen Intonationstypen nur eine untergeordnete syntaktische Funktion zugeteilt werden. Sie kennzeichnet nur die Zusammengehörigkeit von unselbständigen Redeteilen und kann daher nicht auf paradigmatischer Ebene mit den anderen Typen verglichen werden. Es ist deshalb unzulässig, sie mit den anderen Typen zu den "satzdifferenzierenden" Mitteln zu zählen.

In this he follows Isaenko & Schädlich (1966:52), which he quotes:

Eine melodische Konfiguration, die nicht den Satz, sondern nur den Teil eines Satzes charakterisiert, kann aber nicht als eine der Grundformen der deutschen Satzintonation angesehen werden.

In the absence of a definition of "Satz", and "Teil eines Satzes", such remarks are superfluous. If the suspended progradient intonation has any independent justification, a matter which there has been some uncertainty about, then this requires explicit discussion on a substantive rather than a terminological plane. Since it is not justified to speak of a single "paradigmatic level", in Heike's manner, without reference to particular sets of criteria of analysis, the conclusion is in any case false. Heike's criticism of von Essen for not noticing the point is therefore groundless; the similarities and differences between the "progradient" intonation and the other two are made neither more nor less explicit in von Essen's handbook than the similarities and differences between the "interrogative" and the "terminal" intonations.

A new form is also introduced by von Essen: a rising configuration of nuclei with falling tunes. This configuration is not easy to fit into the system outlined by von Essen, and he makes no attempt to do so; it would have been appropriate to introduce a systematic account of "emphatic" phenomena and roles at this stage, after the fashion of Armstrong & Ward, particularly in view of von Essen's overall rhetorical aims (cf. p. 114 above and the reference to Bolinger there).

No treatment of other intonation styles, or of the forms associated with emphasis, is given; the further discussion concerns questions of the use of intonation such as "rhetorische Bindung" (rhetorical adjunction of two distinct syntactic sequences by associating the first with a suspended tune) and "rhetorische Auflösung" (rhetorical disjunction of two syntactically related items by associating the first with a falling tune); these categories are rather different from the other. Apart from his interpretation of the basic patterning in rhetorical terms, von Essen introduced the caesura, the re-start, the distinction between suspended and rising nuclei, and the observation of rising nucleus sequences into the description of German intonation, all useful innovations. Aside from these five main points, and a number of minor phonetic details concerning intonation analysis at a very much lower level (e.g. preheads and tails), the forms and structures which von Essen gives for German are, interestingly enough, a proper subset of the forms and structures given by Klinghardt and Armstrong & Ward for English. It is regrettable, in view of the fact that von Essen's handbook appeared three decades later than the Klinghardt and Armstrong & Ward handbooks, that the developments in the study of intonation which took place during these three decades were not incorporated; these developments will be reviewed, after an examination of two attempts to explicate von Essen's description, in the following two main sections of this chapter.

Two interesting and quite differently conceived explications of von Essen's description of German intonation have been constructed. Heike (1969) suggested a representation of von Essen's description of the three nuclei in terms of distinctive features; Bierwisch, in his classic intonation study (1966), went further in suggesting a set of explicit rules to express the system in generative terms. Inasmuch as the Armstrong & Ward system strongly influenced von Essen, these explications can also be applied to the former.

In his outline of the most important characteristics of German into-

nation, Heike gives three possible translations of von Essen's terms for the three nuclei into the language of features; they are rendered in Tables 3 to 5. It is stated explicitly that the features are based on von Essen's

PITCH		CATEGORY		
		terminal	interrogative	progreident
Direction	falling	X		(X)
	rising		X	(X)
	level			X
Relative position of contour	high		X	X
	low	X		
Interval	relatively large	X	X	
	small			(X)

Table 3: Heike's initial representation of von Essen's contours (cf. Heike, 1969:23, Tabelle I.1).

FEATURES	CATEGORY		
	terminal	interrogative	progreident
1. falling / rising	+	-	0
2. hight change relatively large / not large	+	+	-

Table 4: Heike's binary feature representation of von Essen's contours (Heike, 1969:24, Tabelle I.1).

FEATURES	CATEGORY		
	terminal	interrogative	progreident
Tension	X	X	X
Relaxation	X	-	-
Degree of tention relatively high	X	X	-

Table 5: Heike's re-interpretation of von Essen's contours in terms of tension (Heike, 1969:25, Tabelle I.3).

description of the phonetic characteristics of the three contours, and on von Essen's descriptive terms, including some from a later essay (1960), are listed, but the motivation for the features is not always clear, in particular for the variable "relative position"; in a second, binarised array of features (cf. Table 4), this variable is omitted without comment. No explanation is given, either, of the choice of polarity for the pitch direction variants; indeed, the polarity common in the literature, and easily motivated in phonetic terms (cf. §§1.2.2., 2.2.) is reversed, and later commented on by Heike as being unfounded. The polarity does not appear to have any systematic importance in the description, but both the choice of variants for these features and the choice of polarity could have been argued in a more thoroughgoing explication. A further classification of the contours is given in terms of von Essen's notion of tension (Table 5). All the contour categories are tense, presumably a consequence of accentuation rather than intonation proper; the motivation for the third feature is not stated, and is indeed difficult to find. This third interpretation is, in fact, entirely intuitive, and redundantly formulated; it is, in effect, a reproduction in physiological terms of the system of auditory attributes in Table 3. One final point of interest is that Heike later cast some doubt on the distinction between progreident and interrogative intonations (pp. 111ff.), thus whittling away at the foundations of his own explication of von Essen's three contour approach. It may be maintained, in conclusion, that while the attempt to provide an explication is laudable, the execution of the attempt, and perhaps even the explicandum itself, is somewhat inadequate.

The Bierwisch explication attempts to build an account of intonation, slightly modified under the influence of Isacenko & Schädlich (1966; cf. §3.3.2. below), into an overall generative system containing a syntax derived from Katz & Postal (1964) and an accentual system deriving from Chomsky, Halle & Lukoff (1956). The overall description is organised into an ordered sequence of rule blocks; the basic generative block is the syntax: its output is first interpreted by the accentual rules, then by the intonational rules, which operate on the output of the accentual rule block. Each block of rules is internally ordered: the syntactic rules in various ways (which Bierwisch does not discuss); the accentual rules cyclically, for the most part; and the intonation rules apparently in a non-cyclical, linear order. The accentual rules are very similar to those used by Chomsky, Halle & Lukoff (cf. §3.3.3. below), and there is no need to discuss them here.

The block of intonation rules consists of fifteen rules, some of which are schemata covering iterations with no internal structure; the rules are abbreviated first into ten, then five blocks, to express various generalisations. In addition, a tentative modification of the rules governing the relative height of stressed syllables is suggested, and two general "principles" are invoked for intonation: one (Principle III) deals with unstressed syllables and their phonetic interpretation, the other (Principle IV) is due to Isacenko & Schädlich, and governs the position of the nuclear glide (placement). Table 6 contains the rules; the individual rules within the sub-blocks have been given letters for convenience of reference.

The first rule, labelled 'o', marks all vowels negatively for nuclear pitch movement; the vowels already contain a positive marking [+son] of the feature Sonorant, which forms the basis for the later assignment of pitch; no reason is given why the abbreviation [V] rather than [+son] is

- A. GENERAL CONVENTIONS
- (i) For all i : X, Y contain no $i\#$.
 - (ii) C stands for any, including empty, sequences of segments with features $[-\text{son}]$ or $[+\text{son}]$.
 - (iii) $m \text{ acc}$ stands for accents with $m = 1, 2, 3$.

B. RULES

$$(o) [V] \rightarrow \begin{cases} [+ \text{fall}] \\ [- \text{rise}] \end{cases}$$

$$(i) [m \text{ acc}] \rightarrow \begin{cases} a. \begin{cases} [+ \text{fall}] \\ [3 \text{ son}] \end{cases} / W \text{ --- } Z \\ b. \begin{cases} [+ \text{rise}] \\ [3 \text{ son}] \end{cases} / X \text{ --- } [- \text{fall}] Y \end{cases}$$

- Conditions: (i) Y, W contain no $[n \text{ acc}]$ with $n < m$;
 (ii) Y, Z contain no $[n \text{ acc}]$ with $n \leq m$;
 (iii) Z contains no Q .

$$(ii) [m \text{ acc}] \rightarrow [4+n \text{ son}] / \text{---} X ([m \text{ acc}] Y)_n \begin{cases} a. [+ \text{fall}] \\ b. [+ \text{rise}] \end{cases}$$

Condition: Y contains no $[m \text{ acc}]$.

$$(iii) [3 \text{ son}] \rightarrow \begin{cases} a. [5 \text{ son}] / \text{---} X E \\ b. [n+2 \text{ son}] / [n \text{ son}] Y \text{ --- } [+ \text{rise}] \end{cases}$$

Condition: X contains no $[m \text{ acc}]$.

$$(iv) \begin{cases} [+ \text{son}] \\ [- \text{obs}] \end{cases} \rightarrow \begin{cases} a. [1 \text{ son}] \\ b. [3 \text{ son}] \\ c. [n-2 \text{ son}] \\ d. [2 \text{ son}] \\ e. [n \text{ son}] \end{cases} / \begin{cases} [+ \text{fall}] C \text{ ---} \\ / i\# C \text{ ---} X \end{cases} \begin{cases} b. [+ \text{fall}] Y D \\ c. [n \text{ son}] \\ d. Y E \end{cases}$$

Condition: X contains no $[m \text{ acc}]$.

$$(v) [n \text{ son}] \rightarrow \begin{cases} [n-2 \text{ son}] / \begin{cases} a. [+ \text{rise}] \\ b. [+ \text{fall}] \end{cases} X \begin{cases} a. Q \\ b. D \end{cases} \\ c. [1 \text{ son}] / [+ \text{rise}] X Q E \end{cases}$$

- C. NOTES: (i) $i\#$ is an indexed boundary; cf. §3.3.2.;
 (ii) Q, E, D are syntactic question, emphasis, and pre-ictic fall markers, respectively (see text);
 (iii) Indices on braces mark pairings and discontinuous subrules.

Table 6: Bierwisch's revised rule set; notation amended (1966:155).

used in this rule. The two features Fall and Rise pertain to the absence and presence of nuclear pitch changes. This is an area where the influence of Isačenko & Schädlich is particularly clear: the features are not given detailed phonetic correlates, but are left ambiguous as to whether they represent pitch steps or glides, and the pitch changes are allowed to vary in position relative to the nuclear syllable to make a further distinction between nucleus types, occurring either immediately before or immediately after this syllable (the possibility of occurrence on the nuclear syllable, as in traditional descriptions, is considered a purely phonetic matter due to lax articulation, p. 142). Five patterns of nuclear and non-nuclear contour are thus generatable (the combination of $[+ \text{fall}]$ and $[+ \text{rise}]$ being excluded): the non-nuclear specification introduced by Rule (o), and the two nuclear contours, each with a choice of two positions with respect to the nuclear syllable.

Rules (i)a. and (i)b. assign the nuclear pitch changes: the falling tune may not be chosen where the syntactic interrogative marker 'Q' is present, though the rising tune may also be chosen when 'Q' is absent provided that the falling tune has not already been chosen; falling pitch is first assigned to the rightmost main accent, rising pitch to the remaining rightmost main accents in the phrases already marked out by the accent rules.

The assignment of the value 3 to the feature Sonorant introduces a special feature of Bierwisch's notation: instead of relying on a purely relational notation (cf. Tables 1 and 2 above) to symbolise the trajectories, pitch levels having been denied validity, he adds a notational construction of integer series in order to express the pitch relations indirectly. These pitch height units are arbitrarily chosen, and simply represent the larger-smaller relation as it holds between integers. There is not the slightest reason to suppose that the assignment of individual pitch values to syllables qua syllables and not, say, qua accented syllables or trains of unaccented syllables, has any justification in a linguistic description; Bierwisch rightly rejects this as a possible interpretation of his notation. It will be shown in the following, however, that this choice of the integer construction obscures rather than reveals the relations holding within the tune. The level 3 introduced as the first pitch height unit is an arbitrary value serving as a fulcrum for the assignment of syntagmatically relative pitch height units to the other syllables.

Rules (ii)a. and (ii)b. describe the falling trajectory along which the accented syllables within the body of the tune are aligned; this is done by retrogressively incrementing the pitch level of each accented syllable by one pitch height unit for each accented syllable before the nucleus, starting with a minimum height of four units for the last accent before the nucleus. This formulation misses the von Essen generalisation that all accented syllables, including the nuclear syllable, are organised in the same system, the body or "rhythmischer Körper"; a suitable reformulation within the Bierwisch integer notation would be the following:

$$(B) [m \text{ acc}] \rightarrow [n+1 \text{ son}] / \text{---} X \begin{cases} [n \text{ son}] \\ [m \text{ acc}] \end{cases}$$

The conventions and condition of Bierwisch's rule sub-block (ii) are retained; the reformulation is both simpler and more to the point than the sub-block, and would apply until the environmental condition is no longer satisfied. This account still does not explicate von Essen's "Neuansatz" or even Klinghardt's "neuanhebung"; although the retrogressive incrementa-

tion neatly accounts for the dependence of head height on tune length, there is no nucleus with initial pitch height value 3 in the section of a tune preceding the re-start. One way of explicating this within the tune approach would be to start the intonation interpretation with two overlaid tunes, the end of the first being deleted; another way would be to allow rules (i) not to apply in certain types of phrasing.

Rules (iii)a. and (iii)b. perform similar tasks: both raise the pitch height value of the nuclear syllable. The first does this by converting the value 3 to the value 5 in all sentences containing the syntactic emphasis marker 'E'; the nucleus then has a value above that of the preceding accented syllable, a fact that is not directly expressed by the notation; it cannot be argued that an integer, rather than the kind of expression used in (8) above, is necessary for bodiless tunes, where the nucleus stands alone, since the integers have no direct phonetic interpretation and thus the difference between 3 and 5 has no significance in such cases. The second of this block of rules describes a deviation from von Essen's description, approximating to Barker's suspended tune: the pitch values of rising nuclei are raised from 3 to a value 2 units above the preceding accented syllable, thus making an upward step to the nucleus. This fact must be deduced from tracing the history of derivation of [3 son], all syllables so far having this specification being nuclear; this is a rather devious way of reaching the desired conclusion.

The fourth sub-block of rules begins the treatment of unstressed syllables, which is continued by Principle III (see below). Rule (iv)a. purports to describe the tails of falling tunes; in fact, it only allows monosyllabic tails. A reformulation would have to allow for multiple application as in (8) or iteration (ii). The sub-block (iv)b., (iv)c., and (iv)d. describes various kinds of prehead. Rule (iv)b. constitutes the first step towards providing a foil for a pre-ictically falling nucleus in a bodiless tune, which has to have somewhere to fall from, by assigning the prenuclear syllable (the rule must be modified to cope with more than one) the same value as the nucleus; the nuclear syllable is subsequently corrected downwards by Rule (v)b. to complete the movement. The second prehead rule, Rule (iv)c., would, suitably reformulated to allow sequences, yield the normal prehead, 2 pitch height units lower than the head of the tune. The third rule, Rule (iv)d., provides a low prehead as a foil for an immediately following emphatic nucleus. The first and third rules of this sub-block form an addition to von Essen's description by introducing a principle of offsetting by means of unaccented syllables. The final rule of this section, Rule (iv)e., assigns values to the unaccented syllables intervening between the accented syllables of the body, and to rising tails.

The output of sub-block (iv) is a construct: to match its explicandum, von Essen's description, it needs to be corrected or readjusted by the principle of phonetic interpretation mentioned above (p. 121, Principle III). This principle gives the requisite slope to trains of unaccented syllables: downwards in prehead and falling tail (which ignores the "bottoming" of falling tails mentioned in connexion with previous descriptions); up in rising tails (which ignores to "suspended" variety of "progreddient" intonation); in free variation in the inter-accentual syllables. The principle is very imprecisely formulated, and no reason is given why this divided treatment of unaccented syllables should be necessary.

The final sub-block of rules has, like Principle III, a corrective or readjusting role. Rule (v)a. drastically revises the results of rule (iii)b.: in fact it undoes these results completely in the presence of the interroga-

tive marker 'Q' which is introduced via the syntax. By this operation, a distinction is introduced between a pre-ictically rising nucleus where no 'Q' is present, and which explicates von Essen's "progreddient" tune under the influence of Isachenko & Schädlich, and a post-ictically rising tune in the presence of 'Q', which explicates von Essen's "interrogative" tune. This is a somewhat obscure way of expressing a simple fact; the rule could have been incorporated into sub-block (iii), for instance, adopting condition (iii) of sub-block (i), thus creating a further, and more abstract, generalisation. Rule (v)b. completes the operation of describing a pre-ictic fall, which was initiated by Rule (iv)b. In this rule, the nuclear syllable is lowered by two pitch height units in the presence of the device 'D', introduced for the purpose; in fact the fall is to level 1, a more pertinent fact, perhaps, than that stated, if the "relaxation" aspect of falling tunes in von Essen's account is also to be given any status in the description. The last rule of the intonation block, (v)c., performs essentially the same operation on a rising "interrogative" nucleus in the presence of 'E', the emphasis marker, as the preceding rule (v)b. performs on the "terminal" nucleus in the presence of the pre-ictic fall marker 'D': the pitch height value of the nucleus is reduced to 1, in this case from the constructed value of 5, which had been introduced by Rule (iii)a., also in the presence of 'E'. It is difficult to see why Rule (v)b. should have been paired with Rule (v)a. in preference to Rule (v)c.; there is no difference in output, of course, but different claims about plausible generalisations would be made. The decision is not argued.

An extension to the von Essen repertoire of intonation patterns is suggested by Bierwisch in a later rule sub-block, which modifies the overall pitch trajectory in accordance with the pre-established accentual pattern; since heavier accents are assigned lower numbers in the notation system which Bierwisch took over from Chomsky, Halle & Lukoff (1956), whereas the more prominent, i.e. higher, pitch levels are assigned a high number, the pitch varies inversely with the accent in Bierwisch's notation. The degree of influence of accents on the pitch level is determined by a variable k , higher values producing greater influence. Since the major accents have already had their influence on the pitch trajectory via the intonation rules in Table 6 (cf. the specification (m acc) there), this sixth subblock of rules is designed for the minor accents; a condition is introduced in which the integer chosen as the reference value of m , distinguishing major from minor accents, can be varied, thus altering the range of accents to which the rule is applicable. No syntactic or other source is given for the two variables k and m . The sixth rule-block is as follows:

(9) Rule-block (vi):

$$[n \text{ son}] \rightarrow \left\{ \begin{array}{l} [n+\frac{k}{r} \text{ son}] / \left\{ \begin{array}{l} \text{a. } i\# \\ \text{b. } [+ \text{fall}] \end{array} \right\} \\ \text{c. } [n-\frac{k}{r} \text{ son}] / \left\{ \begin{array}{l} +[\text{rise}] \\ [+ \text{fall}] \\ [+ \text{rise}] \end{array} \right\} \end{array} \right\} \times \frac{\text{---}}{[r \text{ acc}]}$$

Conditions: (i) X contains no $i\#$ and no $\left\{ \begin{array}{l} [+ \text{fall}] \\ [+ \text{rise}] \end{array} \right\}$
(ii) $r > m$

This block of rules is a very interesting attempt to provide a flexible means of generating a very wide range of intonation patterns. An example given by Bierwisch makes it clear, though this is not stated in the text, that the choice of m would also apply to the first five blocks of rules,

providing a source of varying the phrasing by selection of pitch-prominent accents, which would supplement the effect of the phrase length factor *p* in the accent rules (p. 116; cf. also §3.3.2. below). This kind of rule could well be utilised in a more general theory of accent, such as a pitch accent theory (§3.3.3. below), using variables such as *k* and *m* to range over continuous scales of intonation variants. There would not necessarily be any need to link this kind of system with accent rules of the kind which Bierwisch uses, nor with rules like those of Table 6; this would depend on the empirically derived explicanda used.

By way of illustration of Bierwisch's rule system, the intonation pattern which Barker assigns to the following sentence (cf. (7) on p. 168 above) will be derived by means of rules in Table 6:

(10) Am anderen Morgen kam er wieder.

The derivation is given in Table 7. In the representation of the derivation, consonants and distinctive vowel features are ignored for the sake of clarity in presentation. The input and accentual levels are given without any implicit or explicit claim that the Bierwisch accentual rule block would generate it as it stands; the accentual specifications are reduced to the minimum markings required for the application of the intonation rules, and further details would be required for the operation of the supplementary accent-intonation interaction rule-block (vi). In the course of the derivation, the indexed boundaries are deleted when they have served their purpose. It should also, by the same token, be possible to delete the features Fall and Rise, since according to Bierwisch's Principle IV (p. 143), the pitch trajectory is sufficiently represented by the specification of the feature Sonorant at the lower levels of the derivation.

There are a number of points in the Bierwisch explication which require comment, beyond the remarks made about individual rules in the above account. The origin of the "syntactic intonation markers" 'D', 'Q' and 'E' in the syntax can be disputed, but the matter is part of a more general problem of the use of intonation which cannot be discussed at this point. The choice of an integer notation for the description of pitch trajectories is difficult to motivate; without further metatheoretical constraints, the integer notation is a source of undesirable transcriptional paraphrases (cf. §2.4.2.). Such paraphrases have different consequences for the expression of generalisations, one instance being the choice of generalisation available in sub-block (v) which is not made clear in the formulation given. A more glaring instance, also due to notational paraphrase, is a failure to make an important generalisation present in the explicandum, to be found in the three sub-blocks (i), (iii), (v): each of these rule sub-blocks refers to the nuclear syllable. There appears to be no compelling reason for scattering references to this important syllable throughout the intonation rule block when, in the manner indicated at various points in the discussion of individual rules, such references can be made more homogeneously. In addition to these notational points, there is a category in the explicandum which receives no attention, the re-start. The failure to treat this category may be due to the descriptive decision to use the nucleus as a fixed fulcrum for organising syntagmatic pitch relations, rather than, for instance, the head of the intonation group, which has a greater claim to this status (§2.3.3. above). The reality of the representations given is also not satisfactorily dealt with, though it receives some discussion; in particular the relation between the accentual and the intonational sys-

VARIABLE	VARIANTS SPECIFIED IN DERIVATION								RULES APPLIED
(Input)	0# Am anderen Morgen 1 kam er wieder D 0#								Syntax & phrasing
(1) Accent	-	m	-	-	m	-	-	-	Accent rules Lexicon } (o)
Sonorant	+	+	+	+	+	+	+	+	
Fall	-	-	-	-	-	-	-	-	
Rise	-	-	-	-	-	-	-	-	
(2) Accent	-	m	-	-	m	-	-	-	(i)
Sonorant	+	+	+	+	3	+	+	3	
Fall	-	-	-	-	-	-	-	+	
Rise	-	-	-	-	+	-	-	-	
(3) Accent	-	m	-	-	m	-	-	-	(ii)
Sonorant	+	4	+	+	3	+	+	3	
Fall	-	-	-	-	-	-	-	+	
Rise	-	-	-	-	+	-	-	-	
(4) Accent	-	m	-	-	m	-	-	-	(iii)b.
Sonorant	+	4	+	+	6	+	+	3	
Fall	-	-	-	-	-	-	-	+	
Rise	-	-	-	-	+	-	-	-	
(5) Accent	-	m	-	-	m	-	-	-	(iv)a., b., c., e.
Sonorant	2	4	4	4	6	6	3	3	
Fall	-	-	-	-	-	-	-	+	
Rise	-	-	-	-	+	-	-	-	
(6) Accent	-	m	-	-	m	-	-	-	(v)b.
Sonorant	2	4	4	4	6	6	3	3	
Fall	-	-	-	-	-	-	-	1	
Rise	-	-	-	-	+	-	-	-	
(7)	(Sloping of unstressed syllables)								Principle III

Table 7: Derivation according to Bierwisch's intonation rules (motivation for input omitted).

tems in phonetic terms, and the distinction between levels in the rule system which are convenient constructions and those which have a clear relation to specifiable criteria of analysis are not discussed. Two instances of places in need of clarification are the level of representation of unstressed syllables before the application of Principle III, and the phonetic role of the features Fall and Rise, commented on in connexion with Principle IV. Whatever the shortcomings, however, Bierwisch's explication of von Essen's intonation description remains, after a decade, the most thorough and detailed application of generative principles to the phonology of intonation. The failings lie mainly in the choice of explicandum.

It has been shown that von Essen's description of German differs only minimally from those given for English by Klinghardt and Armstrong & Ward;

consequently, Bierwisch's explication of von Essen's description can be regarded also as an explication of sub-sections of the earlier descriptions, and thus applied to English more or less as it stands since the specific differences between English and German which have been noted at various places are not at a level captured by Bierwisch's explication.

3.1.2. Tonetic approaches

The received distinction between the tune approaches and the tonetic approaches is, as previous discussion has already hinted, more one of convenience than one of substance; just as tonetic approaches operate with categories of the 'size' of tunes, so the tune approaches operate with a certain amount of internal tune structuring. In the case of Klinghardt, however, the internal structuring is extremely rigid in that hardly any paradigmatic variation is entertained, while in the case of Armstrong & Ward the internal structure is not regarded as warranting an explicit terminology to make it easier to work with. There are a number of characteristics which positively characterise the tonetic as opposed to the tune approaches, which will appear in the following discussion; perhaps the most important of these is the increased awareness of linguistic distinctions between paradigmatic classes of linguistic forms and the syntagmatic positioning within structures to which the forms are subject (cf. Klinghardt's interchangeable use of "hochton" and "taktkopf"). The term 'tonetic' itself is generally held to refer to the notational technique of writing tone diacritics in the line of text, which presupposes a certain amount of prestructuring (e.g. a certain amount of intonational segmentation) of the text. This distinction is not watertight, however, just as the distinction on descriptive lines alone is not watertight; diacritics of various kinds for intonation contours are to be found in a wide variety of manuals and studies dating much further back than those considered here, and long before any distinction between schools of intonation analysis could be considered; a number of instances also occurred in accounts discussed above.

The studies covered under the present heading will be those made along the lines of Palmer and Kingdon's descriptions; Jassem's work is not entirely of the same persuasion, but sufficiently close to allow treatment under the same general heading. Although Bolinger's work, as already mentioned, is essentially compatible with the prosodic school of thought about intonation, it does have a diverging emphasis and different historical status; in view, also, of the recent increase in studies related to (and indeed sometimes based on) those of Bolinger, a separate treatment of the 'pitch accent' approaches in a different context, that of a reaction to phonemic approaches and their sequels, is called for.

3.1.2.1. Palmer

Although Palmer's description (1922) falls chronologically between those of Klinghardt and Armstrong & Ward, it did not, apparently, affect the development of the tune approaches; there are similarities, however, between Palmer's analysis and the Armstrong & Ward description which do not occur elsewhere, and which will be pointed out in the following discussion.

The advance beyond tune approaches which Palmer made was to introduce a further kind of generalisation about the organisation of non-nuclear syl-

lables. The basic unit, the "Tone-Group", is said to be "a word or series of words in connected speech containing one and only one maximum of prominence" (p. 7), i.e. the "nucleus". The locution quoted cannot be regarded as a definition, since not all tone-groups have nuclei; some, particularly those associated with parenthetical *verba dicendi*, may have no nucleus. For a definition of the tone-group, therefore, other criteria are required. If pressed, Palmer might have come up with factors of temporal organisation rather than pitch patterns alone in order to define his major structural category. The generalisation introduced by Palmer is a distinction between two distinct categories within the tone-group at approximately the same level of analysis: the "head" and the "nucleus". The latter category has been sufficiently characterised in the preceding discussion; the former comprises all the syllables which precede the nucleus, which are held to enter into a different kind of patterning from that of the nucleus. Both head and nucleus are described in terms of pitch contours, six for the latter and three, plus heterogeneous combinations of these three, for the former. Table 8 gives the trajectories occurring at the nucleus, which Palmer

TOPE No.	DESCRIPTION OF TONE	BASIC FORM	CONDITIONED VARIANT	INTENSIFIED VARIANT
1	Falling			
2	High-Rising			
3	Falling-Rising			
4	Low-Rising			

Table 8: Palmer's nuclear tones (1922).

refers to as "tones". There are four main types, the first of which has two variant forms, a low fall conditioned by a preceding superior head, and an intensified variant formed by prefixing a slight rise to the falling tone. This rise prefix was described by Armstrong & Ward as applying not only to falling nuclear syllables but also to other accented syllables including the fall-rise, under the heading "additional emphasis" (above, p. 114). Palmer's falling-rising tone has, in the iconic tone sign he uses, a prefixed rise as an integral part, but this is not commented on (cf. pp. 114f. above). The contours assigned to the heads are given in Table 9.

The basic structure postulated by Palmer is considerably different from that postulated by the studies so far discussed. While there are similarities, particularly in the notion of nucleus and tail (which differs in no way from Klinghardt's *abtakt*), the idea that all non-nuclear syllables are organised according to the same principle, and that systematic choices are available for these syllables, is one which is not met with in the tune approach. No distinction is made by Palmer between the *aufakt* or pre-head and the rest of the head; the break, Klinghardt's *neuanhebung*, is covered by the heterogeneous head. It is not clear whether the "vertex" (cf. Table 9) has any particular functional status or whether it is a category derived from the juxtaposition of a head and a nucleus. In his descriptions of the tones, Palmer uses, without explicit comment, both the concept of relative pitch and that of constant pitch (cf. §2.3.3. above). The inferior and the

HEAD	DESCRIPTION	SIGN
Inferior	Never higher than beginning of nuclear tone. Variant before tone 1: "starts on the mid or neutral pitch (about midway between the highest and lowest notes of the speaker's voice)" (p. 17); otherwise: low pitch.	[—]
Superior	Higher than beginning of nuclear tone.	[^]
Scandent	"...the tones of which rise or climb from the mid-level to the highest pitch of the whole tone-group. The highest point (which may be termed the 'vertex') is therefore higher in pitch than the initial point of any nucleus" (p. 17).	[^]
Heterogeneous	A combination of any of the foregoing.	

Table 9: Palmer's head tones (1922).

superior heads are defined as syntagmatically relative to the initial point of the nuclear tone; since tone 1, at least, has a conditioned form dependent on the occurrence of the superior head in Palmer's description, there is a mutual dependence between head and nucleus rather than a priority of the one or the other. The distinction between low-falling and high-falling, as well as that between low-rising and high-rising, involves the notion of paradigmatically relative height with respect to the starting or finishing points of the contours. In addition, reference is made to a normal baseline when describing the variant of the inferior head with tone 1, and the scandent head: as with Klinghardt's description, and unlike those of Armstrong & Ward and von Essen, a mid point is taken as reference level. The notion of highest pitch is also used, but in a syntagmatically relative sense, not with reference to extremes of pitch range.

The question of the privileges of occurrence of the head tone variants and the nucleus tone variants with each other may also be discussed on the basis of decisions given in Palmer & Blandford (1939), which select various "Tone-Patterns", or tunes compounded out of various head and nucleus combinations. Table 10 lists these combinations, which are given mnemonic names on the basis of iconic associations. In Palmer (1922) all of these categories were given except the combination superior-rising-falling-rising (the latter was referred to as falling-rising in the earlier work); the 1922 study also has the combination scandent-high-rising. From these data it can be seen that the low rising nuclei are held to occur only with scandent heads, and (rising-)falling-rising nuclei only with superior heads; these two thus form fixed tunes with optional heads. The high rise occurs freely with all heads, but the high and low falling nuclei also occur complementarily, the former with inferior and the latter with superior and scandent heads. It is a striking feature of Palmer's analysis that no mention is made of the pattern of falling accented syllables within the tune, which would presumably be a head in his system, all the more striking in view of the fact that all the analyses so far discussed have observed this pattern. Neither the superior nor the inferior heads answer to the description given in the other studies.

TONE-PATTERN		STRUCTURE OF TONE-PATTERN	SIGN
No.	Name		
1	Cascade	Head:superior - Nucleus:low falling	[—]
2	Dive	Head:inferior - Nucleus:high falling	[—]
3	Jump	Head:scandent - Nucleus:low falling	[—]
4	Wave	Head:superior - Nucleus:high rising	[—]
5	Snake	Head:inferior - Nucleus:high rising	[—]
6	Swan	Head:superior - Nucleus:rising-falling-rising	[—]
		Head:scandent - Nucleus:low rising	[—]

Table 10: Palmer's Tone-Patterns in: Palmer & Blandford (1939).

The wide range of patterns which Palmer offers in contrast to the other studies so far dealt with makes it interesting to note the role criteria used in differentiating the heads and nuclei. In a "synoptic summary of the semantic functions of the tone-groups" (1922:86), various functions are tersely listed, the major classification being according to utterance types, and subclassification relying on various labels. Palmer clearly did not regard intonation as a mark of utterance (or sentence) type; the categories 'statement', 'special question', 'general question', 'command' occur with all heads and both rising and falling nuclei. From the point of view of the role criteria of analysis, the superior and scandent heads have much the same function, the latter being consistently described as more "animated"; they are closely related from the point of view of type criteria, too, both conditioning low falling nuclei. The inferior head varies in role according to whether it occurs with falling or rising tunes: in the former case it functions as a foil for an additionally prominent nucleus (cf. the Armstrong & Ward "special prominence", pp. 113ff. above), and in the latter case, though not as unambiguously, adding a note of hesitation; the function in the former case is well illustrated by the introduction of a further utterance type "Isolated Words when quoted or contrasted" (cf. the discussion of 'normal role' above, §1.2.5.3.), and the function in the latter case is equally well illustrated by noting the utterance type "Words or word-groups modifying nucleus-word of adjacent Tone-Groups" which are specific to these patterns. The (rising-)falling-rising and the low rising patterns function more independently and with relatively specific labels. The former are said to imply concession in statements and commands or to be used chiefly for contrast. The latter are associated with reassuring statements and the utterance type "Parting Greetings" (cf. the scandent low-rising combination on bye-bye). One point which is not made clear is the extent to which the low rising and the high rising contours are related; particularly the combinations of these with scandent heads appear to come rather close in both form and function, though Palmer makes no comment on this.

Another interesting perspective is opened up by Palmer's comments on "Tone-Sequences" or sequences of tone groups in any one simple or compound sentence. He claims that tones function instead of conjunctive adverbs, and distinguishes two kinds of sequence: co-ordination, with identical tone-groups in sequence (for equally prominent alternatives, apposition and comments), and subordination, with alternately rising and falling groups in which both nuclei, though important, differ in degree of importance, the

rise marking the lesser degree (cf. below, Kingdon, Schubiger and Crystal on sequences; also §4.2.2. below). A further comment throws light on the syntagmatic relations expressed by subordinate sequence: "The speaker wishes to call the attention of the hearer to the fact that a given element in the sentence is to be related to, modified by, or connected in the hearer's mind with another element in the same sentence" (p. 91); though vague, the "integrative" role of intonation (§1.2.4. above) is clearly what is meant. The sequences mentioned are falling - high-rising (commutative), falling - falling-rising (also commutative) and high-rising - falling-rising. Of the last kind of sequence, Palmer writes (p. 95):

This sequence is probably nothing other than the simple Tone-Group 3 [Falling-rising - DG] with a scandent head [↗] in which one of the head syllables is felt to have become prominent enough to warrant an independent nucleus tone.

The example he gives of this equivalence of tone-sequences and single tone-groups is the following:

- (11) a. ↗It wasn't↗white. (Unemphatic 'wasn't'.)
b. — It ↗wasn't ↗white. (Emphatic 'wasn't'.)

The question of the equivalence of different structures will recur frequently in the following sections.

3.1.2.2. Kingdon

Kingdon's essay on tonetic stress marks (1939) is best known for two contributions to the analysis of intonation: his extension of the traditional system of stress marks and ad hoc tone diacritics to form a system of "tonetic stress marks", and his demonstration of the variety of intonation patterning in English by means of a tabulation of sixty patterns, composed of relatively few forms, associated with the sentence *I can't find one*. In the case of the latter contribution, his tabulation is highly conservative (in allowing only *can't* and *find* to be "stressed") and it can easily be shown that his description will generate upwards of three hundred patterns for this one sentence, if more liberal stress assignments are allowed. Even allowing for additional constraints which would reduce this number, the quantity is considerable, and interest in this quantitative aspect marked the growing awareness of the importance of intonation which the earlier studies had gradually engendered.

In this short study, Kingdon develops his notation from the Palmer direction rather than from the Armstrong & Ward interlinear notation; in the forms and descriptive categories which he employs, however, he criticises Palmer for neglecting the "level stressed syllables" (p. 60) in favour of the head, and tends towards the Armstrong & Ward tune analysis, his own notation not being intended as a replacement but as "a useful auxiliary" (p. 61). The analysis, both implied and expressed, which he gives differs in a number of ways from that of Armstrong & Ward, however, and lays the foundation for his own and other later analyses which proceed more on the lines of the Palmer analysis; it should be stressed that this is not as obvious in this earlier essay as it is in Kingdon's later work.

Two kinds of tonetic stress mark are introduced: five for the basic

TONE DIRECTION	BASIC SERIES		EMPHATIC SERIES	
	Mark	Characterisation	Mark	Characterisation
Level	˘	Non-nuclear accented syllables of earlier non-emphatic tunes.	ˆ	Upward break in tune descriptions; initially: higher range of whole tune
Fall	˘	As in Armstrong & Ward's tune I.	ˆ	As in Armstrong & Ward's tune I with emphasis; upward break on nucleus.
Rise	˘	As in Armstrong & Ward's tune II.	ˆ	As in Armstrong & Ward's tune II but with downward break on nucleus; high pre-head if no intervening body.
Fall-rise	˘	Either on single syllable or with rise on following unstressed syllables.	ˆ	Analogous to fall.
Rise-fall	˘	a. Rise, followed by low unstressed syllables, or b. Low level, followed by one higher and then lower unstressed syllables.	ˆ	Analogous to rise.

Table 11: Kingdon's tonetic stress marks (1939).

range of "tones", and a parallel set of five marks for the "emphatic tones" with increased pitch range. The system is summarised in Table 11. This is not the only information which Kingdon gives about his system, though nothing more is presented explicitly in the text; the chart of intonation patterns mentioned above contains some information on how the tones symbolised by these marks combine in tunes. No information, however, is given about levels of analysis involving unstressed syllables, beyond the scant information attached to the characterisation of certain tones. Although Kingdon avoids the terms "head" and "nucleus" in this study, his tabulation of patterns reveals this kind of structure, and it will be convenient to use the terms in the following discussion. In the examples given (versions of *I can't find one*), *can't* and *find* may be said to represent the positions of the head and the nucleus, respectively. In this terminology, six contours may be said to occur at the head position (level, rise, fall, in both basic and emphatic variants) and eight at the nucleus position (rise, fall, rise-fall, fall-rise, also in both basic and emphatic variants) making a possible total of forty-eight patterns. Four of these are disallowed by Kingdon, those with a basic falling head and any basic nuclear contour, leaving forty-four. Finally, Kingdon gives sixteen patterns with no head, i.e. eight nuclear contours on *can't* and eight on *find*, making sixty in all.

The description outlined above contains a number of innovations. Perhaps the main innovation is the generalisation of the notion of "break", Klinghardt's "neuanhebung", to a more broadly applicable "emphatic" accental form which is not limited to mid-tune occurrence. The received "break"

would be Kingdon's emphatic level contour in mid-tune; the paradigmatically relative aspect of this form with respect to the basic accentual contour (in addition to the obvious syntagmatically relative aspect) is clearly brought out by the possibility of its occurrence initially in Kingdon's system, corresponding to "intensity" in the Armstrong & Ward system (cf. pp. 113ff. above). A further generalisation is that the initial point of falling contours may behave in a similar way, as in Armstrong & Ward's "intensity" and "special prominence". In this new accentual interpretation, a downward break, rather than the hitherto described upward breaks, may occur; this downward deviation from the basic trajectory is associated with the initial points of rising contours. This observation is presumably systematically related to Bierwisch's observation for German that slightly accented syllables in a rising tail tend to receive downward, rather than upward, pitch modifications (cf. (9), Rule (vi)c., p. 125 above). A further interesting point is the implicit principle of contrast invoked to associate emphatic rises (from very low pitch) with high pre-heads; it is also noteworthy that Bierwisch observed similar patterns in German, though not with rises (Table 6, Rules (iv)b., d.). The two variants of rise-fall patterns are also new. On the negative side, it should be noted that the earlier observations of Palmer, and in particular of Armstrong & Ward, about the rise-prefix in accentual systems has been lost; the new generalisation over several of the Armstrong & Ward systems to the one emphatic system does not include the rise-prefix. Although certain similarities between the rise-prefix and the height increase of Kingdon's emphatic contours, or even between the rise-prefix and the rising head in Kingdon's description, are rather clear, no generalisations of these kinds are made. No way is given, either, of expressing generalisations comparable to the Palmerian "head", i.e. the series of pre-nuclear syllables; no instances of tunes with more than one such accented syllable are commented on, though they occur in the final transcribed text given by Kingdon. Nor are possible similarities between intra-tune and inter-tune sequences of rises and falls noted, as Palmer had noted them.

It is possible that the last of these open questions is a sign that Kingdon was unsure of the status of the "tune", as Armstrong & Ward also appear to have been in the context of emphatic tunes (cf. Kingdon's 'one-nucleus-condition'). In this respect, both the Armstrong & Ward and the Kingdon theories might be held to be more 'pitch accent theories' of intonation (§3.3.3. below) than tune or tonetic analyses. This interpretation would be supported by Kingdon's lack of interest in demarcating tunes (cf. §2.3.2. above); by the unusual practice of referring to contours e.g. as "level stress" (unlike the traditional use, meaning 'equal stress on more than one syllable'), "falling stress", &c.; and by his choice of the term "tonetic stress marks" for his contour-marking notation rather than, for instance, "tonetic marks" pure and simple.

In Kingdon's more comprehensive later studies (1948-9; 1958; 1958a), the system of tonetic stress marks is extended in the context of a more detailed account of intonation structure. At a level of analysis involving only stressed syllables, the tune or intonation group consists of the head (first of the series), the body (subsequent non-nuclear stressed syllables) and the nucleus; the head and the nucleus are familiar categories, but the body is new. There is nothing to correspond to the Palmer generalisation which was also termed "head", and the question of the independence of the head (in the non-Palmerian sense) and the body, a moot point, is not raised; parallel treatment of individual "tones" and the body series in some re-

tone	varieties and characterisations	
Static	High level: "a full stress", p. 5.	Low level: a partial stress", p. 5; before low rise, conditioned variant of high level (cf. the Palmer "inferior head" above).
Kinetic		
I Rise	High: middle to top of voice range.	Low: bottom to middle of voice-range; weaker stress than high rise; different functions.
II Fall	Anywhere in range (depending on tonetic context, i.e. preceding head or falling body) to bottom of range	
III Fall-rise	Fall similar to II. Rise similar to I low. Three types: Undivided: on one syllable; Divided: fall on one syllable, rise on next; Separated: fall on one syllable, following unstressed (or partially stressed syllables, rise at end (see text).	
IV Rise-fall	Tends to condition high pre-nuclear sections. Three forms, depending on stress and emphasis: One syllable (if choice: maximum prominence); Two syllables: low level followed by fall, second syllable also given stress; More than two syllables: low level, skip up to one higher syllable, finally sequence of low syllables (cf. Fig. 7 (b)).	
V Rise-fall-rise	Both in form and function an amalgamation of IV & II; both are referred to as "hesitant", p. 158	

Table 12: The tones of Kingdon (1958).

spects suggests interdependence rather than independence. Associated with each of the stressed syllable positions in head, body and nucleus (only the latter being obligatory in tunes) is a range of forms, the static and kinetic tones, which are listed in Table 12. In addition to the basic parameters of trajectory shape, others of height (as with the static and rising tones), emphasis (increased "force" and range, or with static tones a skip out of line of the tune), duration, and contour slope are mentioned (pp. xxvff.), though the last two are not dealt with in the exposition. It should be noted that Schubiger (1961) notes the absence of a variant of II (high level tone followed by low tail) in her review, and that Uldall (1961) remarks on the absence in Kingdon's study, as in earlier studies, of a high-mid fall (as in "non-committal" dialogue idioms such as "Yes", "Mm") in her review, a pattern taken up again by Crystal (cf. p. 69 above; §3.1.4. below).

The question of criteria for defining the various structural categories at this level of analysis is not dealt with by Kingdon in explicit terms. The nucleus, for instance, is characterised partly by the forms associated

with it: of kinetic tones it is said that "one of these must be used to form the tonetic nucleus of every intonation group" (p. 6). There is no one-to-one association of classes of forms with structural positions, however, since the head and body may also take kinetic tones; consequently, no definition of this kind is possible. It is apparently not possible for the nucleus to be associated with a static tone, except in a trivial sense when accompanied by a tail). Other characterisations give a different impression, however. The nucleus is said to be "the last fully stressed syllable of a group" (p. 6), fully stressed syllables being either high level or kinetic. This account is supported by the following description of an intonation group (p. 3):

An analysis of English intonation shows that this consists basically of a slowly descending series of level tones usually starting at or near the top of the normal voice range and finishing at or near the bottom. The stresses fall on the more important words in an utterance and are interspersed with unstressed syllables that occupy pitches between those occupied by the stressed syllables on either side of them.

Both meaning and feeling are added to this sober framework by replacing the last level tone - and, in the more colourful types of intonation, other stresses - by one or other of the Kinetic Tones.

This description presents the intonation group as a series of stresses, each of which may be associated with either a static or a kinetic tone; although the final stress must have a kinetic tone if others have one, no claim is made that the final stress must always have a kinetic tone. It is clear that further criteria are needed for defining the term "intonation group", which is a primitive in Kingdon's account; such criteria, such as boundaries, temporal criteria, are not given. It seems unlikely that internal pitch criteria will suffice, though there seem to be some constraints affecting the occurrence of kinetic tones in heads and bodies; Kingdon adduces non-phonological criteria on a number of occasions (e.g. p. 123). This problem of definition will be discussed again in the present section.

The head, "the first full stress of a group" (p. 22), and the body, the sequence of syllables "falling between the Head and the Nucleus" (p. 25), are so similar in their status that the motivation for keeping the head out of the body is hard to discover; there are two kinds of body, for instance, a gradually falling series of high level tones (the standard type familiar from earlier descriptions) and a gradually rising series of low level tones, the last of which, like low level heads, occurs before low rising nuclei. It seems that Kingdon himself wished to regard the head as belonging to, rather than preceding, the body in view of formulations such as "the Head of a long Body" (p. 25). If this latter interpretation is regarded as the most adequate to the facts, then Kingdon's "body" is the same as Palmer's "head".

Schubiger (1961) notes inconsistencies in the distinction between "full stress" and "partial stress" at the level of analysis under discussion. The low level head would, with the characterisations given, be a contradiction in terms; this is a source of notational inconsistency in which low level stresses are sometimes indicated with dots and sometimes with full stress marks, depending on their position in the tune. The conclusion is to be drawn, one which Schubiger does not draw, is that the distinction is not a formal one anchored to the distinction between low level and other tones, but a structural one; a high level tone may be demoted to partial stress, and indicated by a dot, before a relatively more prominent break in the

in the body, just as a low level tone may be promoted to full stress in appropriate positions. There may, therefore, be a descriptive inconsistency, while the notation of particular examples is justifiable on other grounds.

Kingdon also introduces a system of "devices for giving emphasis", which are, in so far as they are in fact phonological, based on an explicit principle of pitch contrast, for providing a syntagmatic foil for emphasised syllables. This principle has already been mentioned in connexion with Kingdon (1939; p. 134 above), where the principle had not yet been explicitly formulated. There several applications of this important principle, which is basically a pitch accent principle and may be termed the principle of syntagmatic pitch contrast; Kingdon's term is "Emphasis through Pitch Contrast" (1958:47), and his characterisation: "The prominence of a stressed syllable may be enhanced by using an unstressed syllable of contrasting pitch immediately before it". The main application is in the emphatic tones themselves, which involve greater range of pitch for kinetic tones, and a step out of the overall trajectory for the static tones; the latter characterisation could in fact be generalised for both static and kinetic tones. Breaks in the body of the tune are discussed in the general context of emphatic patterns, as foreshadowed in Kingdon's earlier study; the upward and the downward breaks appear to differ in role, however. While the former is said to add interest and to occur either "as a kind of sub-head" (p. 62) on the first stressed word of clauses, phrases or other grammatical units, or on "words of sufficient semantic importance to need extra prominence, irrespective of their position in their clause or phrase" (p. 63) and can be supplemented by an emphatic increment to the step out of the overall trajectory, the latter is held to be emphatic only (p. 65). It is noteworthy that the quasi-physiological explanation for upward breaks which others had advanced earlier is not given by Kingdon. The plain upward break is said to be lower than the height of a previous head or upward break; the emphatic upward break appears to be regarded as higher than these categories. By means of this distinction, the simple generalisation over breaks and emphases which was implicit in the earlier description by Kingdon is modified, and the distinction made by Klinghardt between two kinds of break (p. 106 above) is recovered. A further application of the principle of syntagmatic pitch contrast, that of stress reduction on unimportant syllables, has already been noted in the Armstrong & Ward description of emphasis, in particular the type they term "special prominence" (cf. above, pp. 163f.); Kingdon has two kinds: reduction of high level tones to low level tones, and further reduction of low level tones ("partially stressed" in his terminology) to unstressed syllables. A third application of the principle lies in the use of the seven kinds of prehead which Kingdon observes (high rising, high level, high falling, normal - "on a uniform pitch a trifle above the bottom of the normal pitch range", p. 12 - low rising, low level, and low falling, pp. 51f.) to offset the following fully stressed syllable: low preheads with initially high tones, and high preheads with initially low tones. An interesting observation, noted by the reviewers, is that of the "homosyllabic prehead", which is also involved in the system of emphasis by syntagmatic pitch contrast. The configuration of contrasting pitch with no preceding syllable is described as follows (pp. 53f.):

This is effected by pronouncing the beginning of the stressed syllable on a pitch which will contrast with the tone to be used, and delaying the tone and its accompanying stress for a length of time sufficient to allow the initial unstressed contrasting pitch to be felt.

The category of homosyllabic prehead is in fact a generalisation of the rise-prefix which Armstrong & Ward called "additional emphasis" (p. 114 above), to cover analogous fall-prefixes to tones and subsume them under the same general principle, which applies not only to these prefixes but also to the other devices already dealt with. It is not the case that the homosyllabic prehead only occurs on initial 'head' tones and only on kinetic tones, though Kingdon's examples (pp. 55f.) are restricted to these forms, and the term "prehead" is, on systematic grounds, misleading. The nature of this generalisation was not recognised by either Kingdon or his reviewers, but its plausibility seems to me to be rather high.

Kingdon also discusses sequences of tones in a number of contexts which highlight a problem that has gradually been developing throughout the discussion of earlier intonation analyses: that of the validity of the structural categories postulated. It has been shown above that Kingdon's category of intonation group (the form associated with which is the tune) is primitive in his system, but without empirical criteria to identify it. Though this category is undefined, it is refined into a whole system of related categories: simple tunes, compound tunes, divided tones, combined tones, which raise even greater problems of demarcation and identification. Simple tunes have only one kinetic tone, the nucleus; compound tunes have kinetic nuclei and kinetic tones in head or body; divided tones distribute one contour direction over one syllable and the other over a following syllable; combined tones are sequences (apparently of simple tunes) in which two (or more) contours are assigned to separate intonation groups. The problem is this: there are obvious similarities between these categories in terms of the forms associated with each of them, and the functions which are associated with the forms, and consequently there are generalisations to be made between the different categories; on the other hand, if there are genuine differences which justify the postulation of so many distinct categories (not to mention heads, bodies, homosyllabic pre-heads), there must be criteria which can be offered to justify the differences while preserving the similarities. One instance of a case of this kind was given by Palmer (cf. e.g. (11) above) and involved similarities and differences between a head-nucleus pattern and a two-tune pattern. There are many analogous examples in Kingdon's study.

The tone which is involved in most of these examples is the third, the fall-rise. The similarities of this tone to both tone II, the falling tone, and the low rising tone I were noted by Kingdon (p. 9) and are, for the most part, the source of the ambiguities. The possibilities are: combined tune (II-I), compound tune (II-on-head - I), simple tune (divided tone III), for instance on the following sentence:

(12) I'll take it if you'll let me.

For distinguishing between the combined tune and the simple tune Kingdon gives three criteria (pp. 79f.): "(1) the relative importance of the two groups, (2) the semantic homogeneity of the whole utterance, and (3) whether there is a break between the groups". The simple tune with tone III (which Kingdon also refers to simply as "tune III", *passim*) has more weight on the first (falling) element, is homogeneous, and has no break (= pause). A minimal pair of this type had been given previously (p. 35):

(13) I'll take it - if you'll let me

(4) I'll take it if you'll let me

If the three criteria listed above are to be taken at face value, they each provide a necessary, but not a sufficient condition for the identification of a simple tune; the sufficient condition is only given by all three together. If any condition is not met, then the analysis will presumably be as a combined tune. If condition (3) for the simple tune analysis is met, but one or both of the others are not, then presumably combined tune analysis must be made. But since condition (3) is the only condition with phonological, or at least phonetic, consequences in the analysis, this means that it is possible for combined tunes and simple tunes, e.g. II - I_{low} and III, to be homophonous. The tune boundary may, by this argument, be taken to be only peripherally of phonetic moment, rather like morpheme boundaries or word boundaries defined in terms of "potential pause".

For distinguishing between the compound tune and the simple tune, Kingdon gives a "useful rule" (p. 127): the compound tune analysis is chosen "if the low rise following an unemphatic fall in a simple clause is sufficiently prominent to need marking by an emphatic tone"; one example given is the following:

(15) We'll leave you six of them

Presumably if the clause were not simple, as in (12), the compound tune analysis would not be available, though the simple tune analysis would surely be misplaced too; the second of the previous set of conditions would assign the combined tune analysis. This is not commented on by Kingdon. Further, the following analysis would presumably be as III rather than as II + I_{low}:

(16) We'll leave you six of them

Schubiger, in her review (1961), points out that elsewhere in the book the pattern of (15) is referred to as a "development" of the divided tone III (Kingdon, 1958:232); this is clearly a rudimentary attempt to generalise between the different structures, the difference being claimed to lie in the "impatience" of the compound tune. Schubiger also points out that Kingdon labels a related pattern inconsistently, a high level prehead followed by a low rising nucleus, as in the following example:

(17) See you later Good night

On one occasion (pp. 49f.) these two farewells are analysed as "Skeleton Tune III", while another (p. 238) the former is analysed as a high level head (transcribed 'See ...') and the latter as a high level prehead (no change in transcription), plus a low rising nucleus. Again, it might be said that the notion of "skeleton" tunes is a rudimentary attempt to express a generalisation about two patterns which receive different analyses in the Kingdon system, a generalisation whose validity is perhaps underscored by the inconsistency in description.

It would appear from these examples (tunes with the patterns IV and V provide many more examples of potentially homophonous analyses where the appropriate generalisations are missed, and of near homophonous analyses where rudimentary generalisations are attempted) that there are certain basic relations involved which the structures postulated, whose role may be said to be to express the relations established between forms on the

basis of type criteria and role criteria (cf. §1.1. above), are inadequate to convey; this inadequacy is ironed out ad hoc by such terms as "development of", "skeleton", indicating paradigmatic relations between tunes. There is no reason why the tune terminology illustrated in examples (13), (14) and (15), with the massive constraints it implicitly imposes on possible conditions of tones and boundary breaks, should be allowed to obscure this state of affairs. In Table 13, a far greater number of falling and rising tone sequences (involving "emphasis", symbolised by diacritic iteration, and pause, or boundary, symbolised by a vertical line) are shown than Kingdon illustrates in connexion with the differences and similarities of diverse structures. The organising principle behind the table is one which

MAXIMUM PROMINENCE ON									
Left "stress"							Right stress		
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~
~	~	~	~	~	~	~	~	~	~

Table 13: Illustration of generalisation concerning shift of relative prominence from left to right by means of tone patterns (high & low, emphatic & non-emphatic, rising, falling & level trajectories, with & without intervening tone group boundary).

Kingdon uses in distinguishing between combined and simple tunes, and compound and simple tunes: the relative prominence of the two accents. At the left hand side of the table, the left hand accent ("stress" in Kingdon's terminology) is relatively more prominent than the right hand accent of the pair; at the right hand side of the table, the opposite holds. It can easily be seen that a number of distinct devices contribute to the relative prominence of the accents: static vs. kinetic tones, upward and downward broken tone (the "emphatic" tones) vs. unbroken tones, and the prefixing of a fall to a rise; the pause also plays an elusive role in this respect, perhaps not to support any particular value of relative prominence but to underscore any prosodic effect by enforcing a juxtaposition rather than integration of the two accents into an overall pattern. The vertical dimension of the table also has some significance: the overall emphatic value of the whole sequence decreases from top to bottom. The point of the tabulation is not to demonstrate any overall variation, but to show that a very simple relational variable (values of relative prominence as its variants) can be given more variants than Kingdon's system has structural categories available to describe coherently.

The preceding discussion points towards the possibility that the complex structural machinery of tunes and tune sequences of various kinds which has been developed by investigators up to and including Kingdon may have become rather too elaborate to retain a close connexion to the basic facts of accentuation and intonation, while having a certain amount of justification as special cases of contour sequences. The patterns illustrated in Table 13 had in common the intonational contribution (in the narrower sense of "intonation") of a falling sequence followed by a low rising se-

quence (the limiting case being Tone III), and they differ as variants along a simple scale of differing relative prominence of the accents involved in the intonation pattern. The comparative importance of accentuation in this account points towards the suggestion that the intonational relations implicitly described in terms of heads, nuclei, tunes, and so on are essentially accentual relations and not intonational in the narrower sense. It was pointed out above (cf. p. 194 above) that Kingdon (1939) appeared to have certain characteristics of a pitch accent theory; these traits are still present in Kingdon (1958a), though the individuality of the accents, and their interrelations, are kept somewhat obscure by an elaborate system of structural categories.

There are many interesting problems left open in the Kingdon description even after the subtraction of the above criticism. One has to do with the relation of fall-rise sequences, for instance, to lexico-syntactic complexes. In this connexion, Schubiger takes Kingdon to task (1961:54) for confusing a fall nucleus followed by a rise at the end of a longish tail, as in (18), with a "genuine" tune III, as in (19), and both with a rise nucleus preceded by a fall as in (20), i.e. for lumping things together which should be kept apart.

(18) I 'met your 'mother at the .party

(19) 'I have never .met them

(20) 'Hurry .up

It is unlikely that these patterns can genuinely contrast; if they are homophonous when associated with comparable lexico-syntactic items, as seems probable, the differences will be of role rather than of type, which is how Kingdon deals with them. What differences there are would appear to be more the consequences of accentual relations within the tune, and partly determined by the accompanying lexico-syntactic items, than actually intonational. Schubiger illustrates this herself by an interesting test: it is only in the last case that these relations are not disturbed by making the rise "emphatic", showing that in this case, for reasons which seem to me to be in good measure non-intonational, the item up was originally higher on the scale of relative prominence than hurry. By this test, whatever the factors involved, the status of up as "nucleus" remains unchanged, whereas the status of party and met would tend to be different, becoming relatively more prominent. The contribution of various factors, including non-phonological, to the interpretation of accentual relations is quite subtle and will be given some attention below (§3.3.).

Finally, the problem of how to characterise tunes in terms of their more specifically intonational, non-accentual characteristics is raised by Kingdon's discussion of compound tunes in such terms as "tonetic harmony". Such sequences are: IV - IV ("blend well", p. 153); IV - V ("a very harmonious series", p. 154); V - III ("the pitch arrangement is harmonious", p. 155 - though they are said to clash semantically); V - IV ("has the drawback of an awkward junction of pitches", p. 156); V - V ("awkward junction of pitches", p. 156 - though "the feeling of the two tones is in harmony"); II - IV ("has the advantage over the II - II combination that it does not involve a jump in pitch; it is also less abrupt", p. 156); III - IV ("introduces a jump in pitch and is therefore less used than III + II", p. 157); I_{low} - V ("From the point of view of tonetic harmony there is not much to choose between this combination and I_{low} + III (§63); since the Low

Rising Tone finishes about the middle of the voice range the jumps upward to the initial pitch of Tone III or downward to that of Tone V are about equal", p. 157); II - V ("This combination is tonetically harmonious, and therefore easier to use than II - III", p. 157). A comparison of these patterns reveals that the "harmonious" sequences, with one exception, involve sequences of alternate rises and falls; the exception is I_{low} - V where the low rise is followed immediately by a higher rise, but, as Kingdon points out, there is only an insignificant hiatus involved. The "awkward" sequences are those which have sequences of contours with the same direction, i.e. fall - fall, rise - rise, and of necessity involve jumps in pitch from the end of the one to the beginning of the other contour. The "harmonious" sequences, to which the tones III, IV and V themselves must be reckoned, have specifically intonational rather than accentual character in which the overall contour pattern is most in evidence; the "awkward" sequences are clearly more accentual in character, involving steps out of an overall trajectory for this purpose. The criteria for defining "harmonious" and "awkward" sequences thus differ from those which Palmer used to distinguish between the subordination and the co-ordination of tone sequences (cf. p. 190 above). It is true that the subordinating sequences are, in general, "harmonious" and the co-ordinating sequences are, in general, "awkward", but this association is not an invariable rule. It is conceivable that both of these principles may operate in the intonational system: the "harmonious" sequences, i.e. successions of unlike contour directions (or like contour directions with no leaps from the end of one contour to the beginning of the next), could be based on a phonetic principle of least effort, i.e. minimal glottal and sub-glottal gymnastics, which would tend to support in a natural way (§1.2.4. above) the functionally integrating and subordinating roles which Palmer notes; the "awkward" sequences would tend to establish sequences of individual accents rather than overall intonation patterns (cf. the principle of syntagmatic pitch contrast, pp. 137f. above, §3.3. below), and would lean towards the co-ordinating and appositive roles which Palmer records. The interaction of features of the temporal organisation of utterances with these trajectory-characterising variables is an interesting field of study, as is the issue of whether trajectories are to be componentialised serially or simultaneously; these points will be treated below (esp. in §4.2.). The possibility of non-congruent systems (cf. §§1.2.6.3., 4.2.2.) is suggested, as Kingdon's observation of occasional semantic "discordance" with phonologically "harmonious" sequences, and vice versa, indicates; it is not possible to do more than note this suggestion here, linking it to the integrative/delimitative roles.

3.1.2.3. Schubiger

The contributions of Schubiger to the study of intonation during the past four decades have been original, numerous, and influential. Her main insights have been into the roles of intonation; they will enter into the discussion of the roles of intonation in the next chapter. Although her work has been mainly to pinpoint correlations of intonation and function in various corners of syntax and pragmatics, in this similar to the work of Lee, which, like Schubiger's, reveals the influence of the Prague "means and ends" school, she has also been involved in the development of insights into the forms and structures of intonation. Lee's ideas in this respect (esp. 1960) are more closely related to pitch accent approaches than to the

tune or tonetic approaches, and will receive attention below (§3.3.2.); except for traces of pitch accent theory in some of her articles, Schubiger has generally moved either in the tune framework, in her earlier work, or in the tonetic framework of Kingdon, in her later work.

In her first monograph on intonation (1935), Schubiger introduces a distinction between tunes (both I and II, in the Armstrong & Ward terminology) with "Intonation turn A" and those with "Intonation turn B"; the former types are ordinary emphatic types (apparently Armstrong & Ward's "special prominence") with the additional emphatic rise-prefix, while the latter involve a further modification: the pre-nuclear syllables (to use a term from tonetic terminology) are high, contrasting with the low starting point of the fall (apparently with or without the rise-prefix; p. 47):

Here not the fall itself is heightened, but the interval between the initial unstressed syllable, which is pitched very high, and the starting-point of the fall, is made wider. The fall itself, which is generally preceded by a slight rise, may be very low.

Using the Kingdon notation to express this, the contrast may be expressed as follows:

- (21) I 'am tired (Intonation turn A, associated with "contrast")
- (22) 'I .am tired (Intonation turn B, "purely emotional function", "simply means 'I am extremely tired'")

As Schubiger points out, Intonation turn B appears to correspond in status to Palmer's scandent head plus low fall, the "Jump" pattern (cf. Table 10), though she envisages a high head throughout being used in the pattern rather than the rising (scandent) head. Kingdon later listed the B pattern under the devices for giving emphasis by means of pitch contrast, but without making this particular contrast explicit; it is interesting that in both cases the principle of pitch contrast explicit; it is interesting that in both cases the principle of pitch contrast appears to be involved; the difference is that in the case of Intonation turn A, the accentual contour itself is the point at which the contrast operates, whereas in the case of turn B, the accented syllable need not cover a wide range since the basis for pitch contrast has already been provided by the high pre-nuclear syllables. The latter state of affairs illustrates that there are non-linear principles of organisation at work in intonation systems. The kind of contrast illustrated here is one in which Bolinger delights, and will be discussed below (§3.3.1.). In addition to these two variants of the Armstrong & Ward tunes, Schubiger also notes what she calls "unstressed syllables pitched high" (1935:66); where only one "stressed" syllable precedes the nucleus, the effect is that of Palmer's scandent head, and the function "animation, cheerfulness, etc.", p. 66) also corresponds to that given by Palmer for the scandent head. What Palmer did not have, however, was a head in which this pattern was repeated for each pre-nuclear stressed syllable, making an overall pattern analogous to the "Zickzackmelodie" with rising trains of unstressed syllables which von Essen later observed for German (1956:25, cf. above, p. 118).

Schubiger's second intonation monograph (1958) is very much influenced by an earlier version of Kingdon (1958; i.e. 1948-9); the same nuclear tones, for instance, are presented, with the same division, for pedagogical purposes, into a first section on falling, rising, and falling-rising tones,

and a later one on the rising-falling and rising-falling-rising tones (a division which led Stockwell in his review to state erroneously that Schubiger does not deal with the last two tones). Her ideas on the analysis of falling-rising patterns have been introduced already in the context of her review of Kingdon (pp. 204ff. above), and will be dealt with in more detail in the next chapter in the context of a discussion of the relative weight of type and role criteria of analysis in establishing forms and structures, using the very considerable number of contributions to the analysis of falling-rising patterns as starting-point. It is convenient at this point, however, to note an important aspect of Schubiger's methodology, inherited from the Prague school, which will figure prominently in the discussion of generative contributions to the study of the accentual and intonational complex, developed later, and also inherited from the Prague school. In Schubiger's discussion of ambiguities associated with falling-rising patterns, she notes that purely phonetic criteria are inadequate, and that tone patterns must "be viewed against the background of linguistic consciousness, with its capacity to recognize what mentally belongs together, even where physically another classification - or no classification - would seem to suggest itself" (1958:26). The relevance of "linguistic consciousness" as a source of paradigmatic criteria of analysis has already been discussed (§1.3.2. above), and the specific relationship between these paradigmatic criteria and the analysis of forms and structures was outlined at the beginning of the present chapter.

Schubiger goes further than previous analysts in suggesting that there are three different rising contours, not just two; in this respect, she notes (p. 11n) that Palmer's low and high rises differ from Kingdon's in that the former are based on the criterion of contour-final height, while the latter are based on contour-initial height. The union of these two classifications, low-ending (i.e. mid-ending, in effect) and high-ending, each with low starting point, on the one hand, and low starting and high-starting (i.e. mid-starting, in effect) on the other hand, with end-points unspecified, leads to the three rises low-mid, low-high, mid-high. Arnold, in his review of Lee (1960), also advocates the recognition of three rises, presumably in cognisance of Schubiger's note; he illustrates them as follows (1961:15):

- (23) 'Did you? - "unenthusiastic";
- (24) 'Did you? - "surprised and perhaps impressed";
- (25) 'Did you? - "casual".

The low-high rise is symbolised ad hoc by means of a slash for present purposes. Stockwell puts his finger on this notational difficulty: Schubiger's low rise notation would be ambiguous between (23) and (24), since she does not actually provide a symbol for the additional term in her system; it is instructive to consider the solution which Stockwell proposes in his review (1960a:547), referring to examples of Schubiger's (1958:43f.):

In order to tie down a pattern that she would like to isolate as having a specific connotation, the pattern must be described (for instance) as 'Type R₁ [low rising] without head. The rise is low and narrow' (43). How much easier to specify it as 211 in contrast, for instance, with 212 || - which is the pattern I take to be meant by 'Type R₁ with or without head ... The nuclear rise is wider ...' (44) - meaning 'contradict-

ing, protesting' in contrast with the previous pattern, which means 'casual, guarded'. For illustration:

'How are you? All right, thank you. / ... 1əənk yɪw1||/
'You smoke too much. No, I don't. / ... 1daʊnt2||/'

Schubiger has no way of indicating that 'the nuclear rise is wider', and yet it is the distinguishing minimal difference between the intonation patterns of the contrasting pair.

In Stockwell's view, the fault lies in Schubiger's failure to consider junctures or systematic tone-group boundaries. It is not easy to see, however, what advantage his suggestion has to offer over the ad hoc marking of (24) above, in the absence of any precise justification for the 'Trageremic' (cf. Crystal, 1970:86) distinction between sequences of pitch height phonemes and terminal junctures (cf. also §2.3.2.2. above). No reason is given why the pattern in question should be a binarily structured three-segment sequence (two pitch phonemes, plus terminal rise) or why it should not be componentialised in some other way, perhaps non-sequentially along the lines of Schubiger's other componentialisations. Schubiger is herself aware of the problem of supplying criteria, stating that the "connotation" of the very low rise which keeps below the mid point differs from that of the low rise which goes above it (p. 11n). Presumably the difficulty of pinpointing the role criteria involved keeps Schubiger from notationally distinguishing between the two rises; comparing Arnold's glosses with those cited by Stockwell, one can understand the difficulty. The problem will be raised again below (§4.2.2.).

With regard to longer trajectories, Schubiger presents the following interesting thesis (p. 86):

The tone-patterns that make up a sequence are combined in such a way as to form as near as possible a replica of the simple pattern that would be used if the sentence were not divided. That tone-group which contains the nucleus of the corresponding simple pattern is the decisive one. Its nuclear glide, falling or rising, characterizes the sequence as a whole. Just as the nucleus of a simple tone-group can occur early, mid-way or late, the nuclear tone-group, as it will be called here, can be at the beginning, in the middle, or at the end of the sequence.

Preceding tone-groups are said to be analogous to heads and bodies, generally having rising or falling-rising nuclei, with certain speakers frequently using falling tones. Following tone-groups are said to be analogous to tails, either behaving like tails (low level after fall, no pitch glide; continuing to rise after a rising nucleus) or entering into a sequence with one or more rising nuclei, making a pattern like the fall-rise with one or more rises in the tail. Two sentences noted by Schubiger may be given in illustration, each with two rises after the nuclear element; the first is shown as a single tone-group (p. 20), the second as a tone-group sequence (p. 87):

- (26) There are 'lots of things we have to put up with, nowadays.
- (27) We can 'start to-morrow if the ,weather is ,fine and the ,glass goes -up.

The criteria for distinguishing between the two kinds of sequence are pause (not a reliable criterion, since it may, for certain rhetorical effects, oc-

cur within tone-groups, and it may be absent between tone-groups) and the assimilation vs. non-assimilation of pre-heads to preceding tails. Crystal's theory of tonal subordination (cf. §3.1.4. below) suggests that there are relations between nuclei which are expressible in terms of the relative width of the pitch contours of the nuclei involved; this provides supporting evidence for Schubiger's contention, though only for the special case of "endocentric" sequences, i.e. sequences of nuclei in like pitch directions occurring together. Crystal criticises Schubiger for not distinguishing between endocentric and exocentric (i.e. where unlike pitch directions occur together; a special case of Kingdon's "harmonious" sequences) sequences of nuclei (1969:237), but in the absence of a comparable theory about the "exocentric" sequences the criticism does not hold much weight: Schubiger treats patterns of subordination in Crystal's sense (which for the most part correspond to Palmer's co-ordinating sequences of like nuclei) on a par with patterns of subordination in Palmer's sense (cf. esp. p. 206 above), and for the purpose of discussing hierarchies this may be deemed sufficient. It is not to deny that there are perhaps different kinds of intonational hierarchy; to identify these kinds, such as Crystal's tonal subordination, is a further analytic step. Trim mentions Schubiger's thesis in developing a theory of his own about hierarchies of tone groups (1959:27); his theory overlaps with that of Schubiger, though the two approaches differ in certain respects. The topic will be taken up again in the context of trajectory componentialisation (§4.2.).

3.1.2.4. O'Connor and Arnold

Perhaps the most comprehensive and coherently organised of the pedagogic studies of English intonation is the handbook of O'Connor & Arnold (1961), particularly in its second edition (1973); the latter edition will be in the forefront of the present discussion, although its adoption of amendments suggested by reviewers of the earlier edition, and of later advances in the theory of intonation which could not be incorporated into the earlier edition, somewhat disturbs the roughly chronological ordering of the present sub-chapter. The differences between the two editions will be mentioned where relevant.

The two basic categories of structure are given as the "word group" ("groups of words which are grammatically relevant"; 1973:3), and the "tune" ("the complete pitch treatment of a word group"; p. 7). Despite the terminological change from "sense group" in the first edition (1961:3f.) to "word group" here, presumably under the influence of Trim (1959:27), the starting point for the description of intonation is an essentially non-intonational category based on the grammatical structure of the lexico-syntactic text, as the definitions show. An innovation in the second edition which is clearly due to the major and minor tone group thesis of Trim (1959) is the distinction between two kinds of "word group", those (symbolised by a single bar) "which have a very close grammatical connection", and those (symbolised by a double bar) "at the end of utterances which are not closely connected to what follows" (p. 4), corresponding to Trim's minor and major tone groups, respectively. The correspondence is borne out by the similarity between the O'Connor & Arnold "terrace" tune (see below) and Trim's "a-nuclear" minor tone-group (1959:28). For both kinds of group, the term "word group" has the advantages of being neither too much on the side of the role criteria nor too much on the side of the type criteria used in

setting up the categories; it has the disadvantage, however, of having a somewhat ad hoc relation to intonation patterns, in the absence of an explanation of the term "close grammatical connection", perhaps after the manner of Halliday (1967; see next section). Via the detour of "grammar", there reappears the dependence on role criteria which the switch to the new term seemed at first glance to cancel. The neutral "tone group" or "intonation group" is not available to O'Connor & Arnold ("tune" being form, rather than structure, in the senses used in the present study, cf. §1.1.), since they have an idiosyncratic use of the term "tone group" for which the term "tone set" or "tone class" would have brought terminological advantages.

The internal structure which is assigned to "tunes" is Palmerian, with the basic "head" (in Palmer's sense, not Kingdon's) and "nucleus" dichotomy; these are supplemented by the familiar "pre-head" and "tail", with the received meanings. Seven tones at the nucleus are postulated: low and high falls; rise-fall; low (to mid) and (mid to) high rises; mid-level (not in the first edition) and fall-rise. Absent are Palmer's and Kingdon's rise-fall-rise (also accepted by Schubiger) and the rise-prefix generalisation over the rise-fall, the rise-fall-rise, and non-nuclear accents which Armstrong & Ward give, as well as the third rise (low to high) which Arnold himself had mentioned in his discussion of Lee (cf. p. 142 above). All of these absences might be due to the neglect of emphatic phenomena outside the pre-nuclear categories. The mid-level tone has already been mentioned, and will receive further attention in the following chapters.

The analysis of the forms which appear at head position is considerably more extensive than that which appeared in the earlier edition. Whereas the earlier description had a low head (with rising varieties before low and high rises), a stepping head (the "standard" head found in all analyses, except Palmer's, since Klinghardt), and a sliding head (in which the head accents have a falling kinetic character, keeping the same overall falling trajectory as the stepping head) as well as a "compound" tune in which the sliding head gives way to a sequence of falling tones (high falls), the later description returns to a more Palmerian analysis. In the new analysis, the Palmerian superior, inferior and scandent heads (re-dubbed "high", "low", "rising", respectively) are introduced again, supplemented by a falling head (differing from the older stepping head in keeping the accented and unaccented syllables strictly on the same trajectory, the "purest" version of the "standard" head), as the basic "unemphatic" set. The scandent, or rising head was presumably reintroduced as a separate form at the suggestion of Sharp, in his review (1962); in the earlier edition it had been regarded as a variant of the low head (as in Kingdon, 1958:26, though Kingdon has it before a low rising nucleus rather than falling nuclei). A number of co-occurrence restrictions between head forms and nuclear tones are introduced: the falling head is given only before the fall-rise tone as the basic "unemphatic" form, which differs from previous analyses; the rising head is given only before a high fall, which differs considerably from the latitude allowed by Palmer (p. 130 above); the low head is restricted to occurrence before the low rise, again differing from Palmer's analysis, but resembling Kingdon's, and Halliday's (1967; cf. next section).

Completely new in the second edition is the introduction of a class of "emphatic" heads: high heads may be replaced by stepping heads for emphasis, falling by sliding, rising by the new "climbing" head (analogous to the sliding head, but with the kinetic accents rising, not falling, in the context of an overall rising trajectory, rather than an overall falling one). The high and rising heads may, for even greater emphasis, be replaced by

the series of falling tones already mentioned above provided that a high fall or a fall-rise tone follows; since the falling head also precedes the fall-rise tone, it appears that the falling sequence may have the monopoly of highly emphatic heads. The possibility of rising interaccentual unstressed syllables (as in the climbing head) on an overall falling trajectory (cf. p. 143 above) is not mentioned. This extended analysis is a considerable advance over the previous one, in which the different kinds of pre-nuclear configuration were left in isolation and without the immediately obvious generalisations such as the scalar ordering within some kind of relative prominence variable of the head types stepping, sliding, and high fall sequence.

The treatment of pre-nuclear emphatic devices is supplemented by the principle of syntagmatic pitch contrast, which has already been discussed on a number of occasions (cf. pp. 124, 133f., 137 above) for preheads. Implicit in the observations made by O'Connor & Arnold is the interesting possibility that preheads and heads, which otherwise appear to have distinct roles to play, enter into a "conspiracy" to provide the environmental pitch contrast for nuclei: the alternation of high prehead and low prehead plus high head in tone group four (Table 14), as well as the co-operation of high preheads and high heads in the emphatic forms suggest this. If the suggestion had been made explicit, it would have pointed towards a possible relation between a pitch accent theory such as Bolinger's, with its "flanking unaccentables" for the purpose of setting off pitch accents (cf. §3.3.1. below), and the kind of intonation theory developed in Europe. The head-and-nucleus analysis suggests a hierarchy of pitch contrast devices: the head as "flank" for the nucleus and the pre-head as "flank" for the head or, in the absence of a head, for the nucleus. It is premature to discuss this point further here. In the context of devices for emphasis, it should be noted that no mention is made of the well documented "break" contours in O'Connor & Arnold's handbook. The only connexion which can be established between their description and those which include breaks is rather indirect, via their use of Trim's major and minor tone-group thesis (p. 144 above): Trim had suggested that the category of "break" could be abolished by admitting minor tone-groups with suspended tones (corresponding to O'Connor & Arnold's mid-level tones), which he decided to consider a-nuclear, thus allowing a generalisation over a genuine suspended tone and a non-suspended Kingdonian static tone, and according the "broken" accent the status of head (in the Kingdonian sense of "first accent of a tone-group") of a minor tone-group. This will not account for the variety of breaks recorded by Kingdon, however. It has already been remarked (p. 147 above) that the participation of nuclei in the emphatic systems is not dealt with.

O'Connor & Arnold make an extremely interesting attempt to distinguish between a phonetic level of analysis and a phonological level of analysis for intonation. The tunes described according to the essentially phonetic system outlined above are grouped into equivalence classes on the basis of role criteria, much as phonetic types in segmental systems may, on some criteria of analysis, be grouped into phonemic equivalence classes, or, by different criteria more like those used in intonation analysis, morphemes. These equivalence classes are called "tone groups", ten of which are postulated (displayed in Table 14). A tone group (cf. the terminological remarks above, pp. 144f.) is "a grouping of tunes all conveying the same attitude on the part of the speaker"; rather like a morpheme, "a tone group is unified and distinguished from all other tone groups both by the attitude it conveys and by the pitch features of its tunes" (p. 39); apparently, the

GROUP	No. Name	UNEMPHATIC			EMPHATIC		
		Prehead	Head	Nucleus	Prehead	Head	Nucleus
1	Low Drop	(low)	(high)	low fall	{high (high)} {(prehead) step.}		low fall
2	High Drop	(low)	(high)	high fall	{high (high)} {(preh.) step.}		high fall
3	Take-Off	(low)	(low)	low rise	high	low	low rise
4	Low Bounce	{(low) high}	{high --}	low rise	{high (high)} {(preh.) step.}		low rise
5	Switchback	(low)	(fall)	fall-rise	{high (fall)} {(preh.) slid. high fs.}		fall-rise
6	Long Jump	(low)	rise	high fall	{high (rise)} {(preh.) climb.}		high fall
7	High Bounce	(low)	(high)	high rise	{high (high)} {(preh.) step.}		high rise
8	Jackknife	(low)	(high)	rise-fall	{high (high)} {(preh.) step.}		rise-fall
9	High Dive	(low)	(high)	high fall (low accents) - low rise	{high (high)} {(preh.) step.}		high fall - (low acc.s) - low rise
10	Terrace	(low)	(high)	mid level	{high (high)} {(preh.) step.}		mid level

Table 14: O'Connor & Arnold's tone groups (1973).

situation, common with segmental morphemes, that there may be shared role without shared type, and vice versa, does not arise. The ten tone groups given in the second edition are not quite identical with the ten given in the first; the discussion above makes it unnecessary to detail the differences. In the second edition, the groups are given names on the basis of iconic associations, a procedure clearly adopted from Palmer (cf. Table 10 above), some of the names being Palmer's, too. The abbreviations used in the table should be self-explanatory; it should be noted, in particular, that tone group nine is regarded as a "compound" tone group, or rather a group of compound tunes. Of the three compound tunes listed in the first edition, only this remains; one of the other two, the sequence of high pre-nuclear falls, is treated vaguely under the category of heads, and the other, "formed by the omission of a pause between what would otherwise be separate sense groups with simple tunes" (1961:25), is no longer treated separately from sequences. A section is, in fact, added in the second edition, in which a number of minor tone-group (in Trim's sense of the term) sequences are treated: High Drop / Take-Off; Long Jump / Take-Off; High Drop / Switchback; High Drop / High Drop; the interpretations of these sequences accord with Palmer's view of subordination and co-ordination discussed above.

A number of comments need to be made about the abstractions made in setting up these tone groups. Even a cursory study of the tabulated patterns shows considerable redundancy; groups 1,2,4,7,8,9,10 have prenuclear patterns which differ (in the sets 4 and 7) only in minor detail, both in the normal "unemphatic" structures and the marked "emphatic" structures. The burden of distinguishing these groups therefore rests, to all intents and purposes, with the nuclei alone, a fact which should have been stated. Two of the remaining tones, 3 and 5, also have similar functional characteristics (cf. the sequences listed above), while the final tone, 6, would bear comparison with the eighth. There are five possible sources of falling-rising patterns (groups 4,5,7,9, and the Take-Off, i.e. 2 + 3 sequence), the distinguishing characteristics of which merit further discussion in the interests of simplifying what turns out to be a very, perhaps unduly, complicated and detailed picture; the two sources of rising-falling patterns (groups 6 and 8) have already been mentioned. These potential sources of intonational ambiguity will be discussed again below (§4.2.2.). The possibility of establishing scalar orderings within the equivalence classes on the basis of head similarity has already been mentioned; it is conceivable that similar orderings could be made between the equivalence classes on the basis of the proximity of nuclei along scalar variables; cf. Trim (1970).

The points made here amount, basically, to systematic extensions of the line of thinking already suggested by O'Connor & Arnold themselves; they are hardly fundamental objections. The paradigmatic role criteria used to establish the equivalence classes are not immediately the subject of the present chapter, but it should be pointed out that they are considerably more systematic than those listed in the first edition, which was much criticised in this respect (e.g. by Crystal, 1969:295), and could form the basis of further systematisation. The obvious gaps in the inventory of tones, many of which have been mentioned explicitly, are presumably ascribable to the metapragmatic requirement of presenting a basic selection for pedagogical purposes.

3.1.2.5. Halliday

Halliday initiated a whole series of intonation studies in the sixties based on his scale and category and systemic theories of grammar, and using, for the most part, the received tonetic analyses of intonation. The first two articles, Halliday (1963a) and (1963b), reprinted in modified form as Halliday (1967), were the starting point; the differences between the earlier articles and the later book are thoroughly reviewed in Crystal (1969b). These articles were followed by Halliday (1966), partly incorporated into Halliday (1966-68), given pedagogical applications in Halliday & al. (1964), Albrow (1968) and Halliday (1970), and their principles were used in a study of some German intonation systems by Pheby (1969), this last also under the influence of Bierwisch (1966; cf. §3.1.1.3. above) and Isačenko & Schädlich (§3.3.2.).

The outstanding characteristic of the Hallidayan descriptions is their reliance on a previously formulated grammatical model. The reliance is twofold: both methodological, in that the same basic assumptions are applied to intonation description as had been developed for grammatical descriptions, and structural, in that the starting point for the descriptions is a prior account of grammatical systems of which the intonation patterns are then said to be "exponents", i.e. types or forms used in these grammatical roles.

It is not necessary to review the Halliday version of syntactic theory here except for a few central notions which affect his account of intonation and distinguish it from earlier accounts in the same tradition; much of the rest of the earlier accounts is heavily indebted to Bloomfieldian syntax. Many of the relevant points have been given a thorough review already by Crystal (1969b); it will be convenient to centre the preliminary remarks around the five key terms "delicacy", "discreteness", "grammar", "system", and "hierarchy".

The first of these terms, "delicacy", was originally described by Halliday as "the scale of differentiation, or depth in detail...whose limit at one end is the primary degree in the categories of structure and class... [and whose] other limit is the point beyond which no further grammatical relations obtain: where there are no criteria for further secondary structures, or systems of secondary classes or formal items" (1961:272). The term may be compared, roughly, with Chomsky's "descriptive adequacy", though the emphasis is somewhat different with the two terms: the former tends to emphasise the deductive element of linguistic fact-finding, from the general to the specific or "more delicate", while the latter (oddly enough in view of Chomsky's general position) acquires a distinctly inductive flavour within a programme of hunting down "linguistic generalisations" when compared with the Hallidayan concept. In fact the terms are simply two sides of the same coin (cf. esp. §1.3. above).

The second term, "discreteness", has a special, and controversial, role in any discussion of intonation, and when Halliday claims for intonation patterning in English that "the selection can be regarded as discrete on both axes, both syntagmatically and paradigmatically" for the purposes of analysis (1967:9), the nature of the claim calls for comment. The establishment of discrete variants of linguistic variables, and the discrete segmentation of trajectories of various kinds requires discrete criteria of analysis and thus the partitioning of the scale of delicacy into discrete steps; the alternative is the arbitrary chopping up of continua into portions. Halliday proceeds as if the discreteness of criteria were given and did not need to be argued; neither role nor type criteria permit this assumption, however, as scholars of various persuasions, from Bolinger (1951) to Trim (1964; 1970) and Quirk & Crystal (1966), have been at pains to point out. In Halliday's case, the assumption of discreteness for intonation patterning is a direct consequence of treating intonation patterns as standing in the relation of "exponence" (= 'realisation'; 'representation' in the sense of §2.4.3. above) to grammatical systems established by different criteria of analysis.

These grammatical systems, and the relation of exponence, determine the degree of delicacy to which the analysis of intonation is taken by Halliday; in practice, criteria are used which cast doubt on this claim: it is by no means clear why the criterion of "committal statement ('assertive', 'forceful')" (1967:27), used to distinguish a systematic role of a rising-falling plus low rising pattern from the role of "statement (neutral)" ascribed to a falling plus low rising pattern, should be regarded as "grammatical" in any explication of the received term, or indeed as well defined at all in the present state of research (cf. esp. §4.3.2. below). In fact, Halliday distinguishes elsewhere (e.g. 1966:121f.) between "categories of mood" and "contextually defined sentence functions"; it is the former which are a part of "grammar", if the term is not to be made so general as to lose its meaning. The latter, however, are the categories used in the body of Halliday's intonation analysis, rather than the former: "interrogative"

(formally and structurally defined) yields to the functional "question", "imperative" to "demand", &c., though in general both classes of terms are used together, the functional terms apparently as hyponyms of the grammatical terms. The weakness stems, perhaps, from the dominating dichotomy between "grammar" and "lexis" characteristic of the Halliday approach: the two terms are contradictories within an undefined area of discourse, little more being said about the difference between the two sub-levels of the linguistic "level" of "form" (1961:244) than that grammar is where closed systems operate, and lexis where open sets operate. Crystal, among others, has pointed out the inadequacy of this simple distinction in several respects as used to distinguish the two linguistic levels; two of the important points pertain to the closed systems within lexical patterning, and the impossibility of reconciling continua with the notion of "system", which is a set with a finite number of members, among other characteristics. In the absence of explicit criteria delimiting the scope of the term "grammar", the danger of confusion is present; one confusion which actually is present in Halliday's description is that between his own levels of "context" (where, presumably, the "sentence functions" are "contextually defined" (cf. above) and "form", in particular the sub-level of "grammar" (where, presumably, the "categories of mood" are defined). Later (1970:22), Halliday refers to the difficulty of distinguishing between "syntactic" distinctions (actually, those made on the basis of "sentence functions") and differences of "the speaker's attitude" in intonation analysis, and justifies his use of the term "syntactic" (corresponding to "grammatical" in earlier accounts) on this basis; both of these kinds of distinction are to be contrasted with "syntactic" or "grammatical" in the limited sense of the terms where the notion of "closed system" has any relevance, however, a distinction which Halliday does not mention in that context.

The point of the preceding discussion is that the "grammar" to which Halliday relates intonational patterning is ill-defined, and, in practice, is not grammar at all, but rather (in one sense of the term) pragmatics, albeit mixed with grammar. It is misleading to claim that the analysis is based on a prior analysis of grammar: the laxity of the relation between strictly grammatical categories and grammar is masked somewhat by the locution "neutral tone" with respect to grammatical constructions, and similar turns of phrase (cf. Crystal, 1969b:387) with respect to the role criteria themselves (e.g. "statement (neutral)" &c.). It cannot be doubted that there are subtle relations between grammatical patterns and intonational patterns; one way of seeing these, in terms of the semantic "harmony" or "congruence" of patterns from different levels of analysis, has been mentioned above (§1.2.5.3.). The subtlety of these relations should be made explicit, however, rather than disguised by the extension of a term to cover both grammatical patterning and the systematic role criteria used to establish it and other kinds of patterning. The reason for debating these matters at this stage is that a bare presentation of the intonational forms and structures outlined by Halliday would not do justice to his attempt to embed his description in a coherent methodology and in an overall description of language, which demands consideration of the fundamental position as well as of the descriptive fruits of work conducted from this position.

The terms used to guide the discussion so far pertain to the general theoretical framework used by Halliday; the final term of the set listed at the outset, "hierarchy", leads into an account of the actual structures he postulates. Phonology, conceived as an "interlevel" which "relates form and phonic substance" in the relevant formulation of Halliday's theory

(1961:244), is said to be structured as a hierarchy ("a system of terms related along a single dimension which must be one involving some form of logical precedence (such as inclusion)", 1961:248) with the terms 'tone group', 'foot', 'syllable', and 'phoneme', in that order. To show that these terms are in fact organised hierarchically, both the dimension of abstraction along which they are organised and the kind of logical precedence involved must be specified and provided with criteria; it is not sufficient to assume such organisation on the basis of some such elementary criterion, perhaps, as average relative length. These units each have their own criteria of analysis, and it is not immediately obvious that the relations between these sets of criteria will justify the postulation of a hierarchy in any non-trivial sense. The tone group is a structure with two parts, tonic and pre-tonic; these correspond to the received categories of European analysis, nucleus and head or body, with one important difference: Halliday quite rightly gives these units a level of analysis within the tone group which excludes intonational facts (e.g. concerning "tails") that are either phonetically completely predictable, or operate within different systems. The clear distinction between the categories tonic, tonic foot, and tonic syllable (one might ask: Why not "tonic phoneme", if the terms are genuinely organised within a hierarchy? - a bizarre possibility) was not always made explicit in previous descriptions, though some vague distinction of this kind was always implied (cf. the partial explication of Klinghardt's tone description given above). The foot is also a bipartite structure, with the elements ictus (correlating with "salient" syllables) and remiss (correlating with the following trains of unstressed or "weak" syllables), after Abercrombie (1964). This conception of the foot, in which the initial element is always the ictus (a view derived from Abercrombie's approach to the analysis of metre) and which therefore does not allow for initial sequences of unstressed syllables, is modified by Halliday to include the possibility of a "silent" ictus, an ictus with zero exponent. The modification is presumably to rescue the theory from falsification in the case mentioned. Crystal (1969b) and Wade (1969) have both criticised this construct in their reviews as lacking any supporting evidence, either in the signal or in kinaesthetic introspection (contrast Daniel Jones' well-known analysis of ['kku] for "Thank you", 1956:245n). The other two units in the "hierarchy", the syllable and the phoneme, are not dealt with. For tone group and foot structure an ad hoc symbolism is suggested: the foot is $I(R_1...n)$, and the tone group is $(P_1...n)T(2...n)$ with one tonic, or with double or compound tonic $(P_1...n)T(2...n)T(2...n)$ (1967:12f.). The symbolism is intended to show that certain elements are "optional", those in parentheses; since the symbolism is not part of a formalised generative description and is not utilised in the description itself it can be ignored. Another reason for rejecting the symbolism is that both in the case of the foot and in that of the tone group, two different positions in the "hierarchy" are unnecessarily conflated (foot and syllable, and tone group and foot, respectively), which Halliday is otherwise at pains to keep distinct. At the degree of delicacy with which Halliday is concerned this conflated symbolism obscures, rather than reveals, the relations under discussion. It would have shed light on the situation to point out the tagmemic character of this kind of patterning: each unit (tone group, foot) is structured as a sequence of elements (pretonic and tonic, or ictus and remiss, respectively), each having a unit of a different "hierarchical" status (foot and syllable, respectively, for these examples) with its own internal structure, as the "realisation", "exponent", &c.; Halliday's symbolism can be interpreted

with no difficulty in this way: the "places" denoted by integers represent the lower ranking exponent and its internal structure, and the capital letters represent the higher level structural element; the pairing of structural element and lower rank unit is what might be termed an intonational "tagmeme" in precisely the sense of the term used by tagmemists (discussed in Gibbon, 1974).

In Halliday's description, it is the tone group and its structure which are of primary importance; with the tone group he associates three "systems", termed "tonality", "tonicity", and "tone". Tonality is "the distribution into tone groups - the number and location of the tone group boundaries"; tonicity is "the placing of the tonic syllable (in "double tonic" tone groups, both tonic syllables) - the location, in each tone group, of the pretonic and tonic systems"; tone is the choice of intonation trajectory at tonic (at primary and secondary degrees of delicacy) and at pretonic (at secondary degree of delicacy; cf. p. 18). The structural relations which these systems incorporate are of rather different kinds. Tonality and tonicity are very closely related; both are systems which relate intonation patterns and their concurrent lexico-syntactic texts; their definitions thus pertain to the use of intonation patterns, the phonological choices being unique, and thus hardly choices at all. Tone involves selection of a variety of different trajectories on the basis of a number of type and role criteria, and is thus clearly a more strictly phonological matter. The three systems will be dealt with one by one, starting with tone, and proceeding to tonicity and tonality.

In the system of tone, the primary degree of delicacy is concerned only with tonic contours; the recognition of further distinctions between tone groups is said to be at a further degree of delicacy: one secondary system amounts to a further specification of the primary tonic trajectories postulated, mainly in terms of trajectory width (or height); the other is an extension of the system to the pretonic, assigning different pretonic contour types to the primary tonic trajectories. These three divisions of the tone system are summarised in Table 15. No level tone is recognised at tonic position (cf. 1970:7); Halliday appears to be the first to recognise a falling on-glide to the rise-fall contour, a pattern which reappears in Crystal (1969:218). Certain co-occurrence restrictions appear to hold between the various subsystems. In the case of tone 4, no choice is allowed and there is, in effect, only one combination for each of the secondary choices; hence the use of the same transcription symbol (4). In the case of tone 1, there is a "strong pull" (1967:17) between the secondary choices -1 and 1+. The primary tones listed in Table 15 are the simple tones, with one tonic per tone group; Halliday also permits tone groups with double tonics, containing tone 1 followed by tone 3, or tone 5 followed by tone 3, transcribed 13 and 53 respectively. These double tonics are not listed in Table 15, since no secondary tone systems are given for them.

A compilation such as that summarised in Table 15 clearly has to be based on a fairly comprehensive set of role and type criteria. As far as the role criteria are concerned, however, the information given is not very extensive. The notion of "contrast" is used to establish the distinctness of tones 1 and 2; tones 1, 3 and 5 on the one hand and tones 13 and 53 on the other; and between tones 3 and 4 (1966:121), 3 and 2 (1966:123f.) are made explicit, but nowhere is the precise nature of these "contrasts" made clear. The problem of discreteness was mentioned at the beginning of the present section: the discreteness of these role criteria - as with "statement or answer (neutral)" for tone 1 against "statement or answer (contradict-

PRIMARY TONE SYSTEM	SECONDARY TONE SYSTEMS			
	at TONIC		at PRETONIC	
1 Fall	1+ 1 1-	(n) wide (high-low) medium (mid-low) narrow (midlow-low)	1 --- -1 --- ...1 ---	(n) even (stepping towards onset of tonic) bouncing (salient syllables low, rising) listing (salient syllables mid, rising)
2 (Fall-) Rise-to-high	2 2	(n) straight broken (fall-rise)	2 - -2 -	(n) high (high level, perhaps stepping with (n) tonic) low (low level)
3 Rise to mid			3 - -3 -	mid (mid level) low (low level)
4 (Rise-) Fall-rise-to-mid	4 4	high (fall to mid) low (fall to low)	4 - 4 ---	high (high stepping to mid) low (salient syllables mid, falling)
5 (Fall-) Rise-fall	5 5	high (rise to high) low (rise to mid, "breathy")		

Table 15: Halliday's tone systems (1967:16f.). (Neutral terms in systems are denoted by '(n)'; iconic signs given only for pretonic system, others straightforward - N.B.: pretonic secondary choice notation '4' presumably error for '-4'; underlining indicates main "intensity"; parentheses indicate optional variants in primary system column.)

ory)("challenging", "aggressive", "defensive", "indignant, etc.") for tone 2 (1967:25) - and even the nature of other paradigmatic relationships holding between such terms appears to be assumed, perhaps on the basis of the discreteness of the lexical devices borrowed from English for Halliday's metalanguage (cf. Trim, 1970:267 on this problem). The same applies to the "major speech functions" and "minor speech functions" later used as criteria for the establishment of intonation patterning (1970:26ff.); these speech functions lack the precise definition which they might have been given to establish at least a few reasons for sticking to the notion of discreteness. Crystal wonders, in his review, why no further generalisation is made between the rising tones, on the one hand, and the falling tones on the other (1969b:384); indeed, the relations between the simple tones 2 (falling) and 3, or 2 (falling-rising) and 4, or 1 and 5 are very close from the point of view of type criteria, especially when the secondary systems at tonic are taken into consideration. Explicit criteria for distinguishing between primary and secondary levels of delicacy and thus, in the end, between the various primary tones, are not given, though some of the differences between secondary systems within the confines of individual primary tones are given

(e.g. 1967:28f.). It is difficult to come to a decision on the validity of the "contrasts" given, since only a very few of them are minimal, differing only in intonation; most differ quite considerably in the accompanying lexico-syntactic text, and so fail to provide a relatively well-defined basis for role judgments. A further question would concern the status of the "onglides" of tones 4 and 5; their parallelism in the presentation suggests that they are parallel in other respects, too. This may be so, but some indication should be given of the reasons, perhaps at a tertiary level of delicacy; a fruitful starting point for the provision of criteria for a fuller description of the tri-directional trajectories would be either Armstrong & Ward's rise-prefix for "additional emphasis" (this is, in fact, how these authors describe the contour which Halliday gives as tone 4), or Kingdon's homosyllabic pre-heads (see above, pp. 114, 137f.).

The compound (double) tonics magnify the problem of finding criteria for distinguishing between five possible sources of falling-rising patterns: a tone (i.e. tone 4); a tone group (with tone 2, the fall and the rise being in different parts of the group, the number of feet permitting; 1970:17); a compound tone group (13); a sequence of tone groups (1 || 3, or 1 || 2). Tone 53, the second compound tone, might be added, and compared in particular with tone 4; the relation of the compound tones to each other, too, requires clarification: it is surely no accident that the difference between the two is to be ascribed only to the constituent tones 1 and 5, traditionally regarded as very similar and differing perhaps only along some dimension of emphasis. Further instances of ambiguity are the "listing" head on the one hand, and sequences of tone 3 or tone 2 on the other, either with tone 1 following; another is the difference between 53 and 5 || 3. Many of these ambiguities also involve the discussion of tonality and tonicity: although these are presented as separate systems, decisions about tonicity are required in discussing the compound tones 13 and 53, and even the simple tone 2, and decisions about tonality (boundary placement) are required in discussing the relation between different structures assigned, say, to falling-rising patterns. The incorporation of tonality into the discussion is all the more difficult since Halliday holds (1970:51) that "the tone group boundary does not imply any break in the structure, and there is no pause between successive tone groups"; there seems to be a dearth here of both "characterisation" and "delimitation" criteria, in the sense of Trim (1959:26; cf. also §2.3.2. above), for the definition of tone groups. A question which suggests itself in this context is whether the tone group, even assuming it could be given adequate defining criteria, is sufficient to account for accentual groupings in English intonation. The absence of "larger" units and "smaller" units - all above the rank of foot - is conspicuous, since (however the pre-theoretical notion of "delicacy" be defined) these distinctions may, in a manner of speaking, be said to be rather "indelicate". There is a point in Halliday's description where this might have been done: the notion that the compound tone groups can be described as having a "major information point" (tone 1 or tone 5) followed by a "minor information point" signalled by tone 3 (the distinction here being derived from Hultzén, 1959 - cf. the discussion of falling-rising patterns in the following chapter) is very close to Trim's distinction between major and minor tone groups (1959), without actually taking the step of postulating minor tone group boundaries; the consequence is that the other patterns which Trim captures elude Halliday. The other possibility, in the absence of delimitation criteria, would have been to concentrate on building up a pitch accent theory; despite Halliday's particular interest in the complexities of theme-rheme

patterning in the syntax and given-new patterning in the intonation systems (cf. 1966-8), which would have lent itself to such a formulation, this is not done, with the result that relevant categories such as Kingdon's "head" (the first salient syllable of a tone group, in Halliday's terminology), or the widely documented "break", both of which may be roughly characterised as thematic accents, are not incorporated into the description at all.

There are a number of other interesting aspects of the Halliday description of intonation, both in the number of patterns described (cf. Albrow's extension of the number of pretonic patterns, 1968:60ff., adopted by Halliday, 1970), and in the attempt to provide a stringent set of role criteria in his systemic approach (cf. esp. 1966-8); the former are subject to the same considerations, however, as the other patterns, and the latter fall outside the scope of the present chapter. Although many of the preceding remarks may appear to have had mainly destructive character, the attempt of Halliday to put the often subtle, but theoretically wayward prosodic descriptions of intonation into a coherent framework is unique on the scale at which Halliday works, incorporating as it does quasi-tagmemic ideas on structure on the one hand, together with Prague school ideas on the functions of language and their means of realisation, and his own original distinctions and observations, on the other. It is unlikely that the nature of precision in intonation analysis can be seen except in the light of such bold attempts at description, idealised though they may be, as those of Halliday. There is, however, no easy progression from an idealised description to a more accurate one (perhaps "more delicate", but in any case "descriptively more adequate"); this progression may necessitate thorough rebuilding rather than simple progression by extension. It is this difficulty which Halliday has to face head on when he acknowledges many of the ambiguities discussed above, under the innocuous heading of "difficulties of recognition" (1970:19ff.). Besides the ambiguities in sequence type, there are also problems associated with the possibility of "gradual distinction" (i.e. continua), for instance between the secondary tones of tone 1 or tone 4, between tone 1 and tone 5, each being a case of semantic and phonetic continua in association with each other (cf. Trim, 1969), or between tones 2 and 3, a case where a phonetic continuum relates to "fairly distinct" meanings and where the shading may thus be seen as phonetic overlap in the usual sense of the term (for the "distinctness" of low and high rises, cf. esp. Kingdon, 1958:7 - "The high and low varieties of Tone 1 have to be treated separately, as they are used for different purposes, whereas in the case of the other tones the difference between the high and low varieties is one of emphasis and feeling, and not one of function."). It is not possible, however, to tack on observations about continua to a description based on the postulate of discreteness, without raising grave doubts about the very foundations of the description.

3.1.3. Jassem

Although Jassem's description of the intonation of conversational English (1952) is clearly in the European tradition if judged by the forms postulated, its methodology departs quite considerably from that of other European approaches. Jassem's debt to previous European descriptions is acknowledged by way of Palmer's notation, which he takes as the basis for his own (p. 10), but he gives practically all European descriptions up to that time, with the exception of Palmer's, rather short shrift, and omits

to refer his results with the "new" methodology to the older results. The new methodology follows the Bloomfield procedure of providing a system of postulates based on a small number of empirically motivated primes, and deriving from these definitions of linguistic units (cf. Bloomfield, 1926); this methodological debt, documented by references to Bloomfield and his followers, may be illustrated by quoting one of the eight postulates set up (p. 29):

- (2) Only those features and combinations of features of the sound waves are linguistically significant which are detectable by the ear and are conventionally recurrent in a speech community.

There are differences between Jassem and the Bloomfieldians, for instance in the respective conceptions of the status of phonetic transcriptions (pp. 17f.; cf. §2.4.1. above), but the similarities extend to details of empirical underpinning: psychological associationism (p. 25); meaning as "the listener's reaction" (p. 33); underestimation of the complexity of the relation between acoustic measurements and linguistic forms (p. 47); and also reliance on the simplistic dichotomy between "empirical" and "dogmatic" (p. 32). Unlike the later analyses of intonation in the Bloomfield tradition, however, Jassem does not apply a monolithic phonemic criterion to establish intonation forms; he is aware of the different nature of intonation meanings, which he calls "connotations" (not to be confused with "connotation" in older philosophical semantics). Omitting a "phonemic" stage in his analysis, Jassem bases his analysis on "the specific meanings" carried by intonations (p. 27), making the status of these meanings explicit:

Intonation carry meanings which, though they may be said to relate to other things than those to which morphological and syntagmatic forms relate, are essentially similar in character. Intonations of non-tone languages tend to serve to communicate the attitude of the speaker to the listener and to the things spoken about.

In addition, he points out (p. 28) the impossibility of providing criteria of demarcation for strictly linguistic items on the one hand and supposedly non-linguistic attitudinally relevant items in speech on the other. But, despite the placing of both sound and meaning in the forefront of the analysis, the presentation of the analytic results ignores the role criteria, presenting first the forms, classified in various ways, and then the "connotations" (intonation meanings) of some of the patterns, more as an interpretative appendix than as a set of criteria for identifying forms. This manner of presentation differs in no way from the traditional manner of the earlier studies. Jassem's study differs considerably from Halliday's, however, to take the most conspicuous example, in its theoretical emphasis; in the more favourable climate of the early fifties, the most weight was laid on formulating assumptions and criteria of analysis, while Halliday's theoretical approach concentrates on the forms and structural relations, leaving the methodological background inexplicit. The Bloomfieldian flavour of Jassem's list of four "prejudices" to beware of in intonation analysis can well serve as a therapeutic counter-measure in the post-Chomskyan age of linguistic description (p. 22):

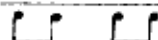
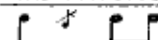
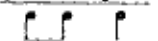
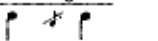
- [These prejudices] will probably be (1) paralleling intonation patterns in the language under investigation with native intonation patterns, as the result of acquired speech habits, (2) a preconceived relation between

intonation patterns and morphological or syntactical constructions such as words and sentences, (3) perception of intonation in units other than tone-segments, (4) preconceptions as to the value of tonal patterns following from general linguistic theory, which is liable to overrate similar tendencies in different languages, make rash and sweeping decisions often by a priori reasoning, and look for examples to suit those decisions.

This is undoubtedly a healthy approach, whatever reservations might be made about particular atomistic decisions, as in the third prejudice, which still retains its pertinence to accurate intonation analysis (see below).

The procedure of presentation, reflecting Jassem's analytic priorities, is from an initial segmentation to the identification of intonation forms, based on these segments and sequences of them, by procedures of grouping and classification. In addition, an analysis of the rhythmic system of English is given, though it is kept somewhat isolated from the rest of the description.

The description of rhythm contains a number of notable features which, though not closely integrated into the rest of the description, are of interest for the description of the relations between accentual and intonational systems. It can be characterised briefly by the following points: English rhythm is isochronous; the notion of "word" is supplanted by the more strictly phonological "rhythmical unit"; the notion of "stress" is - a highly interesting point - defined via the categories of rhythm, and not vice-versa. The chain of definitions starts with what might be termed a weak form of the postulate of isochronous rhythm, i.e. the postulate that the "stresses" which constitute rhythm occur at roughly equal intervals. The rhythmical units of which utterances are said to consist, in Jassem's system, tend to be "of equal length", and consist in turn of "syllables whose length tends to be inversely proportionate to their number" (p. 39). It is not quite clear from this formulation how the priority of rhythm over the individual stresses in the rhythmical units is actually established: there are two ways of identifying and delimiting the rhythmical units, one with reference to the temporal distance between the stresses which commence these units (p. 40), and the other by means of the relative length of syllables, and neither of these involves the priority of an overall rhythmical pattern. The nature of rhythm in language is still, however, by no means fully researched (cf. Crystal, 1969:161f.). Apart from the regular rhythmical patterns of English, Jassem finds another rhythmical phenomenon which he terms "anacrusis", defined as a succession of syllables which "tend to be pronounced extremely rapidly, and [whose length] does not show any relation to their number in succession" (p. 40). Since the rhythmical juncture which terminates rhythmical units is said to occur before an anacrusis, and on the other hand rhythmical units begin with a stressed syllable, the syllables of an anacrusis (symbolised in musical notation as grace notes) appear to have proclitic character with respect to rhythmical units. This is confirmed by Jassem's examples (p. 41):

- (28) summer dresses vs. some addresses


- (29) greater gain vs. great again



The examples show that the postulate of anacrusis is an attempt to explain in rhythmical terms what the American structuralists, roughly contemporaneously, were explaining by means of the notion of internal open juncture, a topic which will figure again to some extent in §3.3.3. below. Trim (1959) allows a more flexible interpretation of "anacrusis" as an a-nuclear rhythm group, to be treated as one kind of clue to the positioning of minor tone group boundaries, in association with enclitic a-nuclear rhythm groups of a kind which Palmer (1922:7, cf. p. 129 above) had already described in connexion with parenthetical phrases, particularly those containing *verba dicendi*. This interpretation is not in conflict with Jassem's definition, but the enclitic types of rapid syllable sequence are not covered by Jassem's illustrations (and perhaps, judging by the traditional use of the term "anacrusis", are not intended to be covered). The point is not quite clear. Sequences which are neither isochronous nor in anacrusis are said to be "anomalous" or "disturbed" (p. 40), but no further use is made of this aspect of the classification.

The intonational system which Jassem proposes touches the rhythmical system only at a small number of points, in particular in connexion with a marginal role given to pause, and the definition of 'tonal unit'. The two starting points for Jassem's description of intonation, however, are apparently independent of the rhythmical system. In accordance with the strict inductive procedure of initial segmentation, followed by classification and grouping procedures, to which he had committed himself in earlier sections of his study, one of the two starting points is the "tone segment". This tone segment is, in fact, the syllable (p. 36), a unit which is obviously identified prior to the intonation description on independent (and here unspecified) grounds. The role of the tone segment in intonation remains somewhat obscure, since it "is easily found to be too small a part of the intonation pattern to have functional relevance" (p. 46); it has a marginal role, at best, to play in the intonation system, and there is no reason to believe that it has more than an informal heuristic role to play in intonational discovery procedures.

The second point at which the description of intonation is taken up is at the other end of the scale of magnitude, the "tone group", defined in terms of "utterances" (these having been defined previously in the theoretical preamble) and "tonal junctures" (p. 43):

The tone group is an utterance, or that part of an utterance, which is delimited by two consecutive tonal junctures.

The tonal juncture, in turn, is defined in three related ways (pp. 44f.):

- (a) the beginning of an utterance after silence, (b) a normal pause [i.e. a pause occurring after, not within, a rhythmical unit - DG] separating utterances with specific meanings, (c) a place in an utterance having no phonetic value at which a normal pause may be inserted without causing any change of meaning of the utterances which it separates.

The semantic criteria on which all of these sub-sections of the definition are ultimately based (p. 43) are not, however, given as explicit a place in the further description as they would seem to require. While Jassem is clearly justified at this point in taking Palmer to task for his imprecision in delimiting the "Tone-Group" (cf. §3.1.2.1. above), pointing out that the criterion of identification fails when tone groups without a "maximum of prominence" (cf. also discussion in §2.3.2. above) are allowed, his own definition, on the other hand, is one-sided in the opposite direction: Jassem's

tone-groups are defined solely by semantic delimitation criteria rather than internal phonetic characterisation criteria; the phonetic information which might be relevant to delimitation are only hinted at in later accounts of combinations of tonal units and of tunes.

Although the intonation description ostensibly starts from the tone segment at the one end and the tone-group at the other, the basic item for which both functional and phonetic criteria are given is the "tonal unit". This unit is based on the identification of pitch trajectories which have a role in the system which could be described as functions from tone segment into rhythmical units, if Jassem's statement of the status of the tone segments is taken at face value. Using simple tests, in which a text (such as *Why didn't you take a bus?*) was pronounced with a number of different pitch patterns, which native speakers of English were requested to assign to the same number of different semantic interpretations, Jassem arrived at the following list of six different "classes of tonal units": (1) level, (2) falling, (3) rising, (4) falling-rising, (5) rising-falling, (6) rising-falling-rising (p. 50). In this context, certain items are referred to as "intonations", a term which is not defined in Jassem's system, but which is perhaps to be interpreted simply as "pitch trajectory". It would take the present discussion too far to discuss the empirical foundations on which these tests and their results rest; despite the meagreness of this foundation, a genuine attempt to provide such a foundation was made, comparable in the history of intonation description only with Bolinger's roughly contemporaneous study of pitch levels and configurations in intonation, and, considerably later, with the work of Quirk & Crystal (esp. 1966).

Since tonal units only represent one aspect of intonational contrast, the relative initial and final height of trajectories also functioning in this way, and since tonal units assigned to different trajectories are held to be sometimes in free variation (pp. 52-3), a further type of classification ("systematization", p. 46, this time, rather than the "grouping" function by which the tonal units themselves were established) is introduced. The criteria for this systematisation involve both kinds of variable just mentioned: functional equivalence and relative pitch height, different pitch height relations leading to different types of systematisation. The new structural category introduced by means of these additional criteria is termed "tune".

Two kinds of subclassification are introduced for tunes: one into simple (consisting of one tonal unit) or compound (more than one), and another into nuclear or prenuclear tunes; the attempt is made to rely on characteristics of pitch trajectories alone for these subclassifications. The criteria for classing tonal units and sequences of tonal units as simple or compound tunes are fairly straightforward, and can be stated in terms of trajectories of successive tonal units and the syntagmatic height relations holding between them; the criteria are tabulated in Table 16, using the notation applied in the systematic reformulation of Klinghardt's observations above (cf. Tables 1 and 2), but simplified in an obvious way, eliminating Greek variables in favour of the direct expression of greater/less relations. In cases where the assignment of level tones to preceding or following rising or falling tonal units is not clear from the tabulated information, the decision is made to assign them to the following, rather than the preceding, sequence (pp. 55f.).

The subclassification into nuclear and prenuclear tunes is made on the basis of criteria which refer nuclear tunes to the bottom of the speaker's pitch range, and prenuclear tunes to the initial height of nuclear tunes.

TRAJECTORIES OF TUNES	CRITERIA OF ANALYSIS FOR COMPOUND TUNES	
	SUBTRAJECTORIES OF CONSTITUENT TONAL UNITS	CONDITIONS ON SYNTAGMATIC PITCH RELATIONS BETWEEN ADJACENT POINTS OF TONAL UNITS
Level	[level]TU _k	[Height]TU _i = [Height]TU _j
Falling	[level]TU _k v [falling]TU _k	[Height]TU _i ≠ [Height]TU _j (i) & [Height]TU _i > [Height]TU _j (ii)
Rising	[level]TU _k v [rising]TU _k	[Height]TU _i ≠ [Height]TU _j (i) & [Height]TU _i < [Height]TU _j (ii)
Rising-falling	[risingfalling]TU _k - ([falling]TU _{k+m} v [level]TU _{k+m})	(Condition on falling section as condition (i) on falling compound tunes.)
Falling-rising	[fallingrising]TU _k - ([rising]TU _{k+m} v [level]TU _{k+m})	(Condition on rising section as condition (i) on rising compound tunes.)
Rising-falling-rising	(No rising-falling-rising compound tunes observed; only simple tunes.)	

Table 16: Criteria for analysis into compound tunes (after Jassem, 1952:54f.), tabulated with modified notation of Tables 1 & 2 above; N.B.: $1 \leq k \leq n$; $1 \leq i \leq j \leq n$; $m \leq n$; quantification omitted but otherwise expressions as in standard interpreted predicate and propositional calculi; concatenation symbolised by ' - '.

Apart from the following general definition (p. 57; cf. §2.3.3. above) -

Tunes which are defined in terms of the directions of the tone movement and their relation to the bottom pitch of the speaker's voice are nuclear - a number of specific criteria are given, which are tabulated in Table 17, adapted from Jassem's own diagram of nuclear tune types, which shows an analysis similar to those of distinctive feature theorists. The main problem raised by a feature classification such as this is basically one of the functional criteria used: if phonetic criteria are relied on solely, an embarrassing choice of alternative analyses arises, and clearly no claim to "distinctiveness" in the phonological sense can then be made. Jassem chooses to analyse the unidirectional non-level trajectories, for instance, in terms of a particular hierarchy of features, five in all (in the columns of Table 17), each binary. The reasons for this particular choice, either on a phonetic or a functional basis, are not explained, however. One odd feature of the classification is the clash it occasions with the fundamental definition of "nuclear tune" in respect of the height variable: one of the two height variants is defined negatively with respect to the bottom pitch of the speaker's voice, which, lacking an overall characterisation of the structure of the height variable, destroys the definition as a definition in the technical sense. Other divisions into components on phonetic

VARIANT CLASSIFICATION BY TRAJECTORY FEATURES			CROSS-CLASSIFICATION OF VARIANTS	
			HEIGHT	WIDTH
Unidirectional	Level		High Low	
		Not level	Fall	High To bottom pitch Full Low
			Rise	High From bottom pitch Full Low
Bidirectional	Falling-rising		High Low	
	Rising-falling		High Low	
Rising-falling-rising:			Noted as rarer, "probably used more frequently by women than by men" (p. 61n); less used by younger speakers (61n).	

Table 17: Jassem's classification of nuclear tunes (thirteen feature combinations represented by the rows of the table; 1952:60).

grounds are conceivable: with reference to top pitch, or with narrow contours grouped together, or with the trajectory conceived as a relation between pitch levels as in pitch phoneme theory or Trim's non-phonemic model (1970). It must be assumed that Jassem had supplementary criteria for grouping the full (high to low) contour with the low (mid to low), rather than the high (high to mid) contour. The problem has been mentioned already in connexion with Schubiger (§3.1.2.3.), and will be discussed in systematic context in the next chapter.

The pre-nuclear tunes are defined with reference to the syntagmatic pitch height relations between them and the initial point of the nuclear tune; the relations, and the trajectory components which enter into them, are tabulated in Table 18. Jassem notes the rise-fall here as a free variation of the fall (p. 63), and (without further explanation) regards an initial level element in a compound rising pre-nuclear tune followed by a lower nuclear tune as constituting a separate pre-nuclear tune. There are serious problems of definition involved in Jassem's system, however. For a given sequence which is held to reach the bottom of the speaker's pitch range (cf. the definition of nuclear tunes given above), there is no criterion for deciding how many nuclear tunes are involved if the low pitch limit is reached by more than one tonal unit. One kind of trajectory associated with the text of example (30) could, for instance, fall equally low in each word; Jassem remarks (p. 61) that "when the tone-group expresses reproach, Mister may reach the bottom pitch or not. It makes no difference

TRAJECTORY VARIANTS	CROSS-CLASSIFICATION BY HEIGHT	
	High	Low
(Rise-) Fall	[Height]PN ≠ [Height]N	[Height]PN < [Height]N
Rise	[Height]PN > [Height]N	[Height]PN ≠ [Height]N
Level	(a)[Height]PN > [Height]N (for [rise, rise-fall, level]N)	[Height]PN < [Height]N (for [fall, fall-rise, level]N)
	(b)[Height]PN ≠ [Height]N (for [fall, fall-rise]N)	[Height]PN ≠ [Height]N (for [rise, rise-fall]N)
Fall-rise	[Height]PN > [Height]N	[Height]PN ≠ [Height]N

Table 18: Jassem's pre-nuclear tunes (1952:62); 'PN' = 'pre-nuclear tune'; 'N' = 'nuclear tune'; disjunctions of variant predicates symbolised by comma; relations hold between adjacent points of tunes.

in meaning". The only criteria which would enable a grouping into pre-nuclear and nuclear tunes to be made in this case would be either functional, e.g. "tonicity-preservation" (cf. §4.1. below) as a paradigmatic relation between utterances corresponding to the following two transcripts -

(31) \Mister \Smith

(32) 'Mister .Smith -

or an arbitrary principle that each tone group contains only one nuclear tune. Jassem's treatment of the nuclear status of compound tunes suggests that the latter principle might be in operation: in summary, it can be said that if it is not the first tonal unit of any compound tune which reaches (or leaves, if rising) the bottom pitch, then the tune is regarded as split, and the rightmost section which does reach the bottom pitch is given nuclear status. This shows that the tendency to rely on covert criteria is quite strong: this "pull" of the nucleus to the right, and the accompanying tendency to allow only one nucleus, is primarily a function of the role criteria employed. This analytic problem relates closely to problems of accent analysis, and discussion of it will be resumed below (§3.3.).

Two further observations of Jassem's relate to sequences of tunes; the first he discusses as "tonal sandhi", and the second as "the bottom pitch band". The cases of tonal sandhi are incompletely characterised, but amount to the simplification of individual tonal units in favour of spreading a trajectory configuration over a sequence of tonal units. In the first case, unidirectional non-level tonal units are simplified to level tonal units if "not final before a pause" and consisting of a single syllable, as in the following alternations (examples (33) and (34)). In the second case, bidirectional falling-rising tonal units are simplified to falling tonal

(33) .Those are what \I .like .Those are what 'I .like

(34) /Sir, said he ... ,Sir, 'said he ...

(35) \John \Poor .John

(36) ... ,like \English mutton ... ,like 'English .mutton

units under the same conditions (with two-syllable sequences occasionally observed in addition; example (35)). In the third case, bidirectional rising-falling tonal units are simplified to rising tonal units under the same conditions (36). The statements of the conditions of alternation are Jassem's; more adequate to the phonetic facts is the interpretation of Jassem's "replace" as "simplify" (more adequate still would be the incorporation of this into an explicit version of neo-Praguean markedness theory), and the statement of the conditions of alternation in terms of global trajectory similarities, as indicated in the introductory remark above on tonal sandhi.

The bottom pitch band is postulated in order to cater for a certain laxity in the notion of "bottom pitch": a falling tune may continue falling after the tonal unit in which "bottom pitch" is supposedly reached; "rhythmically strong syllables" after a falling nucleus are said to have a tendency to "sound about a tone or so higher than the rest" (p. 67); finally, the notion of "bottom pitch" has a slightly different status for rising tunes than for falling tunes, tending to be somewhat higher than for the former. The second of these three cases corresponds to what Trim (1959) called "enclitic rhythm groups", and covers an aspect of intonational structure which is capable of further analysis in Jassem's own terms, utilising his description of English rhythm (cf. the remarks above, pp. 232f.), as well as in terms of pitch patterning, rather than the simple variation which Jassem postulates (cf. Kingdon on adjectives, 1958:120ff., and §3.1.2.2. above).

The details of semantic interpretations which Jassem provides for some of his forms and patterns are not of immediate concern here, though they will figure in later discussion. It would have been more in line with Jassem's program if he had shown during the discussion of forms and structures how the role criteria of analysis which the semantic interpretations he provides at the end obviously reflect the descriptive decisions made. The interpretation tests he performed give an interesting taste of the possibilities. Despite criticisms which can be made of other aspects of Jassem's description, such as the tenuous thread linking the analyses of rhythm and intonation, and the related neglect of the notion of "accent" or "sentence stress", or the uncertain status of the atomic "tone segments" in the otherwise carefully developed chain of abstraction, the description which Jassem provides has stood alone for a long time among the European descriptions of intonation in the standard of its theoretical underpinning.

3.1.4. Crystal

Crystal's extensive studies in English intonation and related fields may be said to represent, in many ways, an extension and refinement of Jassem's methodology; in content, many details of the analysis are more in line with the earlier tonetic studies, but the kinship of Crystal's and Jassem's methods - perhaps by virtue of the paucity of comprehensive empirical studies with equally explicit theoretical underpinning - is hardly to be denied. To equate the two methods would be false: there are quite

large differences in emphasis, and the linguistic developments which intervened between Jassem's and Crystal's work have left their mark in terms of the relative sophistication of the latter. But many similarities, quite independent of their common ancestry (most clearly discernible in the notational debt to Palmer), are rather striking, and justify treating both approaches separately from the general development traced above in §3.1.2.

Like Jassem, Crystal based his work on an extensive corpus of recorded utterances and provided his analyses with a carefully argued foundation in a form of empiricist methodology; Jassem went further in the direction of the extreme empiricism of Bloomfield, attempting to reduce all descriptive categories to a limited number of empirical primes via a system of postulates and definitions in the Bloomfieldian manner, while Crystal follows an empiricist procedure which is toned down by the confrontation with Chomskyan argumentation (1969:6ff.), using statistical methods (relating both to corpora and to interpretation and other tests) and intuitive judgments about plausible generalisations in complementation of each other (1969:9):

Reliance on intuition is justified until one meets with conflicting intuitions about what is the case, and phenomena like intonation produce queries on every front (though no-one thereby doubts the underlying systematicness of intonation). This in my view is the main justification for any statistical work on language: it should produce information about the facts of English which is unexpected, non-trivial. Of course only such facts will be accepted as linguistically significant as receive a posteriori intuitive ratification, otherwise one would let in distributions reflecting all kinds of irrelevant phenomena ... But the function of intuition here is not as a basis of analysis or classification. The statistics display a distribution or pattern which, upon reflection, we realise underlies our unconscious performance.

Apart from this broader methodological base of Crystal's, the analyses also differ somewhat in the weighting of role and type criteria, at least in the theoretical discussions, actual analytic practice being a different matter. Jassem insisted on the parallel use of both role and type criteria, whereas Crystal, in emphasising the importance of 'formal' analysis, takes up a different position, more characteristic of later structuralistic approaches than Jassem's, which in effect gives priority to phonetic criteria (1969:18):

All that emphasising a formal, as opposed to a 'semantic' or 'notional' approach to description implies is that, procedurally, considerations of meaning ... do not enter in until a stable basis of formally defined features has been determined. Then a more satisfactory classification of meanings can be carried out.

The process of analysis is not, however, quite so unidimensional: certain decisions on role criteria, such as those on the 'linear' ('gradient') or 'digital' ('all-or-none') nature of type-role correlations, or those on the presence or absence of 'double articulation' in intonation systems, are already present in pre-theoretical characterisations of descriptive adequacy, and as such require simultaneous operation with role and type criteria (§1.3.2. above). The difficulties to which the use of role criteria can lead are obvious, but the limitations of what Crystal calls a 'formal' approach, with its implicit, ad hoc, and at best paradigmatic role criteria (§1.3.2. above) should not be overlooked either. In practice, Crystal allows in criteria from areas outside a strictly formal analysis of intonation alone, as an aid to analytic decisions; similarly, Jassem tended to leave

syntagmatic role criteria implicit in his presentation; one instance of the use of such additional criteria is in Crystal's discussion of the problem of tone-unit delimitation (1969:206f.):

... if a tone-unit with a rising tone and a tail of more than one syllable precedes a tone-unit with a relatively long prehead, then the series of low unstressed syllables could theoretically produce a sequence which would be phonetically impossible to split. In such a circumstance there would be no alternative but to have recourse to grammatical or semantic criteria to place the boundary.

This assumes the existence of a boundary prior to the establishment of criteria for finding it. In a later study, the functional elements of analysis are given a more explicit status (1975a), though at the expense of the methodological clarity of the earlier version and without the clear definitions of functional categories which would be necessary to match those of the type categories in the earlier version.

In the earlier formal analytic framework, Crystal attempts to keep his definitions free of 'notional' elements. Jassem had already discussed the difference between phonemes and intonations in terms of the variability of the latter (changes in intonation being predictably allowed, and associated with predictable changes in meaning) and the fixture of the former (non-predictability of either the possibility of change or of analogous change in meaning) with respect to words (e.g. from 'pack', 'pack' and 'tack' one can predict the possibility of 'tack' and the kind of meaning change involved, but from 'pack', 'tack' and 'patch' one cannot predict either the possibility of 'tatch' or any regular change in meaning), and Crystal's own definition of 'prosodic systems', of which intonations are a special case, is very similar (1969:5; also §1.2.3. above):

More precisely and positively [than a definition in terms of "the non-segmental 'residue of utterance'" - DG], we may define prosodic systems as sets of mutually defining phonological features which have an essentially variable relationship to the words selected, as opposed to those features (for example, the (segmental) phonemes, the lexical meaning) which have a direct and identifying relationship to such words.

That is, the definition of prosodic features is, Crystal's own claim to the contrary, approximately the same as the negative section of Jassem's characterisation of intonation. The positive, and in fact essential, aspect of Jassem's characterisation is the use of the semantic criteria, which Crystal wishes to eschew in the 1969 presentation. Even the negative part of the characterisation, in Crystal's version too, only exists by virtue of a reference to the non-intonational category of 'word'. Despite this slight unevenness in the application of the different kinds of criteria of analysis, the care taken in making the empirical foundations of their descriptions explicit distinguishes both Jassem's and Crystal's studies from those discussed in §3.1.2. above.

Crystal's phonetic criteria of analysis are organised into a fairly taut, systematic net, based explicitly (unlike Jassem's) on a very detailed feature framework. This approach, which is characteristic of all of Crystal's work on prosodic and paralinguistic features (esp. 1963; 1964; 1969; 1975; Crystal & Quirk, 1964; Quirk & Crystal, 1966; Crystal & Davy, 1969) is called by Crystal 'parametric' (1969:195f.; this study, the most comprehensive, will form the basis for most of the present discussion). In

the context of intonation analysis, for instance, this approach means that intonation forms are not organised in a single system, but are functions of several features, each of which is associated with roles relatively independently of the others. The type variables used are referred to as 'parameters' and 'dimensions' (more or less synonymously) in the physical (acoustic) and physiological (articulatory) domains, and as 'sound attributes' or 'psychological attributes' in the domain of auditory sensation (the last is distinguished from a domain of 'interpretation' on methodological grounds, though the close relation of these two domains is pointed out - p. 15). Correlating type variables are associated into contrasting 'features' at a more phonological level of analysis, and these are organised into 'systems' ('categories of phonological contrast', p. 130). The bundles of correlates which constitute the features tend to be named in terms of the attributes, rather than the physical dimensions, presumably by virtue of the close relation between auditory sensation and interpretation mentioned above (cf. also §1.1. above). Crystal lists (p. 131) eleven systems within the overall domain of 'non-segmental phonation', itself subdivided into the three subdomains of 'prosodic', 'paralinguistic' and 'non-linguistic' systems, and the last (cf. the definition of 'system') referred to simply as 'features'.

These three sub-domains are established mainly on the basis of type criteria, though role criteria are later mentioned in passing (pp. 128ff.); the intonation systems are a sub-class of the class of prosodic systems, while the stress systems are a different sub-class. The major distinction between prosodic and paralinguistic features is made in terms of a type distinction between pitch, loudness and duration (as well as silence) on the one hand, and "vocal effects which are primarily the result of physiological mechanisms other than the vocal cords, such as the direct result of the workings of the pharyngeal, oral or nasal cavities" (p. 128) on the other. In addition, the latter features are said to be phonetically less discrete than prosodic features, and also "discontinuous in connected speech", having the character of additions, rather than ever-present trajectories, to the segmental and prosodic complexes. Functionally, these two sub-classes are said to be rather closely related, and the possibility of arranging the union of these two sub-classes in terms of a 'more linguistic' and 'less linguistic' ordering of its members is mooted (p. 129; cf. modifications of this scale, and related scales, on pp. 176, 289). The tension system is seen as ambivalent between prosodic and paralinguistic classification, falling into both classes, and occurring approximately half-way along the 'more-less linguistic' scale, between the prosodic and paralinguistic parameters. The further sub-classification into intonation and other prosodic systems is, in fact, a derived one: the intonation system is "the product of a conflation of different prosodic systems of pitch contrasts" (p. 6), in fact the systems of 'pitch direction' and 'pitch range' (the former also referred to as 'tone') closely interacting with the other prosodic systems of 'loudness' and, to a lesser extent, 'rhythmicality' and 'tempo'; the prosodic systems also include 'pause' and 'tension', while the paralinguistic systems comprise 'tension', 'voice qualifiers' and 'voice qualifications', and the non-linguistic features are 'voice quality' ("the permanent non-segmental idiosyncratic factor in a person's speech", p. 126) and 'vocal reflexes'. It is obvious that the major criteria for distinguishing between many of these systems are role criteria, from the most primitive (identification of personal idiosyncratic traits) for voice quality, through the situationally more flexible voice qualification features (laugh,

giggle, tremulous, sob and cry) and voice qualifier features (whisper, breathy, husky, creak, falsetto, resonant, spread), each with exactly statable phonetic correlations (cf. p. 135), to the lexico-syntactically relevant segmental features; it is not possible to make these distinctions on phonetic criteria alone, since even with the most primitive kinds of effect, the 'natural' role-type relation involved in the features (cf. §1.2.5.3. above) cannot be idealised into a purely physical dimension, or attribute, in view of the interpretative element involved alongside of the perceptual and other elements. Within Crystal's frame of reference, such criteria can be traced ultimately to the initial negative characterisation of 'prosodic systems' in terms of their "essentially variable relationship to the words selected" (p. 5; see above), and to the similar characterisation of 'paralinguistic systems' in terms of the variability of prosodic features with respect to them, too; it is not clear whether this variability is a symmetrical relation, but if it is, and this seems likely, then these two characterisations are logically the same. Otherwise they are converses, but still similar in principle. Nowhere is the exact structure of the role criteria used in establishing prosodic and paralinguistic structures and forms presented in a unified manner, however; this is presumably a consequence of the claim to the priority of a 'formal' approach, discussed above.

Still in the context of the descriptive devices which Crystal uses, there are two further kinds of subclassification of prosodic systems which are of interest: that into simple and complex systems, and that into systems of different scope with respect to syllable structure. The division into simple vs. complex systems is made in terms of paradigmatic constancy and relativity (§2.3.3.1. above), and referred to further as 'simple contrast' and 'complex contrast' (1969:141):

The simple contrast system refers to contrasts made solely with an individual's norm (these will be referred to as 'marked' features, as opposed to the norm, which is 'unmarked'); the complex system refers to contrasts made in terms of a marked feature's own variability. Thus, for example, a speaker may speak louder or softer than usual to produce a particular semantic effect (this would be simple contrastivity in the loudness system); but if he speaks louder, then there are different degrees of loudness which he may choose to use within a single loud utterance - it may get progressively louder, for example - this being one instance of complex contrastivity.

The notion of 'markedness' in this sense, and other interpretations of the term noted by Crystal at this point, have already been discussed (§§1.2.5., 2.3.3. above). This interesting distinction is only used irregularly in this sense in the description itself, however, and it is often difficult to see the relationship between the terms 'simple' and 'contrast' as actually used and those as here defined. In the system of pitch direction (tone), the subdivision is explicitly said to differ from the distinction just defined, in fact amounting to Jassem's (and the traditional) distinction between unidirectional (simple) and non-unidirectional (complex) trajectories. In the system of pitch range, the distinction made appears to be that defined above, but the application of the distinction shows that it is not one between constancy and relativity, as the definition indicated, but one between paradigmatic relativity (with constancy as a special factor involved here) in the case of simple systems, and syntagmatic relativity in the case of complex systems (§2.3.3.2. above). This interpretation is borne out by closer scrutiny of the example involving the loudness system given by Cryst-

tal in the quotation above. A similar distinction is made for the tempo system, but the distinction is not held to apply to the systems of rhythmicity, pause, and tension (though good grounds can be given for involving tension trajectories, i.e. syntagmatic tension relations, rather than simple values alone in the constitution of prosodic, in particular intonational, systems; cf. the notion of fade in the phonemic intonation theories, or in the more paralinguistic trailing away of the voice when someone is at a loss for words, or in the more non-linguistic phenomenon of downdrift as a gradual fall in pitch over an utterance - cf. Lieberman, 1967; also §52.2.5., 2.3.1. above). The distinction thus involves only three of the systems.

The second further distinction, referring to the scope of prosodic features over different kinds of syllabic structure, is not explicitly introduced, but used *ad hoc* in the description of the simple systems of loudness and tempo, and the simple and complex pitch range systems; the other systems are not affected. No generalisation is made about how role criteria might be involved in this distinction, though various possibilities pertaining to other domains (e.g. the lexico-syntactic domain) suggest themselves.

SYSTEMS	SUBSYSTEMS	FEATURES
Pitch direction (tone)	Simple	fall, rise, level
	Complex	fall-rise, rise-fall, rise-fall-rise, fall-rise-fall
	Compound	fall + rise, rise + fall, rise-fall + rise, fall-rise - fall
Pitch range	Simple	low drop, drop, zero, continuance, booster, high booster, extra-high booster (stressed syllables) extra-low, low, norm, high, extra-high (for unstressed syllables) step-up (high), step-down (low)(stretches)
	Compound	wide, narrow (sequences of nuclei) wide, narrow, monotone (polysyllabic stretches in sequence) ascending, descending (over a series of tone-units)

Table 19: Two of Crystal's prosodic systems, and their subsystems and features (1969:141-152).

The systems and features which are immediately relevant to the study of intonation are given in Table 19; the phonetic correlates of these variables and their values will be clear from discussion in Ch. 2 above. The table is incomplete in the sense that other prosodic systems are also relevant in varying degrees to the present topic to the extent that they involve pitch trajectories (cf. the glissando variant of one of the rhythm systems, Crystal 1969:142, 163f.); they will be introduced in the text as necessary.

From the display in Table 19 it is easy to see that the systems and their subdivisions cover a variety of phonetic and phonological relations. Of the nine variables shown in the table, only the pitch direction variables are uniquely characterised in terms of systems, and then not in the sense of 'simple' and 'complex' defined above. There are undoubtedly further relations between these variables, both phonetically and functionally, and in the structural terms of complementary distribution, but they do not receive expression in the description. The componentialisation is very similar to that proposed by Jassem, the main variables being pitch direction, height (simple pitch range) and width (complex pitch range); the details are somewhat different, both in number and in the way the height variable is related to pitch constants at particular points in the structure. All of the variants of the simple and complex pitch variable have been noted in previous descriptions, and the problem of distinguishing between individual trajectories and sequences of various sorts such as the compound pitch direction variants has been touched on above (esp. §51.2.2.-3), and will be discussed in systematic context in the following chapter. The simple pitch range variable is traceable to Klinghardt's *neuanhebung*, and has developed through various descriptions in which new variants constantly appeared, from Kingdon's introduction of the downward break to Trim's systematic re-evaluation of the status of such pitch steps (1959; cf. p. 148 above) as head syllables of minor tone-groups, in §3.1.2. above; the additional variants introduced by Crystal for all three of the variables with different scopes represent considerably more detail than is found in the older descriptions. In fact, the postulation of seven distinct degrees of pitch step relation (plus non-discretely different higher degrees in intensified extra-high boosters) approximately doubles the number postulated elsewhere, even in pitch phoneme theory (except for the sixteen Trager & Smith allophonic pitch levels - §3.2.2.3. below). Since the criterion of "the minimal amount of height increase required to cause a definable and replicable attitudinal change" is not further discussed outside this introduction of the inventory (1969:145), proof of definability and replicability of transcription is (though admittedly difficult to attain) lacking. Over and above this, the actual criterion would appear (in the absence of more detailed specification of what is meant by "definable") to be phonemic rather than of the more direct (roughly, morphemic) sort which Crystal apparently supports in explicit discussions (*passim*, esp. 1969:53ff., 197ff.). The pitch step relations of Crystal's simple pitch range variables have a different status in the system from the levels in a pitch phoneme system, the former having more emphasis on syntagmatic pitch relations, the latter on paradigmatic pitch relations, but they share the same claim to discreteness in height judgments, and both require further evidence to support the criteria of analysis named. Crystal himself casts doubt on the availability of such evidence in the context of phonemic theory, and there is no reason to suppose any greater availability for his own simple pitch range system (cf. §2.3.3.1. above). The variants of the first of the simple pitch range variables come very close to some types of pitch accent theory (§3.3. below), differing from these in sheer number of variants. Further aspects of the componentialisation will be discussed in the context of the structural categories which Crystal uses in his description.

The phonetic categories briefly summarised and commented above are mapped on to the segments of the intonation structure. These are essentially the traditional items already encountered in the accounts discussed in §3.1.2. above: pre-head, head, body, nucleus and tail. The term 'onset' is

used for 'head', while 'head' is used for 'body' (following O'Connor & Arnold, §3.1.2.4. above).

The account of pre-heads and tails extends the range of functional phenomena recognised for English intonation: rather than being considered completely conditioned (in the case of tails) or in most respects conditioned (but cf. Kingdon, §3.1.2.2., and the principle of syntagmatic pitch contrast, esp. p. 137 above) as with the pre-heads, the categories are not relegated to a purely phonetic existence. As with Kingdon, the pre-head may provide pitch contrast for the onset; the tail may flatten out when associated with certain attitudes ("irony, sarcasm or boredom", 1969:224), though more traditional views are presented elsewhere (pp. 207, 248). Otherwise, only the description of the falling tail differs somewhat from the norm of earlier accounts: it is said to fall continuously, levelling out if near the bottom of the voice-range; this last condition is perhaps a little on the narrow side, and could be complemented by a slightly earlier observation by Halliday (1967:14n):

The exact way in which the pitch movement is distributed over the tonic depends on the tone. In general, a tonic with a single pitch movement tends, if extended, to flatten, whereas one with a change of movement tends to continue the movement in the final direction.

Earlier accounts tended to have the fall on the nuclear syllable, with the tail at a low level; this is, however, too narrow a conception as it stands.

The category of onset, "the first prominent syllable of a tone-unit" (p. 143), has a rather special status in Crystal's account, which also played an important role in the discussion of paradigmatic constancy and relativity above (cf. §2.3.3.1.). In view of the previous discussion, it is only necessary at this point to recall that Crystal found in his extensive data (ca. 30000 words of connected speech, 1969:12) only one onset in two hundred which varied from an auditorily identified norm (acoustically as yet unchecked) for a given speaker; on the basis of these figures he suggested a kind of pitch height constant for any given speaker, an idea followed up in a separate paper (1971; cf. §2.3.3.1.). On the basis of this constant, the seven elements of the simple pitch range system for stressed syllables, as well as the other pitch range variables are given a syntagmatic definition (p. 144):

Once the pitch level of the onset is determined the pitch range of the remainder of the tone-unit is defined in relation to this by plotting the various upward or downward movements which take place.

A minor exception to this is clearly the pre-head, which is defined according to the following standard, i.e. progressively. The issue of linear vs. other (hierarchical) structure which would be necessary to provide an explicit account is not raised, however. As a structural category, the onset also has rather a special status; unlike Trim, who has paid special attention to the status of the onset 'head' in his hierarchical theory of major and minor tone-groups (1959) and in descriptions of the correlations between head height and certain role scales (1964; 1969), Crystal does not go beyond the phonetic level in order to find a general explanatory context for his observations. One point at which further generalisation would have been possible is the area of pitch-prominent syllables; a more general theory of pitch accent could have been based on a number of key places where onsets and the syllables bearing the features continuance, booster, &c. are treated as a natural class. There are at least four such places (cf. also Wade,

1971:100):

- (1) In the definition of 'high booster' (p. 145): to be marked as a high booster a syllable "must be higher in pitch than the next previous pitch-prominent step-up syllable (i.e. onset, continuance, booster, high booster)";
 - (2) In connexion with secondary accent (p. 158): "Non-nuclear onset syllables, and marked items from the simple syllabic pitch range system, i.e. a step-up or -down other than the norm ...";
 - (3) In the definition of type B falling head (p. 229; see below): "a descending series of stressed syllables (with or without intervening unstressed syllables), some or all of which are higher than, or occasionally at the same pitch as the preceding syllable, but none of which is higher than the next previous pitch-prominent syllable or onset";
 - (4) In connexion with subordination theory (p. 246; see below): "We may say that if the nucleus does not fall on the last lexical word of a phrase, and if the nucleus is pitch-prominent in simple pitch-range (particularly if it co-occurs with an onset or high booster) or if it carries strong stress, then it is highly probable that the final lexical item will be subordinate".
- In addition to these four points, a term "segment-initiator" is introduced (p. 249) as one of the relata of the simple pitch-range system, and appears to cover precisely the class of variants under discussion, although according to the definition of 'prosodic segment' the categories of 'head' and 'nucleus', but also 'pre-head' and 'tail', are all covered by this term, and the last two can hardly be meant by the new coinage. The only comment made on the possible roles of this class of syllables, particularly those inside the tone-unit, corresponding to the *neuanhebung*, &c., of older studies, is this (p. 233):

Their function seems twofold: to spread relative prominence over the words in the head, and to add prosodic variety to connected speech. They occur in about 80% of all heads.

Why relative prominence should be thus spread, in certain styles, is not investigated; the second function is in fact the fourth in Lee's inventory of the functions of intonation - differential, demonstrative, implicative and variative (1956c: esp. 357f.). The present remarks show that these points would have provided a suitable opportunity for a discussion of the Bolinger pitch accent and intonation approach, which (despite frequent citation of numerous details of Bolinger's work) is lacking, and for going beyond passing references to 'emphasis' (*passim*, esp. 120, 263ff., 290) as an unexplicated designation for a possible role for items from the simple pitch range system (*inter alia*). Trim's hierarchy of tone-group types would provide a somewhat different basis for further generalisations; Crystal incorrectly associates Trim's major tone-groups with sequences of his own tone-units (pp. 238, 245), however, and thus misses the generalisation over shorter prosodic segments (in Crystal's own sense of this term, see above) which is the characteristic feature of Trim's analysis (cf. Trim, 1959; also pp. 251, 215 above).

The main segments of the tone-unit are the head and the nucleus. The systems operating in the head, a category which, though not obligatory, occurred in 70% of tone-units in Crystal's data, are fairly unrestricted, leading to a wide variety of head contours. Crystal's inventory has eight different kinds of head, four falling, two rising, one referred to as "rising-falling(-rising)" and another referred to as "falling-rising(-falling)" (1969:229-31); the cross-classifications are made by means of the simple pitch-range system, i.e. presence or absence of booster, high booster, &c.,

and for three falling and the rising tones also according to whether the nucleus itself is marked in pitch range. At first glance, the classification is considerably more detailed than those of previous analyses, though Palmer and O'Connor & Arnold had noted a fair range; in view of the fact that all of these fairly complicated head patterns are clearly functions of the trajectory components already described, namely the terms in the pitch range system, the motivation for an additional inventarisation needs to be discussed, the basic question being whether there are grounds for supposing the head to be a unit segment at all. Trim's theory of major and minor tone-groups (1959), which is the only analysis so far in which the notion of 'head' is critically examined, would bring a different kind of order into these patternings: the primary classification would deal with those pre-nuclear sequences initiated by an onset or a marked variant of the simple pitch range variable ('head' and 'break', respectively, in the older terminology), assigning each sequence to a contour; a further classification would be of sequences whose initial onsets, boosters, &c., in turn are placed on an overall trajectory (Trim, 1959:27). These two items in Trim's hierarchy, the minor and major tone-groups respectively (only one sub-class of minor tone-groups being relevant here), are not commensurate with any of Crystal's structural categories or 'segments', as has already been pointed out.

The nucleus is described in terms of both sequential and simultaneous componential structure: sequentially as simple, complex or compound, and simultaneously as bundles of variants from three variables, simple pitch range (i.e. height of the beginning point), complex pitch range (i.e. width of the trajectory) and tone (pitch direction). The classification is essentially that of Jassem (§3.1.3. above); simple tones are Jassem's unidirectional tones and complex tones are Jassem's non-unidirectional tones, while the choice of simultaneous components is quite similar, differing only in the choice and placing of the term relating to a pitch height constant: Jassem refers to bottom pitch, and the point of the tone which reaches or leaves it, whereas Crystal brings his notion of constant onset (which may of course coincide with nucleus) into play, and settles for the beginning point of nuclei as the relevant position. The distinction between the segmental componentialisation into complex vs. compound tones is based on the relative scope of trajectories with respect to syllables: monosyllabic scopes and polysyllabic scopes, respectively. The criteria of analysis for these categories will be touched on again below in the discussion of sequences, and again in the following chapter. It is not necessary to tabulate the tones according to their components in view of the close relation between Jassem's and Crystal's systems (cf. Tables 17 & 19 above).

There are two aspects of the simultaneous componentialisation which Crystal is particularly concerned to elucidate. The choice of width (complex pitch range) rather than other variables such as end-point height (cf. the discussion of Jassem's componentialisation, pp. 161ff., and of Trim's approach, esp. pp. 69, 135 above) is made as part of a generalisation affecting non-nuclear contours also (1969:214): Crystal claims that the "formal semantic contrast" produced by width changes is the same for nuclear tones and the polysyllabic sequences for which the width variable was originally set up. For the decision to allow nuclei with level tones, rather than restricting them to kinetic tones, Crystal adduces six arguments; the first is phonological, consisting in the observation that one level tone in a sequence of level tones is "always more prominent than the others" (p. 215) and is thus analogous to a kinetic contour, while the other five

are functional arguments based on tonicity and contour roles, and will be dealt with in systematic context in the following chapter.

The area where Crystal's study goes considerably beyond previous studies in the area of intonation itself is that of sequences of tone-units. Although previous studies had concerned themselves with such questions, using notions such as 'co-ordinating', 'harmonious', &c. sequences, and Trim had explicitly proposed an intonational hierarchy (1959), the ideas developed in these studies were not based, at least overtly, on extensive statistically evaluated data, and gave no indication of the generality of such ideas. The backcloth against which Crystal's discussion should be seen is his view that the boundaries of tone groups can be fairly unambiguously identified (cf. §2.3.1. & p. 167 above). Five kinds of criterion are given for this segmentation: (1) Initial signal - perceptible step up or down to standard onset level after a nucleus; (2) A slight pause, frequently with segmental modifications (length variations, differences in aspiration, &c.); (3) There is a significant but not entirely predictable correlation between the boundaries of other prosodic and paralinguistic features and tone-unit boundaries (cf. discussion of segmentation, esp. within phonemic phonology, in §2.3.2. above); (4) The internal structure provides evidence (which goes against Crystal's previous ascription of priority to boundary identification, i.e. to delimitation, rather than to the identification of units by their properties, 1969:205); (Falling phonetic or phonological criteria such as those above, Crystal allows grammatical or semantic criteria to clarify further ambiguities (one instance of the use of such criteria was cited above, p. 167, in a different context). Given these segmentation criteria (1969:205ff.), the characterisation of different types of sequence, both intra- and inter-tone-unit, is possible.

In order to distinguish between compound ('binuclear') tones and sequences of tone-units, Crystal adduces four types of argument, based on overall pitch trajectory, segmentation criteria, relative prominence, and relative importance for semantic interpretation of the two elements. The criterion for distinguishing between compound and complex tones has already been given: the latter are monosyllabic. Compound tones are endocentric (i.e. the two pitch directions are of opposing polarities - e.g. rise + fall, not rise + rise; cf. esp. pp. 141f. above), with no evidence of a tone-unit boundary (cf. the criteria given above) between the two elements, the pitch trajectory being smooth throughout; in addition, the first element is relatively more prominent than the second, while the second determines the overall semantic interpretation to a greater extent than the first. The last two criteria are by no means contradictory; they refer to different aspects of the intonation system, namely to accent and intonation proper, as I have been calling it, respectively. A very similar point was discussed above in relation to Kingdon's description (p. 140 above); Crystal makes no further comment on the interrelation between his criteria (cf., however, discussion of tonal subordination below), but Table 13 above can be applied without modification to illustrate the relations under consideration in Crystal's system as well as Kingdon's. The possibility of ambiguity is acknowledged by Crystal; the question of ambiguity will receive further attention in the next chapter.

In his treatment of inter-tone-unit sequences, Crystal examined in particular "di-sequences" (p. 240) and their forward transition probabilities, finding that there was an extremely strong tendency towards "tonal reduplication", i.e. for an occurrence of a given tone to be followed by another occurrence of this tone. Falling tones were not included in the

statistics as members of the domain of the di-sequence relation, but they occurred in the counter-domain; the reason for omitting these tones was their dominance in the sample (in half of the tone-units a falling tone occurred at the nucleus). Further, complex and compound tones were counted together "to give better frequencies of occurrence", though no further reason is given for this ad hoc grouping (p. 241). Di-sequences were found to be far more important than longer units in the measurement of transition probabilities between tone-units.

A special case of reduplication is dealt with in the "theory of tonal subordination" (Crystal, 1969:244ff.; also, with a few minor deviations, identically phrased in Crystal & Quirk, 1964:52ff.). The criteria for identifying tonal subordination are two fold: first, reduplication must obtain; second, the width of the pitch trajectory (i.e. the complex pitch range variant) of the one nucleus must be greater than that of the other. Level nuclei are held to enter into subordination with narrow superordinate kinetic nuclei, and may thus in theory be a neutralised version of either falling or rising subordinate nuclei. On the basis of the results of a reproduction test, in which groupings of tones were made (*inter alia*) according to substitutions made by native speakers in the reproduction task, Quirk & Crystal (1966:364) suggest a "parallel series" (i.e. membership in the same relation) for the following tone-unit pairs:

- (37) ... the n-fellow -came (Systematically: n[''])
 (38) ... the -fellow n-came (Systematically: [''])

Narrow complex pitch range is indicated by 'n', and the subordination hierarchy by square brackets round the subordinated part. A further taxonomy of types of subordination is suggested in which longer sequences are accommodated (all of which, at least in Crystal's examples, involve falling nuclei): complex subordination has more than one tone-unit in either preposed (subordinate unit preceding superordinate) or postposed subordination, while compound subordination involves a combination of preposed and postposed subordinate tone-units; one instance of combined complex and compound subordination was observed by Crystal.

The treatment of complex nuclei differs from that of simple nuclei in that a complex nucleus may be superordinate either to a complex nucleus of the same type or to a simple nucleus. In this respect, the treatment of preposed and postposed subordination differs. For postposed subordination, the complex tones are classed together with the kinetic simple tones according to the final element in the tone (e.g. fall-rise tones are classed with rise, &c.); the grouping, which is a traditional one, was given some empirical underpinning by Quirk & Crystal (1966), who found that substitutions in reproduction tasks (see above) administered to native speakers tended to fall into classes of this kind. Crystal refers to the kinetic simple tones as "primary", "major", or "main" categories (pp. 201ff., 221, 245, 250), since it was these which tended to be substituted for the complex tones; one could consider taking this to be a sign of the unmarked status of the simple tones (cf. also §1.2.5.1. above). For preposed subordination, however, this classification is not used. Instead, complex and simple tones are grouped according to the "phonetically most dominant element" (i.e. the first element of binuclear tones, cf. p. 256 above) rather than the functionally most important element (i.e. the second element) as in the grouping by major categories. There are other differences between preposed

and postposed subordination: there was a greater tendency for preposed subordinate units to be more prominent (defined in terms of relative height, &c.) than the superordinate unit (defined in terms of width), the general tendency being for subordinate units also to be less prominent than the superordinate units for both sorts of subordination. Further, there appear to be more stringent restrictions on length and on the occurrence of certain variants, particularly level tone, for preposed subordination.

It appears that Crystal conceives of tonal subordination as forming part of an accentual system, with the subordination hierarchy signalling relative prominence. This interpretation is supported by the tendency of subordination to co-occur with the variants from other prosodic variables which contribute towards prominence. In addition, Crystal observes the following functional characteristics of (postposed) subordination (p. 246):

Subordination would thus seem to be restricted in its occurrence to certain 'favourite' configurations of pitch/stress features. We may say that if the nucleus does not fall on the last lexical word of a phrase, and if the nucleus is pitch-prominent in simple pitch-range (particularly if it co-occurs with an onset or high booster) or if it carries strong stress, then it is highly probable that the final lexical item will be subordinate. It is rare for the subordinate nucleus to fall itself on the penultimate lexical item, or for other lexical items to occur between subordinate and superordinate nuclei ...

Commenting on the difference between nucleus-tail sequences and nucleus-subordinate-nucleus sequences, Crystal & Quirk (1964:56) refer explicitly to the "increased overall prominence" and to what Crystal (1969:248) referred to as "extra information" in the latter sequence; Crystal & Quirk also refer here to the theme-rheme analyses of the Prague school (cf. also Halliday's functional categories, 1967; §3.2.1.5. above). It is to be regretted, in view of the promising start, that Crystal does not develop a unified treatment of accentual phenomena (cf. also the discussion of 'segment-initiators' above); the term 'prominence', roughly characterised (following Jones, 1956:247) as "the general distinctiveness of an utterance of any length" (1969:120n), is, strange to relate, said to have "no theoretical status in this framework" (ibid.), and the hints at an accentuation theory remain ad hoc. Remarks made elsewhere give a different impression, however: a functional term 'emphasis' is introduced (p. 120), which appears to have a direct relation to 'prominence', and later (p. 158f.) accentual and stress variables, each with three variants, are introduced, whose interlocking is described in terms of 'prominence'. A further hint of possible generalisations in this respect may be seen in the "parallel series" of examples (37) and (38) above, and another comes in the suggestion by Quirk & Crystal (1964:61) that similar "higher-order systematisations" can be made in which "it may be possible to set up points in a scale of contrasts at which we can conflate stress, pitch range and tone contour exponents in certain patterns" (cf. also Crystal, 1969:271). Crystal presents the patterns along this scale in the following notation:

- (39) [''] (Tonal subordination)
 ' ' (Nucleus and tail)
 " " (Strong stress and nucleus)
 + + (Booster and nucleus)

If sets of pairs like these are simply seen as members of a syntagmatic prosodic relation, as seems to be intended, then this relation can be termed 'prominence' (or 'relative prominence'), and there is no reason to keep this prosodic Cinderella in a back room of the theory, without official status but with enormous heuristic influence. The idea of repeated regularities at different positions in a subordination hierarchy, such as that found in Chomsky, Halle & Lukoff (1956) and, as cyclical rules, in later generative phonology, could easily be given a critical analysis within a more general theoretical framework of the kind suggested here. An indication of some additional aspects of such a description is given in Table 13 (and the accompanying text) above. In particular, the observation of asymmetry in preposed and postposed subordinations can be related to a number of aspects of intonation noted in previous accounts. The affinity of preposed subordinate sequences to the leftmost element of complex tones suggests that these sequences function in different systems from the postposed sequences, and vice versa. This point will be taken up again in the next chapter.

Tonal subordination is one of four kinds of sequence in which one tone variant is followed by another; the other three are complex tones, compound tones (the relations between which have already been mentioned), and glissando (in the rhythm system: a gliding transition between stressed and following unstressed syllables in the head of a tone-unit, i.e. a source of non-nuclear kinetic tones). Crystal differentiates in some detail between glissando and preposed subordination (1969:251ff.); in glissando, pitch-prominence or pause may intervene before the nucleus; glissando tends to have a decreasing width vector to the nucleus, and glissando glides may be wider than nuclear glides; presubordination rarely has more than one glide, but glissando has a whole sequence, rhythmically unified and without the same rhythmic relation to the nucleus as in presubordination. These six criteria are supplemented by a functional one (pp. 251f.):

Pre-subordination ... has a wholly accentual and grammatical role to play, while glissando seems to be wholly attitudinal, the pulsations falling on lexical items with no apparent grammatical pattern.

Certain cases of ambiguity are conceded to be possible, though most cases can be disambiguated by one cue or another; the term 'neutralisation' is mentioned parenthetically as one descriptive possibility, but no attempt is made to employ other aspects of the Praguean framework in the description, such as the functional categories of integration, delimitation, &c.

The difference between the theory of subordination and the theory of compound tones lies mainly in the reversal of the reduplication requirement of subordination theory. Otherwise, the conditions which are given for compounding are remarkably similar to those given elsewhere for subordination. Crystal does not remark on these similarities, however, or link these two subsections of the description in any way. On the contrary, he reproaches Schubiger (1958; cf. §3.1.2.3. above) for conflating exocentric and endocentric types of sequence in her treatment, and for not distinguishing between the latter and compound tone (1969:237); the other side of the coin is that Crystal does not attempt this kind of generalisation (and, indeed, if his criticism is to be taken seriously, fails by his own criterion: pre-subordination and post-subordination conflate endocentric and exocentric sequences, the former being exocentric for complex tones, the latter endocentric). The criticism takes no account of the necessity for descriptive adequacy in intonation description (cf. §1.3.2. above), and it may be doubted whether the exocentric/endocentric distinction has any foundation

in this respect, as opposed, say, to Palmer's co-ordination/subordination distinction (note that the theory of subordination involves co-ordinated sequences in Palmer's sense), or Kingdon's harmonious sequences; these notions were discussed above (pp. 255f., 205f. and references there). The similarities between subordination and compounding theory can be briefly summarised as follows: (1) lack of intervening pause in each case (pp. 252, 218f. respectively); (2) absence of marked pitch-range features between sections in each case (ibid.); (3) presence of rhythmic unity between sections in each case (pp. 252, 219 respectively); (4) unequal prominence between sections in each case (pp. 221, 219 respectively); (5) difference in relative width of kinetic elements in each case (pp. 245, 218 respectively); (6) each signals an "important" grammatical link between the items marked by the kinetic elements (pp. 221, 251, 267); (7) the grammatical category with which both kinds of intonational structure correlate best is the 'group' (Halliday's term), with considerable similarities even in terms of lexical categories (pp. 269, 268 respectively). The same considerations apply to generalisations which may be made about compounding and subordination as to those which apply to subordination theory itself (see above), and need no further comment here.

Crystal's accounts of intonation may be said to represent the most sophisticated development within the European, particularly the British tradition of intonation description. The descriptive categories used are those of the tonetic school, and the detailed observations of previous descriptions are compiled and added to, both phonetically and phonologically. In addition, the study of intonation is embedded into the study of prosodic features in general, to an extent and with a coherence which had been lacking hitherto. Further, the methodological example of Jassem, and Halliday's attempt at explicitness of description are both taken up by Crystal in his analytic practice, setting a new standard in intonation theory; this is matched by the extensive empirical checking on which his analysis is based, both in the 1969 monograph and the later study (1975a), which has provided a more coherent basis for analysis, and for critical appraisal of other approaches to intonation and accentuation description. The remarks made above were generally concerned with areas left open-ended by Crystal - hardly a criticism of the foundations of the study, but an indication of some of what remains to be examined in the field, and which Crystal himself later listed (1975a(1975:45f.)) under the six points of tone-unit boundary placement, inter-sentence relations, non-verbal context, meaning-relations, the concept of equivalence, and comparative study of other languages than English. It is interesting to note the shift of attention: almost all of these points have to do with roles, not types, in contrast to the 'formal' approach of the previous study in which the status of roles was left inexplicit. A number of these points will receive further attention in Ch. 4 below; some of them are dealt with in Gibbon (1975).

The representative character of Crystal's studies makes it possible to close this section on prosodic approaches to intonation without further summary; the ground covered here also provides a useful landmark for the following accounts of phonemic and pitch accent theories of intonation and related areas, both in terms of the common ground within the various traditions, and in terms of the diversity of observations and descriptive means which have already been described.

3.2. Phonemic approaches to intonation analysis

With rare exceptions (e.g. Strang, 1962), the analysis of intonation in terms of a phonemic set of criteria of analysis has been confined to American linguistics; even linguists of similar persuasion to some neo-Bloomfieldians tend to fight shy of applying phonemic criteria to the analysis of intonation in particular and to prosodic analysis in general (e.g. Halliday, in the earlier work on which his intonation analyses are based). Within the set of descriptions which apply the term 'phoneme' to intonation units, three different tendencies can be identified: early phonemic analyses, including Bloomfield's; Pike's approach; and the approach most closely associated with Trager & Smith. Two approaches which are fairly closely related to the Trager & Smith approach are those of Harris, differing in theoretical and procedural explicitness in the analysis of 'long components' of various types, and Chomsky, Halle & Lukoff, differing in the narrowness of its domain and in the coherence of its formulation of phonological structures.

Bloomfield represents intonation by fairly primitive orthographical means, noting only the final pitch turn of trajectories in the traditional manner of pre-Klinghardt analyses. The differences noted are the pitch phonemes "fall", [.] , "rise", [?] (as in yes-no questions), "lesser rise", [.] (as in "supplement" or wh-questions), exclamatory pitch", [!] (when sentences with the above phonemes are "distorted as to pitch, and also as to stress, when the speaker is responding to a strong stimulus", 1933:115), and finally "suspension-pitch" or "pause-pitch", [.] ("which consists of a rise of pitch before a pause within a sentence", *ibid.*); these items are discussed in the context of "modifications" of a phonemic "basis" (133: 109ff.), and are associated with functions which Bloomfield characterises as follows (p. 114):

Differences of pitch, that is, frequency of vibration in the musical sound of the voice, are used in English, and perhaps in most languages, as secondary phonemes.

And, further:

Moreover, we use features of pitch very largely in the manner of gestures, as when we talk harshly, sneeringly, petulantly, caressingly, cheerfully, and so on. In English, and in the languages of Europe generally, pitch is the acoustic feature where gesture-like variations, non-distinctive but socially effective, border most closely upon genuine linguistic distinctions.

The first kind of function ascribed to pitch trajectories is as secondary phonemes, i.e. "phonemes which are not part of the simplest linguistic forms, but merely mark combinations or particular uses of such forms" (p. 109); the secondary phonemes of pitch are those listed above. The second kind of function is "non-distinctive" and "gesture-like"; the only further reference to modifications of the primary phonemic basis which are not secondary phonemes is the suggestion that "the varieties within this type [i.e. the phoneme of exclamatory pitch - DG], such as the intonations of anger, surprise, call, sneer, and the like, are non-distinctive gesture-like variations" (p. 115). Lieberman (1967:181) misinterprets Bloomfield as claiming that pitch is also used to play a part in expressing actor-action constructions in English (Bloomfield, 1933:172); Bloomfield is, however, not con-

cerned with features of modification at this point, but about features of selection (i.e. distributional or co-occurrence restrictions; Chomsky's term 'selection' is narrower).

Although the term 'phoneme' is used by Bloomfield, his approach is clearly not phonemic in the sense later made more precise in pitch phoneme theory; the distinction between primary and secondary phonemes is a sign that he was aware of fundamental differences both in form and in function between the primary phonemes and the secondary pitch phonemes. In his use of contours as the fundamental units of intonation, and in his ascription of meanings to these contours without the intervening stage of minimal distinctive, or distributionally determined, phonological units, Bloomfield worked along the same lines as European analysts (cf. Schubiger's distinction between the intellectual and the emotional functions of intonation and the two kinds of function noted by Bloomfield - Schubiger, 1935). This point of view was also adopted by Bloch & Trager (1941), who introduced two further pitch phonemes, suspensive, /.../, and contrastive, /i/, pitch. In these analyses, there is nothing like the detail, either in contour types or in intonational structure, which is to be found in the studies by Armstrong & Ward, Palmer, Klinghardt, &c., which had appeared in the two decades prior to the Bloch and Trager study; in Bloomfield's account, there is still the strong conviction, scotched by the European studies, that a direct relation exists between pitch contours and grammatical categories or emotional labels (cf. §1.2. above).

The characteristic position of other pitch phoneme theories differs considerably from Bloomfield's. The theoretical paradigm of phonemes and morphemes, developed for the description of the more central lexico-syntactic regions of language, was applied to the analysis of intonation: the contours were morpheme-like, since they were fairly directly meaningful, so the reasoning went, and thus there may well be minimal segments of the pitch contours which make up these morphemes or their allomorphs. In roughly contemporaneous publications, Harris (1944), Pike (1945) and Wells (1945) developed approaches in which pitch height values, pitch levels, were used as basic segmental components of intonation contours. As a preliminary orientation, it is useful to note that practically all the work on the pitch level phoneme theory of English intonation took place during the decade in which neo-Bloomfieldian descriptivism grew up; later contributions, with the exception of generative explications, were fairly simple extensions of the forms recorded already, with little further development in the foundations of the theory. At the same time, it should be remembered that the foundations of the theory came under fire practically immediately from Bolinger (1947, 1949, 1951), and for considerable criticism from European scholars from the mid-fifties to the early sixties; there has only been sporadic reaction, on the other hand, from proponents of pitch level phoneme theory to other approaches to intonation description and to criticisms (e.g. Smith, 1955, on Jassem). The following sections will deal with studies on pitch phoneme theory grouped into two subsections: first, Pike; second, Harris, Wells, Trager & Smith, as well as one or two later extensions to this approach and Stockwell's attempt at explication.

3.2.1. Pike

The extensive contributions made by Pike to the study of intonation, in particular American intonation, are to be found mainly in his monograph

on the intonation of American English (1945). Later works presuppose the basic validity of the contents of this monograph, and attempt to integrate the intonation systems of English and other languages into Pike's combined functionalistic and structuralistic theory of language and behaviour (1963; 1967); this integration takes place at a general level, however, and does not add to or modify the original suggestions in any essential way. The 1945 monograph is one of the first attempts to look at intonation from an explicitly linguistic point of view and at the same time examine the details of intonation; many of the earlier European studies had used structuralistic principles of analysis, but in general without making these principles explicit, and without coming to the conclusions which Pike reached. Pike's is also the first detailed study of American intonation.

Pike's analysis is characterised by three salient characteristics: its use of pitch heights as the exclusive variants in terms of which intonations are to be characterised ("pitch phonemes", 1945:25); its use of a relatively systematic set of role criteria pertaining to "speaker attitude" (p. 1 & *passim*); and its recognition of a multiplicity of interlocking systems which operate together with, and which exert an influence on, intonation - stress, quantity, tempo, rhythm, voice quality. The first of these, first formulated in language-teaching materials in 1942 (cf. 1945:10; 1967:540), the pitch phoneme theory using four levels, was to become the hallmark of mainstream American intonation analysis for the next two decades and even beyond. Its justification, and possible criticisms of it, will deal with in passing in the present context, and taken up again in §4.2.1. below in the context of problems of role criteria and componentialisation. The second characteristic is shared with a number of European analyses, both earlier and later; in particular, Schubiger and Jassem have concerned themselves with such matters, and Lee (e.g. 1956c) has developed a fairly comprehensive account of intonation roles (cf. also §1.2.4. above, §4.2.1. below). The third characteristic was developed to some extent in later American work, but the most substantial development in this respect did not come until the work of Crystal.

Pike starts his description of the forms and structure of intonation, after a lengthy discussion of the problems associated with the use of role criteria, with the following claim (1945:25):

In order to describe an intonation contour it does not suffice to say that it is rising, or falling, or falling-rising. Even the simplest rise has a complex series of relationships to other contours, and complex internal structure. The size of the interval between beginning and ending points, the height of the beginning point relative to the general pitch level of the sentence, paragraph, conversation, or speaker's norm, the relation to timing, phrasing, stress, and pause, - these and other characteristics need to be described for the complete understanding of any contour.

In order to capture these relationships, Pike developed a system of forms based on the analysis of pitch trajectories into sequences of pitch height variants, and a structural framework which provides a limited number of points at which these forms can occur. The forms are given as "four relative but significant levels (pitch phonemes)", whose "significance ... is determined by their height relative to one another" (p. 25). The conception of relative pitch invoked here is that of syntagmatic relativity (cf. §2.3.3.2. above, and Crystal, 1971). The intonation contours are constituted by the occurrence of pitch height variants in sequence at specified points in a constituent structure which may be concisely summarised in terms of

an elementary phrase structure grammar with rule abbreviation:

- (40) i. TC → (PC) PMC
ii. PMC → BP (DCP) EP

The symbols used here mean 'total contour', 'precontour', 'primary contour', 'beginning point', 'direction change point' and 'ending point', in order of occurrence. The items 'PC', 'BP', 'DCP', and 'EP' are pre-terminal symbols, i.e. they are rewritten with one member each from the terminal vocabulary of four pitch levels (the integers 1, 2, 3, 4, interpreted as 'extra-high', 'high', 'mid', 'low', respectively). The following example illustrates the Pike pitch transcription system, using one of the maximal contours generated by the grammar formulated above (cf. Pike, 1945:50):

- (41) We'll try ...
3- ⁰1-3-2

The notation incorporates two structure-marking devices: the degree sign, which labels the beginning point of the primary contour; and the hyphens, which (in conjunction with the degree sign) are placed between all terminal symbols dominated by TC (redundant extra hyphens are placed where integers are separated by a considerable stretch of text, and after the precontour integer). As Wells pointed out in his review (1947:262-3), this notation is uniquely translatable into a notation using boundary markers, and in this sense is equivalent to such a notation; this issue is distinct, of course, from the question whether boundary markers represent juncture phonemes or have any other kind of direct interpretation, though Wells does not make this distinction (§3.2.2. below). An additional requirement is given for the terminal item occupying the BP position; the intonation contour is coupled in this way with the "stress" system (1945:27):

A stressed syllable constitutes the BEGINNING POINT for every primary contour; there is no primary contour without a stressed syllable, and every heavily stressed syllable begins a new contour.

This definition leads to a few difficulties in connexion with the contours which are not generated by the grammar given above; these will be discussed below. The twenty-nine contours which Pike noted as conforming to the basic pattern (i.e. as explicated above), and which constitute a subset of the contours generated by the grammar given above, are tabulated below (using additional criteria given by Pike) in Table 20.

The number of members of the terminal vocabulary is motivated by Pike in the following way (p. 26):

This number is not an arbitrary one. A description in terms of three levels could not distinguish many of the contours - for example, the three contours beginning on low pitch and each rising to a different height. A description in terms of five or six levels would leave many theoretically possible contrastive combinations of pitches unused.

These two arguments are not without weaknesses: the second, amounting to a claim that the weak generative power of the grammar (40) would be too high with more terminal symbols available, applies also against the four-level system (Pike only notes 29 of the 80 primary contours generated by grammar (40)), a criticism which was also levelled against the Trager & Smith

four-level analysis by Householder (1957:239); the first argument assumes a monosystemic analysis of linguistic forms, i.e. that the linguist is entitled to generalise, under certain conditions, between forms which occur in contrast at different syntagmatic positions. The latter point of view is not one which has been taken by many European linguists, even non-Firthians, at least in the context of intonation analysis; even a cursory investigation of Pike's example (the three rising tunes) shows that three, not four levels are actually in contrast. No safeguards on generalisations of this kind such as those used in segmental phonemics (e.g. complementary distribution, phonetic similarity and their reflexions in generative theory) are proposed by Pike. Other points pertaining to the pitch level approach will be discussed in subsequent sections, particularly in the treatment of componentialisation (§4.2.1.); Pike's own descriptive practice in this respect will be treated in the following paragraphs.

Pike renders the status of his own componentialisation somewhat dubious by further types of classification of primary contours in his presentation. Although the pitch levels, like other phonemes, are said to be "completely meaningless by themselves" (p. 26), this approach is relaxed in the description of two kinds of "generalisation of usage" (ibid.). The first kind, which Pike does not consider particularly valid, notes a tendency for certain levels to be associated with various functions directly: e.g. level 1 with "some element of surprise", level 2 as a norm for stressed syllables, level 4 for unstressed ends of falling contours, level 3 for other unstressed syllables. The other generalisation which Pike considers is the interesting one, however (ibid.):

A more legitimate and effective generalisation can be made by gathering into groups those contours which have related form (for example, contours falling to pitch four) and meaning (for example, mild versus intense contrast or pointing).

This second type of generalisation supplies the organising principle for Pike's presentation of specific contours; Pike's classification on this basis is summarised in Table 20. The tabulation in this form shows quite

CLASSIFICATION BY LEVELS	CLASSIFICATION BY CONTOUR DIRECTION		
	Fall	Rise	Level
4 (fall to 4, rise from 4)	$\circ_2-4, \circ_1-4, \circ_3-4$	$\circ_4-3, \circ_2-4-3, \circ_1-4-3, \circ_3-4-3, \circ_4-3-4, \circ_4-2, \circ_2-4-2, \circ_1-4-2, \circ_4-1, \circ_1-4-1$	$\circ_4-4, \circ_4$
3 (fall to 3, rise from 3)	$\circ_2-3, \circ_1-3, \circ_2-3-2, \circ_1-3-2$	$\circ_3-2, \circ_3-1$	$\circ_3-3, \circ_3$
2			$\circ_2-2, \circ_2$
1		$\circ_2-1, \circ_1-2$	$\circ_1-1, \circ_1$

Table 20: Pike's cross-classification of contours (1945:26, 44ff.).

clearly that the functional principle according to which intonation forms are established is not simply one in which distinctive levels are used, but one in which two type variables, contour direction and the lowest level reached by the contour, are used together in the initial stages of the classification. This dual criterion is in principle used in the European tradition of intonation description; the use of bottom pitch as reference point for contours, implicit in Pike's organisation, was formulated explicitly by Jassem (cf. §3.1.3. above) a few years after Pike. The fact that Pike explicitly motivates this kind of grouping with reference to the correspondence of phonological forms and meaning, a relation which does not exist in the "segmental" area of language, for which phonemes were initially postulated, and the fact that the first of the generalisations of usage practically excludes the pitch levels from direct relations with meaning on their own can be used in drawing a rather different conclusion about intonation from that drawn by Pike: if intonation roles are directly related to type variants which are not pitch heights, and if pitch heights are not considered directly relevant to the roles of intonation, then their primary justification is that they are notationally convenient in representing the contours. Any further claim about phonemic status for these levels requires more justification than is given by Pike. Of course, if a direct relation between pitch levels and roles is found, however tenuous (cf. Pike's first suggestion about generalisations of usage), then the levels can no more be given phonemic status on this basis than the phonological items which enter into phonaesthetic series can be declared phonemic on the basis of their membership of such series. Over and above the concession which Pike makes to non-phonemic elements in his description, there are features of the classification which call for comment. It will be noted that the six cells in the first two rows of Table 20 contain a wide variety of different contour shapes, despite the overall classification in terms of monodirectional contours. The first cell contains only falling contours; the second contains falling and falling-rising; the third (first in the second column) contains rising, falling-rising, rising-falling; the fourth contains only rising contours. Since the motivation for these groupings (e.g. why decisions on allocation to simple contours are made sometimes with the BP category and sometimes with the DCP category corresponding to the BP category of simple contours) can only be read out of Pike's descriptions of roles used in the analysis, the present chapter is not the place to go into this point further. The status of roles in decisions on componentialisation will be discussed in the next chapter (§4.2.).

Apart from the central contours discussed so far, Pike describes precontours, which extend primary contours into total contours, and a range of special contours which do not fit into the set of contours generated by the grammar (40) above.

Precontours are said to be level, slurred, or supplemented by a "proprecontour" (1945:66ff.); as a proclitic element in an intonation contour, the precontour may be compared roughly with the prehead or aufтакт of the European analyses. As in the European analyses, these proclitic elements are level (at each of the four heights - if proprecontours are excluded, only the three levels 1 to 3), rising or falling (slurred). No criteria are given for distinguishing between rising slurred precontours and precontours supplemented by a preceding proprecontour (said to be on a lower pitch); the only difference, interpreting the examples given, appears to be in the relative length of the proclitic contours (cf. p. 68; slurred precontour indicated by slur plus beginning and ending levels, proprecontour plus pre-

contour indicated only by levels):

(42) What does the man think he's doing, anyhow?
4) -2- 02-4 02- -4

(43) He wanted to use it.
4- 2- 02- -4

(44) I want to go home.
4) -2-03-4

In a previous context, relevant to the question of relative length, Pike makes the following remark (p. 26):

In the last two samples, there were more syllables than contour points. These extra syllables can be pronounced with intermediate pitches in a general descending scale, or with considerable variation in the amount of drop from syllable to syllable.

If this remark applies to all stretches between the contour points for which levels are given, and if the initial point of a precontour is also regarded as a contour point (as the examples imply), then the definition of the notion "slurred" is inadequate to provide the distinction required (p. 67):

The syllables do not limit themselves to fairly neat steps up or down on just four pitch levels, but are spaced more or less evenly on a rising (or falling) contour with each one a bit higher (or lower) than the next, and the whole giving the impression of smooth gradation from the first pitch of the precontour to the last one preceding the primary contour.

In previous definitions there was no question of limiting contours to "fairly neat steps up or down on just four pitch levels"; the preceding quotation (pp. 26f.) continues:

There may be many more than four actual levels, but it is the contour-point levels which are pertinent to the system.

The distinction between simple precontour, and proprecontour plus precontour might have been shown by means of a direct contrast in the context of "an unstressed syllable preceding a suppressed lexical stress", ascribed to proprecontours (p. 68); no direct contrast, which could have taken such contour variations out of the phonetic free variation which had already been expressly allowed, is suggested, however.

It is possible that a small correction of the definition of "slurred" would change the picture slightly: if the syllables involved in a slurred stretch are seen as glides rather than pitch levels, then a valid distinction may be made. Elsewhere, Pike does distinguish between steps and glides, though in a different context (when two contour points fall on a single syllable, a glide is noted, otherwise a step between syllables). There may be some support for this interpretation in the description of a further type of slurred precontour, the "slurred precontour with stresses" (p. 68), which involves "a continuous slide over a broad pitch range, without sharp pitch steps up or down" and which is distinguished from other types of contour involving descending series of stressed syllables in that "the syllables between the stresses are lowered in a small series of slur-like steps instead of being lowered by large sharp steps". The following example is given:

(45) Permit me to place this in your hands.
3-02- -1- 03-4

If it were not for Pike's rigid definition of stress in terms of intensity, independent of pitch (p. 83), a definition which is now obsolete (§2.2. above), this section might be regarded as anticipating Crystal's notion of 'glissando' (cf. §3.1.4. above).

It was noted above that the grammar (40) does not cover all of the contours described by Pike. In addition to the more central forms which the grammar does cover, Pike suggests four kinds of "special contour", five kinds of "amplifications of contours", and a wide variety of ways in which pitch contours may be modified by other prosodic systems.

The "special contours", listed in Table 21 below, are a very heterogeneous group of contours. The first kind, complex contours, are "arrangements of two primary contours or of a precontour and a primary contour [which] seem to have a meaning in addition to those which could be deduced from their separate elements" (p. 69); they are, therefore, fairly simple extensions of the set of contours already proposed, together with a modification of the principles of semantic interpretation of these contours to allow the interpretation of other categories than PC and PMC. Bolinger sees

SPECIAL CONTOURS	COMPLEX CONTOURS	DESCENDING STRESS SERIES	SPOKEN CHANTS	SINGSONG
	02-4-03-3, 03-1-04-3, 1-04-3, 2-04-4	02- -1-03-4	02-2-03-1- 02-2-03-3, 02:-3:-, 02-3	03-2 03-4, 02-4 03-3 03-4 &c.

Table 21: Pike's "special contours" (1945:68ff.).

this kind of extension of Pike's system as an implicit confession of the inadequacy of the initial framework, which was restricted to intonation patterns which were "too small" (Bolinger, 1947:73); more on this score below. The first of the complex contours, a falling-rising contour, has already been noted in the discussion of European descriptions as providing a constant source of analytic difficulties; Pike does not attempt to generalise between this and other falling-rising contours (cf. esp. §§3.1.2.3. ff. above). Both this and the next contour, as well as the descending stress series, in fact amount to a partial recognition of the European head-nucleus structure, though Pike's analysis remains ad hoc in this respect. The descending stress series, in particular, in which "there may be more stressed syllables on distinct pitches than can be fitted into four levels" (p. 70), is in itself a counter-example to the four-level theory, whether the theory be interpreted as phonemic, or merely as a notational convenience (see pp. 184f. above). The spoken chants and singsong are quite obviously different in form and function from the other intonation patterns; they will be given a very detailed treatment later on in the present study (§4.3. below).

The "amplifications of contours", too, are a rather mixed selection. The first sort, referred to as "resumed contours" is a form of reduplication of the primary contour or the DCP - EP stretch of a primary contour as a free variant of the non-reduplicated pattern (cf. also Schubiger, 1958; and pp. 145f.). The second, "deferred contours" (p. 73), and the third,

which in fact belong together and complement each other, are parts of a theory of "general pitch subordination", i.e. hierarchical intonation structure. Pike gives the following example, which may be used to illustrate deferred and subsidiary contours (p. 73):

- (46) "That's the 'way to 'buy a 'basket, Tom.
002- -4- 03- -4- 03--4- 03--4- -4-3

The deferred contour is 002- -4- ... -4-3, and the subsidiary contours are the three occurrences of 03-4. The terminology used by Pike might lead one to suspect an early version of what Crystal meant by "tonal subordination" (cf. §3.1.4. above); this is not the case, however. This contour is not very different from the "descending stress series", and corresponds approximately to the canonical form of the European analyses: the double degree sign, marking the beginning of the superordinate contour, is Klinghardt's 'takt-kopf', v. Essen's 'Hochton', Kingdon's 'head', Crystal's 'onset', and the lower primary contours are the 'body' (head in Palmer's or O'Connor & Arnold's analyses) or 'rhythmischer Körper' (v. Essen). The nucleus would be on basket, in the European analysis, unless for contextual reasons the nuclear accent were assigned to that; however, Pike does not distinguish between the relative prominences ascribable to way, buy, basket, and therefore, since the most plausible interpretation (in the absence of other information) would assign greater relative prominence to basket than the other two, the European system with its two distinct prominent categories 'head' (that) and 'nucleus' (basket) has the greater descriptive adequacy. This conclusion is supported by Jassem's comments on another of Pike's examples from a different context, but also with sequences of primary contours (Jassem, 1952: 45):

- (47) A big black bug bit a big black bear.
3-02 02 02-3 3- 02 02 02-4/

(cf. Pike, 1945:61); the slashes indicate tentative pauses - see below). Jassem remarks that where Pike finds six total contours in his sense, there are only two tone groups in the sense which Jassem makes explicit, corresponding in effect to the tone groups and tone units of other European analyses, too. It might be tentatively suggested, in view of this difference between the European and the Pike analyses, that Pike is in effect offering a theory of pitch accent (cf. the treatment of pitch accent theories below, §3.3.), and only handles sequences of pitch prominent items in an ad hoc fashion. There is a certain similarity between Pike's notion of general pitch subordination and Trim's theory of major and minor tone groups (Trim, 1959), a special form of the European approach, but Trim's minor tone groups cover more than Pike's total contours.

A fourth "amplification" of intonation contours is termed by Pike the "double rise". This would correspond to a form of long rising tail, in European terms, where one item in the tail has greater relative prominence than the others. That this is not a discretely different kind of structure from the others previously set out is indicated by Pike's rider (p. 73):

It may approximate the effect of a single complex contour if the phrase is grammatically unified, and if no hesitation is present to break it into two distinct rhythm units, and if the second rise does not begin with a very strong stress.

Pike relates the following four examples in this way (p. 74):

- (48) Does he have to do it?
3- 04-2 2-1/
(49) Does he have to do it?
3- 04-2 2-02-1/
(50) Does he have to do it?
3- 04-2/ 2-02-1/
(51) Does he have to do it?
3- 04-2/ -2-1/

The phonological systems and relations obtaining here can be made more explicit in terms of a system of accent and a system of rhythm, a kind of explication which was performed above for a number of Kingdon's observations (Table 13 above); this becomes clear if the series is reordered as (48) - ((51) + (49)) - (50) in order of increasing prominence, with (51) and (49) at approximately the same level of prominence, shown by the commutable '+' sign, with respect to the penultimate syllable. The final kind of "amplification" is considered by Pike to be an "early drop or rise of pitch" (pp. 74f.). This is only indirectly a matter of contour structure, however, involving the matter of placement of the beginning point of a primary contour on non-rightmost lexical items in the accompanying text (cf. Halliday's "tonicity", p. 224 above). Nothing is said by Pike about contours with more than two pitch directions (in his terms, two or more DCP categories); it is likely that these are more characteristic of British than of American English (cf. 1945:106).

A very important part of Pike's analysis, and one which did not figure in anything like the same degree of detail in earlier analyses, is the section on "modifications of contours"; the only later study in which this degree of detail is to be found is Crystal (1969), though Lehiste (1970) has a thorough study of the three main factors. Three of the systems which modify the basic trajectory, as Pike conceives it, contribute directly to perceived pitch: "change of key" (i.e. overall contour height), "spread of intervals" (i.e. contour width), and "drift" (i.e. downward drift of the whole contour, or upward drift of a precontour before a rise). The last of these categories is mentioned as a modification of level contours; this could account for Pike's transcription of certain items with the same pitch level which would have been placed on a falling trajectory in European descriptions (quite apart from dialect differences); cf. examples (46) and (47) above. Other modifications are due to internal word structure (quality, stress, boundaries), to word boundaries and compounds, and to stress, quantity, and voice quality at other levels. In discussing the modifications, Pike introduces a distinction between systems which apparently function according to discrete contrasts and those which are "gradient"; for example, in discussing change of key, he points out the following (p. 76):

Instead of phonemic contrasts between differences of general height, there appears to be GRADATION from one to the other. To call one utterance high, and another low, is to select an arbitrary point of reference, since there is no phonemic systematization of a limited number of heights, one of which is high and another low.

This is a point which has been made already in connexion with Pike's own

phonemic levels, of course (cf. Bolinger, 1951). Later, in the discussion of variations in quantity, gradiently functioning systems are further qualified in the following terms (p. 99):

In order to allow for the social significance of this graded type, one might choose to show the relationship between them by using a classification of speech phenomena into sounds representing PHONEMIC CONTRASTS [elsewhere in this paper called phonemes] and SOCIALLY SIGNIFICANT GRADATIONS [elsewhere in this study called nonphonemic gradation]. The first type has a strictly limited number of distinct units. The second type has vague norms and an equally vague but infinite number of degrees of departure from those norms.

The distinction is a development of Bloomfield's "gesture-like variations, non-distinctive, but socially effective" (cf. p. 180 above); Bolinger later made the distinction into an essential part of his theory of pitch accent and intonation (§3.3. below), and Crystal used a very similar notion to Pike's "socially significant gradations" in his "scales of linguistic contrastivity" (1969:201); similarly in Quirk & Crystal's "scales of contrast" (1966; cf. also §3.1.4. above).

The polysystemic character of Pike's analysis taken as a whole, in the sense that not all observable patterning is pressed into the same mould of phonemic role-type relations, is even more apparent in his account of rhythm systems. These are, in fact, not treated as modifications of the intonation systems, but introduced simultaneously with the intonation system, and on the basis of independent criteria (pp. 30ff.); the systems are, as examples have already shown (e.g. (48) - (51) above), interrelated, each with approximately the same status as the other. A rhythm unit has the following definition (p. 34):

A sentence or part of a sentence spoken with a single rush of syllables uninterrupted by a pause is a RHYTHM UNIT.

The pauses in terms of which rhythm units are in part defined (the other criterion being tempo) are characterised as follows (p. 31):

There are two significant types of pause (i.e. two pause phonemes or morphemes) - a TENTATIVE one and a FINAL one; these may be symbolized by a single and double bar, [/] and [/ /], respectively, and have the meanings indicated by their labels.

The pauses are said to be accompanied by other cues, particularly departures from normal syllable length in the case of tentative pause, and lowering of the ending point of contours, both falling and rising, in the case of final pause. A further category, the "intonation break", is used in introducing the category of rhythm unit, but not in the actual definition (p. 34):

English sentences are spoken with recurrent bursts of speed, with long or short pauses or with intonation breaks between.

Wells, in his review, criticises the relative inexplicitness of Pike's treatment of this category (1947:esp. 262-3), as well as the fact that it is only symbolised indirectly (cf. p. 183 above). The only information on intonation breaks is to be culled from the following observation regarding errors by foreign learners (p. 187, fn. 108):

A second common mistake is to omit the intonation break entirely, by pronouncing the end of the first contour with the same speed as the following

precontour, and introducing in this way an unnatural and objectionable syllable-timed effect.

This remark, and one to the effect that intonation breaks are often mistaken for pauses, points to the possible interpretation that what is meant by 'intonation break' is in fact the timing relations holding between syllables within a unit, rather than between units. If this is the case, Pike's hyphen notation indicates presence of such timing relations, and their absence may be underscored by pause - though pauses may also occur independently. This would be empirical motivation for choosing the hyphen rather than the apparently equivalent juncture notation suggested by Wells. However, there would be no reason for incorporating the hyphens in the pitch, rather than the rhythm system, in the absence of a specific accentuation theory, if this were the case. Wells' review contains further remarks on the use of mixed criteria, or, in other words, on the mixing of distinct systems in Pike's description: he questions the criteria for assigning precontours to following rather than preceding primary contours (items which Pike refers to as "syllables in double function" - pp. 38f.), and for the analysis of stresses in precontours and in the descending stress series (i.e. why do these stresses not initiate primary contours?). He reaches the following conclusion (p. 259):

The answer to all these questions is the same. Contour beginning-points are not determined by phonemics alone, not even by the 'impression of a single unified contour' ... (insofar as that impression has a purely auditory basis), but by meanings - by grammatical analysis. It follows that if we desire a clear-cut separation of phonemics from grammar, Pike's system must be accordingly modified.

Irrespective of the merits and drawbacks of an autonomous phonemics (cf., e.g., Postal, 1968:xi & passim), the desirability of clear distinctions between different kinds of criteria of analysis is beyond question. The possibility that the intonation break is indeed a construct rather than a category with phonetic correlates, as Wells implies, is hinted at in Pike's formulations "the contour ending constitutes an INTONATION BREAK in the middle of the rhythm unit, which is still capable of influencing the rhythm" (p. 37), and "the hyphen arrangement signifies an intonation break of organization ... even when no pause occurs there" (p. 38), both "contour ending" and "break of organization" being structural notions. The interpretation in terms of temporal organisation - fluctuations in the 'single rush of syllables' of a rhythm unit - would appear to be more plausible, however; indeed, Pike provides an explicit answer to the first of Wells' three questions: the syllables in double function, i.e. medial precontours, are assigned on the following grounds (p. 38):

Furthermore, the unstressed syllables of the precontour are more rapid than those of the ending of the preceding primary contour, and this difference in speed sets them apart. This coherence of the parts of a total contour is symbolized by the hyphens which connect their parts.

The tempo criterion is made even more explicit here. The interlocking of pitch and rhythm systems, otherwise described by Pike in terms of "simple" vs. "complex", "curtailed" and "weak" rhythm units according to the co-extensiveness of rhythm units with different stretches of pitch contours, appears to be more intimate than Pike describes, and than Wells is willing to acknowledge.

Pike's monograph is undoubtedly one of the most original ever offered on the subject of intonation, both as regards the method (cf. the acceptability tests, 1945:79f.) and as regards the treatment of intonation forms in terms of phonemic levels rather than in terms of contours described for convenience at the phonetic level with integer notations for pitch heights (cf. Coleman, 1914; Harris, 1944). Quite apart from noting that Pike's description stimulated the even more stringent phonemic analyses of Wells (1945), Trager & Smith (1951) and their followers, it is interesting to note the relations between Pike's analysis and the analyses of other schools. For instance, Bolinger's contributions to the study of prosodic systems are, despite differences on what is and what is not 'phonemic', in many respects quite similar to Pike's, and perhaps traceable to impulses from the latter: the separate handling of rhythm systems and pitch contours; the distinction between discretely and gradiently contrasting systems; isolation of primary contours or accents; the distinction between lexical (placing of) word stress - in Pike's terms 'innate' - and phonetically identifiable sentence or phrase stress (Bolinger's 'accent'); the denial of phonetic reality to 'contrastive' stress (Pike, 1945:85; Bolinger, 1961a). A number of points of contact between the Pike analyses and the earlier European analyses have already been mentioned: the multiplicity of systems, the classification according to contour directions, the correspondence of some of Pike's 'special contours' with the standard European head-nucleus approach and the tune approach; the similarity of proclitic contours (precontours and preheads). Further similarities may be registered in the light of the critical discussion above: the use of an explicitly hierarchical intonation structure (which is not used by other phonemicians); the (in Pike's case implicit) primacy of contour direction criteria over criteria based on other phonetic variables such as pitch height, and the related conception of pitch relativity as syntagmatic; the explicit use of role criteria. These similarities are extensive, despite the initially greater prominence of the differences: the monosystemic conception of pitch heights, generalised at different syntagmatic positions into a single set of four pitch phonemes by Pike; the "shortness" of Pike's primary contours, which are accentual in character, corresponding partly to the European nuclei, partly to heads (in Kingdon's sense), and partly to breaks, and thus also the shortness of the total contours, which do not correspond to European tunes or tone-units (another point misunderstood by Lieberman, 1967:187). It would be a simplification, of course, to propose the thesis that Pike's analyses did not differ in essential respects from the tonetic analyses; the novelty of pitch phoneme theory as applied to pitch heights, and the differences in weight attached explicitly to the pitch direction variable are sufficient to document the important systematic differences. In European analyses, for instance, the notion of syntagmatically relative pitch was hardly used with any significant degree of explicitness before Jassem (but cf. the early study by Coleman, 1914), perhaps because the pitch direction variable was taken for granted as an evident prime in the analysis; Pike, with the different weight attached to the height variable in his system, came to formulate contours in effect in terms of syntagmatic pitch relativity.

The different kinds of relation between Pike's analysis and the other pitch phoneme analyses will be the subject of the following subsections, where phonemic approaches with greater autonomy from previous studies, and more thoroughgoing phonemic procedures will be dealt with.

3.2.2. Strict phonemic analyses

The common characteristics of the approaches of Harris (1944), Wells (1945) and Trager & Smith (1951) lie mainly in their use of strictly phonemic procedures; there are other elements which these approaches share, such as the treatment of stress and juncture, which partly derive from the application of phonemic procedures. There are also considerable differences in descriptive detail, however; Harris, for instance, appears to regard levels (i.e. variants of the pitch height variable) as phonetic, and devoid of phonemic status, setting up a phoneme inventory of a highly sophisticated sort, while Wells and Trager & Smith have phoneme inventories which are more like Pike's four levels, though the approaches differ from Pike's both in procedures and in the other phonemes they include. A further trivial, but unfortunate, difference is notational: Pike uses pitch level integers in such a way that higher numbers denote lower levels, whereas in the other descriptions to be discussed in the present section the higher numbers denote higher levels. In view of the concurrency of Pike's and Wells' publications (1945), it is difficult to decide on the relative priority of these studies with respect to the introduction of pitch levels as phonemes; Trager (1964:267) and Lieberman (1967:183) regard the Wells study as having priority, but Pike points out that his study is an expansion of previously published pedagogical material which used the four contrastive pitches (cf. 1967:540). There is no doubt that the Pike analysis is by far the more comprehensive, both in the number of forms it postulates, and in the variety of type and role criteria it uses; later descriptions appear, however, to be in general more indebted to Wells for the structure of their analyses.

The following subsections will deal with these three approaches, and later formulations of the Trager & Smith version.

3.2.2.1. Harris

The outstanding characteristic of Harris' discussions of intonation (1944; 1951:45ff.) is, as in his discussions of other aspects of linguistic analysis, the emphasis on finding the inventories of forms, in particular phonemes and morphemes, of specific languages, and on finding precisely statable operations as principles underlying the discovery procedures by means of which these forms are identified. A more specific distinctive characteristic of his descriptions is the development of procedures, and procedural motivations, for the establishment of "components", in particular "long components"; a major stimulus for this was clearly the approach developed by the Prague circle in the thirties (mentioned by Harris, 1944 (1972:115), in a brief acknowledgment to Jakobson) which used distinctive features. There are, however, considerable methodological differences between Harris' componential approach and the Prague feature approach, which will be discussed below. Brief comment on the relation between the componential approach and Firth's prosodic analysis is also called for, and will be given below.

A number of different kinds of criterion are used by Harris for the selection of possible descriptions in the process of discovery. They can be summarised under the three heads of 'simplicity', an explicitly used though only partly defined metatheoretical criterion; 'distribution', involving an implicit theory of linguistic structure; and 'phonetic value',

explicitly relegated to subordinate status as "arbitrary" (cf. 1944 (1972: 117n)), and thus differing from the phonetic features of the Prague approach. Harris recognises two kinds of operation as fundamental to his discovery procedures: segmentation, in particular as applied to the "segmental phonemes", and the componentialisation of the resulting segments. The two procedures are not equal in status; the latter is described as "the division of each segment into simultaneous components" (p. 115), and is said to "go beyond" phonemic analysis (p. 131) in the interests of providing a simpler description. The components which result from carrying out componentialisation procedures are also, on occasion, referred to for this reason as "generalized phonemes" (p. 133).

In his first statement of the approach (1944), Harris identifies three kinds of component: the short components, comparable with distinctive features; long components which are comparable in some ways with Firth's (non-intonational) prosodies, or with Halle's later morpheme structure rules; and long components which are comparable with prosodic features, including intonation, in the traditional sense. The latter kind of long component, the kind with which the present discussion is concerned, is distinguished terminologically from the former in Harris' second account (1951:45ff.) by being referred to as "utterance-long elements" or "utterance-long features", and no longer as "long components". The reason for this terminological innovation is presumably twofold: the relative independence of the second kind of long component from the segmental phonemes, and the associated difference in definition of the two long component types in terms of their scope of "length", the first kind covering only stretches of a few phonemes, the second covering utterances. Harris points out that the extraction of the second kind of long component was, in fact, always involved in older phonemic analyses, though not explicitly, and without recognition of the theoretical consequences.

The "utterance-long" kind of component is ultimately justified in terms of role criteria (1944(1972:116)):

The extraction of these features out of the flow of speech is due to the fact that they constitute morphemes by themselves, independent of the rest of the speech, with which they are simultaneous.

The procedure of analysis itself, however, is conducted as if role criteria of this kind were not involved. It is only by way of illustration that the items of (52) are given a two-stage analysis using role criteria. The first stage is to suggest the vowel phoneme inventory of (53):

(52) You. You? Yes. Yes?

(53) /U/, /E/, /u/, /e/.

The upper case letters symbolise high pitched vowel phonemes, the lower case letters symbolise low pitched vowel phonemes. The second stage is to note that "the pitch features which are symbolized by /U, E/ have the specific meaning of interrogation"; these are therefore abstracted from the rest of the feature complex, and said to constitute a distinct morpheme. But this is not how the operation of componentialisation is presented in explicit form, and in fact role criteria are regarded as determining separate systems (p. 123):

The fact that most of these fixed sequences of sound components have meanings, or correlate with morphological constructions, is a matter

apart. Dependent sequences may turn out to be phonemic without being morphemes, e.g., word-stress, varying rhythms and melodies of speech.

The operation of componentialisation can be summarised in terms of four constituent procedures. First, an inventory of items is set up which fulfil the criteria for phonemes (p. 121n), but which are still allophones in the sense that vowels with different pitch and stress patterns, for instance, are grouped separately. Second, a search is made for "some connection among particular successive components in successive allophones" which should be "readily noticeable" (p. 120), in which "past experience with languages" (p. 121) is the guide according to which particular components are regarded as likely candidates. This stage of componentialisation clearly depends on a preformulated universal phonetic theory, however impressionistic; but this goes contrary to Harris' assertion (noted above, pp. 193-4) that phonetic criteria of analysis are arbitrary. If this is an over-interpretation of Harris' claim, the reason is that Harris does not distinguish between "arbitrary" phonetic criteria (as used by the Prague school) and possibly non-arbitrary phonetic criteria, for instance as far as type-role relations are concerned (as used by Harris), and therefore only allows the one generalisation to be made. This stage of the analysis leads to the discovery of "fixed patterns" or "automatic sequences" of components in neighbouring phonemes (p. 121):

The essential operation here is to put two successive sounds or features into one unit if they always occur together in a particular environment.

The procedure is familiar from other areas of phonemics. The final stages of the componentialisation involve the application of a general simplicity criterion in conjunction with various other criteria: the number of fixed patterns is reduced by noting other conditioning factors, enabling generalisations of the phoneme-allophone type to be made; simultaneous components of the "utterance-long" type may be identified; components may themselves be divided into further "phonemic" elements.

There are a number of differences in the interpretation of these stages in the 1944 presentation and the 1951 presentation; the frame just sketched holds for both, however. In the first version, the second stage of componentialisation (finding relations between successive allophones in terms of their components) was presented using examples with constant syllable numbers, constant stress distributions, and constant pitch heights, varying the accompanying texts. Thus, in the following examples a fixed pattern ending in the pitch sequence 30 is found which also holds for other "utterances with the same stress positions" (p. 121):

(54) 1 2 3 1 1 30
I don't know where he's going.

(55) 1 2 2 1 1 30
We can't tell when they're coming.

In the 1951 version, one procedure is used which keeps the text constant, and varies the sequence of components, first finding regular differences between repetitions of each "utterance" (p. 47), and then taking the regular differences together as an "utterance-long contour" plus a constant set of "9 tone-less segments". A second procedure compares unlike texts with unlike pitch sequences in an interesting substitution technique coupled with acceptability judgments. Taking the *i* of *marking* and *Kingsley* in (56)

and (57), Harris notes the judgments of (58):

(56) I'm marking.

(57) Kingsley!

(58) 0 2 0 4 1
aym 'markig ~'kingzliy
0 2 4 0 1
'aym 'mar''king *kingzliy

Using a "working hypothesis" about "the feature we suspect may constitute an utterance-long contour" (p. 48 - cf. the remarks on Harris' use of an implicit universal phonetic theory, p. 285 above), the investigator tests other utterances segment by segment for acceptability, and notes that "while almost every vowel quality will occur in the positions of the vowel-segments ... we can obtain only a few different tone sequences". These few "permutationally possible tone sequences" (p. 48) are then the fixed patterns or automatic sequences which constitute the utterance-long components. Sequences such as 1221130, 4221130, 2230, 230, 012233333456 (You're not going over to Philadelphia?) in the 1944 version, and a number of others in the later version, are found by means of such procedures.

Further reduction of the inventory of patterns may take place by noting complementary distributions and conditioning environments; for instance, the number of pitch height variants noted in a sequence is clearly conditioned by the number of segments in the text. The examples (56) to (58) show a different kind of conditioning, which may be summarised as follows in the familiar feature notation, but using Harris' components:

(59) [1 pitch] + [2 pitch] / [mildly loud stress] [3 pitch] [0 pitch]

(60) [1 pitch] + [4 pitch] / [loud contrastive stress] [3 pitch] [0 pitch]

These variants, conditioned by the stress environment, might be regarded as phonemic variants of a phoneme /1 pitch/, in Harris' terminology. The sequences thus described are special cases of the same fixed sequence. The classes of long components thus established may be subjected to further analysis with regard to their internal structure. Harris writes of "components of components" set up "on the basis of phonetic similarity (since there are no limitations of distribution among them) in the same way that this will be done for segmental phonemes [i.e. the analysis of short components - DG]"; for long components such as those listed at the end of the previous paragraph, he suggests "the direction of pitch change after the last loud stressed vowel, the degree of change there, etc." (1944(1972: 122)). One aspect of the 1951 description, which appears to be a modification of the stress-conditioned allophones approach of the earlier description, is a suggestion that contours involving the same phonetic variable may occur simultaneously (1951:50f.). The variations in paradigms like the following -

(61) 1 0 2 0
That's his bedroom

1 0 3 0
That's his BEDroom

1 3 2 0
That's HIS bedroom

2 0 3 0
THAT'S his BEDroom

are said to consist of the basic contour 1020 with occurrences of the contour three in different positions, accompanied by "extra-loud stress" on the vowel and surrounding consonants. This aspect of the system is structurally very much like the pitch accent theory later developed by Bolinger; the descriptive details are, of course, rather different. This conception of superimposed contours has its cognate in the 'upward' direction, in the recognition of contours which extend over more than one "utterance", which characterise individuals, age groups, social classes, situations; Harris adopts the Bloomfieldian phrasing that "these features border closely upon gesture and are of importance to any consideration of how language occurs in social interaction" (1951:55), as did Pike in his monograph, and regards such features as free variants of the contours established for individual utterances; in this last respect he differs from Pike, who did not associate contours as intimately with syntactic categories as Harris does.

Harris appends a section on the phonemic status of contours (i.e. the utterance-long features), and suggests a way in which certain equivalences between contours can be extracted and formulated as phonemes (or "phonemic elements", 1951:57), out of which the contours are constructed. Table 22 summarises the contours which Harris lists, with their descriptions, semantic interpretations, and the suggested phonemic constituents. The compound

COMPONENT	SIGN	DESCRIPTION	INTERPRETATION	CONSTITUENTS
0123	/?/	low-rising	(none given)	
1234	/??/	high-rising	impatient question	/?/ & /./
0132	/?!/	rising-falling	surprised question	/?/ & /./
120	/./	mid-falling	assertion	
241	/!/	high-falling	excited assertion	/./ & /./
122	/./	mid-level	to-be-continued assertion	
(none given)	/!./	(none given)	wh and echo- questions	

Table 22: Harris' phonemicisation of "utterance-long" long components (1951:57, & /!./ on p. 292).

tunes described as rising-falling and high (rising or falling), respectively, are constituted in a rather different manner from what one might expect from phoneme combinations. Many well-known contours are omitted which the "phonemes" could quite easily have been used to construct: falling-rising, for instance, and the tri-directional contours (assuming these to occur in American English also). The operation by which the mid-level con-

tour is applied to the rising and falling contours to make high-rising and high-falling contours is fundamentally different from that by which the rising and falling contours are applied to each other (no precedence, such as that in Armstrong & Ward's theory of emphatic contours, is given): the former is simultaneous, while the latter are sequential; the latter are straightforward constituents, while the former "has the effect of raising the relative pitch of the contour" and creating an opposition between the "middle register" and "low register" base-lines. No further comment is made, however, about the kind of relation involved, and about the status of the base-line (cf. §2.3.3.1. above). No reason is given why /./ should not be applied to itself to give a high level contour, or /?/ and /./ should not be applied in the reverse order, or why low level contours are altogether missing; nor is any comment made on the difference between the compound contours which involve the level 4 and cases of superimposition of contours of other kinds (cf. p. 288 above). It should be noted, too, that the relation between /!/ (= 241) and its constituents /./ (= 120) and /./ (= 122) cannot be obtained by comparing the sum of the constituent figures at each position with the constituent figure at the corresponding position of the compound tune, however one tries to interpret the figures: not even the bare syntagmatic pitch relations are preserved (the result being 242, rather than 241). Harris points out the following himself (p. 58n):

Note that the combinations suggested above are not phonetically exact. We do not have to restrict ourselves to cases where perfect phonetic similarities may be found among the contours. We can say that /./ is defined as mid-level tone (e.g. 122) when it occurs by itself, but as a raising of tone-level (register) when it occurs simultaneously with other components (so that /?/ is 0123, while /./ is 1234).

Two notions involved in these characterisations are in need of clarification, without which not even the consistency of Harris' definitions can be examined: 'phoneme' itself, and the notion of 'level'. The contours are said on the one hand to be "generalised phonemes" (see above), and yet they are considered, in the section under discussion, to consist of phonemes. In addition, the long components themselves are said in the 1944 version to share with phonemes the condition of "preserving the bi-unique one-to-one correspondence of phonemic writing" (p. 120; cf. also p. 131), and to resemble phonemes "in that both are distributional symbols with phonetic value" (p. 131). It is difficult to see why phonemes should be considered to be elements generalisable to other elements in turn consisting of phonemes. The validity of phonemicisation depends on showing that the bi-uniqueness condition is preserved: the comments above on possible ambiguities indicate that this has not been shown. Part of such a demonstration would involve a more explicit characterisation of the denotations of the integers which Harris uses, and of the status of the integers themselves. This is not provided, however, presumably as a side-effect of the uncertainty about the status of phonetic criteria of analysis pointed out above (cf. also the discussion of transcriptions, §2.4.1.). The integers are simply assumed as the only kind of variant-name, linked with the height variable, which is appropriate to pitch description, and the possibility that pitch directions might be phonetic primitives rather than composites (cf. in particular the difficulties which Harris would have to transcribe short monosyllables ending in a voiceless consonant) is not entertained. The 'zipping relation', as one might call it, which Harris in effect postulates between the components of segmental phonemes and intonations, is not

a plausible one.

Harris' transcription system appears to be observationally inadequate, since there are a number of cases where the unacceptability judgments used in the course of the substitution procedures do not appear to be justified in view of the lack of evidence given for the phonetic variants used, in particular 'stress' and 'pitch height', and the vague hints given on the interpretation of the 'relative' pitch height notation by integers:

- (62) 0 1 1 13
12 ðæt ə 'bayt
- (63) 0 1 1 33
12 .ðæt ə 'bowt
- (64) 0 1 1 21
12 .ðæt ə 'bowt

If the pitch heights are relative, then a transcription such as (62) can only make sense if the relativity is paradigmatic, rather than syntagmatic (cf. §2.3.3. above); this is an essential difference from Pike's approach. The paradigmatic interpretation is supported by Harris' reference to a "base-line", with respect to which the numbered heights are relative, and which must, in some sense, be a constant, in his discussion of intonation phonemes (1951:57; cf. p. 289 above). But until such categories are given explicit support in phonetic terms, there are no criteria for deciding on whether such patterns as those transcribed in the examples above have anything like a "bi-unique" relation with phonetic categories of English, as Harris would claim.

There is a further significant difference between the Harris approach and that of Pike, beyond the differences in procedural stringency and in the actual phonemic variants suggested. Whereas Pike does not postulate any priorities, either in descriptive procedure or in logical structure (cf. also the Firthian approach), between the various systems which constitute the description (stress, intonation, segmental phonemes, &c.), Harris' description does involve such priorities. Both stresses and segmental phonemes (bar the associated pitch components) need to be characterised before the intonation patterns can be extracted; all the approaches referred to in the present study as "strictly phonemic" share this characteristic. Trager, for instance, in a schoolmasterly editorial comment on Bolinger's review of Pike (1945), accuses both these scholars of failing to recognise this priority, and goes on to praise Wells' description (cf. §3.2.2.2.), which resembles that of Harris in this respect, for the following somewhat dubious and unempirical reason (1947:78):

The merit of Wells' treatment ... lay precisely in his recognition of the general validity of our stress system.

The latter reference is to Bloch & Trager, 1941); there, however, the priority of stress systems is simply assumed as evident, not demonstrated. In view of the obsolescence of this particular view of stress (cf. §3.3. below, and §§2.2.1. ff. above), such priorities can not (or perhaps 'no longer') be taken as self-evident.

Were it not for the fact that Firth explicitly excludes matters of intonation from overt treatment in his presentation of the theory of prosodic analysis (1948(1957:121)), which has often been compared with Harris' long component analysis (e.g. by Langendoen, 1968:54 ff.), this would be the

place for a discussion of the relations between these schools of thought; a few brief comments would still seem to be called for, however. The prosodies which Firth discusses come closest to the shortest of Harris' long components, later distinguished terminologically from the longest components (as noted above). Firth's "pragmatic functionalism" (1935(1957:79)), with its distinction between major functions and minor functions within phonological description (the former referring to interrelations between the phonological and other systems, the latter to autonomous phonological structures based on 'paradigmatic' oppositional criteria of analysis), is more explicit in sketching the interrelations between different kinds of criteria of analysis than Harris' approach, though not more so than Pike's, and provides a means of resolving Harris' wavering over the position of semantic criteria in intonation analysis (cf. pp. 284f. above). Firth's conception of a universal phonetic theory, with various relations of differing degrees of 'naturalness' to particular languages and their phonological systems, his rejection of what amounts to a bi-uniqueness condition (1948(1957:132)) and a linearity condition (p. 127) on phonological descriptions, his allowance of major functions in phonological analysis (pp. 122f., 125f.), his use of ordered rules (e.g. p.136) and his selective claims about perceptual realities in relation to phonological description (p. 138) are all fundamental differences from Harris' views which have not generally been recognised (cf. Langendoen's oversimplified account of Firthianism, 1968). The further differences in detail between Harris' components as generalised phonemes and Firth's prosodies as generalisations "beyond the phonematic level" (1948(1957:123)), which are not inconsiderable (cf. Robins, 1957; Lyons, 1962), concern non-intonational questions of phoneme structure and distribution, and are therefore of no further consequence here.

The criticisms which have been made of Harris' sophisticated application of phonemic methods of analysis to pitch regularities centred on the notion of 'phoneme' and on the relation of pitch categories to segmental phonemes, as well as on the selection of criteria, in particular the phonetic criteria, on which the analysis was based, and only marginally pertained to the original and subtle formal operations postulated. Similar constellations of problems are associated with the later strictly phonemic approaches, though the descriptions differ in significant details which cause the problems to emerge from slightly different points.

3.2.2.2. Wells

The two accounts of pitch systems given by Wells (1945; 1947a) bear a number of similarities to the approaches of Harris (1944) and Pike (1945) respectively. Harris (1951:46n) comments on the first similarity, and Wells notes the similarity of his approach to that of Harris (1945(1972:142)) as well as, in effect, endorsing the correctness of Pike's analysis (1947a (1957:205)). Wells' two descriptions differ in a number of ways which will be noted in passing at the relevant places.

Harris (1944) had established two fundamental kinds of analytic operation in phonology: segmentation and componentialisation. Wells (1945) starts with the very closely related pair of phonemic principles: the segmental principle, and the principle of phonetic similarity. The first is characterised in four respects: each segment should be continuous, and belong to just one phoneme, constituting the only elements of phonemes, as well as being "as short as a phonemic analysis warrants" (1945(1972:135)). The

second principle is rather stringently formulated, stating that if phones are indistinguishable they belong to the same phoneme, and that allophones in complementary distribution are members of the same phoneme if and only if they are relatively more similar to each other than to allophones of other phonemes. The pitch patterns of English, like other prosodic systems, are said to require exceptions to be made to the segmental principle, though Wells' main aim is "to apply to pitches, *mutatis mutandis*, all the principles and methods of segmental phonemics" (p. 136) and these *mutanda* are not, in fact, made explicit; application of the continuity principle, particularly in the 1947 analysis, leads to a number of inelegant complications, for instance, which will be dealt with below. Of the principle of phonetic similarity, which in Wells' formulation excludes even partial overlapping of phonemes, Wells makes the following remark (p. 140):

How faithfully we have observed the principle of phonetic similarity cannot be known until the present phonemic analysis has been compared with phonetic graphs from the laboratory - a comparison which however is not necessary for establishing the validity of the phonemic analysis itself.

The lack of an explicit phonetic theory, whether on a perceptual basis, or on lines which combine perceptual and instrumental techniques with quantitative methods of analysis, is obvious from this remark, which casts doubt on the systematic status of the principle of phonetic similarity. But if the pitch patterns are to be regarded in fundamental respects as exceptions to the segmental principle, there is little left of the principles of phonemic analysis in this area of phonology. The main burden of analysis falls on the principle of phonetic similarity, Harris' operation of componentialisation, if segmentation is not the guiding principle; if there is doubt about the validity of the phonetic variables chosen to provide similar and dissimilar phonetic variants as defining features for phonemes and allophones, such as pitch height, width, &c., then the description may turn out to be a model without an object. Even if segmentation were the main guiding principle, the problem would not disappear, since a segment must have defining qualities, and thus presupposes the availability of the principle of phonetic similarity.

The other kinds of criteria which enter into an analysis of pitch patterning are summarised by Wells under the heading "Meaning of 'Suprasegmental'" (pp. 136f.). Since those particularly relevant to intonation analysis involve role criteria and relations with other language systems, they will be dealt with after the discussion of Wells' description of the main facets of English pitch patterning.

Unlike Harris, who starts with a segmental phonemic analysis, Wells observes the pitch contour as a whole, and proceeds to segment it; each segment has, phonologically rather than phonetically, one pitch level associated with it, its "key pitch", with fluctuations of level which are not further specified; the key pitch is held to begin each segment. The pitch level variable is paradigmatically relative (p. 137):

The distinctive feature of the segments assigned to the pitch phonemes is pitch relative to the speaking-range of the speaker's voice.

The "distinctive feature" is said to be "assigned to the pitch phonemes", but since it is the sole feature involved, the terminology becomes somewhat redundant at this stage. There are four functional variants, the pitch phonemes, which Wells numbers, unlike Pike, 1 (lowest) to 4 (highest).

No phonetic underpinning is offered for the notion of 'pitch' or pitch level, and in particular for the clustering of pitch fluctuations around certain key pitches, four in all. One way of providing such underpinning would be to give criteria for identifying segment boundaries; this could be an important part of a justification of the reality of Wells' description, since pitch phonemes, i.e. the segments associated with a key pitch and its fluctuating trajectory, are not allowed to iterate: any two adjacent segments which might be postulated as regarded as a single segment if they are members of the same class with respect to their key pitches. No boundary criteria are given, however, for the segments. In the 1947 description, boundary criteria are only given for whole contours, which end, per definitionem, for Wells, at a "pause" (1947a(1957:206)) - in this respect, too, differing from Pike's model, in which the intonation and the rhythm systems were independent to a considerable degree. In the 1947 description, the notion of 'pitch phoneme' is rather different: the phonemes are associated with individual vowels, and iterate; the old contours without iteration now have the status of morphemes, and the contours written with iteration are said to be morpheme alternants (the number of vowels having nothing to do with the status of the pitch morpheme), rather than phoneme alternants. Well states (p. 205f.): "In phonemic transcription and in citing alternants of pitch morphemes ..., it is convenient to record only the first of a series of occurrences of the same pitch-phoneme ..."; the 'segment' of the earlier description is demoted from phonemic status proper to that of a further construct based on criteria internal to the theory. This conception of pitch phoneme is not found elsewhere; the nearest parallels are phonetic pitch transcriptions such as those of Coleman (1914) or Harris (1944), though these scholars do not, of course, claim functional status for their syllable-by-syllable notation of pitch heights. No further motivation is offered for the trilogy of pitch phoneme, pitch phoneme of convenience (perhaps to be interpreted as a new kind of morphophoneme in this context), and pitch morpheme.

The difference between Pike's 'contour points' and Wells' segment-initial key pitches (in the earlier formulation) appears to be mainly in the embedding of these items in a more general theory of intonation structure in Pike's case, and the lack of this in Wells' case; their actual transcriptions of <text, intonation> pairs differ only in minor details. Pike differentiates between various syntagmatic positions for pitch phonemes within contours, and between different kinds of phoneme sequences, each of which he provides with a label, while Wells leaves syntagmatic aspects of intonation relatively inexplicit. This is not only a matter of Pike's more generous linguistic ontology, which manifests itself in Pike's theories of other aspects of language and behaviour besides intonation (cf. Pike, 1967), and the more parsimonious linguistic ontologies of other American structuralists; scattered statements of distribution in terms of initial, medial and final positions of pitch phonemes within contours are in fact made by Wells, and in particular the co-occurrence of loud stress with whichever phoneme is in medial position is a structural fact which, for descriptive adequacy, can be most easily captured by explicitly labelling the various positions in pitch contours.

Wells' description is bipartite: first, the pitch contours and the "selection and order" (1945(1972:139)) of the phonemes they contain are discussed; then the "spacing" (p. 139) of these phonemes (i.e. placing, the function which maps them on to texts) is treated in the context of the "semantic values" (p. 140) of the contours. The present discussion will follow

this division.

The contours which Wells lists, nineteen in all (twenty if a contour which Wells transcribes in an example but does not list is included) are: 23, 231, 23132, 23231, 2343, 24 (not listed), 241, 242, 2423, 24231, 31, 312, 32, 321, 3231, 34, 341, 342, 4, 42. For this list, and the examples, Wells does not claim completeness (p. 139):

The list of examples is by no means complete; for instance, of the twenty-seven possible orders of three pitch phonemes PQR, where P is initial and therefore not 1, and where $Q \neq P$ and $Q \neq R$, only ten are exemplified in the list.

This statement is made on the basis of properties of his description, however, and not on empirical grounds: with respect to the examples given, his 'grammar' overgenerates, i.e., its weak generative capacity is too great; the additional question of whether there are empirical criteria for contours in English which correspond to those of Wells' description is not to be confused with the question of what sequences are generated by this description. A comparison with Pike's notation of simple patterns, in particular primary contours (cf. Table 20 above), converting integer notations and attempting to assign structure to Wells' contours, shows that the inventory given above is a subset of Pike's collection of contours. Some of the contours in the above inventory are referred to as "compound contours" (p. 139); they are defined not on suprasegmental grounds, however, but by their spacing or placement: the compound contours are said to require consideration of "stress and juncture phonemes and morphemes also, and sometimes syntactical structure as well" (p. 139). In effect, they are the contours with more than three integers. The "intrusive contours" mentioned in passing, but not exemplified, form a further kind of non-simple contour, and amount to Pike's "subsidiary contours" within "deferred contours" (1945:73).

As far as phoneme distribution is concerned, Wells notes simply that the lowest phoneme (1) does not occur initially, while the highest (4), occurs more readily than the other phonemes as a contour in its own right. It is not clear, however, that the distribution is in fact quite so simple, even granting the phonemes some degree of validity (cf. the remarks in the previous paragraph, as well as those on the generative capacity of Pike's system, §3.2.1. above).

The contours are said to be associated with a number of phonetic variants of various kinds. The pitch trajectory within a segment (the stretch associated with one pitch phoneme, in the earlier version) is said to be a function of the key pitch of the phoneme concerned; this is not the only variable involved, of course. Pitch height is also said to vary with stress: the less the stress, the lower the pitch; this is only said to be "sometimes" the case, however. The non-lowest phonemes (2, 3, 4) end in a rise under certain circumstances: "before pause juncture", and (only noted in passing for phoneme 2 in the sequence 3231) in antepenultimate position within compound contours. This treatment of the final glides as allophones of the pitch phonemes enables Wells to avoid the postulation of an additional phoneme 5 to account for the higher pitch after phoneme 4 (p. 140); it ignores the contrasts which can be observed between, for instance, questions with rising sequences at the end and questions with level sequences at the end, however. Wells' treatment is of interest in this respect, nevertheless, as provisor of the basic framework for the Trager & Smith account, which adopts most of the features of Wells' description.

The second aspect of pitch patterning which Wells treats is the "spacing" of pitch phonemes with respect to texts. His discussion is, in effect, a statement of various relations between the pitch system and other linguistic systems, such as the segmental phonemic and the stress systems, and an account of some of the roles with which pitch patterns are associated. An indefinite number of possible spacings of pitch phonemes is said to be possible; only one of the three pitch phonemes in a simple contour is allocated the status of independent variable in this respect: the medial one. The phoneme occurring in first position begins the contour, by definition, since the key pitch is said to be the first pitch of a segment, and is a function of the medial phoneme, which for this purpose would have been better defined as 'penultimate' rather than 'medial', to the extent that if the penultimate phoneme occurs at the beginning of the contour, there is no antepenultimate ('initial', in Wells' terminology) phoneme at all. The spacing of the final phoneme is a function of the spacing of the penultimate phoneme in that it occurs on the syllable of the text immediately following that on which the penultimate phoneme occurs, unless the latter occurs on the final syllable, when the last two phonemes occur in sequence on the final syllable itself. A further observation on the relation between phoneme sequences and syllables is manifestly inaccurate: it is not true to say that "a single vowel may be affected by two pitch phonemes, but never by more than two" (p. 139), either in British English or, apparently, in American English. Pike, for instance, has examples such as the following (in Wells' notation the contour would be 2412) in his study (1945:56):

- (65) What's my name!
3- 01-4-3/

It is not possible to describe the final rise as allophonic, since, in Wells' system, only the non-lowest phonemes can have such allophones.

A further aspect of spacing or placement is that "the place of the independent pitch phoneme coincides with the place of the loud stress" where there is only one such stress in the "utterance" (p. 141); the dubious nature of definitions of stress which is independent of pitch has already been mentioned at a number of points (e.g. p. 199 above), but this kind of definition was current in all of the schools of phonemic intonation analysis and in a number of other phonetic schools too, at the time. The co-occurrence observation holds not only for one-stress utterances, but also for other pitch rises in compound tunes: the other stress would occur on the preantepenultimate phoneme of the pitch contour, given the contours of Wells' inventory, though it could apparently occur without a change in the pitch trajectory (p. 141). Longer sequences are not taken into account, and no general principle of accentuation or of the relation that accentuation might have with pitch contours is invoked.

Although Wells' analysis is generally held to differ considerably from Pike's in a number of respects, the distributional facts stated can be translated with ease into Pike's system, and given names from Pike's description. Pike's primary contours do not differ in transcription of actual examples, in phoneme sequence length, or in their association with "stress" from the sequences of penultimate and final phonemes of contours; the precontours of Pike's analysis do not differ either, in phoneme selection, in length, in optionality, or in their "double function" (Pike, 1945:67) between two primary contours, from the antepenultimate phoneme of Wells' simple contours, and of most compound contours; the main similarity is, of course,

their use of four pitch height phonemes.

The second version of Wells' description differs from the first, and from Pike's, in its approach to placement problems, now referred to as "scope" (1947(1957:206)) rather than "spacing". The claim is not made that "the scope of a pitch-morpheme is always taken to be a pause-group"; it will be recalled that for Pike the intonation and the rhythm systems did not have coextensive constituents. The presence of pause can thus be used, by definition, as a criterion for deciding on whether a contour consists of one or two morphemes, even where the two contours, one with and one without pause (the former monomorphemic, the latter bimorphemic) are similar or indistinguishable in meaning (p. 206n). It is difficult to see why the two sections interrupted by pause should be taken to be two pitch morphemes; on the same page, pause is said to mark, for instance, clause boundaries, and there is no reason for forcing the pitch contour into the same function without additional evidence, particularly if the same contour may occur without this function. Wells' criticism of Pike for using non-phonetic or phonological criteria in his setting up of structural categories for intonation has been mentioned already (§3.2.1.). It seems, however, that the alliance of pause and pitch in the second version of his own description has more of the character of a shot-gun wedding entered into for appearance' sake, to mask the entry of unwanted non-phonological criteria, than that of an empirically justified relationship. It is presumably Wells' definition of the scope of pitch morphemes that leads him to make an ad hoc distinction between the "scope" of a pitch morpheme and the "constituent with which the pitch morpheme is paired" (p. 206) for the following sentence:

- (66) /³ey-sāhrvdmīy-an²āysj²ūwsiy-st²⁴eyk/

The scope of the first pitch morpheme is of course the sequence they served me a nice, according to Wells' definition, as he himself points out; but his immediate constituent analysis of this sentence is as follows (convert-int Wells' numbered cuts into the now more familiar parenthesis notation):

- (67) ... (ə)((nāys)((32(x))(((fūws)(iy))((2)(junct))((steyk)(')...)))

In this analysis, for some reason the 32 morpheme, for instance, is regarded as first pairing with the pause, and then with the item nice; the same morpheme is said to occur again after the pause, in the alternant /2/. No motivation is given for this atomistic analysis of the pitch contour, which results in items which are no larger than those whose inadequate size was criticised by Bolinger in his review of Pike (1947:73; cf. §3.2.1. above), and which reflect the intonational facts to a lesser degree than Pike's analysis. It should be recalled, in this connexion, that in his earlier analysis, Wells had suggested that syntactic and other criteria not intrinsic to the pitch system have to be used to disentangle the constituents of compound contours; this instance of such disentanglement leads to a different kind of entwining, and for the unravelling of the ensuing knot no further criteria are given. This attempt to associate the intonation and the grammar of English represents, despite the difficulties it introduces, an important landmark in the history of intonation descriptions in the American tradition; the close association between intonation, accent, and syntax posited here can be traced as a conspicuous distinguishing mark through the descriptions of Trager & Smith (1951), Chomsky, Halle & Lukoff (1956), Stockwell (1960), Bierwisch (1966), Chomsky & Halle (1968), and

Bresnan (1971), which represent the main stages in the development of the relevant aspect of generative phonology.

This close association with syntax was not present in the first analysis made by Wells to quite the same degree; there, the association of pitch morphemes with syntactic structures was no more than vaguely hinted at, and the "meanings" of pitch morphemes were described without reference to syntax as being not particularly unified but formulatable in the following terms (1945(1972:140)):

These meanings reduce to two main kinds: emphasis and attitude. Emphasis is a modification of attitude; any attitude can be emphasized or merely expressed without emphasis.

These role categories are unfortunately not further characterised, however. In fact, a slight contradiction arises in the following paragraph, where Wells makes the following claim: "Every utterance contains at least one emphasized word ...", which is impossible to reconcile with the claim just quoted, unless "emphasis" is used ambiguously, with the classic type-role confusion discussed in §1.1. above; in the latter instance, it could be a synonym for Wells' "loud stress". The notion of "modification" used by Wells is not clarified either; it is odd, for instance, that emphasis should be seen semantically as a modification of attitude, where the phonological relations are the other way round: pitch patterns are modified (obviously in a different sense of the term, but with the same implication of priorities) by the stress patterns.

The length of the present discussion and criticism of Wells' relatively brief contributions to intonation theory is due to their status as the most direct ancestors of what might be termed the mainstream of American intonation analysis. The most outstanding representative of this tradition of intonation analysis is Trager & Smith (1951), at least in the sense that it is the most apparent source of the numerous later applications of the phoneme paradigm to the description of American intonation, as well as being the explicandum, in various ways, for the generative studies of Chomsky, Halle & Lukoff, (1956) and Stockwell (1960). The present section will continue with an account of the Trager & Smith description, and Stockwell's explication of some of its intonational aspects; the Chomsky, Halle & Lukoff explication of the stress system will be left to the context of Bolinger's distinction between intonation, accent and stress (§3.3. below).

3.2.2.3. Trager & Smith

Trager & Smith (1951) presented a comprehensive and practical survey of those areas of the description of English which had been of central concern to the neo-Bloomfieldian structuralists: phonology and morphology, with an embryonic syntax. Thereby they established a paradigm for the formulations of descriptions of English in America which retained its status for a considerable length of time. It is of particular interest that the study provided a source of analysed material for pedagogic texts, which was its avowed aim (p. 3), and that it also functioned as a suitably compact and 'clarified' compilation of data and tentative suggestions for structure which was later taken up by later explications of the notion of 'linguistic' or 'phonological' structure which provided descriptions of English on a generative basis.

Methodologically, the analysis is "based on classifications of behav-

ior events (the occurrence of phonetic material)" (p. 8), culled from many years' experience. This classification proceeds in five main steps, after which questions of semantics and language use, which are given no more than a cursory review at the end of the book, are reached. These steps, arranged in order of priority, are (p. 8): (1) statement of pertinent pre-linguistic data; (2) account of observed phonetic behavior; (3) analysis of the phonetic behaviour into phonemic structure; (4) presentation of recurring entities composed of one or more phonemes that constitute the morpheme list; (5) analysis of these into morpheme structure (including making the syntax-morphology distinction). This setting of priorities is adhered to, and constantly alluded to (cf. pp. 76f.), throughout the book. It is not clear, however, whether the priorities involved are priorities of discovery (for instance in the idealised sense in which Harris wanted his procedures understood), or whether they are priorities within the logical structure of English, or of their own presentation. A conceptual difficulty which the analysis creates lies in the clash between the listing of priorities, and the deliberate omission of "pertinent prelinguistic data" and the lack of phonetic evidence for certain conclusions drawn. One of the most distinctive characteristics of American phonemics, the four pitches of its intonation analyses, is actually said to be based on "the prelinguistic finding that pitch as used in language is heard around a limited number of points rather than as a continuum" (p. 41), for instance. But who has ever presented solid evidence, linguistic or pre-linguistic, for the validity of such a finding? Yet Trager & Smith present it as an evident empirical prime, and not even as the result of a linguistic analysis.

The three main subsystems of English phonology, the segmental, stress and pitch systems, are also dealt with in that order; Trager's conviction of the necessity of this priority has been mentioned above (p. 199). There is a systematic motivation for this priority, quite distinct from any empirical considerations, as will become clear below; it is very unlikely that their analysis of pitch would have turned out as it did, with highly implausible pitch phoneme-allophone relations, if Trager & Smith had not made the prior postulation of four levels of stress.

Apart from these assumptions, the Trager & Smith account of pitch patterning in English derives in most respects fairly directly from Wells (1947a). A number of further modifications are introduced, however, and the phonetic level, which Wells had only treated in passing, is given more prominence and, in accordance with the methodological programme, has priority in the presentation. The initial statement about the perception of pitch in language in terms of a limited number of heights was mentioned above; it is further noted that relative, not absolute pitch is the relevant variable. No account of the relata involved is given, however; it is not clear whether paradigmatic relativity, with pitches relative to a limited number of quasi-constant points on a height metric, or syntagmatic relativity of pitches relative to each other in a trajectory (§2.3.3. above) is involved. A complication is introduced by a further aspect of the Trager & Smith description, which is frequently overlooked: apart from the four pitch phonemes, which they share with Pike and Wells, Trager & Smith introduce a system of pitch notation for the phonetic level which divides the pitch height scale into four main sections (presumably corresponding to the limited number of points cited above), with four subdivisions for each phonemic pitch range, indicated by the relevant integer plus one of four diacritics. This notational system defines 4⁴, i.e. 16 combinations of integer (as in the Wells system) and diacritic (from low to high: ~ · ^ -), from

the lowest pitch level [1] to the highest [4]. Furthermore, the pitches marked with diacritics are described as "absolute" (p. 42): "lower absolute pitch ([1]) ... higher absolute pitch ([4]) ... [2], an absolutely highest variety of [2]". Besides the four prime perceptual levels, the sixteen absolute levels, there is a further indication that some notion of absolute-ness of pitch underlies the Trager & Smith conceptual framework: there is a simple function mapping the set of sixteen pitch levels on to the set of four degrees of stress, and the pitches associated with tertiary stress in this way attain some kind of eponymic status for the group of diacritics associated with any given pitch height; they "may be considered as the standard of comparison for each speaker", in effect pitch constants (cf. discussion in §2.3.3.1. above). The function maps all levels transcribed with the diacritic ~ on to weak stresses, all transcribed with · on to tertiary stresses, all transcribed with ^ on to secondary stresses, and all transcribed with - on to primary stress. An example of such a transcription (including junctures, see below) is the following (p. 42):

(68) / [1]hæw + [2]da + [3]ðæy + [3]stə [1]diy [1] /

The mixed phonemic-phonetic transcription illustrates the priorities set by Trager & Smith for their analysis. The function just described results in a biunique relation between diacritic markings and stress markings, and forms the basis for Trager & Smith's suggestion that the four diacritically marked variants within each of the four pre-linguistically established pitch height ranges should be regarded as allophones of their respective pitch heights, which are thus given phoneme status. The original observation behind this system is clearly Wells' note (1945/1972:140), cf. p. 203 above) that lower pitch sometimes accompanies weaker stress; Wells had good reason not to commit himself on this score: there is no reason for allowing a fall-rise pattern of this type before the primary (nuclear) "stress" and not some other, or a falling pattern, a rising pattern, or a rising-falling pattern, as equally permissible sequences. These patterns, of course, would not allow such convenient phonemicisation, since there would be no regular association with stresses, and since the patterns would in many cases differ not only phonetically but functionally. No criteria are given for regarding this particular function between pitches and stresses, rather than some other, or none at all, as the normal case. On the contrary, the evidence, both internal and from other (later) sources, points towards the possibility that the sixteen absolute pitch heights which are said to be "recognizable pitches" have no firm basis in observation (cf. also Lieberman, 1965), but are rather projected constructs derived from a pre-established set of four stresses and a pre-established set of four pitches by way of Wells' cautious observation on pitch conditioning by stress; in other words, the sixteen "absolute" levels of pitch are abstract constructs, rather than observed empirical facts. To use the distinction made by Lieberman (1967: 159f.; cf. §2.2. above), Trager & Smith present their sixteen levels in terms of categorisation, rather than discrimination, i.e. as paradigmatically recognisable variants, independent of sequence, rather than syntagmatically recognisable by comparison with preceding and following levels of the pitch trajectory. There is no evidence at all to support this extraordinary claim about human perceptual ability. If the presentation had not been in terms of independently recognisable "absolute" pitches, but in terms of syntagmatic pitch relativity, the present criticism would be weakened, though not far: sixteen consistently recognisable kinds of end point

for steps or glides mean in effect 16^2 , i.e. 256, independently recognisable binary pitch relations, yielding what is still an improbably generous phonetic theory (cf. the total of seven such relations for stressed syllables, and five for unstressed syllables, postulated by Crystal in his simple pitch range system, §3.1.4. above).

A further modification of Wells' description is Trager & Smith's promotion of the allophonic terminal rises, plus a terminal fall, to phonemic status as terminal junctures. The two rises noted by Wells are re-interpreted as pitch sustention and pitch rise, respectively, for medial and terminal positions. Since the position of these glides and the sustention varies according to the previous phoneme, they are regarded as allophones which can be grouped into three juncture phonemes, on the basis of similarity of pitch direction, which in turn are independent of the basic set of four pitch phonemes. This solution is chosen in preference to a solution which would triple the number of pitch phonemes (presumably as fall from level one, sustention at level one, rise from level one, rather than just level one alone), or one which (as Wells had previously noted) would necessitate the postulation of an extra phoneme at a fifth level to accommodate rises from phoneme level four. Whereas Wells had limited the distribution of the terminal contours to the non-lowest phonemes, Trager & Smith allow them to co-occur freely with the pitch level phonemes. The history of the binary intonation patterns of the later American analyses is thus clearly traceable from an initially monolithic level only system, to a system with pitch levels in the initial section of any trajectory, and terminal contours at the end. The latter tend to draw into their collection of phonetic correlates the category of pause, for instance, from Pike's system (1945), in later formulations of the juncture analysis. The question of the relevance of different components, levels on the one hand and contours on the other, within both the American style of binary intonation contour analysis and the European style (accentual, head-nucleus) of binary intonation contour analysis, will be taken up again below (§4.2.).

The priorities which Trager & Smith present in their preliminary methodological discussion hold for the intonation analysis, as for the other sections (p. 52): "On the level of phonemics there are no such things as 'intonations'." At this level, the term 'phonemic clause' is introduced (pp. 49f.) as a synonym for 'minimal complete utterance'; this "must have one or more pitch phonemes, one - AND ONLY ONE - primary stress, and may have one or more other stresses and one or more plus junctures" as well as a terminal juncture (p. 49). A form of phonemic immediate constituent analysis, though without the segmentation principle, is then practised, starting with the category of phonemic clause: the pitches are separated from the rest, the pitchless remnant being referred to as a 'phonemic phrase' (cf. Hockett's 'remainder', 1955:44); this may then be cut at the plus junctures into 'phonemic words'; the latter cut involves modifications of the stress system (elimination of secondary stress) in a manner which is not made explicit, but which can hardly be done without prior knowledge of superfixes of various kinds (i.e. morphemes consisting of sequences of stresses and plus junctures), unless stresses are non-phonetic in other respects too. The difference between this kind of analysis, which is in effect derivational (cf. Hockett's IP model, 1954, and the Chomsky, Halle & Lukoff description of accent, 1956, and §3.3.3. below), and the analysis of Wells (§3.2.2.2. above) is considerable; the abandonment of the segmental principle in phonological IC analysis in the separation of intonation from text as the major cut does far more justice to the phonetic and distribu-

tional facts of intonation, as well as to its relative independence in terms of role criteria, and is comparable to the abandonment of the segmental principle in certain parts of transformational analysis (cf. Chomsky's treatment of the auxiliary verb, 1957:39). In order to determine what is genuinely phonemic about the intonational component of phonemic clauses, Trager & Smith introduce the criterion of the "smooth curve", which resolves the difficulty involved in Wells' non-iterating pitch phonemes (cf. p. 202 above): the boundaries between adjacent phonemes of different levels are abrupt steps, whereas those between adjacent diacritically marked variants of the same level are said to be smooth; the smooth curve is said to be the scope of one occurrence of the phoneme concerned (cf. pp. 47f., 60).

Practically nothing is said about pitch morphemes, which Trager & Smith term "intonation patterns", except that they "always contain at least one pitch phoneme, and end in one of the terminal junctures", and that "the addition of an intonation pattern to a phrase" (i.e. a morphemic phrase) results in a "morphemic clause", this taking place "wholly in the realm of syntax" by some unexplained feat of legerdemain. Only seven intonation patterns are listed (pp. 57, 69, 75f.): $\sqrt{231\#}$, $\sqrt{31\#}$, $\sqrt{241\#}$, $\sqrt{32\#}$, $\sqrt{3\#}$, $\sqrt{232\#}$, $\sqrt{23}$; the root signs indicate morphemic status. No comments are made, despite obvious similarities which had received comment by Pike and Wells, on relations between these items which would justify grouping them further into morphemes in a sense of the term more like the customary one, as the alternants of these morphemes. A few more patterns had been used in examples at the phonemic level: a tag following pitch patterns ending in $\sqrt{1\#}$, i.e. $\sqrt{1\#}$; patterns like some of the pitch morphemes except that $\sqrt{74}$ occurs for $\sqrt{3}$, i.e. $\sqrt{42\#}$, $\sqrt{41\#}$, $\sqrt{4\#}$; patterns with different level and juncture combinations, i.e. $\sqrt{231\#}$, $\sqrt{31\#}$, $\sqrt{1\#}$, $\sqrt{2\#}$, $\sqrt{232\#}$, $\sqrt{23\#}$, $\sqrt{32\#}$, $\sqrt{23\#}$. Some of these examples had been accompanied, presumably for expository purposes only, by references to role categories such as "echo question" (p. 44), "with polite interest rather than insistence" (p. 44), which indicate potential morphemic status. No comment is made, either, on the morphemic status of phoneme level four (cf. Pike's remarks on this, §3.2.1. above), though at the phonemic level "the examples given so far can now be said over again with a distinctly higher pitch replacing each instance of $\sqrt{3}$ " (p. 43), namely the phoneme $\sqrt{4}$, which also perhaps implies some kind of functional parallelism. Hockett isolates this form later as an "extra height" operator (1955:48) of a different kind from the other pitch level phonemes, which may be used to augment the height of contours with a $\sqrt{3}$ in medial position, symbolising the new phoneme by $\sqrt{7}$; in this respect, Hockett's analysis approaches that of Harris by postulating simultaneously operating pitch forms, and may be compared with a rudimentary pitch accent theory (cf. p. 197 above).

The main developments within the four-level pitch phoneme approach to intonation analysis which occurred after the appearance of Trager & Smith are summarised by Trager (1964); other developments took place, of course, but had the status of explications using a somewhat different structural armoury rather than extensions of what remained basically the same system. In this later summary, in which Trager gives "a presentation of a position, and a statement of conclusions" (p. 266), unfortunately without going into the criticisms which had been made in the meantime (e.g. by Bolinger, 1949, 1951; Sledd, 1955) of the earlier phoneme theory formulations in their fundamental assumptions, taking up only minor points. In retrospect, Trager sees the earlier formulation as presenting intonation patterns in terms of a four-place pattern (developing the syntagmatic aspect): three pitches and

a terminal contour, the medial pitch co-occurring with the primary stress, and being in general $\sqrt{3}$, but $\sqrt{4}$ with "what is usually called emphasis" (p. 267), and also allowing the occurrence of the other two phonemes. As the lists given above show, two-place and one-place patterns with terminal contours also occur. In the 1964 version, Trager (noting observations by Hockett, Welmers and Sledd) sees the necessity for a six-place structure, five pitch level positions and a terminal contour position. Only four out of the five pitch level positions are filled in any given contour, the second and fourth not being filled at the same time. Using the letters a, b, c, d, e to mark these five positions, Trager notes the following occurring patterns (each ending, of course, in a terminal contour):

- (69) a - c - e $\sqrt{1}$ as in: $\sqrt{2}$ I'm going $\sqrt{3}$ hōme $\sqrt{1\#}$
 (70) a b c - e $\sqrt{1}$ as in: $\sqrt{2}$ It's in $\sqrt{2}$ chāpter $\sqrt{3}$ ōne $\sqrt{1\#}$
 (71) a - c d e $\sqrt{1}$ as in: $\sqrt{2}$ I'm $\sqrt{3}$ gōing $\sqrt{1}$ hōme $\sqrt{1\#}$
 $\sqrt{2}$ It's $\sqrt{4}$ wōn $\sqrt{3}$ derful $\sqrt{1\#}$
 (72) - b c - e $\sqrt{1}$ as in: $\sqrt{2}$ Chāpter $\sqrt{2}$ ōne $\sqrt{1\#}$
 (73) - - c - e $\sqrt{1}$ as in: $\sqrt{3}$ Always $\sqrt{1\#}$
 (74) - - c d e $\sqrt{1}$ as in: $\sqrt{2}$ Eat $\sqrt{3}$ yōur lūnch $\sqrt{1\#}$

The standard pattern is the first, illustrated in (69); the medial position is accompanied by primary stress. The pattern (73) is the truncated version of this which was listed, though not as a truncated version of another pattern, in the 1951 version. None of the single-position pitch phoneme patterns are noted here. A further difference, not further explained, is the possibility of phoneme iteration, which had been excluded on the basis of explicit criteria in the 1951 version. But the main innovations are the patterns with the positions b and d, both of which are generally associated with secondary stresses, though tertiary (and, in the case of d, weak) stress is possible. It is difficult to appreciate the criteria for putting together the two examples given under (71) as instances of the same pattern; likewise, the reason for taking (74) to be a three-place rather than a four-place pattern (e.g. $\sqrt{2321\#}$) are not clear. Nor is it possible to transcribe the following item within the terms of the (largely implicit) scope rules:

- (75) $\sqrt{2}$ It's $\sqrt{3}$ grēat $\sqrt{1\#}$

though the pitch pattern is, by the perceptual and functional criteria appropriate to intonation, the same as that of the second item of (71); the transcription actually used for (75) must receive an interpretation based on different methodological assumptions from those presented by Trager, either in 1964 or, with Smith, in 1951, and more resembling those of Pike (who did not associate phonetic pitch heights with individual vowels as a procedural priority) or the "contourists" (Sledd, 1955:329). The introduction of explicit structuring into phonemic pitch sequences appears to be an indirect recognition of the structured role played by pitch in accentual systems, more like Pike's system, and less like the Trager & Smith or Wells descriptions. In its own way, this description is no less inexplicit than most of the head-nucleus descriptions developed by earlier European analysts, which involve the same close association between accentual

To complete the present section on pitch phoneme theory it is necessary to present the explication which Stockwell (1960) offered of the Trager & Smith system. If the whole range of suprasegmental patterning were being covered in the present study, which is not the case, then the Trager & Smith analysis of stress, together with contrastive stress and the 'shift morpheme' would be dealt with at this point, in preparation for Stockwell's study. The separation of the intonation and stress descriptions of the Trager & Smith study, in order to treat the stress section within the context of theories of accent and intonation, is justifiable, however, in terms of the overall typological strategy of the present study, as well as in the rather different roles they have played in recent linguistic history, and the minor role they play in Stockwell's explication is not sufficient to overrule these reasons.

The methodological basis for Stockwell's account of English intonation is the generative strategy of explication, used in Chomsky, Halle & Lukoff (1956), Chomsky (1957, &c.), and illustrated above with Bierwisch's detailed explication of v. Essen (1956; §3.1.1.3.). Stockwell presented his description (1960) as an extension of Chomsky (1957), with a number of rule modifications and additions in order to be able to include at least the morphological aspects of the Trager & Smith pitch and primary stress system.

Like the other generative explanations, Stockwell's description is essentially a syntactically orientated placement theory; the main point which his account attempts to capture are the placement of the nucleus or intonation centre, and the extent of intonation groups, in relation to the lexico-syntactic text which the intonation accompanies (Halliday's 'tonicity' and 'tonality', respectively). It is explicitly stated (1960:362) that "this is (at best) a sentence-generating grammar which is still unable to specify relations between sentences" (clearly meaning 'syntagmatic relations'). For this reason, Stockwell points out, the notion of 'contrastive stress' outside single sentences cannot be explicated. It is also the case that practically all problems of the semantic interpretation of pitch patterns, not just this one, are left unsolved by this approach. (For a brief discussion of placement theories which omit reference to pitch patterning, see below, §3.3.3.).

In addition to placement problems, Stockwell also discusses the range of pitch patterns to be introduced (Halliday's "tone"), and formulates rules which introduce them into the system and handle phonological aspects of their placement. It should be pointed out again, as it was pointed out for Bierwisch's explication, that where the explicandum fails on specific claims about empirical matters, the explication must also fail; for this reason, criticisms of much of the empirical content of the Trager & Smith claims will apply also to Stockwell's explication. In addition, there will be points of criticism which apply to the further assumptions and to the way in which the explication is executed, which will be the main concern of

Chomsky (1957:71) notes that there may be two "fundamental sentence intonations", falling (associated with kernel sentences), and rising (associated with yes-no questions), and, further, that the interrogatives with pro-forms (wh-forms) "normally have the falling intonation of declaratives". He sketches a suggestion for handling these facts; the falling intonation must be associated in some manner with terminal strings of the phrase structure grammar (how this is done, e.g. by PS rule or by obligatory transformation, is not made explicit), and the question transformation subsequently replaces the fall by a rise, while the transformation for pro-form questions undoes this by reintroduction of a falling intonation, much as it undoes the effect of the question transformation in other respects (1957:70).

(76) i. $S \rightarrow Nuc + IP$ ii. $IP \rightarrow C + JP$

iv. (Disc)

$$C \rightarrow \{Cont\}$$
$$\text{vi. a.} \quad \text{Cont} \rightarrow \begin{Bmatrix} 002+ \\ 003+ \\ 004+ \\ 021+ \\ 032-+ \\ 043-+ \end{Bmatrix}$$

b. Cont $\rightarrow \left\{ \begin{array}{l} \{000\} \\ \{002+\} \\ \{003+\} \\ \{004+\} \\ \{021+\} \\ \{032+\} \\ \{043+\} \end{array} \right\}$

The non-Chomskyan categorial symbols stand for 'nucleus', 'intonation pattern', 'contour', 'juncture point', 'discontinuous' and 'continuous', in the order of occurrence. The zeros are to be understood as variables over the integers 1, 2, 3, 4; the minus signs may be said to be indicators of a variable in final position in the pitch phoneme sequence whose upper bound is the integer with which it is paired. The first alternative given for rule (vi) is for an explicandum with two terminal junctures, rising and falling, while the second is for an explicandum with three terminal junctures, rising, sustained, and falling; later, Stockwell argues for the former.

The first rule is said to be "Hockett's first IC cut"; as noted above, this is traceable to the Trager & Smith distinction between phonemic clauses and phonemic phrases. Few remarks are made on the status of the symbols involved, as far as the grammar itself is concerned, however. The category JP is, in effect, a sentence boundary symbol; it is said to mark the end point of the intonation morpheme, the sequence of pitches and a juncture, and is referred to in the "morphophonemic rules" which distribute the phonemes of the intonation morpheme over the text. The status of Disc and Cont is somewhat unclear; on the one hand they are presented as terminal symbols (e.g. "a morpheme C", p. 360), but on the other hand they are themselves rewritten as the intonation morphemes proper, and are said to specify "the two basic functions of intonation contours" (p. 360), and provide

"a choice at this point between a pattern which disjoins a segmental sequence from any following sequence, or joins it to such a sequence". There is no reason why semantic considerations of this kind should enter into the kind of grammar which Stockwell is attempting to construct, particularly since he explicitly excludes relations of this kind from his treatment, as noted above, and since he also contradicts this specific interpretation by suggesting "a phonetic rule that /v/ has the allophone [v] whenever it is not followed by a pause or silence" in order to eliminate the sustention juncture (p. 366). The rules (v) and (vi) have the character of subcategorisation rules, such as those later introduced by Chomsky into the description of certain kinds of co-occurrence restriction between morphemes (1965); Stockwell's rules are similar to these to the extent that Disc, Cont and the pitch patterns can be regarded as features and feature matrices, but they differ from the Chomskyan rules in that the apparently non-phonological category Disc also defines a class of phonological matrices defined by Cont. In effect, this amounts to a claim that there is some kind of direct relation between form and function in intonation which is qualitatively different from the relation between the semantic and phonological matrices of other morphemes in the Chomskyan system; at the time, of course, the status of other morphemes in this respect had not been defined and consequently Stockwell's formulation is a significant innovation. The present interpretation of Stockwell's rules (v) and (vi) relates them to one of the traditional views on the semantics of intonation (§1.2.4. above). But since the phrase structure level of representation had originally been designed to account for a certain number of well-defined facts of co-occurrence between lexical morphemes (here in distinction to 'intonational morphemes', not to 'grammatical morphemes') and sequences of such morphemes, there is no reason to suppose without further evidence that it will also define superficially similar facts about intonations or the relations between intonations and texts. No further evidence is in fact forthcoming in Stockwell's exposition, and the relative independence of intonations and texts is an important danger signal in this respect.

The structure of the phonological matrices which characterise the intonation morphemes (a plausible interpretation of Stockwell's integer series) makes essentially the following claims about the systematicity of intonation patterns. The patterns are (roughly speaking) structured as a sequence of proclitic element, nucleus and tail (ignoring for the moment the distinction between the final integer of the series and the juncture), and their generalised representations by means of variables show that it is the final element of the contour, either tail alone, or tail and nucleus, which is the important functional element, and that the first element is of the least importance. The generalisation into the classes Disc and Cont is a fairly traditional one into the class of contours which reach the lowest pitch level at the end, and its complementary class (cf. e.g. Jassem, §3.1.3., but also Klinghardt, v. Essen, &c. and the 'terminal' vs. 'pro-gredient' distinction).

It was noted above that where Chomsky made no statement about the point in the grammar at which the basic intonations for kernel sentences are introduced, Stockwell opts for a phrase structure source. This means that there is no homogeneous source for intonation patterns in any single component of this grammar, since there are transformations, as in Chomsky's original suggestion, which introduce new classes of intonation morphemes. Stockwell suggests the following formulation for the question transformation, which introduces four new classes of morphemes (p. 366):

(77) SD: NP, { Te (n't), VP₁ (X) }, IP
 { Te + M (n't), X }
 { Te + have (n't), X }
 { Te + be (n't), X }

SC: 1, 2, 3, 4 ⇒ 2, 1, 3, Intrg + JP

Intrg = 011+, 022+, 033+, 044+

Chomsky's concord morphemes, covered by 'C' in his rules, are here represented by 'Te' for 'tense'; the plus sign indicates a variable with a lower bound (namely the integer with which it is paired), analogous to the minus sign in the phrase structure rules. The introduction of Intrg, the class of interrogative intonations, is effected by substituting it for C, i.e. either for the class Disc or the class Cont, though the formulation using an unanalysed IP obscures this; the substitution of morphemes is a rather dubious procedure, though it is apparently sanctioned by Chomsky in his transformation for pronominal interrogatives. The same kind of substitution, though in reverse, is performed by the transformation for pronominal interrogatives on the output of the question transformation, following Chomsky's suggestion; Stockwell adds a further substitution, re-introducing the set of interrogative morphemes, in the echo-question transformation, which operates on the output of the transformation for pronominal interrogatives. These rules are not formulated. Perhaps the main question to be asked here, however, is why the various integer schemata are listed in full, and why, in view of their obvious perceptual similarity, some form of generalisation was not used.

It could be suggested, though Stockwell does not make this suggestion for his contours, that the patterns introduced by the phrase structure rules are to be construed as canonical in some sense related to the canonical character of Chomsky's kernel sentences and their underlying terminal strings, and that they are related transformationally to non-canonical patterns which they resemble in some specifiable way. Stockwell's treatment of the patterns as morphemes precludes such an interpretation of kernel patterns as 'normal forms' (§1.2.5.2. above), however; the intonation patterns are given the job of marking sentence types in much the same way as the morphemes *be + en* ... by in certain sequences mark passive sentences. In his 1957 study, Chomsky was very careful to motivate the transformational, as opposed to the phrase structure, analysis of the passive voice (pp. 42f., 77ff.); an equally careful motivation might have been expected for splitting the treatment of intonation morphemes into two sections (paralleling Chomsky's splitting of the auxiliary verb into two sections, one introduced by phrase structure, one by transformations). This is a decision to which Chomsky does not commit himself; Stockwell makes a decision, but without giving reasons. Consequently, there are no reasons either for not preferring, for instance, to introduce the intonation morphemes by means of a readjustment rule between transformations and morphophonemic rules, after the manner of the concord rule in Chomsky's grammar. This is not to maintain that surface structure placement is correct, and deep structure placement is not, in the parlance of later transformational theory; it is simply to point out that the case Stockwell presents is not argued as far as phrase structure introduction of contours (for discussion of boundary introduction, cf. examples (79) ff. below) is concerned.

The points in the preceding paragraph were argued from within Stockwell's chosen generative methodology. There are other, perhaps more obvious, points which require mention. The most important of these pertain to the assumption made by Stockwell that intonation patterns mark sentence types as defined in a Chomskyan grammar. There is not the slightest reason to suppose that this is the case. Indeed, most of the detailed empirical studies from Schubiger through Pike to Kingdon, and later, follow the maxim of Karcevskij (1931:166): "L'intonation n'a rien a voir avec la grammaire" - not as an assumption, but as a result of empirical investigation (cf. discussion above, §§1.2.3.-4.). The possible argument from Stockwell's echo-question transformation, for instance, to support the grammatical role hypothesis is circular, since it presupposes that echo questions are sentence types in the Chomskyan sense, rather than sentence functions or utterance types, and thus that they are definable by transformational means. Since Stockwell gives no explicit formulation for his version of an echo-question transformation (or of the pro-form interrogative transformation), and no syntactic arguments for this analysis either, this case, too, is unproven. This argument is not, of course, meant to be taken as implying the thesis that there are no correlations of any kind between intonation and syntax (the strongest interpretation of Karcevskij's claim), any more than it should be taken as a specific claim that there are no syntactic correlates for echo-questions. For the latter, the existence of constructions with non-fronted pro-forms (e.g. *He went where?*) is sufficient counter-evidence, and for the former, the persistence of the syntactic reductionistic standpoint taken by many investigators besides Stockwell may perhaps be taken as evidence of an intuition (albeit an undifferentiated one) that there are various relations between intonation and lexico-syntactic forms. The notion of system congruence was introduced above (§1.2.5.3.) as part of a framework for capturing the subtlety of such relations, and will figure again below (§4.2.2.). But the relatively high degree of system congruence which relates sentence type, sentence function and intonation in echo questions is not typical, and is thus unsuitable as a starting point for generalisations; in virtue of their quasi-metalinguistic character, echo questions have a rather complex role structure which distinguishes them from other sentence functions and belies the apparent simplicity of their <intonation, text> pairing. It is this inductive fallacy which underlies the claims of Yorio (1973; cf. p. 23 above, and also discussion in §4.3.2. below, and in Gibbon, 1975, about illocutionary interpretations of intonation function); echo questions were the sole evidence offered there for the notion that intonations function as illocutionary force indicating devices, a notion connected fairly closely with syntactic reductionism but also incorporating sentence role structure.

The other aspects of Stockwell's description concern placement; first, the position of the medial digit of the intonation pattern, second those of the others, in the text. A special facet of this is the question of boundary placement. These points are described by three transformations and two "morphophonemic rules". The first (obligatory) transformation explicates the Trager & Smith (1951:75) "observation ... that the primary stress of a phonemic phrase will come as near the end as possible; here 'as possible' means that some items, such as pronoun objects, certain adverbs, prepositions and others, do not have primary stress though they are normally the last thing in a phrase". The second (optional) transformation explicates the Trager & Smith "deus ex machina of the 'shift morpheme'" (Bolinger, 1958 (1965:68); cf. Trager & Smith, 1951:72f., and for further history and devel-

opment of these observations cf. below, §3.3.3.), which was postulated to account for distinctions between the "'normal' position" (tonicity) of primary stress (Trager & Smith, 1951:73), what Stockwell calls "'normal' intonation" (1960:362). The third transformation deals with the intonation of sentences containing nominalisations, derived by means of a generalised transformation; this transformation serves as the starting point for an argument for eliminating sustaining juncture (cf. discussion of rule (76) iv. above). The two morphophonemic rules associate the middle of the contour with the immediately preceding primary stress, placing the first digit at the beginning, and the last (with the juncture) at the end of the sentence. The first rule is concerned with full three-place patterns, the second with cases in which the optional first element is not present. Only three-digit patterns are described. Although the details of syntactically based placement theories will not receive attention until §3.3.3. below, these five rules may be listed here for convenience of reference.

- (78) i. SD: $X, \begin{Bmatrix} \text{Pro} \\ \text{Prep} \end{Bmatrix} + m, C, Y$
 SC: 1, 2, 3, 4 = 1, 3, 2, 4
 Condition: Position of C does not result from T_{emphatic}
- ii. T_{emphatic} : SD: $X, Y, \begin{Bmatrix} \text{Intrg} \\ \text{Disc} \\ \text{Cont} \end{Bmatrix}, JP$
 SC: 1, 2, 3, 4 = 1, 3, 2, 4
 Condition: X is not A, Af, Wh-
- iii. T_{nom} : SD: $T + it, VP + IP$ (= S_1)
 $NP, Aux, V_t, X + Cont + JP$ (= S_2)
 SC: 1, 2, 3, 4, 5, 6 = (3 + S_2) + ing + 5, 6, 2
- iv. $\hat{X}_n, \hat{Y}, O_1 O_2 O_3, \hat{Z}, JP \Rightarrow O_1 + \hat{X}_n, O_2 + \hat{Y}, \hat{Z}_n + O_3 + |$
- v. $\hat{Y}, O_1 O_2 O_3, \hat{Z}_n, JP \Rightarrow O_2 + \hat{Y}, \hat{Z}_n + O_3 + |$

The variable notation for the intonation morphemes is extended to include integers for marking the positions of phonemes in the phonological matrices (note that it is but a small step to interpret this notation in terms of neo-Praguean feature notation - cf. Chomsky & Halle, 1968:390ff.). All of these rules are concerned, in different ways, with the problems surrounding what Chomsky & Halle (1968) formulated as the Nuclear Stress Rule; as already indicated, the discussion will be taken up below.

As a final point concerning Stockwell's approach to placement, which includes phonological as well as syntactic points, his treatment of pattern sequences (and thus also boundaries) requires attention. Stockwell attempts to predict the occurrence of terminal junctures by means of his phrase structure and morphophonemic rules together with Chomsky's generalised transformations; he claims that the junctures occur at the ends of sequences traceable to the separate strings associated with kernel sentences and joined by generalised transformations, giving the following example:

(79) /²his ³ivənt ²præmptid ²miy | ²tətraytə ⁴vizuwaləyz ²māysēlf +
 fɔrsɪŋ hɪm , təkəm +

The basic mechanism for this prediction is modified by the additional observation that after short clauses (e.g. after *try* and *him*) the juncture may be optionally deleted. No comment is made on the possibility of a similar juncture after *event*, which cannot be transformationally predicted in this way, or of other juncture combinations, or, indeed, on the notion of 'normal intonation' which presumably underlies this claim (cf. pp. 215, 217 above, and, for more general discussion, §1.2.5.2.). The argument which Stockwell adduces for eliminating the sustained juncture has already been mentioned (p. 214 above); it is based on the kind of derivation which involves generalised transformations. The argument may be made explicit in the following manner.

Sustaining juncture occurs medially in sentences like (80), which are derived by rule (78)iii.; therefore it must have been final in the underlying string corresponding to the kernel sentence (81):

(80) John's proving the theorem | was a surprise.

(81) John proved the theorem.

But sustaining juncture has not been observed to occur finally; therefore the hypothesis associating sustaining juncture with underlying strings is not confirmed. On the other hand, so an explicit version of the argument might run, fading juncture does occur finally, but not medially in sentences like (80). Therefore fading and sustaining junctures are in complementary distribution. Following usual phonemic practice, fade and sustention can then be regarded as conditioned variants, allophones, of the same juncture phoneme and the contradiction is resolved.

This argument does not stand up to close scrutiny, however, and nothing is proved about different levels of analysis for juncture. The shaky points are: lack of evidence on the privileges of occurrence with respect to syntactically defined sentences of fading and sustaining junctures (note, for instance, the use of sustention in various kinds of falling, greeting and other vocative-like utterances); the two different uses of the term 'final' which are not kept apart (i.e. one for simple sentences, and one for constructs involved in Chomsky's 1957 derivations which use, in particular, generalised transformations); lack of evidence on phonetic similarity for the proposed phonemic generalisation; and finally, lack of information on the kind of 'contrast' involved, which is observed between sustaining and rising junctures medially (though not between sustaining and fading), and between rising and fading junctures finally in complex sentences (for if non-discrete kinds of 'contrast' are involved, the resulting construct can hardly be called 'phonemic' - cf. §3.2.1. above and arguments there).

In a later review of work in intonation (1972), Stockwell retracts two aspects, and reaffirms four aspects of his earlier analysis, though definitive evidence is provided neither against the retracted nor for the reaffirmed points. The retracted points are first, that "the number of surface phonological phrases tends to correspond one-for-one to the number of deep sentences" (p. 87), with the addition that they are not predictable from surface structure either, and secondly that "choice among alternative intonation contours is on a par with choice among alternative category re-

alizations within the base component: i.e. that one 'chooses' contours as one 'chooses' lexical elements". A number of criticisms of these points were given explicitly above. The points on which Stockwell would insist are: the reality of 'normal intonation'; the transformational introduction of contours; that the "center of the intonation contour" is what is shifted in 'contrastive stress' and that this should be regarded as distinct from other less prominent kinds of stress; finally, that certain functional words are passed over "in computation of the center of the NEUTRAL contour" (p. 89). None of these four points is particularly Stockwellian, of course; the first (in fact, only 'normal tonicity', to use Halliday's term) has long been a commonplace of intonation analysis, and a vague one at that (cf. §1.2.5. above); the second is Chomskyan; the third is particularly characteristic of the approaches of Pike and Bolinger, but can be traced back to Schubiger and Coleman; the fourth has also long been a commonplace of intonation placement theories. The discussion of other work in his review, particularly on what he calls "the representation question" (pp. 89ff.) indicates that he would also reject phonemic aspects of the notation used in his earlier treatment; the remainder of his useful discussion is concerned with questions of syntactically based placement theory, and is not pertinent to the present discussion. The main issue (i.e. not *how* but *whether* intonation is determined partly or mainly syntactically rather than by common functional structuring) is not broached.

Stockwell's explication of the Trager & Smith description was, despite its failure to make any real contribution to the content and method of intonation analysis, a bold attempt to extend generative methods to the area of intonation; in a sense, its value as a pioneering study may be said to be constructively negative: it showed the limitations of a syntactic reductionistic approach to the description of intonation, both by its internal inconsistencies and unclarity, and also by its demonstration of the pitfalls which await the unwary explicator and which turn a would-be explication into a resymbolisation of an older description in a convenient new notation, but without the further evidence and argument which an explication requires (cf. comments on the Bierwisch explication above, §3.1.1.3.). The question of explication of the notion of 'intonation' is not dead, of course; other attempts at explication followed, though more in the wake of Chomsky, Halle & Lukoff (1956; cf. §3.3.3. below) than following Stockwell. But it is still the case that many, if not most points in these later explications are without solid explicanda; the awareness that this is the basic problem appears to be still generally lacking - witness Stockwell's silent leave-taking from the Trager & Smith transcription, on which generative suprasegmental phonology was originally based in its attempt, derived from the original aims of generative grammar, to provide an explication of the concept of transcription (§2.4.3. above). In this respect, Crystal's salutary remarks, in particular his criticism of "their curious semi-awareness of the problem of reliable data" in the context of more recent discussion within the generative framework (1975a:7), are to be welcomed.

3.3. Theories of intonation and accent

If there is a common factor uniting the theories and descriptions of English intonation so far discussed, it is their reliance on the phonetic variables associated with pitch as the distinguishing correlate of intonational systems as opposed to other prosodic systems such as those of stress

and accent, rhythm, or juncture. There have been indications, both in the tonetic and in the phonemic descriptions, however, that the situation is not quite as straightforward as the traditional distinctions would have it. The notions of 'head' (in Kingdon's sense) and 'nucleus' or 'nuclear stress', with other 'pitch prominent' syllables such as the 'upward break' or the 'downward break', in the tonetic approaches, and the coupling of primary stress and intonation centre in the phonemic approaches, indicate that there are aspects of pitch patterning which cross the boundaries between the traditional prosodic systems, in particular between the intonation and stress or accent systems. The various phonetic interrelations between the correlates of these systems were presented in Ch. 2 above; the descriptions of forms and structures discussed above show a certain amount of awareness of this complexity, although the state of phonetic knowledge of these matters was not very advanced before the mid-fifties of this century.

The scholar whose name is most closely associated with a more flexible approach to the relations between prosodic systems and phonetic variables, and who was among the first to attempt quantitative psychoacoustic experimentation in order to provide a firmer basis for his insights, is Bolinger. His theory of pitch accent is the first clear attempt to formulate systematic distinctions within the field of pitch patterning and its use, and systematic relations between pitch patterning and stress or accentual systems. Because of the conspicuous, if not isolated, position of Bolinger in the panorama of intonation studies, his description of intonation and accent will be dealt with before the general line of pitch accent theory and its development is traced both before and after the point at which Bolinger formulated and clarified it. Although the emphasis of the present study is on intonation, in the Bolingerian sense, rather than accentual or stress systems, the relationships between the two fields which Bolinger, in particular, has pointed out require that the relevant aspects of accentual systems be discussed alongside intonational systems. The details of the phonetic and role criteria involved in the analysis of accentual systems cannot form the centre of the present discussion, but require separate treatment elsewhere. Where theories of accent or 'sentence stress' are treated, however marginally, there would be an unjustified gap if the position of generative phonology in this respect were not to be outlined and, in an equivalent degree of detail, commented on, even though the relation of the generative 'stress' system to pitch or other phonetic patternings is far from clear. It has been productive and influential, however, and in view of its historical and material relationship to other approaches discussed in the present study a treatment of the main aspects cannot be deferred entirely to a separate treatment of accentual matters. The following sections will deal, then, with Bolinger's theories, those of others which involve distinctions at various stages of explicitness between intonation and accent, and finally with the generative position.

A preliminary note on certain methodological differences is in order at this point. Since one of the main questions to be faced is that of distinguishing between different systems which are associated with the same phonetic variables, or the same kinds of phonetic variable, clearly the criteria for setting up an analysis cannot be purely phonetic if the distinctions are valid and if there is not some subtle means of distinguishing between different classes of pitch trajectory components on phonetic grounds. This is not to beg the question of the validity of such an analysis; nor is it to imply that non-phonetic criteria do not enter into other analyses. It is simply a reminder that under circumstances which relate several sys-

tems to the same phonetic variables the necessity of invoking role criteria explicitly, which has been avoided to a large extent so far, and which will receive more explicit treatment in the next chapter, looms much larger than under other circumstances. The most extreme case in this respect will be the generative account of stress, which is a syntactically orientated placement theory, and as such depends to a very large extent on non-phonetic criteria of analysis in those areas of accentuation theory covered by Halliday's terms 'tonicity' and 'tonality' (cf. §3.1.2.5. & §3.2.2.4. above).

3.3.1. Bolinger

The prosodic problems which Bolinger attacks are large in number and broad in scope, but, as already indicated, they centre for the most part on the various ways in which pitch patterns and is used. Apart from obvious distinguishing marks in terms of forms and structures, which will be treated below, the descriptions which result from Bolinger's attempts to solve these problems are particularly noteworthy for the transparency of their relationship to Bolinger's informal discovery procedures. The forms and structures postulated are backed up by a considerable body of impressionistic and psychoacoustic observation (cf. esp. Bolinger, 1958'; the same holds for his criticisms of other theories, such as pitch phoneme theory (1951), or stress and juncture superfix theory (with Gerstman, 1957). The extent to which the discovery procedures and the criteria of analysis are made explicit exceeds that of all the tonetic analyses except Jassem's earlier study, and the later studies in which Crystal was involved. None of the phonemic approaches, despite the procedural emphasis frequently encountered, is comparable in this respect, though Pike's monograph contains a considerable corpus of transcribed sentences. Other studies, such as those reviewed in Lehiste (1970a), are more concerned with particular areas of perception and production, rather than with the linguistic interpretation of results in these areas within the framework of an overall description. Studies which involve the lexical uses of pitch patterning are also available, but are not relevant to the present account. Reference to Bolinger's discovery procedures will be made at the appropriate points.

The unique structure of Bolinger's description of intonation makes it tempting to treat the description completely ahistorically. It does owe a number of important debts to other schools, however, particularly to Bloomfieldian linguistics, and these will be pointed out in the course of the discussion (cf. also p. 192 above); they have gone largely unnoticed in the literature. Likewise, Bolinger has himself exercised influence in various directions, and affinities with later developments in intonation description, both those due to influence and those not necessarily due to it, will be pointed out in this and the following two subsections. One way of doing justice to Bolinger's role in the history of linguistics would be to concentrate on the most obvious recurrent methodological feature of his work, namely his reactions to other theories which were on the point of becoming canonical; these range, however, from morphemics to generative lexicalist semantics, and from pitch phonemes and stress superfixes to the stress cycle of generative phonology. Such an approach would be too piecemeal from the point of view of subject matter, however, and would, moreover, not do justice to the internal coherence of Bolinger's own descriptions. Accordingly, the systematic aspects of Bolinger's approach to pitch patterning, rather than its status as a counterfoil to other theories, will be central in the

following discussion.

The phonetic criteria which Bolinger uses differ in some respects from those used in both phonemic and tonetic approaches. In an early study (1946), he employs the following six phonetic types: upglide, downglide, upskip ("an interval across which there is no appreciable connecting glide, the pitch of the following tone being abruptly higher than that of the preceding tone", p. 197), downskip, high pitch, low pitch. These are extended elsewhere (esp. 1947) to mid and mid low pitch (the latter for initial unaccented syllables), wide vs. narrow pitch range, and updash (a very rapid glide upwards) and low voice, "the cracked, unmusical sound that lies below the singing range" (1947:71), i.e. what is often referred to as 'creak' (cf. §2.2. above). New is the distinction between skips and glides; the difference between them is utilised in producing greater and less accentual effect (1947:72), and should thus be included in an account of the prosodic uses of pitch. The illustrations given are: telephone number and I want a red dress, with contours (given in Pike's notation) 02-4-3 and 4-02-4 , and contour centres tel and red respectively. This accentual observation led to the theory of pitch accent (Bolinger, 1958).

A certain amount of psychoacoustic confirmation for the use of configurations of these kinds in intonation, rather than of shifts between levels as in phonemic descriptions, is provided by experimental comparison (Bolinger, 1951). Three tests are administered, in which aspects of pitch trajectories analysed as allphonic in the phonemic system turn out to have more importance than the supposedly phonemic distinctions; the second of these tests finds that upglides and upskips in a sequence that Trager & Smith (1951) would presumably transcribe $/32//$ are categorically distinguished. Despite criticism by Sledd (1955), the tests do indicate important tendencies in pitch patterning and its perception, and have not been matched with comparable or improved versions on the part of phonemicists. The tests cannot be regarded as conclusive, however, in view of the inexplicit and largely binary role criteria underlying judgments, which may be held to distort the overall picture by over-selectiveness; conclusive tests of this kind can only be made when the role criteria are made as explicit and as systematic as the type criteria involved.

The psychoacoustic investigation of the accents of English (1958) consists of a series of twelve production and perception tests, controlled by frequency measurements and synthesised frequency patterns, in which the role criteria involved were much simpler and relatively clear-cut: judgment of 'stress' or 'accent' (but note the possibility of the classic type-role confusion here). The main result of these tests is that pitch obtrusions from the overall trajectory are far more important than changes in loudness or intensity; the traditional stress vs. intonation distinction depended, however, on an independent definition of 'stress'. The tests thus provided a more precise interpretation for the distinction earlier introduced between glides and skips. But over and above this, a whole range of further distinctions was formulated in this article, partly on the basis of the tests, but partly on other grounds.

The most important distinction made was between the three prosodic systems of stress, accent, and intonation. The first of these is regarded as a non-phonetic category; stress is the locus of potential accent within a word, and is thus a lexical matter (cf. the discussion of 'flanking unaccentables' below): whether an accent actually occurs at this point or not is a different matter, and depends on other criteria. Accent and intonation, on the other hand, are distinguished partly on phonetic grounds, and partly

on the grounds of role criteria. The three accents are said to be phonetically different kinds of perturbations of the overall pitch trajectory; intonations may, with considerable justification, be regarded as the residue of pitch patterning, though Bolinger does not provide such a justification, and indeed phonetically they form a kind of reference-line for accentuation. In his discussion of role criteria, Bolinger takes a step which had been avoided by the phonemicists, and considers the kinds of contrast which analyses of intonation in the more general sense of the term are based on. While the pitch phonemes were not, *qua* phonemes, associated with meanings, Bolinger denies any phonemic status to components of pitch trajectories in English; in an earlier paper (1949) he had sketched some of the major differences between the analysis of phonemes and that of intonations, and in his study of pitch accent he makes a further distinction in the area of non-phonemic phonology, on the basis of different types of contrast (1958(1965:48)):

The all-or-none is the domain of the pitch accents; the gradient is the domain of intonation.

The accents are, like morphemes, discrete, both in being either present or absent in any given utterance and in differing discretely from each other. Intonational aspects of pitch patterning, on the other hand, are referred to various kinds of "smooth scale" (ibid.), along which discrete differences are not found, either phonetically or in function. Although problems of accentuation, in particular those of placement, are not central to the present study, Bolinger's treatment of accent requires discussion in its phonological aspects at least, since there are certain implied priorities of accent over some intonations, and since there are overlaps between accentual and intonational patterning, despite Bolinger's neat division into discrete vs. gradient types of system - as in other areas of language. It was pointed out above (p. 192) that this division was anticipated by Pike, though it was not drawn with the same clarity, and is traceable to Bloomfield's views on intonation. Similarly, Pike's account of the difference between 'stress' and its different (phonemic and sentential) placements may be related to Bolinger's stress vs. accent distinction (see below on 'flanking unaccentables').

The three accents are kinds of "pitch prominence", of which Bolinger has this to note (1958(1965:20)):

The experiments that I shall report suggest that it is not pitch RISE, but rather pitch prominence, that is essential to what we react to as stress. By prominence I mean a rapid and relatively wide departure from a smooth or undulating contour. A rise is only one kind of pitch prominence, though it is certainly the commonest kind.

Bolinger groups these various kinds of pitch prominence into three basic types, termed A, B and C. Just as role criteria were involved in the basic characterisation of 'accent', so they are involved in distinguishing between the individual accent types, since the pitch contour itself occasionally leads to ambiguities. Disambiguation, which will be discussed after the description of the accents, also involves lexical (non-phonetic) stress and the distinction between accentable and unaccentable syllables on which the notion of stress is based.

Accent A has two main sub-types. The main type, graphically represented in the first section of Figure 7, is described in the following terms (p. 49):

A relative leveling off of the accentable syllable followed by a relative-

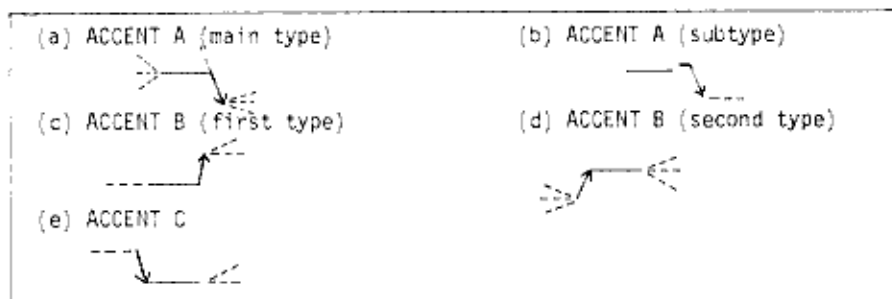


Figure 7: The three accents (Bolinger, 1958(1965:50)); horizontal solid lines represent accented syllables.

ly abrupt drop, either within the accentable syllable (which is prolonged for the purpose) or in the immediately following syllable. In very rapid speech the drop may be postponed to the second following syllable, but rarely beyond this.

The subtype, classified as A more for functional reasons, "puts the accentable syllable at a lower pitch than the one immediately following, but requires that only that one weak syllable remain high - the syllable after it must come down rapidly". The representation of this subtype in Fig. 7 is not Bolinger's, but a construction by analogy with the others, since Bolinger does not supply one. It is clear from the descriptions of these two types of pitch prominence that they can legitimately be compared with the falling and rising-falling nuclei of tonetic analyses; these too are generally classed together on semantic grounds (cf. esp. Palmer, §3.1.2.1., and Kingdon, §3.1.2.2.). No comments are given on further kinds of falling configuration; related configurations are the other kinds of rise-fall, the rise-proclitics (cf. the analyses of Palmer, Armstrong & Ward), and Kingdon's homosyllabic preheads before the appropriate nuclear contour.

Accent B also has two subtypes, which are described as follows (p. 50):

The characteristic of this accent is upmotion. It is neither skipped down to nor skipped down from. It may be approached from below and skipped up to, with the following motion continuing level, or rising (the usual thing), or falling slightly (an abrupt drop would create an A). Or it may be approached from a relative level and skipped up from, after which the movement usually continues upward slightly or levels off.

The "relative level" is presumably a case of syntagmatic relativity in this context. This accent shows more clearly than accent A the differences between Bolinger's accents and the nuclei of tonetic analyses: quite apart from the obvious correspondence to a number of rising nuclei, there is a relation between accent B and the categories of head and break as well as, possibly, to the phonemic sustained juncture.

Accent C receives the following characterisation (p. 50):

This is a kind of anti-accent A, both in form and meaning. The accentable syllable is approached from above, and skipped down to. What follows may level off or rise, but a further fall seems to be avoided.

This accent, too, is not easily associated with forms postulated in other approaches, though the similarity to Kingdon's downward breaks is undeniable.

The accents, as the illustrative diagrams in Fig. 7 show, are phonetically in terms of pitch contour not entirely distinct. Bolinger illustrates this by means of a sentence with two possible accentuations, but essentially the same pitch contour (p. 38), shown by tonetic retranscription:

(82) I broke it. (Tonetically: 'I broke it.)

(83) I broke it. (Tonetically: 'I .broke it.)

A non-biunique relation of this kind between phonetic and functional transcriptions requires, of course, further criteria of analysis if different structures are to be disambiguated. Bolinger suggests a number of types of disambiguation: (1) contextual redundancy, illustrated by (84) and (85) as possible questions answered by (82) and (83) respectively, producing different thematic structuring:

(84) Who broke the vase?

(85) What happened to the vase?

(2) phonetic degradation of broke in (82) and of I in (83) (which could be supplemented by a comment on the lengthening associated with nuclei, cf. Bolinger's description of monosyllabic accent A, and on the possible slurring of nuclei into kinetic tones); and, directly coupled with this, (3) reduction of the duration of syllables with such degradation; and, finally, (4) "The commonest supporting cue is flanking by unaccentable syllables" (p. 38): according to whether the unaccentable who in the following examples is level with man or broke, the accent is either C or A, respectively:

(86) It's the Aman who broke it. (Tonetically: It's the 'man who broke it.)

(87) It's the man who Cbroke it. (Tonetically: It's the 'man who .broke it.)

This last notion of flanking unaccentable derives from the distinction between stress and accent. Bolinger motivates his terminological choice as follows (p. 55):

To avoid unwanted associations, it is better to speak of PITCH ACCENT and to leave the term STRESS to the domain of word stress. In the latter domain, one possible kind of phonemic stress is POTENTIAL FOR PITCH ACCENT.

Bolinger later acknowledges Weinreich (1954) in connexion with this distinction (1961(1965:107)); the approach is favoured by Lehiste (1970:150), and Vanderslice & Ladefoged (1972:827) point out that Lieberman (1965) can be interpreted as confirming the analysis. An 'unaccentable', on this view, is a word or syllable which is not lexically designated as having the potential for pitch accent. But since this notion depends on an abstract, non-phonetic classification ('potential' - cf. also Pike's 'innate' stress), Bolinger attempts to provide some more general explanation of the systematic basis for the distinction. In order to do this, Bolinger notes, referring to Pike's transcribed corpus, that pitch accent A is by far the most frequent (cf. also frequency counts by Fries, 1964; Crystal, 1969:225), and, using this observation, develops an ontogenetic explanation. He suggests that the position of the potential for pitch accent is "learned quite early" (p. 44) by "sheer frequency" of the occurrences of accent A at these positions. On this quantitative basis (which of course assumes low frequency

of metalinguistic contrastive utterances) words are entered into the lexicon or "built-in repertory of the language" (p. 44) as accentable at a certain position. This ontogenetic explanation is apparently in direct conflict with the ontogenetic interpretations given to the generative descriptions of English (e.g. Chomsky, 1965; cf. §1.3.2. above); in fact, however, the two kinds of argument are quite distinct. Whereas Bolinger's explanation is a direct empirical approach based on quantitative considerations - and could without much difficulty be associated with psycholinguistic attempts to explain linguistic structure in terms of perceptual strategies (cf. e.g. Bever, 1970) - the latter is an interpretation from quite different criteria. The 'psychological reality' of the stress cycle has never been argued in direct ontogenetic terms; even if it were, the problem of repertorial elements as against formal universals in learning could not be decided without quantitative evidence. The two aspects must therefore at the moment be regarded as complementary suggestions.

As a corollary to the stress vs. accent distinction, Bolinger suggests a distinction between contrastive stress and contrastive accent. The latter is non-phonetic, being a function of the use or placement of accent (Halliday's 'tonicity'); item (88) (1961(1965:103)) can be construed as non-contrastive, for instance as an answer to (89), or as contrastive, for instance as an answer to (90), with no phonetic differences:

(88) It was easy.

(89) How was the job?

(90) Was the job hard?

This conception of contrastive accent is explicitly referred by Bolinger (p. 102) to Pike (1945; cf. §3.2.1.) and Haugen (1949). Contrastive stress, unlike contrastive accent, is the word-level stress shift which results when unaccentable syllables are given accents in special contexts, particularly when partly similar words are contrasted, but also in other kinds of context; this is basically a placement problem and outside the scope of the present discussion.

Bolinger hints at larger constructions into which accents enter, claiming (1965a(1965:157)) "that the sentence itself tends to polarize its accents, to take its characteristic tonal shape from two main pitch movements, one toward the beginning, and the other toward the end"; these movements "relate to the theme-rheme or topic-comment dichotomy; the last accent in particular attracts the contrastive, new-to-context item", though it also has a non-semantic, rhythmic motivation, as evidenced by recitation of such items as QED, H₂SO₄, do-re-mi, and the like. The accents associated with these positions also show a certain degree of selection: A-A and B-B sequences are common, but a large number of Bolinger's examples show B-A sequences. This binary structuring is strikingly similar to one of the main features of the early Praguean theory of 'l'intonation de la phrase' put forward by Karcevskij. Compare, for instance, Bolinger (1961(1965:114))

Most English declaratives of any considerable length have two marked peaks of pitch, one toward the beginning and one toward the end

with Karcevskij (1931a:203f.), allowing for certain more general differences:

Toute phrase intellectuelle, pas trop courte, tend à se scinder en deux parties ou membres de phrase. Il s'y continue deux sommets phonologiques,

séparés par une pause, le premier dépassant le second aussi bien en acuité qu'en intensité. La direction est montante dans la première partie et descendante dans la seconde.

This binary sequencing of tense and lax intonation is later associated by Karcevskij with question-answer and psychological subject-predicate structuring. The binary structure was also present, though generally uninterpreted semantically, in other European studies: the *hochton*, head, or onset in thematic position, and the *tiefton*, or nucleus in the second, rhematic position. The accents in sequences of this kind are also related intonationally, in terms of their relative height; this will be dealt with below. Despite his own criticism that Pike dealt with units that were "too small" (cf. p. 274 above), Bolinger only goes one step further himself in looking for larger units; in effect, he stops at the level of the tone-group of the tonetic analyses, and does not investigate tone-group sequences.

The preceding account of Bolinger's theory of accent has shown that his term 'accent' covers in part what other approaches deal with under 'intonation', and in part what is otherwise understood by 'sentence stress' in so far as this is seen as distinct from the notion of nucleus. For Bolinger, 'intonation' means the non-accentual aspects of pitch patterning, the kinds of pattern which are said to be gradient rather than discrete in structure and use. Bolinger lists the following kinds of patterning as 'intonational' (1958(1965:54)): steep falls as opposed to gradual falls, "high approaches to a falling A accent as opposed to lower approaches", the "relative height" of the accent peaks or troughs, and "a falling approach to a C accent as opposed to a high-pitched approach with steeper downskip". In addition terminal junctures, which also involve pitch movements, are also to be distinguished from the accents, and thus presumably fall under the heading of intonation (p. 55).

The only aspect of intonation which Bolinger goes into in any systematic detail is that of relative height of accent sequences. His first mention of this kind of patterning is in his review of Pike (1947), but various references occur elsewhere (e.g. 1958), and finally an article was devoted to the topic (1970). The first reference was in the context of a criticism of Pike for not examining relations between primary contours; in examples like Pike's *I knew something was wrong here, or Absolutely!* "the relative height of the two major stresses is most significant: the meaning changes according to whether the tangent to the two peaks is rising, level, or falling, just as it changes with a rise, level, or fall on a simple curve" (1947:73). The suggestion is made that an abstraction of an overall "profile" can be made from intonation patterns, regardless of the number of accents also contained in the pattern; this "profile" appears to be roughly what European studies had referred to as 'tune', 'tone group', &c. In the 1970 study, which, *inter alia*, covers the main topic of Schubiger (1967), a fair range of such "tangents" to accentual peaks is studied, and attempts are made to provide semantic interpretations for these tangents and related variables, such as the presence of rising (A) or falling (C) accents and their co-occurrence with rising and falling tangents, or the presence of rising and falling intervening unaccented syllables, which distinguish between a tangent between two peaks (e.g. two A accents) and a continuous pitch line (e.g. a B followed by an A accent). Although most of the discussion is of semantic aspects of these patterns, the following structures can be isolated. It makes a difference in "appropriateness to situations" (p. 113) whether a peaking or a continuous pitch line is followed, given a

particular tangent direction; the tangent direction is said, however, to have the same overall interpretation in each case - for instance, falling tangents with rising accents and falling terminals are associated with commands, but rising tangents with rising accents and falling terminals may be associated with certain kinds of answers to questions. Using a more systematic notation instead of Bolinger's wiggly lines of type (as icons of the intonation trajectory), this particular contrast can be symbolised as follows:

(91) [A accent]_[α height] - ... - [A accent]_[<α height] - ... - [fall]

(92) [A accent]_[α height] - ... - [A accent]_[>α height] - ... - [fall]

A simple extension of this notation, which was used earlier in §3.1., would deal with longer sequences of accents by means of variables over feature bundles or sequences thereof, of by means of indexed feature bundles. The interpretations 'command', for the pattern (91), and 'question-answer', for the pattern (92) are suggested by Bolinger using example sentences such as the following:

(93) I'd get his consent if I were you.

(94) Get a haircut.

These two examples show that Bolinger is not operating with structural syntactic categories (e.g. 'interrogative', 'declarative', 'imperative') but with more direct role criteria derived from the conduct of dialogue; in view of this, they must be regarded as tentative labels, pending a more explicit account of such roles (cf. §4.3.2. below). An interesting structural feature of this pattern is the co-occurrence of falling terminals with the high accents, supporting the suggestion made above that accent A is similar in character to the tonetic falling nucleus. This is complemented by the co-occurrence in analogous patterns of C accents with rising terminals; the pattern containing these forms and the height relation of (91) is said to have a "warning" character, in contrast to the pattern corresponding to (92), with example sentences such as the following as answers to a child's question "What's this?":

(95) It's Csomething of Cmine.

Similar correspondences are reported for tangent directions superimposed on sequences of A accents with falling-rising terminals. Sequences of more than two accents are said to be more highly restricted than those with two (cf. Crystal's study of di-sequences of nuclei and tonal reduplication, §3.1.4. above); a rising tangent with more than two C accents, for instance, is judged unacceptable (p. 118):

(96) *It was [C accent]_[α height] almost too [C accent]_[>α height] much to [C accent]_[>α height] bear.

Also unacceptable are judged sequences of three accents in which the middle accent is higher than the first and the last, an interesting observation which can be directly reflected in the relative simplicity of representation for the acceptable sequences; as an example, the sentence of (96) is used with A accents. In longer sequences, the C accents are allowed to rise or fall, but the A accents are only permitted to rise, as in (97):

(97) It Cleft the deCpositors with expecAtations unfulAfilled.

It may be doubted whether these acceptability judgments are tenable when other possible role criteria are considered, dialect differences here being, apparently, relatively small. It is Bolinger's contention in his paper on relative height that this variable, and those related to it, may receive consistent semantic interpretation in terms of role criteria such as speaker "involvement" vs. "control" for the height variable, high vs. low "message impact" for the choice of high or low accents (A or C, for instance), "expressivity" for increased height of A accents (cf. pp. 121n, 123, 124f.). Although the interpretations are considered to be "still pretty hypothetical" (p. 125), and the identification of which intonational or accentual system is involved in any given effect remains somewhat unclear (cf. esp. p. 121n), interpretations of this kind are useful, and recur in different analyses by different investigators. The examples (96) and (97) are considered in isolation from these, and other, role criteria, however; the assumptions involved in such judgments were discussed above (§1.2.5.) and cannot simply be set aside. Other criteria, such as position and role in dialogue, which were also used by Bolinger need to be taken into consideration; example (97) with A accents on a falling tangent is conceivable as the conclusion of a contribution to a dialogue, for instance.

When Bolinger's relative height variable is compared with the categories and variables used in tonetic descriptions, it becomes obvious that the variable corresponds to the sets of forms which the category of 'head' (Kingdon's 'body') can take, and in particular to the line between the accented syllables (e.g. Crystal's 'segment-initiators' and the nucleus). The most detailed classification of such sequences is that of Crystal (1969: 225ff., §3.1.4. above), which covers all of the patterns outlined by Bolinger and several others besides. Where Bolinger goes further than Crystal is in his exemplification of these patterns (Crystal unfortunately provides no examples at this point), and in his attempt to provide the patterns with semantic interpretations. The main difference between the tonetic accounts and Bolinger's theory of relative height is parallel to that between Pike's and other phonemic descriptions: the latter, in each case, tend to build up the 'larger' sequences as fairly straightforward functions of the smaller items (accents in Bolinger's case, and occurrences of pitch phonemes in the latter), while the former in each case provide an explicit structural framework in hierarchical form, whose categories at each level are established polysystemically, that is, as distinct systems based on distinct criteria, and not necessarily reduced to treatment in terms of a single set of criteria; often the former kind of analysis appears to proceed via a polysystemic stage of analysis, but this has never been shown to be the case for intonation analyses. Bolinger describes trajectories as sequences of accents which enter into further pitch relations with each other; the tonetic analyses distinguish, beyond such strings of minimal forms, between the different structures into which such forms can enter. From the point of view of Bolinger's analysis, tonetic descriptions can be reproached in this connexion for attempting to bridge the gap between types and roles by means of structures which are too complex and frail to do the job properly, and lack the proper foundations at either end; the opposite criticism can be made of Bolinger's approach, that a few kinds of 'shorter' patterns are associated too directly with roles without consideration of the formulation of 'larger' patterns and their internal structure. The plausibility of such structuring is indicated, however, by Bolinger elsewhere when he

suggests that sequences of accents tend to be binary (cf. p. 333 above), though this point is not followed up or related to prior tonetic analyses. The more restricted inductive approach of Bolinger does make the accentual character shared by differently positioned pitch prominent syllables more obvious than in the tonetic approaches, but an attempt to make the structures of intonation patterning more explicit would have revealed more specific kinds of pattern which require the postulation of different categories.

In this connexion it is interesting to recall once more the attempt made by Trim (1959) to generalise between various kinds of sequence headed by pitch prominent syllables (the breaks and the Kingdonian 'head'), organising them into sequences which enter into pitch relations within minor tone groups, whose initial prominent syllables form parallel kinds of configuration over sequences of several such tone groups. Although he only mentions falling tangents, to use Bolinger's term, in his short article, Trim is clearly dealing with the same kind of linguistic facts as Bolinger (cf. the remarks made above in connexion with Schubiger, §3.1.2.3, pp. 145f.). As soon as more complex sequences of the kind envisaged by Trim or Schubiger are considered, however, distinctions in terms of structural categories within a hierarchy are essential.

In addition, other kinds of observation on the relations between type and role in intonation (cf. Trim's observations, 1964, on gradient type-role relations particularly characteristic of the head, or onset, which are very easily relatable to the Bolingerian framework), or on the phonetic basis of the special characteristics of onsets (Crystal, 1969; 1971; cf. §§2.3.3.1., 3.1.4. above), also require more explicit structural descriptions for their treatment. Finally, the undoubted validity of the structural category of 'nucleus', with associated paradigmatic role judgments of placement ('tonicity'), would appear to require recognition. However, the boot is not only on the tonetic foot, to coin a phrase; it was mentioned above that tonetic analyses often obscure the accentual nature of much of the patterning of tone-groups (cf. e.g. also Sharp, 1960:107). This is partly due to the tendency to take the tone-group itself as a primitive category, which is historically traceable to the tone approaches (§3.1.1. above), but partly also due to the rigidity of the tone-group framework which, once established, made a more flexible treatment of the scales along which accents appear to function more difficult. This was discussed above in connexion with Kingdon's description (cf. Table 13, and the associated text); Crystal & Quirk have also set out accentual generalisations between different kinds of tone-group structuring (§3.1.4.). Similarly, scattered references to syntagmatic pitch contrasts, e.g. high preheads, Kingdon's homosyllabic preheads, point to facts which are closely related to Bolinger's generalisations involving 'flanking' syllables, but do not isolate the general principles involved.

One further point in Bolinger's description requires comment at this juncture: the separability of intonation and accent. Where the tonetic approaches tend to mask this distinction, Bolinger spotlights accentual phenomena, enclosing them with a solid fence made up of the type criterion of pitch obtrusion, and the role distinction between all-or-none and gradient contrasts - which is, presumably, intended itself to be an 'all-or-none' distinction at a metatheoretical level of discussion. But a number of aspects of Bolinger's discussions point towards a more intimate relationship than this between the gradient and the all-or-none areas. The relation between pitch accents and intonational terminals, for instance, though not explicitly discussed, is quite close in a number of respects. In the study of rel-

ative height, falling terminals invariably accompany A accents, while A accents may also be accompanied by a fall-rise; C accents and rising terminals occur together (1970:115). The status of the terminals themselves is far from clear, since they may be gradiently or discretely structured according to the accent they follow (cf. 1958(1965:55)); indeed, at one point the A accent is said to be "the usual terminus for most non-questions and for many questions" (1957(1965:57)), implying formal overlapping between accents and intonations. The pitch patterning of unaccented syllables is said to be intonational, and thus gradient; however, a difference between a "falling slightly" and an "abrupt drop" differentiates between one minor variant of the B accent (cf. Fig. 7 above) and an A accent (1958(1965:50)), which are held to be discretely present or absent, qua accents, and discretely different. Further, in the study of relative height the two intonational systems of relative height, and direction and height of unaccented syllables, are presented in a series of interesting examples as being interrelated, and situated on a functional scale (1970:121n); yet accents are also involved, and the syllables following an accent B are here said, interestingly enough, to make "a graded, but at the extremes a striking, difference in the attitude conveyed", rather than an all-or-none difference between a B accent and an A accent. These examples are (retaining Bolinger's wiggly type notation in view of the analytic difficulty involved):

- (98) Just never you mi
nd.
- (99) Just never you
mi nd.
- (100) Just never you mi
nd.

Parallel examples are given for the sentence *I don't believe him*, though with level relative height rather than falling in the second example. The criteria which enable the identification of B accents rather than A to be made for the left hand (head or onset) accent in example (100) and the like are not given; likewise, the difference between a C accent (in the theory not followed by a fall) and the A accent which the right hand (nuclear) accents of (99) and (100) are expressly said to be, is, if discernible at all, a razor's edge. Questions like this suggest that drops to an accent and drops from an accent should be handled separately, and not only in terms of the overall accentual peaking and dropping contours which Bolinger proposes.

But the plausibility of much of Bolinger's accentual theory also suggests, however, that there may be important congruences between such systems (cf. §§1.2.5.2., 1.2.5.3. above, §4.2.2. below), just as there are apparently important congruences between the accentual system and the system of intonation terminals, which justify the postulation of larger configurations as normal, or unmarked, patterns whose parts enhance, rather than modify, each other's functions. It is conceivable that a conception of 'normality' of this sort may be said to underlie the tonetic notion of 'tone-group' as a patterning of pitch from high to low, in its most popular form, but with an evident unity of form. In such a case, Bolinger's

approach could provide the necessary tools for handling the details of the various kinds of marked patterning, in which accents and intonational systems may pull in different directions (cf. discussion at the end of §4.2.2. below). Further evidence may be found in Bolinger (1972a).

The present discussion of Bolinger's approach to the study of pitch patterning has shown the extent to which Bolinger relies on role criteria to be considerably greater than that to which other approaches rely on such criteria; indeed, much of the diversity and contradiction which has become apparent in the present survey is due to precisely this lack of carefully formulated role criteria. Despite the tentative status of much of what Bolinger suggests, the ill-defined line between intonation and accent, for instance, or the absence, on the type side, of physiological correlates for his accents (which can easily be suggested - cf. §2.2.1. above - in terms of various mechanisms involving intercostal muscles and vocal cords for increasing and compensating for increases in sub-glottal pressure), and his largely ahistorical stance as regards related theories of intonation, it may nevertheless be said that his attendance to details of intonation use as well as to the phonetic side of intonation in his discovery procedures yielded a unique body of description, and produced a wide range of pointers to the most fruitful directions which intonation research can take. In this respect it is not necessarily a drawback that aspects of structure are neglected by Bolinger; rather, the evidence he adduces, though more than that adduced by most, does not lead him to suspect structures where a more cursory examination of the facts has led others to suspect them; witness the title of his genial tilt at syntactically orientated placement theories (1972a).

3.3.2. Other approaches to accentuation by pitch

Most of the work on the role of pitch patterns in accentuation was done in the late fifties (cf. §2.2.1. above, and the discussion of Bolinger in §3.3.1.; also Gutknecht, 1972:890, and references there). Both before and after this period, however, a good many studies appeared which incorporated elements of such a conception. A number of these studies have already been mentioned in passing, and related features in other studies have also been noted. The essentials of the development of an awareness of the role of pitch in accentuation will be outlined in the present section.

One aspect of Bolinger's approach is that pitch accents are set off as accents by the unaccentable and unaccented syllables which flank them (p. 225 above); this kind of pattern has also been referred to in previous sections in more general terms as "the principle of syntagmatic pitch contrast" (e.g. §3.1.2.2., p. 137). An early case of the recognition of this principle is in the work of Alexander M. Bell, the Scottish elocutionist and phonetician, precursor of the I.P.A. school and father of the telephone Bell, who characterises a "preparatory opposition of tone" as follows (1886:53):

Another vocal principle - universally made use of but instinctively, and without recognition - constitutes what may be called the Melody of speech: namely, that an inflexion, of whatever kind, is preceded by a tone which is high or low in opposition to the pitch of the inflexion.

A more extensive application of the notion of accentuation by pitch is given

by Coleman (1914), who utilises the term 'intonation' for what is referred to as 'pitch' in the present study; on the basis of a small set of examples, and parallels from music, he states the following finding (1914:14):

A careful recitation of those examples will reveal that prominence is invariably accompanied by a sudden turn (rise or fall) in the intonation. Further, the example of musical melody given above will convince us that it is this intonation-turn that gives the prominence, while the stress merely serves to mark where the turn begins. The emphasized syllable may begin lower or higher than the preceding one, but there must occur, either during this syllable, or from it to the next, a sudden fall or a sudden rise.

An interesting observation of styles in which pitch is the sole correlate, in impressionistic phonetic terms, of prominence, and where stress is excluded, is made in connexion with "speaking without raising one's voice" (p. 14), said to be characteristic of the sick and aged "and in general those for whom needless exertion is disagreeable"; he points out that "raising one's voice", in the sense of increasing pitch itself, is, despite the currency of the term without this connotation, "precisely the method such people use". Later, Coleman claims that "where merely a stronger expression is introduced by way of contrast to a normal prominence, only a steeper intonation is essential; added stress is not necessary" (pp. 17f.); this is a form very similar to Pike's pitch 1, Trager & Smith's pitch 4 (cf. §3.2. above), though expressed in terms of a slope, rather than a pitch height variable. Coleman goes so far as to call his theory of "the pitch-emphasis of Prominence" (p. 18) "the theory that (I) intonation is in most cases based on mere considerations of emphasis, and (II) that it is the chief factor in the expression of emphasis" (p. 24). At the end of his essay (pp. 21ff.) he gives an "analysis of the chief varieties of intonation, sketching general rules for the more general cases" (p. 21); these six rules assign accents to texts, formulating selection and placement restrictions for rising and falling inflexions for contrastive constructions, inclusive of anaphoric or thematic patterning, and assignment to "the last word" in cases "where no one element demands Prominence rather than another" (p. 24). A decade and a half later, Karcevskij presented a description which overlapped in many respects with that of Coleman; this description (1931a) has already been cited in its relevant aspects in connexion with Bolinger's theory of binary accentual sequences. The idea of binary syntagmas in intonation may perhaps be said to have received some confirmation by Crystal's observation of the prevalence of 'di-sequences' in nuclear sequences (1969:240; cf. §3.1.4. above).

Various aspects of the prosodic approaches which come near to pitch accent theory have frequently been mentioned in passing; they relate both to pitch accents themselves and to the principle of syntagmatic offsetting by means of the immediate pitch environment. Klinghardt's point culminant and the hochton-tiefen analysis (cf. esp. Fig. 6), which are clearly pitch-based points of prominence, set the direction which the tune and tonetic analyses later took. The concepts of head (onset), break, nucleus relate to pitch prominences of different structural status, and with pitch changes either before, on, or after the relevant syllable. In Armstrong & Ward's approach, these elements are supplemented by a further device giving prominence, in 'additional emphasis' a prefixed rise on an already prominent syllable. A suggestion was made above for interpreting certain aspects of Bierwisch's notation in terms of a pitch accent theory (pp. 125f.);

this would provide an interesting extension of the notions which his description (1966) could be said to explicate, beyond the notions contained in v. Essen (1956). Kingdon's tonetic description has a number of kinds of patterning concerned with pitch accentuation; three kinds have been mentioned (pp. 137ff. above): first, greater pitch range superimposed on the kinetically prominent tones and greater step out of the trajectory for the static prominent tones; second, stress reduction on the flanking unaccented syllables (to use Bolinger's term), both by reduction of high level tones to low level tones and by reduction of low level tones to unstressed syllables; last, the use of preheads to offset the head (cf. Bell's "preparatory opposition of tone" above), including the "homosyllabic preheads", which extend the class of rise prefixes such as those noted by Armstrong & Ward. Two kinds of accentual patterning were also noted by Schubiger under the names of "intonation turn A" and "intonation turn B", which are similar to the last of Kingdon's pitch accentual devices just listed. Further information on such devices is provided by O'Connor & Arnold; the similarity of their treatment of preheads and heads in certain tone group classes ("tone groups" in their terminology) to pitch accent theory has already been noted (p. 148 and references there). Further instances may be found in the work of Halliday (p. 154 above) and Crystal (cf. esp. pp. 177f. above).

Some of the details of phonemic analyses which are related to pitch accentuation have already been pointed out. Pike's organisation of intonation into quite short 'total contours' consisting of pre-contour and primary contour was suggested above (p. 188) to be in effect a theory of pitch accent, since these total contours are simply pitch prominences with pre- and enclitic flanking unaccented syllables. His pitch level 1, and Trager & Smith's level 4 (possibly together with Hockett's phoneme /ʔ/, 1955) have already been compared in respect of pitch accentuation with Coleman's "steeper intonation" (above). A somewhat different phonemic notion, Harris' simultaneously occurring contour phonemes, has already been mentioned as bearing a structural affinity to Bolinger's conception of intonation and pitch accent (pp. 196ff. above). On the periphery of the phonemic approaches there are also signs of pitch-accentual notions; Newman (1946) emphasises the role of pitch both for his "expressive accents" (1946:172ff.) and for his "stress accents", particularly the "nuclear heavy stress" (pp. 174ff.), which has been adduced by Chomsky & Halle (e.g. 1968:90) and Bresnan (1971: 258) as the terminological starting point for their syntactic placement theories; it is unfortunate that the history, and thus also the descriptive status of this term, traceable to the Palmer analysis, was apparently unknown to these writers.

One of the first explicit associations of pitch and accent within the framework of a description of English was, of course, Kingdon's interpretation of in-text iconic intonation notation as "tonetic stress-marks" (1939; cf. §3.1.2.2. above). This notation, with Kingdon's interpretation, existed alongside other kinds of notation in the other accounts dealt with above in §3.1.; in these accounts the tonetic stress mark approach was fused with the tune approach to yield more or less complex accounts of intonation structures. A number of accounts laid less stress on the tune aspect, however, and thus tended to approach the accent theory of Bolinger; interestingly enough, they were formulated at approximately the same time as Bolinger's theory, though not with the same comprehensiveness on the phonetic side. The most notable of these are the studies by Lee (1956a; 1956c; 1960; other articles on specific points are, in their important aspects, incorporated into 1956c), Sharp (1958), and Hultzén (1959). Since

the merits of these studies lie particularly in their attempts to identify the roles played by utterances of various types, it is sufficient here to point out the basically accentual characteristics in these accounts without going into detail. In this respect, the salient aspect of each of these accounts is that the accents, represented by various modifications of Kingdon's tonetic notation, tend to pattern in binary fashion, as in the tonetic accounts dealt with previously, and in the accounts of Karcevskij and Bolinger. Lee (1956:346) has "tone-marks" for fall, rise, fall-rise, all typical nuclear forms in the traditional terminology, as well as a vertical upward arrow (+) indicating "a relatively high pitch at the beginning of an utterance, or an upward jump" (p. 346n), clearly corresponding to the head and break categories of the main tonetic analyses, later generalised by Trim (1959) to a single category, and interpretable as one of the items occurring at thematic position.

The main feature of Sharp's discussion of the use of fall-rise pitch patterns is a distinction between unitary and binary patterns: the latter are, however, only said to have two occurrences of a "major prominence" (1958:131) which, unfortunately, "must remain undefined". Indications of an interpretation in terms of thematic structuring are present: the stretch associated with the low pitch after a fall in general "will be at least partly 'anaphoric' in effect, and might in some cases be omitted without much loss", though in other cases the stretch after a fall (presumably still with the anaphora interpretation) may "require a degree of highlighting which cannot be attained on a low level pitch", this highlighting being provided by means of a rising contour and sometimes supplemented by an operation of "front-shifting" (i.e. what has become known in recent years as 'topicalisation') of the accented item (1958:138f.), as in the following "equation":

(101) a. F + FR : FR + F :: F + R : R + F

b. /ai v'si:n 'dʒən/ : /'dʒən ai v'si:n/ ::

/ai v'si:n 'dʒən/ : /'dʒən ai v'si:n/

For further comment on the paradigmatic role criteria involved, see §4.1.

Hultzén notes particularly the "first and last accent positions" within the traditional tunes as being "comparatively conspicuous" (1959:110), but apart from a reference in passing to subject-predicate constructions as one source of two "information points" he restricts his interpretation to a metaphor of "information" (degree of unpredictability), borrowed from the mathematical theory of communication, but with neither the original quantitative interpretation nor a further qualitative interpretation of the notion, though a later study incorporated a reference to Daneš and the notion of theme (1964:91).

It is of historical interest that these approaches are connected with the Prague school in varying degrees and at various points in its development, with influences going in both directions: from Karcevskij to Lee, Bolinger, Hultzén, Daneš, Firbas (e.g. 1964), and including Schubiger (who used Praguean terminology for role categories right from her earliest intonation study, and who was also involved in the Lee, Sharp, Hultzén discussion on fall-rises - 1956, cf. also §4.2.2. below), and Halliday.

A simple and elegant pitch accent system was set up on rather different methodological lines for German, and given an extremely exhaustive interpretation both in terms of types and in terms of roles, by Isačenko &

Schädlich in various publications (Isačenko & Schädlich, 1963, 1966, 1970; Isačenko, 1965, 1967). The major statement is the 1966 publication, which was referred to above particularly as a source for certain aspects of the Bierwisch description (§3.1.1.3.). The 1970 item is a translation into English of the earlier study; it incorporates a number of modifications of the earlier study, the three most important being the excision of much of the second section (concerned with motivating the choice of pitch as sole acoustical correlate used in synthesising intonations for psycho-acoustic testing), the addition of a new section on the use of the patterns generated by their model in phrasing, disambiguation, &c., and the omission of numerous examples.

The Isačenko & Schädlich pitch accent system can be characterised briefly in the following terms. A single phonetic variable, pitch height, is involved, with two variants, a lower and an upper height; utterances alternate at least once between these two variants (monotones are deliberately omitted), either before or after an Iktus (roughly the same as the lexical stress of Bolinger, but not the same as Halliday's 'ictus'). The four categories thus generated, pre- and post-ictic rising and falling breaks (to use the older term; Pheby, in 1969:36, and in his translation, Isačenko & Schädlich, 1970, introduces the term 'tone-switch', which is apt for the model under discussion), are then given direct semantic interpretations: final post-ictic breaks are assigned the double function of integrating the surrounding stretch into a unit (cf. Daneš, 1960; and §1.2.4. above), and providing markers of interrogation (rising break) and non-interrogation (falling), while pre-ictic rises are "progreddient" (cf. v. Essen, §3.1.1.3.) and the pre-ictic fall is less emphatic than the post-ictic. The generalised function of the rising break, the marked item in terms of roles (types not being considered for this), is to announce a following falling break, while the latter has no comparable generalised function and is therefore regarded as the unmarked member of the break opposition, (1966:55).

Isačenko & Schädlich insist on the special character of their method, which is to pare down the types and patterns involved in German intonation to the bare minimum, and to set up this skeletal model as a hypothesis for psychoacoustic testing. The abstraction from types and roles is quite considerable, and has led to a number of criticisms in various quarters; these abstractions affect also the degree of idealisation (cf. above, §1.3.) of their psychologicistic interpretation of the intonational forms postulated as "input units" (cf. esp. Isačenko, 1967:24, and discussion in §2.2. above). These points require brief mention, and can be treated under three heads: abstractions affecting types, those affecting roles, and aspects of the psychologicistic interpretation (including testing).

The abstraction from the range of types involved in intonation of the single height variable leads to a number of observational and descriptive inadequacies. Trim (remark appended to Isačenko, 1965:372) and Heike (1969: 11) note cases (falling tone-unit bodies - cf. also v. Essen, 1956, §3.1.1.3. above, and standard criticisms of pitch phoneme theory - and additional emphasis, respectively) where the model fails; even such a simple sentence as

(102) 'Hans kommt

cannot, it should be pointed out, be handled by the model, since no provision is made for handling monosyllabic (thematically-) accented heads

where the accent is not kinetic. Tillman (appended to Isačenko, 1965:373) and Wode (appended to Isačenko, 1967:29f.) also note the unnaturalness (cf. §2.1. above) which the synthesised intonations have. Apart from questions of adequacy, there is an unresolved structural ambiguity in the model: are the levels primes, or the breaks? Van Katwijk made the following (unanswered) remark after Isačenko (1965:373):

Darf ich Sie fragen, ob Sie mit mir einverstanden sein können, daß die Beschreibung des Intonationsverfahrens vielleicht noch essentiell reduziert werden kann, wenn man nur die Veränderungen in Betracht zieht und die Stufen der Tonhöhe als sekundäre Gegebenheiten anerkennt, deren Zahl von dem Umstand abhängt, wie groß eine Serie von Tonhöhenveränderungen in gleicher Richtung ist?

And indeed, the use of two pitch heights can very easily be reinterpreted as an indirect statement of distributional restrictions on pitch breaks. Whereas the traditional breaks allow iterations of like forms, with series of rises or series of falls (as is also the case with Martin's tone-switch analysis of Korean "pitch components", with operators raising and lowering the pitch level, also symbolised by vertical upward and downward arrows - 1951(1957:364)), the system of Isačenko & Schädlich does not allow such iteration: a rise must be followed by a fall, and, except for a final fall, vice versa. These facts can be conveyed by the following rules, whose interpretation is straightforward:

(103) [α pitch break] → [f pitch break] / ____

(104) [β pitch break] → [-α pitch break] / ____ [α pitch break]

where the question of leftward or rightward environment in (104) is immaterial without further evidence. It is this strong restriction which, essentially, the criticisms of Trim and Heike concern. This interpretation illustrates very clearly the relation of the Isačenko & Schädlich model to pitch accent approaches, a relation which is also illustrated by such claims as the following (Isačenko & Schädlich, 1966:46),

... daß nicht der gesamte "Melodieverlauf" der Satzintonation, also nicht die melodische "Hüllkurve" der Äußerung, sondern nur der letzte Tonbruch allein die erwähnte integrierende und zugleich syntaktisch differenzierende Funktion ausübt.

The subsumption of intonational phenomena under a basically accentual system has already been discussed in the context of Bolinger's description; it is possible that what Isačenko & Schädlich have stumbled upon here is just the kind of system congruence suggested in connexion with Bolinger above.

Apart from the usual omission of emotional and appellative connotations, the most conspicuous abstraction in the area of role criteria is the assumption of context-free utterances (cf. p. 30):

Unter Äußerung (sic - DG) wird hier jeder Redeabschnitt aufgefaßt, der relativ selbständig, d.h. in der Umgebung #____# auftreten kann.

Further characterisation of a minimal utterance is given (pp. 28f.):

Als "Wort" wird hier ein Morphem oder eine minimale Verbindung von Morphemen angesehen, die selbständig in einer normalen, d.h. nicht-meta-sprachlichen Äußerung in der Umgebung /#____#/ auftreten kann.

These minimal normal forms, for which later the term "Ansageform" is used (p. 31), are in fact role norms, and it is not unreasonable to suggest that they are quite the opposite of what Isačenko & Schädlich suggest, in a sense: they may not appear to be part of a metalanguage, but they are nevertheless citation forms (§1.2.5.3.) within their own metalanguage. The assumption of context-free utterances is a source of distortions of the intonational facts; a norm in this sense of the term is not something which should be assumed, but requires evidence in terms of role criteria, system congruence, &c. The inconsistent use of such terms as "Äußerung", "Satz", "interrogativ", "Frage" (despite their criticism of others in similar respects - p. 41) shows a lack of concern with such niceties. One point which falls between types and roles is the potential ambiguity of pitch structures, which Isačenko & Schädlich do not discuss: their table of patterns (p. 38) contains, among other patterns, the items (unter)sagt and (ver)sagen; the pitch patterns can be disambiguated here by means of lexical knowledge, but what about patterns like Hans kommt (similar to (102) above), and the like, where this is not possible? Discussion, either in terms of type (duration, &c.) or in terms of role (different contexts), might be expected here (cf. Bolinger's account of accent ambiguity, with analogous English examples - in fact his accents A and C, which closely resemble the tone-switches - p. 331 above).

Heike (1969:11) has criticised the psychoacoustic tests which are the basis for Isačenko & Schädlich's psychologicistic interpretation of their model as describing input units for the production of intonations, on the grounds of certain general criteria for tests. A number of specific points can be made in addition: the unnaturalness of items used (the synthesiser produces a chanting quality on the record accompanying Isačenko & Schädlich, 1970) has already been referred to; further, the extremely limited range of role criteria allowed for psycho-acoustic functional judgments not only skip straight over to the role side (cf. the classic type-role confusions discussed in Ch. 1) but beg another question, too, namely whether the criteria used (e.g. the pair of predicates "ist eine Frage"/"ist keine Frage" - p. 47) are either relevant or, if relevant, sufficient to provide accurate information. A further obstacle in this respect, if the examples provided are a fair reflection of the actual test items, is that only a very few of the possible pitch configurations were actually tested; thus, there is no comment on post-ictic fall with or without pre-ictic rise:

(105) -Er kommt vs. -Er kommt.

Perhaps the major objection to the adequacy of the hypothesis, with or without the input-unit interpretation, is that no possibility of submitting the hypothesis to a decision or evaluation procedure in which other hypotheses may also be considered is entertained; or, to polarise the point: the element of confirmation of the hypothesis is overemphasised at the expense of the element of falsification.

Similarities to other theories have been pointed out in the course of the discussion; it is appropriate to point out further the particular associations with the Prague school which this model obviously has, but which (despite the authorship) are not pointed out. The binary structure, and indeed its interpretation, may be singled out in conclusion: Karcevskij's juxtaposition of two types of intonation (mentioned above in connexion with Bolinger) is not formally identical with that of Isačenko & Schädlich, but has obvious structural and semantic parallels (Karcevskij, 1931a:207):

L'intonation incitante de la première partie conditionne l'intonation "calmante" de la seconde.

The most recent approach to the description of prosodic features to be based on the pitch accent conception is that of Vanderslice (cf. 1968; 1970; Vanderslice & Ladefoged, 1972). Much of this work is concerned with the kinds of stress rules used by Chomsky & Halle (1968) and modifications thereof; a certain amount is, however, explicitly based on the Bolinger analysis of accent and intonation (cf. 1972:1056, in a reply to a comment). The basic distinction between intonation (which Vanderslice takes to be the choice of rising, falling, and falling-rising terminal) and accent is Bolingerian; accent and stress, the other side of the distinction, are treated in considerably more detail than intonation. The stress vs. accent distinction of Bolinger is replaced by a whole set of binary distinctions; these explicate many of Bolinger's observations, and are also extensively applied as an alternative, and simpler, model to the problems which exercised Chomsky & Halle, and for which the latter had proposed a single stress variable with numerous variants. The binary features given (e.g. in 1972) by Vanderslice are the following variables (which are given +/- specifications): HEAVY (for reduced vs. non-reduced vowels); ACCENT (pitch obtrusion, primary stress in the I.P.A. sense); EMPHASIS (referred to the Trager & Smith pitch 4, and Halliday's tone 5, the rise-fall); DIP (downward vs. upward pitch obtrusion, Bolinger's variant A accent, cf. Fig. 7(b) above); INTONATION ("Abstract feature assigned to nuclear accented syllable, implying a plus value of one or both of the following features" - Vanderslice, 1972:1052), these features being CADENCE (low or falling vs. non-low intonation) and ENGLIDE (rising vs. non-rising intonation). Starting at the end of the list, with the intonational features, it should be noted that the handling of intonation is practically identical to that of Bierwisch's analysis (cf. §3.1.1.3. above, esp. Table 6), so far as it goes, though the fall-rise combination is absent in Bierwisch's analysis. The feature Intonation is apparently a placement feature; there is no discernible reason for formulating it as a feature, however abstract, rather than as a placement rule system (cf. Bolinger's remarks on the Trager & Smith *deus ex machina*, and esp. §§3.2.2.3., 3.2.2.4., 3.3.1.). The features Dip and Scoop have already been related to their Bolingerian equivalents; of them, Vanderslice claims (1972:1053):

However, these last two features expound not grammatical, but rather what Abercrombie (1967) calls indexical, distinctions.

Vanderslice does not go into functional matters any further, though. 'Emphasis' covers a number of the devices which have been postulated in previous descriptions. The relation between Accent and Dip is somewhat obscure; Accent appears to appertain, like Intonation, to matters of placement and does in fact figure in placement rules. No comment is made, however, on the kinds of structure (e.g. thematic structure) in which the falling and rising pitch obtrusions characteristically function, and which are, if the term 'grammatical' be stretched in its application in much the same way as Vanderslice clearly stretches it in implying that certain features are grammatically relevant, clearly eligible for treatment in any adequate placement theory. The feature Accent may perhaps be relatable to Bolinger's notion of stress, undoubtedly a matter of placement. Heavy, or some similar feature, has figured in a number of theories of accent and vowel reduction (e.g. Karcevskij, 1931a:193ff.; Halliday, 1967:14; Chomsky

& Halle, 1968:110ff.) in various ways. As discussions in previous sections have shown, there is more to English intonation than this; the question of relative height, for instance, both in the treatments of Bolinger and those of tonetic approaches in terms of tone-group bodies, is an important feature of intonation and accent in English. Vanderslice, however, refers to one set of such observations which involve "downsloping prenuclear contours" (1972:1056), as "grotesque misconceptions about British intonation", and notes that he has "yet to hear it [the downslope under discussion - DGI] from a phonetically naive Briton" (p. 1057). It is true that this pattern has played an unduly important role, quantitatively speaking, in pedagogic accounts of British intonation, a fact which has already been noted in many places (e.g. O'Connor & Arnold, p. 147 above and references there; Crystal, 1969:226). A more "grotesque misconception" than this overemphasis is Vanderslice's actual denial of the existence of such patterns: Crystal documents several kinds (cf. his head type B, or his glissando feature, pp. 164, 229, 252, & *passim*), and other scholars have frequently documented them; the BBC employs enough phonetically naive native speakers, perhaps unfortunately, and a brief period of listening particularly to announcers and newsreaders would be sufficient to fill the gap in Vanderslice's corpus - not surprisingly, since the pattern is especially characteristic of a number of styles of public speaking. In the course of preparing this account I have confirmed this observation many times over.

Numerous other references could be made to approaches which deal with accent in terms of pitch; Smits van Waesberghe (1957), for instance, with a musicological approach, or Futaky (1965), including other phonetic details, or Lieberman (1967), whose analysis of contours into an intonational and an accentual feature has already been mentioned on a number of occasions (esp. §2.2. above). Lieberman's description, in particular, can be brought into harmony with the Bolingerian approach without much difficulty: the breath group is intonational, while the feature prominence is Bolinger's accent A. Discussion of the physiological correlates is far from closed, however. The major studies which are either in or bordering on the category of pitch accent approaches have been sufficiently dealt with however, in this and other contexts, and these provide a representative cut across the spectrum. The present section has revealed cross-currents which link the various major schools of intonation and accentual analysis, and it has also indicated that there are considerable shortcomings in the formulation of criteria of analysis, particularly on the role side, due partly to ignorance of previous work in the field, and partly to a failure to appreciate the distinctions between various kinds of criteria of analysis. The use of role criteria in setting up intonation analyses and, where appropriate, for distinguishing between accentual and intonational systems, will be dealt with further in the next chapter. The present chapter, though concerned primarily with intonation, by virtue of concentration on the various type variables associated with pitch, and with the internal structure of prosodic systems rather than their placement with respect to texts, will conclude with a survey of the generative contributions to the study of accent and intonation which were not dealt with in §§3.1., 3.2. above.

3.3.3. Generative contributions

The following summary cannot be more than a brief outline, since matters of accent placement, which are the primary concern of the generative

accounts, are peripheral to the present investigation; they will be dealt with in a later study (in preparation). The main methodological characteristic of generative approaches has been, since Chomsky, Halle & Lukoff (1956), the development of systems of representation for various levels of linguistic analysis (cf. §2.4.3. above). This emphasis has had a number of effects in the course of development of the generative treatment of accent and other matters: first, it has led to a sharpening of the notion of 'level of representation', and to the provision of a powerful set of tools for the formulation of models of linguistic descriptions; second, it has illustrated more clearly than ever before the nature of some of the relations between different levels of representation; third, it has strengthened a general awareness of deductive elements in linguistic concept formation, both in linguistic discovery procedures and in the structure of linguistic theories. The new degree of precision introduced by this approach contrasted with the relative lack of precision possible in formulating the criteria of analysis for these various levels, which in turn resulted in a general neglect of the older notion of 'level of analysis' in favour of the newer, and more restricted, notion of 'level of representation'; this happened despite the obvious suitability of the older notion as an *explicandum* for the later one, and resulted in an accompanying neglect of criteria of analysis with concentration on a very few limited kinds, whose status was not always clarified. These points, coupled with the central interest in syntax in the narrower linguistic sense (which formed a natural marriage with the attempt to provide a formal syntax to serve in linguistic representations), conspired to produce an overall description of English in which the congruence of non-syntactic levels of representation with syntactic levels was over-emphasised at the expense of other aspects which were not congruent with the syntax. On the side of representation theory, this lack of autonomy found expression in the interpretive status of all the non-syntactic levels, in which these levels were modelled on to the syntax by means of various kinds of function. On the side of the analytic criteria, however, the emphasis on congruence led to a heavy reliance on the paradigmatic criterion of normal structure; judgments on the basis of this criterion, in the sense of an assumption of system congruence (cf. §§1.2.5.2.-3. above), in which other arguments such as systematic simplicity were also involved, became particularly common in the case of analysis of prosodic features (cf. for instance Stockwell's approach, §3.2.2.4. above), though they are to be found elsewhere, too. Such judgments are presumably felt to harmonise in some way with the criteria underlying the older notion of deep structure in syntax as a canonical or normalised structure based on considerations of systematic simplicity and various paradigmatic criteria of analysis (cf. discussion of adequacy above, §1.3.2.). The recent history of generative approaches is one of an attempt to rescue the adequacy of descriptions from this methodological limb (cf. Stockwell, 1972; Chomsky, 1971). It is worth tracing the development of this position as an instance of an approach in which intonational and accentual structures and the roles on which these are in part based are reduced to approximately the same thing: to the structure of various lexico-syntactic levels of representation within what might be termed an extreme reductionistic, or correspondence theory of placement.

The generative accounts can be traced most directly to Trager & Smith (1951), whose position within the American schools of intonation description was dealt with above (§3.2.2.3.), and who provided the *explicandum* for the forms and structures of the first steps towards a generative de-

scription. The main points which Trager & Smith bequeathed to the generativists were: the conception of a stress variable operating at all hierarchical levels from word through phrase up to clause and beyond, with numerically designated variants arranged along a linear scale (the fact that primary, secondary, tertiary and quaternary or lack of stress were transcribed with typographical accents does not alter this); the conception of an order of stress assignment at various levels, starting with the 'smallest' and proceeding to the 'largest'; the conception of a normal stress placement of a single primary stress per clause on the rightmost lexical item (a view which in turn has a long history - cf. Coleman, 1914, with his intonation rules, and others in the European tradition such as Schubiger, 1935) with a special shift operation moving the accent back for supposedly non-normal placements (cf. Schubiger's "shifted intonation turn", 1935:44, as a "deviation" from a norm; also §§3.2.2.3.-4. above); and, finally, the conception of a relation very close to isomorphism between syntactic and phonological structures as far as "stress" is concerned. The three hierarchies which Trager & Smith establish, the phonological, morphological, and syntactic hierarchies, are related in the following ways: the phonological clause is held to be co-terminous by definition with the syntactic clause (p. 69), which is "descriptively equivalent to the morphemic clause" (p. 70; cf. pp. 209f. above). The kind of derivation envisaged by Trager & Smith may be illustrated, within the morphemic hierarchy, by means of the morphemic word *vtëykar* and the morphemic phrase *vtëykar* (*taker* and *take her*, respectively; 1951:58):

(106) *vtëyk* & *√-ər-* & *√-v* → *vtëykar*

(107) *vtëyk* & *Wnähr* & *Pš-v* → *vtëykar*

The superfixes (word superfix *√-* and phrase superfix *Pš-v*) can be regarded as operators which take words up to the level of phrases, morphemes up to the level of words, and, of course, phrases up to the level of clauses, and possibly these too up to higher levels still within the hierarchy. The precise operation involved in each case is not stated explicitly.

Chomsky, Halle & Lukoff (1956) 'explore the adequacy of a more economical phonemic transcription in which only the opposition accented-unaccented is marked' and "find that for a well-defined and independently significant class of utterances such a transcription suffices to determine the full range of variation in stress which has been brought to light and clarified by recent investigations, provided that we take into consideration the hierarchical organization of the utterance" (p. 65); the first footnote of the study, on the same page, points out that "we have designed our rules to fit the stress patterns described in the literature, accepting available information, tentatively, as valid, and relying in the main on Trager & Smith (1951) and Newman (1946). The methodological orientation of the account as a theory of transcription has already been discussed, and need not be dealt with further here (§2.4.3. above). The transcription system set up by Chomsky, Halle & Lukoff for the representation of accent may be regarded as an attempt to explicate the set of operations clearly envisaged but not explicitly formulated by Trager & Smith.

The transcription at the level of representation which interests Chomsky, Halle & Lukoff is subject to three requirements. First, a criterion of analysis (p. 66):

If two utterance-tokens (actual physical instances of utterances) are phonemically distinct, then their representations differ.

An operational criterion is given for phonemic distinctness, and reference is made to Harris (1951). Later (pp. 77f.) it is pointed out that "condition 1" (read: "requirement 1"; the "conditions" given pertain only to junctures) "has not been met in complete generality", since "for example, pairs of utterances that are different in such a feature as rate of speed, loudness, contrastive intonational features, or pauses, etc. are not distinguished". The second requirement is an enumeration of the vocabulary of the transcription system (p. 66):

The elements of the transcription T are segmental phonemes, junctures and a single accent element.

The two junctures, "-" and "=", are said to correspond, by and large, to the processes of word formation and phrase formation, respectively, the former being "internal juncture" and the latter "external juncture" (p. 69). The third requirement pertains to an evaluation procedure which specifies correspondence between levels as an evaluation criterion (p. 67):

Junctures should be distributed in a manner that is significant on higher levels. Specifically, junctures should appear only at morpheme boundaries, and different junctures should correspond, by and large, to different morphological and syntactical processes.

It is emphasised that this procedure is not circular, and that the junctures are placed in these positions "in order to be able to describe the distribution of stress in a simple way, not because of the type of syntactic and morphological processes involved" (p. 69). In addition, the two junctures are supplemented by an indexing system indicating a hierarchy or constituent structure among the junctures, with lower integers indicating higher rank (completely analogous to Wells' notation of strokes; cf. example (62), §3.2.2.2. above, where parentheses were substituted for strokes); the hierarchy thus established "correlates with the results of constituent analysis on higher levels", by and large (p. 70).

Five placement or stress assignment rules are postulated which convert the lexically given binary accent specifications in a sequence to multi-valued stress specifications; the distinction between accent and stress is thus internal to the structure of the transcription systems involved. Three of these rules are placement rules proper. The first specifies that the final accent in a junctureless sequence is the strongest, the first accent being next strongest and the non-final subsequence as a whole having decreasing stresses (increasing integers) from left to right - an interesting binary structuring resembling that discussed in connexion with various pitch accent theories above. The second rule specifies that the main stress in the sequence to the left of a juncture is stronger (in the case of internal juncture) or weaker (in the case of external juncture) than the main stress of the sequence to the right of the juncture, and that the relations between stresses in the sequence containing the juncture are otherwise preserved. The third rule specifies that the reduced vowel receives the weakest stress. Rule four acts as a general ordering principle on the application of the preceding three rules: the first section provides the starting point by assigning the value [1 stress] to the lexically accented syllables; the second defines a cyclical order of application of rules one and two with reference to the hierarchically ordered junctures (i.e. a junctural con-

stituent structure); the last two sections deal with unaccented syllables. It is the second of these sections which is the central feature of the Chomsky, Halle & Lukoff constituent structure determination of accent and is preserved in later developments of generative theory (p. 75):

(ii) then apply each rule pertaining to accented vowels no more than once to each constituent, applying a rule to a constituent of order n only after having applied it to all constituents of order $n + 1$; i.e. beginning with the smallest constituents and proceeding to larger and larger constituents.

The fifth rule is an informal statement of a restriction on the power of the second section of rule four (p. 75):

There is an upper limit to the number of stress levels which are distinguished. This limit apparently varies for different styles of speech, as well as for different speakers.

This rule is not actually implemented or given explicit formulation.

The debt of the approach to the Trager & Smith description is manifest: it is not only the source of data, but also provides theoretical concepts as explicanda; one instance is the formulation of derivations with reference to a hierarchy or phonological constituent structure. The important generalisation involved in cyclical application of the same rules at each hierarchical level (cf. also in this connexion Schubiger's thesis of an intonational hierarchy, §3.1.2.3. above) had also been anticipated by Trager & Smith (1951:66 - "word-suffixes and phrase-suffixes are often of identical shapes"). Further, rule one is an interesting specific formulation of the widely recognised binary structure of accentual systems. Where Chomsky, Halle & Lukoff take over from Trager & Smith is that point in the grammar where the latter wrote, "Not even initial descriptions exist" (1951:6), referring to derivational morphology; it is the formulation of the way stress patterns are involved in morphological derivation which is the main concern of suprasegmental generative phonology. The main innovation in later accounts was an alteration in the status of the lexical accent feature, which was later shown to be predictable in various ways (1968); the principle of ordered rules, particularly the cyclical ordering principle, was retained; the problem posed in rule five was taken up again by Bierwisch (1968) as the first of his "critical problems", with some hints for its treatment already given in his earlier study (1966). The issue of inter-level correspondence between phonology and syntax remained, though modifications were introduced, especially as a result of the work of Bierwisch (1966), by way of readjustment rules. These matters will be taken up below.

An illustration can be given of the new conception of junctures, as concepts based on stress distribution and considerations of systematic simplicity, using the sequence the Pennsylvania railroad is the main Pennsylvania railroad, which Trager & Smith had transcribed as follows (1951:74):

(108) /²ðə+pən(+)+sɪlvənyə+³rēyl+rōwd²|²ɪz(+)+ðə+mēyn+pən(+)+sɪlvənyə+³rēyl+rōwd¹/

For an explanation of the transcription, see §3.2.2.3. above; the parentheses, though not commented on in this context, presumably indicate option-

ality (cf. p. 69). The quite different, abstract status of the Chomsky, Halle & Lukoff junctures, for which no claim of direct phonetic reality is made (1956:58), is well illustrated by their derivation (1956:76):

(109)	RULE	ðə+pən+sɪlvəny+rēyl+rōwd ₀ +zð+mēn ₁ pən+sɪlvəny+= ₁ rēyl+rōd							
1.	4i	1	1	1	= ₀	1	= ₁	1	= ₁
2.	4ii, 1	1	1	1	= ₀	1	= ₁	3	= ₁
3.	4ii, 1	3	4	1	= ₀	1	= ₁	3	= ₁
4.	4ii, 2i	3	4	1	= ₀	2	3	1	= ₁
5.	4ii, 2i	3	4	1	= ₀	2	3	2	1

The completion of each cycle is indicated in the derivation by omitting the juncture in whose domain the cycle operated. Then follow the rules which assign stresses to non-accented syllables; for this, three procedures are suggested, yielding the following three stress patterns (pp. 76f.):

(110) i. 6 3 6 4 6 1 5 4 5 2 3 5 3 5 1 4
 ii. 5 3 5 4 5 1 3 4 5 2 3 5 2 5 1 3
 iii. 5 3 5 3 5 1 3 4 5 2 3 5 2 5 1 3

These variants can be described as low level variants, since they share the same phonemic transcription and those sections of the derivation which pertain to accented syllables. The first version, on whose phonetic plausibility no comment is made, results from the application of all rules but rule five. The second version, which "seems to be an accurate rendition of the pronunciation of this expression by one of the authors" (p. 77) has no application of a rule which stipulates that unaccented items must receive lower stresses than accented items; this version has a reduced range of stress variants since other sections of rule (4iii) introduce specific values for the stress variants assigned to unaccented items, and this section of the rule relativises these variants paradigmatically (cf. §2.3.3. above) to the variants already given for the accented syllables. The third version, which, with the exception of the reduced vowels, "agrees with the representation given by Trager & Smith" (p. 77), is reached by tacking on to the second derivation a suggestion for rule five, stipulating that accented vowels are never assigned a value below [3 stress]; this reduces the range of possible stress variants even further. To reach the Trager & Smith transcription, the further suggestion for rule five is made that no stress variant goes lower (receives a higher integer) than [4 stress], a further limit on the range of possible stress variants.

A comparison of the junctures of Chomsky, Halle & Lukoff with those of Trager & Smith reveals a large reduction in the number of junctures postulated, from nine (optionally twelve) to three external junctures with a range of two hierarchical ranks; further a reduction from sixteen assignments of a four-variant stress variable at the phonemic level to seven assignments of a two-variant accent variable (note the reverse terminology to that of Bolinger) at that level, plus a small set of cyclically operating rules which predict stress variants, is to be noted. The simplicity of the explication relative to the Trager & Smith description (even allowing for the organisation of the Trager & Smith stresses into superfixes at various

levels), the elegance of the hypothesis about the regularity of the English accentual system, and the high degree of explicitness of the description all represent a new standard of quality in linguistic description; in this respect they require no further comment at this point. What does require comment, however, is the relation of this description to type criteria of analysis (cf. also §2.4.3. above).

The first, and perhaps the major point to be made is that nothing is said about the phonetic correlates of the junctures postulated; the only criterion for their validity is correspondence to the constituent breaks at a syntactic level of analysis (beyond their initial motivation as devices constructed for the prediction of stress patterns). It has not always been held, of course, that junctures have phonetic correlates: Pike's 'potential pause' clearly denotes a non-phonetic category. Nothing is said, either, about the phonetic correlates of the stress variants; Lieberman (1965) showed that there is no reason why the four-variant Trager & Smith system should be accepted as valid in phonetic terms, and since the Chomsky, Halle & Lukoff description, in its least restricted version, goes considerably beyond the Trager & Smith version in its phonetic claims, it must, as a hypothesis about a phonetic level of representation, be regarded as more implausible than the latter. Even in its most restricted version (in which the still fairly complex treatment of unaccented syllables could be even more drastically simplified) it makes the same phonetic claims as the Trager & Smith description. The question of phonetic correlates of the categories postulated must be extended to that of the correlates of other categories such as intonation, since, even though they are not included in the description, one of the junctures (the one indicated by "=") used by Chomsky, Halle & Lukoff is part of an intonation contour in the corresponding Trager & Smith analysis, not part of a superfix, as shown by example (108). A related point is that the notion of pitch prominence, in particular the nuclear accent, is apparently regarded as something quite different from a more fundamental system of stress assignment. The last points are, of course, not specific to the generative description; they are characteristic of the whole Trager school (cf. p. 199 above), and criticisms were only just developing in detail at the time when the generative description was formulated. Nevertheless, this explication of the Trager & Smith approach tended to cement the structure of the latter into a rigid edifice, rather than extending its empirical basis.

Later developments in the generative approach have been mentioned in passing; like the other approaches to the description of accent, in particular the question of accent placement, which is an integral part of the generative approach by virtue of the reductionistic or correspondence theory of placement, this approach requires treatment in a different framework from that of the present study. The main modifications were: first, the change with regard to the predictability of the accent variable (Chomsky & Halle, 1968); second, the extension of the correspondence criterion of adequacy to an interpretive theory of accent structure via accent placement, with the older indexed junctures replaced by labelled parentheses taken from syntactic phrase markers, and the modification of the correspondence theory by the introduction of readjustment rules (such as Bierwisch's clitic rules and rhythm rules for readjustment of phrasing from the syntactic phrase marker to a juncture hierarchy derived from Chomsky, Halle & Lukoff; cf. Bierwisch, 1966); third, modification of the placement rules, particularly rule two, to the compound and nuclear stress rules (Chomsky & Halle, 1968); fourth, criticism of the validity of the placement rules by Bierwisch

(1968, the second of his "critical problems"), Bresnan (1971, 1972), Lakoff (1972), Berman & Szamosi (1972), Bolinger (1972a), Stockwell (1972) Schmerling (1971, 1973, 1974), Hirst (1974), Crystal (1975a); fifth, the introduction of an additional criterion of analysis for stress, the "natural response" (Chomsky, 1970), for defining classes of phrases as the scopes of nuclear stresses (foci, rather than presuppositions, in a strictly structural use of these terms), thus extending the earlier conception of placement as pertaining to syllables or words; sixth, the modification of the notion of the reality of stresses from phonetic reality to incorporate also also a more general notion of psychological reality (Chomsky & Halle, 1968), derived from the possibility of giving mentalistic interpretations to linguistic constructs (cf. §1.3.2. above). Only the last of these, in which the stresses themselves come to look more like the original junctures, at least with regard to their status as constructs, can be commented on in the present context.

It is possible to provide a simple argument, of a kind used frequently within generative argumentation, against the description at the stage formulated by Chomsky & Halle (1968). One of the conditions for the adequacy of any phonological theory is that it must be phonetically specifiable, i.e. it must incorporate a universal phonetic theory and an alphabet to represent it; Chomsky calls this the "condition of phonetic specifiability" (1964:67; cf. also 1965:30f. and Postal, 1968). But Chomsky & Halle describe the state of their account of prosodic features as follows (1968:329), only admitting Wang's work on tone (1967), which is not relevant here:

Our investigations of these features have not progressed to a point where discussion in print would be useful.

Consequently, the condition of phonetic specifiability is not fulfilled and the theory is inadequate. Further, since a placement theory must have something to place (or, conversely, an interpretive theory an interpretation), this aspect of the Chomsky & Halle approach is also inadequate; this point resembles that made by Fry in his criticism of distributionalism, also concerning the question of phonetic specifiability of naturalness (1960:15).

Two different kinds of attempt have, however, been made to alter this unprintable state of affairs: Lieberman (1967) and Vanderslice (1968, &c.) have attempted to supply a qualitative interpretation in terms of other phonetic variables of what Chomsky & Halle try to convey by means of quantitative distinctions within one variable, on the one hand, and Chomsky & Halle themselves attempt to project their transcription system, on the other hand, on to a perception model of the analysis by synthesis type (cf. Chomsky & Halle, 1968:294). The first of these two directions was commented on above (§3.3.2.); as was remarked there, discussion in this respect is far from closed. The second was criticised in some detail in the section on transcription (§2.4.3. above). There the thesis was presented that the 'semantics' of the generative phonological representation (in the logical, not in the linguistic sense of the term 'semantics') is not an interpretation in terms of phonetic types at all, but is in fact rather a form of semantic interpretation in the linguistic sense too, and that this semantic interpretation is intuitively expressible in the similarly quantitative terms of the theory of functional sentence perspective of the Prague linguists as the contribution which the syntax makes (other factors being also involved) towards the specification of the variable they term 'communicative dynamism' (cf. e.g. Firbas, 1964, and other places). This is a rather abstract variable with integral specifications similar in structure and

in distribution (placement) to the generative stress variable, but more overtly semantic (or, in an informal sense, pragmatic). This roughly formulated thesis will be made more precise in a separate study (in preparation).

The present discussion of the generative contributions to the study of accent, which concludes the survey of treatments of the structure of intonation and, so far as unavoidable, accent systems, has shown perhaps more clearly than elsewhere that it is extremely difficult to sever discussions of the structure of these systems from discussions of the types on the one hand, and the roles on the other, which are the primary categories in any analysis. Although the intrusion of role criteria into the discussion is most obvious in the generative case, where it may be maintained with some justification that the structure is the role in view of the heavy reliance on correspondence with the syntax which is characteristic of this approach, it has also been the case in the other sections. Despite the closer relation between type and role criteria in the case of prosodic systems than in the more central lexico-syntactic systems, which has often been postulated (cf. above, §1.2.4.), there is a striking lack of consensus on the formulation of these fundamental criteria of analysis (cf. §1.1. above). With the type criteria, it is basically a case of selecting the relevant types from the relatively limited range of variants and their paradigmatic and syntagmatic interrelations which have been suggested over the years, and discussed in the preceding two chapters. With the role criteria, the situation is far more complex; a brief introduction to the problems was given above (§§1.2.4., 1.2.5.3.), and the next chapter will present suggestions for dealing with certain limited areas of this complex in detail.

4. ROLES IN INTONATION ANALYSIS: PRINCIPLES AND APPLICATIONS

A wide range of topics and problems associated with descriptions of the forms and structures of intonation was treated in the preceding chapter. Most of these concern the selection of forms and the type criteria of analysis from which they are abstracted, with the three main approaches, prosodic, phonemic and pitch accent, for the most part keeping their distance from each other. The degree of consensus on details, quite apart from the main outlines, turned out to be rather low from approach to approach, and also, to some extent, within the boundaries of the three approaches. Certain important resemblances, such as leanings from various directions towards pitch accent theory, were pointed out, however, as well as a number of more specific correspondences and historical debts and influences, which may turn out to be the tip of an iceberg of (albeit implicit) underlying consensus. If there is one point on which analysts are in agreement (again, not expressly so), it is their reluctance to formulate explicitly and systematically the criteria and structural hypotheses on which the analyses are based; it appears that explicitness in one area accompanies neglect and extreme impressionism in others. Of the three aspects of description - i.e. enumeration of techniques of analysis; presentation of abstract and logically (rather than pragmatically) ordered discovery procedures; and the formulation of formal and structural representations - which can be distinguished at the coarsest level (cf. e.g. discussion in Ch. 1, Ch. 2, and Harris' approach in §3.2.2.1.), it is the third which is the favourite, even in analyses such as Pike's, which are generally suspected of favouring the various aspects of discovery; the only exception is Harris, who also considers the second aspect. It is not unlikely that this results from the lack of awareness of the criteria of analysis which is one of the main contributing factors towards the variegated panorama of intonation descriptions; the often noted variety of notations (§2.4. above) is a symptom of more fundamental incoherence.

It is true that a certain amount of dialect variation, in particular between British and American intonation patterns as used in relatively formal delivery, and a considerable amount of idiolect variation, particularly with regard to the formulation of semantic aspects of intonation in terms of labels (cf. Ch. 1, esp. §1.1. above), contributes to the differences between analyses, particularly with the more solid approaches; in general, however, it would seem that these differences merely serve to emphasise the differences already established by way of structural hypotheses, a point which is particularly in evidence in those descriptions (pointed out *passim* above) which appear to have been suggested without direct acquaintance with other dialects, and by way of different selections of type and role criteria of analysis. It is the question of criteria of analysis, and particularly the categories of role criteria, which are the subject of the present chapter, and of which a small selection will receive further discussion and exemplification.

4.1. Criteria of analysis

The function mapping linguistic data (for instance, a corpus) on to a linguistic description (cf. Chomsky, 1957:51) has an internal structure

which is far more complex than the decision or evaluation functions also discussed by Chomsky, and may indeed be regarded as incorporating such functions. But since linguistic descriptions do exist, and very frequently command a high degree of reproducibility, it is reasonable to suppose that discovery functions also exist, however complex they may be. Even if, as seems plausible in view of the cyclical nature of discovery, there are parts of such a function which are not amenable to rigorous formulation for natural languages, and thus giving the notion of function a more metaphorical character in this context, a degree of systematisation is nevertheless possible, not necessarily in the sense of an instruction manual, but in the sense of a logical arrangement of procedures. The main terms in such procedures are concerned with hypotheses about linguistic structure, about the descriptive categories to be used (so-called 'formal' and 'substantive universals', respectively), and about means of establishing the validity and reliability of the conclusions drawn in the description. The main concern here is with the second kind of hypothesis, but since descriptive adequacy clearly involves concern with the first kind, too, both these kinds will figure in the discussion; the third kind of hypothesis concerns more general methodological questions, including decision and evaluation problems as well as quantitative considerations in analysis, and must be relegated to the periphery of the present discussion.

Let it be assumed that there is no simple set of criteria for deciding on an appropriate description (certainly not the appropriate description) for a set of data; there is not even a set of criteria for simply specifying what linguistic data are. Nor is it possible to establish the criteria in full before attempting the assault; not only is the notion of criteria of analysis difficult to define, they are often discovered themselves during the devious processions in and around what is considered to be the linguistic data, and are continuously produced in adopting methods and quasi-reductionistic metaphors from other fields of inquiry. There is no warranty for the completeness of a particular set of criteria, for the compatibility of various different sets of criteria, or even for the finiteness of the set of criteria of analysis which might be used; finally, there are the usual semantic raw edges in the form of vagueness and ambiguity of interpretation, as well as possible inconsistency in interpretation of the descriptive terms used, particularly those which pertain to what have been referred to so far in the present study as 'roles'. It is not necessary to be totally pessimistic, however, about the possibility of formulating criteria for pairing descriptions with languages, or sets of representations with utterances, a related task, despite the odds against producing an explicit discovery procedure. The descriptive terms involved (which are generally simply assumed in accounts of discovery procedures in the narrower, more concrete sense - which is frequently found in the descriptive literature - of discovery techniques for use in field work) are capable of receiving considerable clarification, both on the basis of past consensus, and on the basis of indications from whatever current investigation is in progress.

An initial classification of such descriptive terms, which will on occasion, and with the more complex state of affairs noted in the preceding paragraphs always in mind, be referred to as 'the criteria of analysis', may be made on the basis of the following three distinctions found in one form or another in the literature and frequently made use of above: first, between type and role criteria; second, between linguistic and non-linguistic criteria. Criteria of each kind, within each of these distinctions, are weighed against the other in different ways, each contributing towards

an unambiguous description - or the least ambiguous description attainable - for languages and utterances. The first distinction, between type and role criteria, was drawn in the first chapter of the present study; type criteria were discussed, directly in the second chapter, and more indirectly by way of forms and structures in the third, and role criteria will figure below. The second distinction, between paradigmatic and syntagmatic role criteria, was also introduced at the end of the first chapter, and will receive further discussion below, starting in the next section. The third distinction, between linguistic and non-linguistic criteria of analysis, is one which is often made informally in attempts to limit the domain of linguistic descriptions, and was discussed in passing in §1.2. above; the distinction, in more explicit form, is a complex one involving distinctions of type (including the vocal vs. non-vocal distinction) and distinctions of role (including, for many, the gradient vs. discrete contrast distinction), but in view of the wide variety of overlappings which occur, with disparate types performing similar roles, and one type, or a related group of types, coupled with roles of various kinds, it would not appear to be possible to establish a well-defined set of linguistic, as opposed to non-linguistic criteria.

An illustration of the difficulty of establishing such criteria arguing from types may be taken from a conclusion of Bierwisch's (1966:165):

Wenn mit terminaler Intonation der Satz Und dann bist du also nach Hause gegangen gesprochen wird, so kann damit durchaus die Erwartung verbunden sein, daß der Angeredete mit Ja oder Nein, ich bin noch geblieben, antwortet. In diesem Sinn ist "Frage" überhaupt keine linguistische Kategorie, denn man kann eine Antwort auch verlangen, indem man in einer bestimmten Situation jemanden nur ansieht.

If one aspect of the linguistic vs. non-linguistic distinction be taken to be a distinction between the description of sentences and that of other structures which function in various ways in dialogue, then "question" is not a category which figures in linguistic descriptions, obviously; it is not necessary to adduce a reason from the field of communicative gesture - quite apart from the obvious rider that the support Bierwisch gives for his conclusion requires, in turn, evidence from the study of gesture, which is lacking. This does not, however, affect the importance of such categories as "question" for the description of other kinds of relation within units of language.

Crystal, on the other hand, characterised his "linguistic approach", in the context of the semantics of intonation (1969:294ff.), by means of two selections of paradigmatic role criteria for establishing equivalence classes of intonation forms. One of these selections involves the transcription of imitations by various subjects of a model utterance and the examination of substitutions, which are taken as the basis for assigning forms to equivalence classes. The second selection involves the pairing of intonations with "equivalent descriptive lexical items". This second selection involves an entirely different conception of equivalence, since there can be no question of substitution of, say, the lexical label "boring" and an intonational monotone in actual utterances with preservation of semantic interpretation; equivalence is established via a judgment on the appropriate semantic interpretation of a given type pattern, formulated in an informal metalanguage.

To argue the merits of one selection of criteria of analysis over another, and to declare certain selections as linguistic and others as non-linguistic, requires consideration of a set of metacriteria in terms of which

particular selections can be compared; such metacriteria would, if they existed, be derived from the metatheoretical conditions on linguistic descriptions sketched at the beginning of the present section, such as have been formulated at various times in the past (cf. e.g. Hockett, 1954(1957:398); Chomsky, 1964:28ff.). The selections of criteria which are considered to be linguistic rather than, say, philological, philosophical, speculative, impressionistic, mentalistic, psychological, sociological (to take a few of the possible contrasts along various dimensions which have been mentioned in past studies) appear to tend towards the following kinds of selection: perceptually defined vocal types, paradigmatic role judgments, and non-quantitative treatment of evidence. Within any given overall selection of criteria, subsets may be isolated which define different levels of analysis; this kind of criterion selection, and its relation to the generative notion of level of representation, was discussed in §2.4.3. above, esp. pp. 131ff.; it is clearly necessary to provide metacriteria for the establishment of such selections within a given overall approach to description, since these selections are the major factors which determine the linguistic forms and structures postulated at various places in the description. These metacriteria contain, for the most part, statements of different kinds of type and role criteria and, in particular, statements of the different kinds of relation between the type and role criteria; as an illustration of what is meant by this it is only necessary to refer to the different combinations of criteria of analysis used in various kinds of phonemic and morpho-phonemic description. The application of these points to the description of intonation will be undertaken in the following section.

4.2. Componentialisation in intonation description

It is sufficient at this point to summarise the various factors contributing towards the establishment of intonation components, the majority of which have appeared already in discussions in previous chapters (cf. esp. §2.3.2. above), before going on to discuss two of the concrete problems which have figured prominently in componentialisation discussions: the question of pitch levels, and the question of how falling-rising tunes are to be analysed into components.

Two related distinctions must be made: on the one hand, between forms and their interrelations (paradigmatic and syntagmatic; simultaneous and sequential), a distinction most clearly made in the generative distinction between the elements of terminal strings and structural descriptions; and on the other hand between the characterisation of forms and sequences, and their delimitation, a distinction traceable most clearly to early Prague phonology (cf. Trubetzkoy, 1939(1958:241ff.); but also diverse views from Bloch & Trager, 1942, through Chomsky, Halle & Lukoff, 1956, Trim, 1959:26, Crystal 1969:204-5 and in §3.1.4. above; cf. also §2.3.2.). As Trubetzkoy points out, boundary marking is not essential; however, the importance of boundaries has been stressed by the Trager school, and was particularly emphasised by Crystal, while Chomsky, Halle & Lukoff give them an interesting double status as constructs (with no regard for direct phonetic reality) which are established on distributional grounds, but which are also important, by virtue of the Chomsky, Halle & Lukoff correspondence theory, for establishing the descriptive adequacy of analyses. The basis for the identification of forms by means of the components from which they are made up rather than negatively in terms of their limits does not lie only in tra-

jectories through phonetic type variables, though these provide important clues (cf. §2.3.2.); other kinds of criterion are also involved. One such kind of criterion is lexical information (cf. Bolinger's theory of stress vs. accent, §3.3.1. above). Further kinds of criterion are available in the form of judgments on roles and on the relations between types and roles. For instance, one kind of basic metacriterion might be developed in the following terms: with types, all distinctions (but cf. §2.3.2. above) are potentially gradient or continuous scales, despite the tendency of certain variables (particularly those employed in consonants) to jump rather than glide between variants, owing to the mechanical construction of the articulators; consequently, the onus for deciding on whether forms abstracted from these types are discretely or gradiently different rests on other criteria, presumably role criteria and the internal structure ascribed to the role variables (i.e. the relations between the role variants). An interesting case in point is the scale of relative weight between different forms of pitch prominence (cf. the discussion of Kingdon, esp. Table 13 above, and of the relations between Bolinger's accents §3.3.1. above); another is the question of linguistic levels, to be discussed below. A different, but related metacriterion can be developed from the distinctions between natural and arbitrary relations between types and roles and, in particular, from the semiotic distinction, which is still of great use in this kind of discussion, between indices, icons, and symbols (cf. §1.2.4. above).

Finally, metacriteria can be derived from the distinction between paradigmatic and syntagmatic kinds of role criterion. The former may be characterised roughly as involving judgments concerning property-like, rather than relational, characteristics of utterances, treating roles rather like types, in a sense. In particular, they involve the establishment of equivalence classes. For instance, using Halliday's convenient terms, equivalence classes may be established on the basis of tonality judgments (equivalence classes of scopes in terms of lexico-syntactic sequences) or on the basis of tonicity judgments (equivalence judgments on lexico-syntactic sequences and the presence, number and placement of pitch prominent items, in particular tonic, i.e. nuclear, accents) or on the basis of tone (equivalence classes of substitutable or environmentally conditioned trajectories - cf. Crystal's first kind of equivalence noted in the previous section). An instance of the use of all three of these judgments to establish equivalence classes has already been adduced: Sharp's "equation" (1958:139), reproduced as example (101) above, and involving judgments covering a whole sequence of intonational forms (cf. also examples (132)ff. below). Other kinds of distributional relation, especially overlapping and inclusion, have been suggested for simple contours of the same direction but different heights, for the members of the series low fall, high fall, rising break plus fall, rise-fall, for instance; cf. also the series suggested by Crystal & Quirk (1966; §3.1.4.). Other kinds of paradigmatic judgment involve the establishment of equivalence classes by way of the label-assignment variety of semantic interpretation (cf. Crystal's second kind of equivalence judgment, mentioned in the previous section). Crystal, who makes by far the most extensive and explicit use of such criteria of analysis, provides six arguments for recognising level nuclei (1969:215f.) which may, by way of further illustration, be described as various kinds of paradigmatic judgment: they are, in Crystal's order, judgments on the presence of a nucleus, on the placement of the nucleus, on the substitutability of a trajectory by other trajectories, on label pairing, on trajectory acceptability, and on distributional similarity to other trajectories with respect to non-pitch

variables. It should be noted that the concept of paradigmatic judgment is only being used here with respect to roles, or the relations between roles and types, not with respect to the internal relations between forms at a given level of analysis, which are clearly both paradigmatic and syntagmatic; it is clearly out of the question, for instance, to identify a pitch prominence without considering the syntagmatic pitch relations obtaining in an overall perceptually or otherwise defined trajectory, but the notion of nucleus of a tone-unit is not entirely a phonetic notion, and involves what are generally paradigmatic role judgments of various kinds (as the discussion of fall-rise sequences below will show). Syntagmatic role judgments, to which paradigmatic role judgments may - at least within an explanatory theory of language development - possibly be reducible, involve consideration of situational and contextual relations such as those involved in the study of thematic structure - anaphora, question and answer relations, relations between language users which pertain to the use of language, as well as more conventional kinds of syntagmatic judgment. A particularly clear instance of the use of such judgments is Bolinger's discussion of the relative height variable (cf. §3.3.1. above); a carefully restricted version of this kind of judgment is Chomsky's "natural response" judgment (also termed "proper response", "presupposition-sharing response", Chomsky, 1971; cf. also §3.3.3. above). Other instances of various sorts are to be found in the different approaches to functionalism in semantics, from Firth's "pragmatic functionalism" (1935) to Searle's conditions for the performance of successful illocutionary acts (1969; cf. also §4.3. below). A useful statement of the kind of distinction under consideration is made by Sharp (1958:136), who points out that

... the ultimate justification for stating that two intonation patterns differ in meaning will preferably lie in the demonstration by a technique of 'longer piece' analysis that the sentences which they respectively characterize stand in different formal relationships to surrounding speech events; and the statement of their meanings will consist precisely of the description of those relationships. ... If it ever becomes possible accurately to categorize the non-verbal behaviour associated with speech, further, quasi-formal correlations may eventually be established.

This refers to a particular conception, albeit considerably restricted, of syntagmatic judgment. Sharp goes on:

As a shorthand substitute for the type of description ultimately desirable it has been found useful in the past to make use of intralingual translation and/or brief indication of actual or potential verbal contexts ...

i.e. he introduces paradigmatic, as well as other forms of curtailed syntagmatic judgments.

4.2.1. Pitch levels as sources of components

One of the continuing controversies in intonation description has been over the existence of perceptual and role criteria for the establishment of a measure of reality for the pitch levels used in certain kinds of intonation notation, from Coleman (1914), via Pike (1945), Wells (1945), to Bierwisch (1966). The problems involved have been touched on already, in particular in §§2.3.3.1., 2.4.4., 3.2. above. It will be useful to resolve one terminological ambiguity, though it is not very likely to lead to con-

fusion: the term 'level' is used to collocate with 'pitch' to refer to variants of the pitch height variable, a paradigmatic use of the term, and it also collocates with 'pitch' in a more syntagmatic manner to refer to variants of a trajectory variable; for the latter use alternative terms have been used in the past, such as 'static' (Kingdon), 'sustained' (particularly phonemists, in the context of pitch components of junctures), or 'monotone' (Sharp, 1960; *passim* in Crystal, 1969). The distinction is not simply a trivial one between 'pitch level' and 'level pitch', since there are quite important interrelations between the two notions, in particular the notion (characteristic of Wells' analysis, though not, for instance, of Pike's, who operates with the different notion of contour point) of level pitch phonemes which have a certain scope in segmental terms, i.e. constitute a level trajectory, at the abstract level of pitch phonemes.

Discussion of every aspect of the choice of pitch levels as components would be much lengthier than the present context allows; the main points concerned with the choice of levels, and treatment of the pitch height variable, in phonemic and non-phonemic approaches. There are three main aspects to the problem; all are interrelated, particularly the last two: the first is the question of how the choice of criteria of analysis is motivated; the last two are concerned with the question of the discreteness of forms, first the paradigmatic discreteness of variants within variables, and second the syntagmatic discreteness of forms within trajectories.

A number of scholars (notably Bolinger, 1949; Bazell, 1952, 1954; Haas, 1957; Crystal, 1969) have criticised approaches which make unwarranted assumptions about the transferability of criteria of analysis from one combination to another; in the context of intonation, this has most often meant the transfer of structural hypotheses used with phonemic criteria in the area of lexico-syntactic analysis to the analysis of intonation. The most obvious reflection of such a transfer in structural terms is the attempt by phonemists to discover a 'double articulation' of two levels of analysis, linearly ordered between statements of role and statements of type, i.e. the morphemic and the phonemic levels. In this attempt, structural hypotheses were borrowed from the fairly successful analyses of lexico-syntactic patterns which had already been accomplished. It has already been pointed out (esp. in §2.4.3. above) that the formulation of representations at various levels may be regarded as a reflection of the criteria of analysis used at these levels; if the structural hypotheses which underlie a particular representation are transferred from a different area of analysis, therefore (continuing the same line of thought), it must be assumed that these hypotheses are evidently or demonstrably applicable to this new area. Bolinger, in particular, has pointed out three major factors which are counter-indications against the possibility of such a simple transfer in the case of intonation analysis (1949:248f.): intonation patterns do not involve a co-operation between trajectories through different variables to the same extent as the phonemic patterns, the major variable being pitch (Bolinger omits the important co-factors of timing and loudness, though this does not destroy his argument); nor are intonations as discretely structured as phonemes, with regard to both types and roles; nor is the relation between types and roles as 'arbitrary' in the case of intonations as it is (supported, if not engendered, by the hypothesis of double articulation) in the case of phonemes. Since there is not a great deal of controversy about whether contours are relevant to intonation analysis or not (but cf. discussion of Isačenko & Schädlich, §3.3.2. above), the question really boils down to whether the contours, about which a mea-

sure of consensus obtains, require further componentialisation, and if they do, whether these components should be, either solely or only in part, pitch levels, and, further, whether these components are so structured, paradigmatically, syntagmatically, and in their semantic interpretation (for even phonemes have a minimal 'semantic' interpretation) as to entitle them to join the category of phoneme.

The first set of questions in this respect pertains to the paradigmatic discreteness of the components postulated; since the treatment given by phonemists is the limiting case, in which all components are pitch levels (the junctural glides will be discussed below), this approach will be discussed first.

Proponents of pitch phoneme theories insisted that the pitch levels which constituted phonemes were to be understood as 'relative' pitch (syntagmatically relative in Pike's case, paradigmatically for Wells, and supplemented, without further comment, by sixteen 'absolute' allophonic levels by Trager & Smith; cf. §§3.1.-2. above). The main point where further criteria are required in order to make this conception more precise is the statement of correlations with type criteria (cf. §2.3.3. above) since, as Bolinger in particular has pointed out (esp. 1951), there is considerable overlapping between intonations in this respect, a situation which is particularly acute when (for a four level system) patterns with less than four points are postulated, or with more than four but with occurrences of less than the total number of levels available. It was pointed out in the discussion of Pike (§3.2.1.) that no more than three contrasts are postulated for any one pattern position (this apparently holds for the other analyses too), a fact which does not receive attention in monosystemic phonemic analyses; if four levels are postulated, then the basic contrastive criterion has clearly been supplemented by additional criteria from trajectory structure, unless polyphonemic level trajectories (excluded, for instance, in Wells' approach and also, apparently, in the Trager & Smith approach - cf. 1951:48) are allowed (as in Pike's analysis, cf. Table 20 above). It was also pointed out above in the same place (cf. also Crystal, 1969:199) that the weak generative capacity of the four-level system is both too great, in that it generates too many undocumented sequences (Householder, 1957:257), and too small, in that it cannot generate a number of observed patterns. One such is Pike's own 'descending stress series' (the tonetic 'falling body'); another which the system is too atomistic to be able to represent is the occurrence on monosyllables of the rise-fall-rise sequence which is frequently to be heard with concessive and vocative locutions, and other hearer-orientated kinds of utterance, both in British and in American speech.

But an important argument to note, too, is that given in the previous subsection (p. 372) in the discussion of metacriteria for the selection of criteria of analysis: the major factor in deciding on whether forms are discrete (one of the characteristics of phonemes) or not is the structure of associated role variables and the kinds of relation which hold between role variants. It is interesting, in this respect, to examine the classification of patterns which Pike makes, and to compare the semantic interpretations which Pike (the only phonemist to attempt this in a relatively systematic manner) gives them. One set of patterns, the primary contours ^{3} -4, ^{2} -4, ^{1} -4 from the set of contours ending at level 4, will suffice to illustrate the point (Pike, 1945:45ff.). The features which all these contours share in their semantic interpretations are outlined by Pike as follows (p. 44):

All falling contours have a meaning of CONTRASTIVE POINTING. The word or syllable which contains the beginning point of the primary contour is singled out as the CENTER OF SELECTIVE ATTENTION of the speaker, or constitutes a demand by the speaker that the hearer focus his attention at that point.

For this particular kind of fall, Pike adds (p. 45):

When placed before the final type pause, but not necessarily elsewhere, contours falling to pitch four tend to have a further meaning of FINALITY. This constitutes one of the chief differentiating characteristics between the group falling to pitch four and the group falling to pitch three.

As well as the shared elements of semantic interpretation, the three contours also have differentiating characteristics in this respect. The ^{3} -4 contour differs from the others "by being much Milder in its pointing or contrastive implications" and "by adding an element of DETACHEDNESS, which may imply lack of concern, or a mere attitude of philosophical abstraction" (p. 48). The ^{2} -4 contour means, rather, "MODERATE CONTRASTIVE POINTING or CENTER OF ATTENTION of the speaker, or demanded of the hearer by the speaker" (p. 45). The ^{1} -4 contour is "more INTENSELY contrastive and pointing, so that it often becomes insistent" and "adds an important further element of UNEXPECTEDNESS, which may be variously SURPRISE or unusual attention or contrast"; frequent use "is interpreted as gushiness" (p. 47). It is not difficult to see what kind of principle is at work here. The paradigmatic sequence of pitches at the beginning points of the contours (3, 2, 1) is entirely parallel to the series of role variants used as *differentiae*: milder, moderate, more intense. Also parallel is the scale between the extremes of detachedness (for ^{3} -4) and gushiness (for ^{1} -4). It would not have been necessary to adduce Pike's data here, of course; other sources would have done just as well. What adds spice to this particular choice is that Pike attempts to base his analysis on discrete contrasts (cf. §3.2.1. above), whereas the present additional systematisation leads to categories which are not obviously discrete at all, but more plausibly regarded as more or less arbitrary divisions along a scale - in fact the three points which are more or less intuitively given as a raster for practically any kind of scale: top, middle, and bottom. Just as important as the lack of discreteness is the approximate iconic correlation between positions on the scale of pitch heights and positions along the scales of role variants cited above. This is, of course, an entirely unphonemic state of affairs. The last point has to do with the validity of the structural hypothesis used in pitch phoneme theories, and the first concerns the actual levels postulated; both are points against pitch phoneme theories as formulated to date, even if it is granted that analysts were partly or wholly aware of this state of affairs (as Pike, for instance, must surely have been with regard to the contour regularities just treated). This conclusion depends, naturally, on whether Pike's own judgments are to be accepted; there appears to be no reason to reject them at this stage of analytic precision, since they tally with observations made by others, such as Bolinger in his discussion of relative height (§3.3.1. above), which can easily be confirmed by independent observation, and even with observations made with the aid of completely different techniques by Uldall (1964), if her "strong vs. weak" dimension be taken as the relevant role variable. There appears to be no simple correlation between these roles and the labels examined by Crystal (1969:304f.), possibly since Crystal treats type variables independently and does not

consider correlations with type combinations such as high, medium or low fall, the contours under consideration here; although hints of a similarity of semantic interpretation can be found, no firm conclusion for, and none at all against, the Pike interpretation, on the basis of Crystal's findings. This being the case, it is possible to reduce the area, again with reference to Pike's analysis, for 'phonemic' analysis, and to extend the area to which gradient criteria (such as those used by Pike himself for the description of such variables as "change of key" - cf. §3.2.1. above) apply.

A different kind of argument using role criteria is put forward by Bolinger. In a series of tests using labelling judgments, he established (1951) that equivalence classes could be established on the basis of labels, but that these tallied with natural classes of patterns based on overall trajectory variants, and not with those based on pitch levels; despite the very limited range of labels offered to test subjects, this kind of result is useful supplementary evidence for the general line of argument that there are fairly direct type-role correlations, as well as offering the more fundamental objection that levels are not valid as intonation forms at all.

This last point is not accepted, in its most extreme interpretation, by other non-phonemic analysts, for pitch levels have also figured, though not as phonemes, in non-phonemic approaches. This is shown by the various kinds of componentialisation discussed in §3.1.2.; in Crystal's description, for instance, they are the variants within the simple pitch-range subsystems. One of the more extreme hypotheses outside the phonemic camp is Trim's elegant proposal for regarding types in terms of "continuously variable features", the type-role relations in terms of "matched continua" (i.e. as an iconic relation such as that outlined above for Pike's beginning points), and intonation structuring itself as a unilinear sequence of slots, which leads him to the following surmise (1970:266):

One is led to wonder whether the whole treatment of tone-group structure as currently accepted for (British) English may not be based on the observation of secondary effects, and the imposition of segmental, discrete, replaceable unit structure upon phenomena to which it can not do justice. We may, as speakers and listeners, be involved in a steering activity, finding a proper path through a series of gates, with significance attaching at each gate to the degree of deviation from a neutral path. This neutral path may well be related to Hockett's proposed articulatory 'zero point' but the neutral path through each gate is not independent of context.

Other suggestions to which this proposal could be related are Lieberman's conception of unmarked intonation types (§2.2. above), or - in part - the conception of constant onset levels proposed by Crystal (1971; cf. §2.3.3.1. above), which must be seen in the context of physiological and perceptual constraints which tend to provide a quasi-quantification of the pitch height continuum. There does appear to be considerable circumstantial evidence that the pitch height variable is functional in English intonation, in an as yet not satisfactorily defined manner, and possibly also in German intonation (cf. Trim, 1964).

What is not settled, however, is the extent to which the height variable is functional as well as the manner in which it is functional. Crystal, for instance, takes issue with Trim's use of the height variable to specify end points of contours, thereby slightly misinterpreting Trim's suggestion as involving in addition specification of "a given direction of pitch movement", which is not the case (1969:214; cf. also discussion on p. 69 above).

Crystal claims to reduce the question to one of evaluation, replacing end-point specification by contour width specification, a variable which is needed elsewhere, unlike the former, which is restricted to nuclei. It may be objected, however, that Trim's analysis works with two occurrences of variants from a single variable (pitch height at beginning and end points, contour direction being only secondary and recoverable), and should thus be evaluated as simpler than Crystal's, which uses three occurrences of variants from three different variables (pitch height at beginning point, contour direction, and in addition contour width). The descriptive model for a small set of intonation patterns proposed below (§4.3.) incorporates a number of features which resemble parts of Trim's suggestion, and provides a certain amount of support for it, though the details must be reserved for discussion elsewhere. Nevertheless, a number of difficulties remain unresolved, most of which tend to point against the Trim suggestion as a comprehensive descriptive model for intonation, though not necessarily as a useful model for particular areas of intonation. These points fall, roughly, into two categories. First, if discontinuities should be found to hold for the pitch height variable for certain restricted configurations, the fundamental assumptions would no longer hold. Trim points out one such discontinuity, between high and low rises; he attempts to resolve it, however, into a continuous scale of degrees of "evocation" (1970:266), the converse of "conclusiveness" in the case of falling contours. A further discontinuity of this kind, with the added counter-evidential value of co-occurring with a fairly obvious and abrupt transition between variants of a different variable (contour direction) is the distinction between falling contours (with certain kinds of rhetorical question) and rising contours (with echo questions) in otherwise similar dialogue contexts. The second category of difficulties concerns the patterns which have traditionally been seen in terms of different kinds of trajectory gestalt; for instance, the distinction between steps and glides (important particularly for Bolinger's approach), the various kinds of pitch prominence, the subtle interrelations between pitch and timing systems (for emphases of various kinds, and rhythmic patterns in certain styles), or, finally, the various kinds of multidirectional contours, in so far as they may be regarded as unities.

Trim's proposal leads directly to a consideration of the second set of questions pertaining to the components of intonation patterns, those concerning syntagmatic discreteness (cf. p. 376 above). It is here that the real problem lies; it is here, too, that attempts have been made to reconcile the level camp with the contour camp: for instance, Daneš (1960:39), whose solution was in fact more of a terminological reformulation of a position close to that of the pitch phonemists, brought configurations and levels together as "configurations of levels"; Adams (1969:100) deals with "configurations within levels", the latter conceived as non-overlapping pitch bands (or perhaps frequency bands - the two notions are unfortunately not kept apart, as shown in the claim that the range 170-350 Hz is wider than the range 80-185 Hz, the claim being false for the relevant variable, pitch - cf. §2.2.), but her list of intonemes (pp. 109, 112) reveals the same kind of structure as that which underlies Daneš' formulation. Discussion of this aspect of the question is complicated, furthermore, by the comparative lack of explicit structure in the phonemic analyses, apart from Pike's. This can be made vividly clear by a comparison of the way in which pitch phoneme placement takes place in Pike's system and in Wells' system: in the former, a hierarchy of contour points is established by means of a variety of criteria (cf. §3.2.1. above), and the phonemes occur at

these points with no constraint of a general nature on phoneme iteration; in the latter, pitch phonemes are not permitted to iterate (cf. §3.2.2.2. above), and the internal structure of monophonemic scopes is thus unanalysable. This latter position, which is also taken by Trager & Smith, also makes it hard to see the motivation for including a contour phoneme in sequence with level phonemes, in the guise of a terminal juncture, rather than sticking to the same kind of criterion throughout in the absence of counter-evidence; similar considerations apply to Wells' earlier analysis of final contours as allophonic. The general lack of internal structure for phoneme strings obscures inter-type relations in respect of shared roles; cf., for instance, Bolinger's discussions of timing factors as contributory to accent, or Sharp (1960) on the structure of monotonies.

One way out of this question of how relevant pitch levels are to the syntagmatic componentialisation is suggested by Bierwisch (1966; cf. §5.2.4.3., 3.1.1.3. above): the levels are taken to be notational conveniences, with the integers having no reality independent of the syntagmatic pitch relations between them. Bierwisch does not keep consistently to this interpretation in terms of syntagmatic relativity, in connexion with which he refers to Pike's conception of relative pitch; this is shown in the following comment on the width relation between the pitch relations themselves (1966:134):

[Es] bedeuten die zwei Zahlenfolgen 23 und 13 nur, daß in der zweiten ein größerer Tonhöhenunterschied repräsentiert wird als in der ersten, aber nicht, daß die beiden zweiten Elemente die gleiche Tonhöhe relativ zu einem für die Äußerung fixierten Nullwert haben.

Without some kind of additional type criterion, which is not given, the only claim that can reasonably be made for sequences such as 23 and 13 is that they are both alternative notations for the relation '<' unless, of course, the items 1, 2, and 3 occur together. The additional criterion would have to differentiate between, say, '<' and '<=' and, depending on the number of integers used, between various other potential magnitudes of the 'smaller than' relation; the question which would have arisen had this been made explicit is whether there is a continuum of such magnitudes or whether a fixed number can be postulated. There can certainly be no objection to an interpretation of the pitch level notation itself in terms of syntagmatic relations, though the question of why a more direct representation of these relations in terms of a strictly relational transcription was not used might be raised.

A system of transcription in which pitch relations are expressed directly, rather than via the ordering relations between natural numbers (thus avoiding unnecessary interpretation problems evoked by integers), was used at several points in the previous chapter (cf. esp. pp. 156f., Klinghardt). The least restricted version of the system is derived from the feature notation used in generative phonology, and has obvious resemblances to Bierwisch's notation (cf. Table 6 above); it uses different Greek variables for each occurrence of the pitch height variable, with the relations stated separately in a condition on interpretation. The system has two main advantages. First, that it can be used to represent any kind of syntagmatic pitch relation, or indeed any combination, hierarchical or otherwise, of such relations. Second, that the constants in the system are relations, the question of the interpretation of the *relata* (the variants of the pitch height variable, i.e. 'pitch levels' in Bierwisch's abstract sense) being left open for later treatment if required, and that a priority is thus established between the interpretation of syntagmatic and that of paradigmatic pitch

relations. This form of the system was used in the transcriptions above which explicated Klinghardt's system, and resembles, for reasons sketched above, certain aspects of Bierwisch's notation (cf. rule 8i in Table 6). It is a very unrestricted, not to say cumbersome notation; where less complex states of affairs require representation, restrictions can be formulated and incorporated in modified versions of the notation (cf. e.g. Gibbon, 1975), but the main purpose of the notation is to serve as an aid in the explicit formulation of intonation patterns and consequently such metapragmatic notions as cumbersomeness (cf. §5.2.4.1.-2. above) are not immediately relevant. One restricted form, which is particularly suitable for the representation of linear arrangements of pitch relations (though it can be used, with further conventions for the interpretation of relational expressions, for more complicated states of affairs) was used to transcribe the Bolinger relative height patterns (examples (91)ff.); it incorporates relational expressions directly in the formulation of specified features. These two versions of the relational transcription system can be conveniently illustrated by using an example of Bolinger's (cf. examples (91), (94) above):

(111) GET a HAIRcut.

(112) [A accent] - [A accent] - [fall]
[α height] - [β height]

Condition on interpretation: α < β

(113) [A accent] - [A accent] - [fall]
[α height] - [α height]

The upper case items in (111) give the accent placement; (112) is the full version for a rising tangent, (113) the abbreviated (more restricted) version of the system. For non-binary structures, various courses are open: for certain purposes, iteration of the relation term could be used, giving the following, for instance, as the third term:

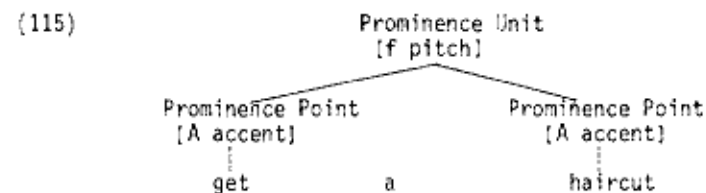
(114) ... {A accent
[>α height]} - ...

Or, of course, the fuller version can be employed, using a gamma variable specification for the third term and the condition 'α < β < γ'; a further variant, perhaps more general still, incorporates indexed features, as in the Klinghardt notation (where accentual categories were used as indices, one of a number of possibilities; cf. Tables 1, 2 above). Apart from the more flexible nature of the last two possibilities (due to the ease with which conjunctions, &c., of conditions can be formulated to cater for all grades of complexity) there does not appear to be a great deal of empirical difference between the various formulations with their possible interpretations. It is interesting to note that the kind of formulation suggested in (114), and used above on p. 228, introduces the question of a possible width variable again (cf. the discussion of Bierwisch, p. 260 above); in this notation such a variable, were it found to be required, would be characterised directly as a higher order relation, rather than via the differences between integers. A fairly direct encoding could be made into an integer notation, simply by indexing the number of iterations of the relation term, if such an encoding could be shown to bring any advantages.

One of the most detailed transcription systems yet developed, that of Crystal (1969), can be related quite easily to the present suggestion. In

particular, his simple pitch range system (1969:144ff.; cf. §3.1.4. above), taken together with the conditions on interpretation which he provides (cf., e.g., pp. 172f. above), assigns occurrences of the pitch height variable (as *relata* of syntagmatic pitch relations) to particular classes designated iconically by arrows of various sizes and directions, the relations between which are fixed, and thus forms a hypothesis about the inventory of syntagmatic pitch relations in English; it is an empirical question whether the seven which Crystal postulates are sufficient, or too many, for English, or whether such discrete structuring is justifiable, and it is also an empirical question whether any restrictions on the sequencing of these relational components (as postulated in Bolinger's relative height theory, Crystal's subordination theory, &c.) obtain.

It should be clear that for such a notation to have any kind of reality, it must have identifiable *relata*; since the relations are the constants, the *relata* cannot be defined in terms of the pitch height variable, i.e. in terms of pitch levels with a paradigmatic interpretation at the phonetic level, without circularity. The kind of *relatum* used in the above account had the accent, or pitch prominence variable as the source of criteria of identification (whose relation to the syntagmatic pitch relation under consideration are specifiable in detail). Where no such non-ad-hoc means of identification are available, there is no point in using this kind of relational notation. A case in point is the accentual trajectory itself, for which there are no phonetically definable *relata*, only the pitch prominence (and, of course, the non-major correlates of duration, &c.) *gestalt* itself. Another would appear to be the tails or terminal junctures of intonation patterns. For these and similar cases, there is no reason to regard the trajectory as relational in the sense described above; normal feature notation, or direct naming of the variant (as in the final feature of the sequences in examples (111) - (113) above) is appropriate here. However, a question does arise concerning the status of the relational feature if the *relata* with which it is associated are themselves to be regarded as constituents of a hierarchically higher ranking unit; some of the Bolingerian relative height patterns can, and in most tonetic analyses must, be regarded as assignable to a higher ranking category (the 'body' of tonetic approaches), for instance. It might be said, in such cases, that the relation is best dealt with as a non-relational feature attached to the higher category; the examples above could then be described in hierarchical terms as follows (using a neutral terminology for the categories):



In such a case, the dual nature of the trajectory is sufficiently characterised by the constituent structure, the link with the *relata* being provided by a general principle of interpretation. If, as appears to be the case from Bolinger's work, this kind of feature can be fairly directly associated with a semantic interpretation in terms of dialogue structure, then such a structuring brings advantages in the formulation of this inter-

pretation; for parallels in syntax, cf. Weinreich (1972:70ff.) and Chomsky (1970:207f.), and for further illustration, cf. Gibbon (1975). Worthwhile *explicanda* for the present suggestion are to be found particularly in tagmemic work (cf. esp. Brend, 1970). A further possibility which the notation offers is the fairly direct expression of system congruence within a given structure itself (cf., e.g., the discussion of co-occurrences in Bolinger's description, pp. 228, 231 above).

This kind of argumentation concerning choices between holistic trajectory *gestalts* and syntagmatic trajectory relations between independently characterisable *relata* (leaving paradigmatic aspects of pitch height out of consideration for the moment) is one which can well be applied to try and sort out ambiguities of various kind in earlier formulations of intonation forms and structures. It has already been mentioned at a number of points that one of the ways in which Pike's description differs from that of Wells is that the former proposes a framework of contour points (not, of course, to be identified with what were referred to above as 'prominence points') at which his pitch levels occur, while the latter, like Trager & Smith later on, does not, referring only to the scope of pitch phonemes as stretching over an uninterrupted occurrence of a phoneme. It is not at all difficult to interpret Pike's notation, in view of this, in terms of the notational system suggested here; the motivation for the structure-less conception of pitch phoneme sequences as described by Wells cannot be provided in such terms, however. This observation is corroborated by the distinction between Pike's and Wells' views on the relativity of pitch levels: for Pike, relativity is syntagmatic; for Wells, paradigmatic (§§3.2.1., 3.2.2.2. above). Thus, for Wells the pitch levels are not dependent on correlation with independently established *relata*, but have a fairly independent status. It is also interesting to note in this connexion that the distinction between pitch level phonemes and the pitch contour aspects of terminal junctures (allophonic for Wells, phonemic for Trager & Smith), which has often puzzled workers in the traditions which utilise contours first and foremost, is rejected outright by Pike (1945:178), who pointed out in his discussion of Wells' proposals the lack of internal contour structure in the latter. It is precisely this lack of structure which makes the Wells-Trager-&-Smith conception of relative pitch so vulnerable. Trager & Smith, indeed, go much further in underlining the paradigmatic nature of their conception of relative pitch: as was pointed out above (§3.2.2.3.), each of their relative pitches is relative to a set of four "absolute" pitches in different "stress" contexts - making sixteen "absolute" pitches in all, in some unspecified sense of the term "absolute". There is a case for allowing some paradigmatic levels in the English intonation system (cf. pp. 258f. above), but certainly not sixteen, let alone sixteen at every conceivable syntagmatic position. Another, quite different system whose inherent structural ambiguity was pointed out above (§3.3.2.) is that of Isačenko & Schädlich. The ambiguity concerns the status of the level pitch trajectories on the one hand, and of the pitch breaks, or tone-switches, on the other; it may well be that the levels are to be regarded as the primary forms, but the abrupt configurations of pitch change which characterise the breaks may equally well be regarded as primary. The former interpretation would be the less structured, the latter the more structured of the two, since the restriction to two pitch levels may, as already shown, be interpreted as a sequence restriction on occurrences of the levels; Bierwisch quite rightly makes a related point with regard to the four-level systems (in his syntagmatic interpretation of 'relative pitch'; 1966:134):

Die Einschränkung auf vier pitch levels bedeutet bei der zweiten Interpretation nicht mehr die Identifizierung von vier diskreten oder auch überlappenden, jedenfalls unterscheidbaren Tonstufen, sondern lediglich, daß nicht mehr als drei Tonhöhenveränderungen in einer Richtung aufeinander folgen können.

The empirical consequences of such assumptions have already been dealt with (cf. §§3.2., 3.3.2., and p. 256 above).

It was mentioned above (p. 384) that the transcription system used in the present study does not exclude the possibility of giving a direct interpretation to the variable specifications of the pitch height phonetic variable, but leaves the option open. Crystal's suggestion (1969; 1971) that there could be some phonetic reality to the notion of a constant onset pitch would be relevant to phonetic interpretation at this point; the suggestion was discussed above in §2.3.3.1., and placed in context in §3.1.4. in the account of Crystal's approach. Since there are physical constraints on pitch range, an adequate account will have to anchor the height of trajectories to the available range at some place in the description; Crystal's "onset" is a prime candidate for the anchored relatum, since the first item of a series has a special significance in all kinds of description, but especially in those which incorporate production and perception criteria of analysis. It is not possible, without considerable quantitative analysis of intonation trajectories in context (an extremely problematic undertaking), to come to a decision, however, between a proposal such as Crystal's and the kind suggested by Jassem, for instance, in which the final element is anchored to the pitch range and preceding elements are related to this; nor can a final decision be made on paradigmatic interpretations of the Trim model and their relevance to sections of intonation descriptions without such further analysis.

The two extremes of componentialisation are holistic tune gestalts on the one hand, and paradigmatically interpreted pitch levels, as the ultimate in trajectory atomisation, on the other. The problem of componentialisation may be seen, from this point of view, as an attempt to progress as far as possible along the network of possible paths from the unanalysed tune to the maximum componentialisation which can still be given a plausible phonetic interpretation; part of the task is the precise statement of the descriptive claims made for the transcription used. A flexible form of transcription, used in the previous chapter, has been characterised in the present section. It can cope with statements at any point along the various paths of componentialisation from whole trajectories to fixed pitch levels, and can thus serve as part of a common language for the comparison of the wide variety of specific proposals for intonation so far made, and the equally wide variety of notations used in them. The precise form of the grammar to be used in generating representations using this kind of notation is impossible to specify usefully without further empirical evidence on trajectory classes, the relevance of other variables and, in particular, on the interpretation of the pitch height variable in terms of paradigmatic constants in terms of Crystal (1971), perhaps also incorporating suggestions of the kind made by Trim (1970). In addition, the relations between intonation systems and accentual systems, which figured above in the definition of the categories to be used in such a grammar, require more clarification than can be given in the present study, and will be dealt with separately (in preparation). Finally, the formulations of gradual variables and their interpretation demands different kinds of mechanism for those hitherto pro-

vided in generative phonology, in which intonation problems in particular, but also details of the semantic and phonetic interpretation of accent, have not been dealt with (cf. §3.3.3. above). Several relevant considerations will, however, receive attention in the next sub-section, and in §4.3. below.

4.2.2. Roles, fall-rises and system congruence

More discussion has taken place about fall-rise contours in English than about any other single kind of trajectory, and more disagreement than usual has developed in the process even among investigators with otherwise similar approaches. The following list, which is quite comprehensive, but still covers only the main contributions, gives some idea of the widespread interest in the analysis of this pattern: Palmer (1924; cf. esp. pp. 131f. above); Armstrong & Ward (1926); Schubiger (1935); Kingdon (1948-9, 1958); Lee (1956a); Schubiger (1956); Lee (1956b); O'Connor (1957); Sharp (1958); Hultzen (1959); O'Connor & Arnold (1961; cf. esp. p. 148 above); Halliday (1967, 1970; cf. p. 153 above); Crystal (1969); Cruttenden (1970); Jassem (1952, 1972; cf. p. 160 above). The title of Tibbitts (1966) is somewhat misleading, in that the article deals with a selection of pedagogical points of intonation, not with fall-rise contours at all. In the present framework it will not be possible to deal minutely with the suggestions made in the studies listed above (let alone with other analyses such as those surveyed by Lee, 1956a:63ff.). Only those points which pertain directly to the use of role criteria of analysis in componentialisation, both directly and via relations with other systems of language, and which necessitate a discussion of the notion of system congruence which develops from an analysis of these relations, will be considered here.

The kernel of the discussion might be said to have been provided by Lee and Schubiger, who discussed the criteria by which fall-rise contours may be componentialised and classified in various ways; their contributions, which were concentrated in an exchange in *English Studies*, 1956, were taken up and developed in a number of ways by other scholars in subsequent years, but since these first contributions contained all the essentials of the discussion, though not always explicitly, and since the later studies tended to specialise, particularly in the area of accent, consideration will be made only of the Lee and Schubiger exchange. More detailed examination will be reserved for a later study.

Lee (1956a) finds three different kinds of fall-rise, which he considers to be "formally distinguishable" (p. 67); these he terms "tone" ("Type 1"), "sequence" ("Type 2") and "tune" ("Type 3"), respectively. With considerable abbreviation of Lee's presentation, the three classes can be characterised in the following terms. The tone is particularly associated with monosyllables, though if it occurs early in the sequence, the rise may be delayed and/or extended over succeeding syllables, with or without considerable modification due to intervening stressed syllables. The sequence consists of a prominent fall and a second, separate prominence, the rise; intervening unstressed and stressed syllables tend to stay low until the rise is reached. The tune, which Lee explicitly relates to Armstrong & Ward's "Tune II" (1956a:70), consists of a fall which is spread over several syllables, followed by a rise which, like the other rises, is spread over any following unstressed syllables. The following examples illustrate typical cases of these classes in the order given. The notation introduced

above, adapted for in-text use, is used; here, the features are paired with stretches of text as *ad hoc* structural categories of intonation structure, and should not be misinterpreted as presupposing a syntactic placement theory. The pitch components are symbolised by the variant terms 'f' (= 'fall'), 'r' (= 'rise') and 'f-r' (= 'fall-rise' - not necessarily implying functional analysability into the components designated by 'f' and 'r' at this stage, though not excluding this possibility).

- (116) It'll take [f-r](long)er to go by [f-r](road).
 (117) I en[f](joy) meeting [r](Tom).
 (118) [f](Where are you) [r](go)ing?

An alternative analysis for (118) could be the following (cf. pp. 261f.), in which 'h' stands for the height variable:

- (119) [α h](Where are you) [^{α h}_r](go)ing?

Schubiger (1956), responding to Lee's suggestions, offers a different classification, postulating three classes which roughly correspond to Lee's, but adding two more with a number of generalisations relating the five classes in various ways. The first of these (comprising some of Lee's second class, the sequences) is said to be a variant of the Armstrong & Ward Tune I, the rise being said to be clearly post-nuclear and occurring on the "weightiest word" of the tail. Her second class is Lee's first, the tones, and is said, like the other three classes, to be a variety of the Armstrong & Ward Tune II. In the case of the second class, the fall-rise substitutes for the rising nucleus (cf. Armstrong & Ward's "special prominence", §3.1.1.2. above). In the third class, corresponding to some of Lee's second class, the sequences, the Tune II rising nucleus is retained, but the head (in Kingdon's sense) falls, rather than being static, followed by a gradual fall, as in the classic descriptions of this tune. The fourth class, an original observation of Schubiger's, is a Tune II in which the stressed syllable preceding the rising nucleus is well above the rest of the body pitch line, involving a sudden step up to and a sudden step down from that syllable; Schubiger notes the pattern as characteristic of public speakers, naming, and taking examples from, Churchill. Lee (1956b) noted that the step down alternates with a fall on the stressed syllable in free variation. The fifth of Schubiger's sub-classes of fall-rise trajectories is equated with Lee's tune, i.e. the basic form of Armstrong & Ward's Tune II. The five classes may be illustrated as follows:

- (120) You can [f](keep) one if you [r](like).
 (121) She's an [f](excellent) [f-r](house)wife.
 (122) [f](Shut) the [r](door).
 (123) ... and a [f](large)^{up step}_f(num)ber of [r](people)...
 (124) [f](Was it) [r](good)?

Other phonetic variables, such as height of contours, or width, were held by Lee (1956a:68) to be independently functional, thus allowing the abstraction of the pitch directions alone. However, both classifications

involve other type-based notions - and, indeed, other criteria - for the establishment of subclasses within the class of fall-rise trajectories; the interesting question is how these other criteria used by Lee and Schubiger, which must obviously be different to produce different classifications, diverge in each case. In particular, the relation between Lee's sequences, as in example (117), and Schubiger's first and third classes, as in (120) and (122), respectively, is of greatest interest.

Lee (1956b), by way of comment on Schubiger's reply, reaffirms that the subclasses must be "formally distinguishable", and makes the following point (p. 160):

From this viewpoint, for instance, *Do make haste* and *You can keep one if you like* would be classified together merely because in both a fall is succeeded by low-pitched syllables and then a rise, and that seems to be one intonation feature for which the term fall-rise is suitable. Analysis of this sort need not exclude the creation of further categories of fall-rise by the use of other criteria. They can be looked upon as sub-classes of the three main types.

In Lee's case, the main criterion for differentiating the sub-classes, over and above identification of the fall-rise trajectory itself, is co-extension with the 'segmental' trajectories which can be characterised in terms of organisation into syllables and further characterised as 'stressed' and 'unstressed' syllables. Although the latter must be regarded as unanalysed cover terms for a multitude of different categories, they are clearly intended to refer to type-based criteria. Lee himself described Schubiger's distinction between her first and third classes as follows (1956b:160):

We could thus regard Miss Schubiger's Types 1 and 3 as sub-classes of the Sequence (my Type 2), the fall in Type 1 and the rise in Type 3 being nuclei, to follow the terminology she uses.

In effect, Lee is saying that Schubiger introduces a further criterial distinction for stressed syllables, between those designated 'nuclear' and those designated 'non-nuclear', thus making further classification possible. It was noted above (§3.3.2.) that Lee rejects the structural paraphernalia of the tonetic approach, preferring something more like a pitch accent theory. His repeated reference to the requirement that criteria be limited to those yielding formal distinguishability, as well as a footnote comparing 'nucleus' with syntactic 'head-modifier' constructions, implies that the additional criteria of Schubiger are not of the same order as his own basic criteria; Schubiger's remarks on similarities between her first three classes - "Type 3 is often identical in form with 1 and 2" (1956:159; cf. also p. 158) - would appear to support Lee's implication.

But this distinction is not as clear as Lee (or Sharp, in a later criticism of Schubiger - Sharp, 1958:150) would have it. For Lee, Schubiger's first and third classes are not formally distinguishable; from his detailed discussion of the distinction he makes between tone and sequence (the tone being Schubiger's second class) it is clear that their variations in terms of co-extension with syllabic sequences overlap to a considerable extent, particularly where the former has extended and delayed rises, and the latter a slight rising tendency on intervening unstressed syllables. O'Connor & Arnold confirm this overlapping (1961:28), using the locution *I like chocolate*. That there are type-based criteria (interpreting Lee's 'formal' to mean this) which can be used to find different patterns is not in dispute here; what Lee is apparently claiming, however, is that all fall-rise tra-

jectories which are not tones (excluding, for the sake of argument, as yet unnoticed classifications) are assignable to the one class or the other, i.e. are tones or sequences. Since this is not so, but there are in fact areas of overlap, Lee's programme of analysis must include further disambiguation criteria (as must the similar analyses of Sharp, 1958, and Kuitzen, 1959). Since these are apparently non-phonetic (in the absence of further analysis of the cover-category of stress, which might conceivably have been taken to be a source of further phonetic distinctions, this must be assumed), the conclusion must be drawn that Lee implicitly allows role criteria, via lexico-syntactic configurations, into his analysis too. It is not unreasonable to propose, as a corollary of this conclusion, that the Lee and Schubiger classifications differ more in emphasis than in kind, the former (like Sharp and other later investigators such as Crystal) judging where possible on the basis of type criteria, and the latter judging also on the basis of type criteria, but making the position of role criteria more explicit as disambiguation problems demand. The key to the puzzle clearly lies in the hidden judgments involved in using the terms 'stressed' or 'nuclear', the latter obviously and the former less obviously connected with type and role criteria of analysis, not just with the one or the other kind of criterion. It is instructive to note Sharp's interpretation of his own terminology, which lends support to the present view: first, he notes the category also used by Lee and refers to it as "the stressed syllable, hereafter referred to as the 'focal syllable'" (1958:129); second, he writes (p. 131):

In both types of falling-rising pattern the focal syllable may be said to have major prominence. This term must remain undefined here, but should not be exclusively associated with 'kinetic tones'. F + R [Lee's "sequence", roughly - DGI, however, in contrast to FR (Lee's "tone" - DGI), is essentially compound, and requires a further major prominence after that of the focal syllable. This necessitates at least one full rhythmic-al juncture at some point after the fall.

The terms "stressed" and "major prominence", which evoke associations with type criteria, are not actually defined, then; the really interesting point, however, quite definitely makes reference to lexico-syntactic systems, in particular to the correlation of 'weak forms' (particularly of pronouns, but also of other kinds of syntactically defined items) and the corresponding 'strong forms' with the absence and presence, respectively, of major prominence, as in the following (with pitch retranscribed in feature notation):

- (125) /aɪ v [f](sɪ:n) [r](hɪm)/
 (126) /aɪ v [f-r](sɪ:n) ɪm/
 (127) *aɪ v [f](sɪ:n) [r](ɪm)/

There is no mystery in this correlation: it is not the syllabic sequences as such which provide the disambiguating criteria (for such patterns can quite easily coincide as far as the distribution of the pitch trajectory is concerned, the weak-strong distinction hardly contributing to this), but rather their assignment to particular lexico-syntactic categories which relate to an accentual distinction via the thematic category of anaphora. It is possible, but not necessary, for the distinction to be made for many utterances in terms of additional type criteria, such as the relative height of the beginning point of the rise, the relative duration of the syllables

concerned; there is a good deal of variation, for all kinds of reasons, in respect of these variables, however.

The concrete objection which Lee has to Schubiger's reassignment of his sequences to a generalised Tune I (for left-hand nuclei) and a generalised Tune II (for right-hand nuclei) may be analysed in the terms developed in §4.1. above. The reassignments made by Schubiger were essentially in terms of paradigmatic judgments on tonicity-sharing items, which are put into the same equivalence class on the basis of such judgments (cf. pp. 252f. above). Lee takes the following two pairs, the first assignable (in Schubiger's terms) to Tune I, the second to Tune II (1965b:161f.):

- (128) It's most aɪfɪ(mu)sɪŋ ɪn pɑ:ts.
 (129) It's most aɪfɪ(mu)sɪŋ ɪn [r](pɑ:ts).
 (130) It's exɪfɪ(tremely well) [rɪ](wɪt)ten.
 (131) It's exɪfɪ(treme)ly well [rɪ](wɪt)ten.

He objects that there are contexts which the members of the pairs do not share, and that it is therefore perhaps over-hasty to generalise in this way; for instance, (128) but not (129) would tend to occur in contexts of "repetition", and (130), in contrast to (131) "might have to be taken as a question" (p. 161). It is easy to say with hindsight, and the benefit of the increased analytic precision provided by generative grammar, that total synonymy, defined by whatever criteria, is not a reasonable requirement for the establishment of equivalence classes, any more than it is a reasonable requirement for transformationally defined equivalence classes; this is, therefore, a criticism of Lee's objection only in a rather abstract sense which might be dubbed a methodological anachronism, though it is none the less valid by present standards. Items may, of course, be assigned to a whole range of equivalence classes, each defined by different paradigmatic criteria. The members of each of the above pairs can undoubtedly be assigned to the same equivalence class, which Schubiger refers to as Tune I for the first pair, Tune II for the second, on the basis of tonicity judgments (or related syntagmatically formulated criteria) about the items given; it will be recalled that O'Connor & Arnold set up what may be explicated as equivalence classes by the use of similar criteria, and with the same kind of phonetic overlapping, in their later study (1961, 1973; cf. §3.1.2.4.). Since the items in the pairs are related not only in respect of tonicity, but also in respect of tone, the equivalence class is in fact even more restricted than it might have been. To criticise the Schubiger analysis at the level she chooses, definable in terms such as those just used, a criticism of the accuracy of Schubiger's tonicity judgments, or the discovery of more general equivalence criteria which support a different classification, or the discovery of other type criteria, involving other type variables, would be required. Later investigators seemed to be puzzled by the selection of criteria used by Schubiger. Sharp, for instance, professes difficulty in understanding the reason for Schubiger's two pairings in the following cases (1958:150):

- (132) There were [f](sev)ən ofɪ[r](them).
 (133) There were [f](sev)ən.

on the one hand, and

(134) There were [f-r](sev)en of them.

(135) There were [f-r](sev)en.

on the other. Schubiger had characterised her criteria as follows (1958:158):

One can also bring out the difference by saying the sentence in the same mood and dropping the last words.

This clearly amounts to an equivalence judgment on the basis of tone and the semantic interpretation of tone (cf. Halliday, 1967; 1966-8); but Sharp himself also used the same kind of criterion in arguing his own analysis, as pointed out already (§3.3.2. above, in example (101)).

The utility of working with explicit criteria of analysis in order to avoid discussion at cross purposes becomes manifest when the arguments supporting different componentialisations and the associated classifications are examined in detail, as in the preceding discussion. It may seem a little behind the times to have made this point using older, rather than more recent studies; the unfortunate fact is, however, that the range and subtlety of criteria of analysis, however inexplicit they may have been, which were used in these studies in the fifties, have not been matched in recent discussion. The point could have been spelled out in even more detail, with attention still restricted to these studies, showing how Lee, for instance, also introduces paradigmatic role criteria of various kinds, from tonicity judgments (e.g. the substitutability of the tone for the second element of the sequence) to semantic labels (e.g. 'gushing'), which Lee associates with overuse of the tone, Schubiger's second class, but which Schubiger associates with overuse of her third class, one of Lee's kinds of sequence, and which Pike - to take yet another interpretation - had associated with frequent use of the ϕ 1-4 contour in American English, cf. p. 257 above; not all of these appeared under Lee's heading "use", either. Enough has been extracted from the treatments dealt with, however, to serve the purposes of the present discussion; further study of fall-rises and related patterns requires separate treatment outside the present context (cf., however, Table 13 and the associated text).

The aim of the present discussion to provide pointers towards the achievement of relatively systematic explicanda for explicit accounts of role criteria of analysis, and consequently for the semantic interpretation of prosodic, particularly intonation, systems, has been achieved so far by a strategy which may in some respects be seen as rather negative. However, the necessity for agreeing on criteria, rather than arguing about incomparables, can best be demonstrated by actual instances of disagreement, and the risk of appearing to take a negative stance is worth taking to reach a useful point of departure for further rounds of discussion. Many of the questions raised are still open; for instance, the notions of stress and nucleus; or Schubiger's own term 'weight', which she first used in 1935, but which in fact has a much older history (cf., e.g., Behaghel's "Abstufung in der Bedeutsamkeit" and its iconic relation with "Betonung", determined by various semantic and syntactic categories, 1917:329), and which is still in the forefront of attention (cf. the neo-Praguean study by Halliday, 1966-8, on the one hand, and other studies both within and in reaction to the Chomsky & Halle approach, including linguistic debate on presuppositions and related categories, on the other). One of the consequences of recognising that different combinations of criteria of analysis generally lead to different kinds of analysis is an awareness that parallels in ana-

lysis may well be attributable to use of the same, or similar, criteria of analysis. One case of such parallelism, which was introduced under the term 'system congruence' in §§1.2.3. ff. above, appeared in the above discussion in Sharp's account of co-occurrence restrictions holding between certain pitch patterns and text features, in particular in this case accent and weak or strong forms; the parallelism is both semantic (in the area of what is often loosely termed 'information') and phonetic (in the area of vowel reduction, §3.3.3. above).

The fact that the conception of intonation patterns as being predictable from syntactic information is so common can be taken as an indication that there may be a whole range of such congruences whose true extent is unknown, largely since the criteria by means of which intuitive hunches of this kind may be made explicit are seldom enquired after. Similar considerations apply, of course, to the other extreme of linguistic folk-lore, in which intonation is regarded as part of some vaguely conceived context for utterances (cf., e.g., Cresswell, 1973:238, and §1.2.4. above), but this is a matter for the next section. One area where congruence may be expected, and has been hinted at in discussion in the preceding chapter, is between different prosodic systems themselves; for instance, the various pitch, tension, and temporal organisation variables are arranged partly by the same or similar role criteria into parallel systems, as in the case of accent, but also partly into divergent systems, on the basis of divergent criteria. Distinctions of this kind were investigated above in §3.3., and will receive further attention elsewhere (in preparation); there are even candidates for treatment in terms of system congruence among features which figure within the organisation of pitch trajectories themselves, above all in the borderline area between accent and intonation. Some of these were discussed in the context of Bolinger's conception of accent, above (§3.3.1.; cf. also discussion in the context of example (115) above). Others can be found in Trimm's account of partly parallel major and minor tone groups (1959; cf. also §3.1.2.3. above) or, indeed, in the popularity of the old classic of intonation descriptions, the Armstrong & Ward Tune I, one variety of which may be seen in the following way (here deliberately associated with Bolinger's relative height variable, 1970):

(136) [f]([f](Hank) the [f](pun)dit [f](laughed) out [f](loud)).

Similar specifications for variant occurrences from the same variable in the sequence, as in this case, may well contribute towards the identification of specially designated intonation patterns; note, for instance, in this connexion, the frequency of similarly specified di-sequences noted by Crystal (§3.1.4. above), his "tonal reduplication", and also the various approaches to characterising pitch sequences in such terms as 'harmony', &c. (cf., e.g., Kingdon, §3.1.2.2. above), which involve consideration of the specification dependencies between successive intonational and accentual variants.

Closely related to these considerations are the relations between pitch trajectories and scopes, which may profitably be regarded as explanations of the traditional 'integrative' and 'delimitative' functions of intonation. An example is the scope-marking relation between an (accentual or overall) rise with a following fall (traditionally regarded, from Palmer and Armstrong & Ward on, as an emphatic version of the fall) on the prosodic side and the intensifying operator *even* and its operand on the lexico-syntactic side (cf. also Schubiger, 1965a; 1965b); compare the following

groupings, which form equivalence classes with respect to an intensifying feature:

- (137) He [r](travelled to Timbuc[r-f](too)) in a balloon.
 (138) He [r]([f](even) travelled to Timbuc[f](too)) in a balloon.
 (139) He [r](even) travelled to Timbuc[f](too) in a balloon.
 And:
 (140) He [r](travelled to Timbuctoo in a bal[r-f](loon)).
 (141) He [r]([f](even) travelled to Timbuctoo in a bal[f](loon)).
 (142) He [r](even) travelled to Timbuctoo in a bal[f](loon).

Similar considerations apply to locutions like the following, which have three readings as they stand:

- (143) He's not coming because of Lucy.

The readings which differ by virtue of the scopes of *not* and the *because* phrase, which are here interpretable in terms of constituent structure, can be associated with different pitch patterns (cf. the detailed discussion by Lee, 1956d, 1960).

In the last example, the situation is more complicated than the first, however; a further kind of congruence may be found in the interpretation of fall and rise sequences as constructions involving certain kinds of dependency or subordination relation, e.g. as head (fall) and modifier (rise), &c. Note, for instance, the way the naive 'normal intonation' reflects the greater degree of congruence, via this interpretation, in (146):

- (144) It's [r]([f](most) a[f](mu))sing in parts.
 (145) It's [r]([f](most) a[f](mu))sing in [f](parts).
 (146) It's [r]([f](most) a[f](mu))sing in [r](parts).

The same principle can be used in connexion with *because*-, *if*-phrases, &c. On a hyponymic interpretation (with, e.g., the *because*-phrase as modifier in the VP, or, in other words, as the negatively designated member of a set of contraries - cf. (143)), the phrase in question may be marked with a rising pitch pattern; the pattern chosen also depends on other aspects of dialogue structure which are similarly interpretable (see below). The same kind of situation obtains when accent and intonation mark any, bringing out qualitative and quantitative readings according to pattern and context. Provided the word occurs in a modal, non-negative context, both these readings coexist peacefully without a choice being forced. If it occurs in the scope of *not*, however, a choice is forced between assignment to a quantitative and assignment to a qualitative hyponymic locution; the choice is no longer a matter of scope, which is frequently an accentual matter, but is rather one of disambiguation by congruence: the qualitative reading coincides more closely with the rising tone as marker of modifying function:

- (147) [f]([f](Don't) give it to [f](an))ybody.
 (148) [f]([f](Don't) give it to [r](an))ybody.

- (149) [f]([f](Don't) give it to [f-r](an))ybody.

The further details call for separate treatment. Related points, also interpretable in the terms used here, have been raised by a number of scholars; cf. esp. Hartvigson (1969), Jackendoff (1972:258ff.), Lee (1956c), Seiler (1962), and Wade (1966). One further area where system congruence is also a useful notion to operate with is that of tags; this is a vast area, and has not been nearly exhausted, the most comprehensive taxonomy so far having been provided by Kingdon (1958:§§51-60 "Adjunctions" and §110 "The Tonetics of Tags"). For the present discussion, it will suffice to note that certain aspects of the intonation of tags can be interpreted on the principle just outlined. More still can be explicated if the field of the modifier-head relation be extended from lexico-syntactic items to items within the pragmatic circumstances of the utterance; there is a danger, of course, of making a spurious generalisation in suggestions such as this, with a purely nominal bridge between two distinct fields (for instance, speaker-hearer 'subordination', or the patterns of question-answer, theme-rheme, part-continuation, &c.), and therefore further, more detailed support is required than can be given here (in preparation). Likewise, considerations of congruences with marginal linguistic systems, paralinguistic systems, &c., which can be found with no more difficulty than congruences with lexico-syntactic systems, must be dealt with in another place; cf. also Cruttenden, 1970, and Worth 1964.

Hultzén (1962:658) made the following remark about the relations between intonation and text (cf. also §1.2.4. above):

Far the greatest part of intonation surely conveys no information whatever ... The tune that must accompany the words when spoken is merely appropriate, not informing. It is only when the intonation denies the straightforward meaning of the words that it can be said to have any function.

This is, of course, an extreme statement of a state of affairs which is not quite so simple (as Hultzén himself has shown elsewhere, e.g. 1964); nevertheless, it is a statement of a relation which is very similar to system congruence as discussed above. Cruttenden (1970), using a general interpretation of "definiteness" for falling and "tentativeness" for rising patterns, takes up a position very close to that presented here, though his categories are not further explained (1970:187):

It seems that a statement of greater generality regarding the meanings of tunes would be produced by saying (as we have done in the case of intonation-groups and main accents) that tunes carry an independent meaning of their own, regardless of sentence type. ... If correlations are found between particular tunes and sentence-types, these can be explained in terms of probably [sic] between the meaning of a tune and the meaning of a syntactic pattern.

Halliday's use of the terms 'neutral' and 'marked' also resembles the use of 'system congruence' (and its opposite, 'incongruence') in the present discussion (cf. also §§1.2.5., 3.1.2.5. above). With this series of pointers to the functionalistic context within which the term 'system congruence' is best understood, the present section on componentialisation and its ramifications is concluded. In the following section, the emphasis will be more strongly on syntagmatic role criteria of analysis, in contrast to the paradigmatic role criteria of analysis used in establishing equivalence classes which figured in the present section.

4.3. Calls

In English and many other languages, a number of intonation patterns of a somewhat formulaic nature are characteristically used to constitute calls and related kinds of utterance. They have been sporadically discussed, the most noteworthy contributions concerning these contours in English having been made by Pike (1945), Abe (1962), Fox (1969, 1970), Crystal (1969a), Lewis (1970); for a development of the position taken here, cf. Gibbon (1975). There are several highly interesting phonetic and phonological questions connected with these contours; for instance, the precise nature of the type criteria by which they are identified (which may be subsumed under the cover term 'chroma' - cf. Gibbon, to appear), or the syntagmatic gradience which frequently characterises them (in contrast to the paradigmatic conception of gradience so far employed in the literature), or their association with other phonetic variables such as timing, or the problem of relating them to other prosodic systems (cf. Sharp's five kinds of monotone, 1960; Pike's spoken chants, 1945; speech surrogates such as whistling communication), or the applicability of paradigmatic role criteria such as tone or tonicity judgments to them (cf. the exchange between Fox and Crystal in the literature listed above). A discussion of these points would not be appropriate in the present context and will be reserved for a separate study (to appear; cf. also discussion of role criteria in Gibbon, 1975).

For present purposes, a rough phonetic characterisation of the following example will suffice:

(150) 'John-ny!

The outstanding aural impression is of a sung or chanted contour; Pike, in fact, refers to the class of pitch patterns to which he assigns this pattern as "spoken chants" (1945:71; cf. also §3.2.1. above), giving the following further characterisation of the contour in question:

Another chant uses a $\circ 2-3$ contour, with each syllable of the primary contour very long and each of the syllables of the precontour somewhat precise and staccato and evenly spaced.

The contour under consideration is not quite as stable as a number of other chants; therefore the tonic sol-fa notation, which could be used as a descriptive model for these, in view of the constant intervals in its perceptual interpretation, is not up to the task of describing the contour just described. In contrast to the other chants, this contour has a continuum of related varieties, from a quasi-sung chant (which I have often observed to contain a minor third interval) on the one hand towards a contour approximating to a high-mid falling trajectory (cf. Crystal, 1969a: 214) and narrower (or, in certain contexts, wider) intervals, often with unchanted proclitic unaccented syllables (not, however, with enclitic unaccented syllables, unlike many other intonation patterns). Pending the appearance of a more detailed treatment, the contour may be characterised in terms of a more general feature representation. The following examples are taken from English, Amsterdam Dutch, and German; a phonetic segmental transcription is used in order to avoid irrelevant placement problems which would crop up with a phonemic or orthographic transcription, but this in no way affects the validity of the pitch transcription):

(151) [f]([l](to:))([l](mi:)) , kam [f]([l](hi:))([l](ja:))

(152) xuja[f]([l](mo:r))([l](xə:))

(153) [f]([l](la~))([l](ta:r))

The symbols 'f' and 'l' stand for 'fall' and 'level', respectively, as pitch specifications. It is not necessary to discuss further phonetic details of this contour in the present context.

Mention must be made, however, of a further, closely related contour pointed out by Abe (1962); in the transcription used to formulate the above examples, the only difference between this and the first contour would be a change from the 'f' specification to 'r' ('rise'). Crystal (1969a) also points out that the contour may be level throughout. The contexts in which this rising version and the level version may occur are more restricted than those in which the falling version occurs, though less so in English than in German and Dutch, where the examples given would not occur with a rising trajectory. In English, they are also associated with street cries such as the following:

(154) [r]([l](pa:))([l](pə:z)) (Papers!)

(155) [r]([l](əjʊəræ:bʌ))([l](ŭw)) (Any old rags and bones!)

Such items are pointers to the special status of this contour; it is no accident that they have also been incorporated into traditional songs in such locations as the following, with the same melody:

(156) [r]([l](Cock))([l](les)) and [r]([l](mus))([l](sels))

(157) [r]([l](Cher))([l](ry ripe))

It is interesting to note that a street cry similar to (156) is current on the Flemish coast:

(158) [r]([l](mɔ))([l](sɛ:ts))

Klinghardt (1914:104) reports rising, level and falling street cries of apparently the same kind, observed in Leipzig and Königsberg; Trim (1964: 377) notes a contour which he calls "high level", which is related to the contours just outlined but differs sufficiently to warrant its exclusion from the present discussion. It can be accounted for by a simple extension of the principles suggested below.

Since the main theme in the present section has to do with roles, this will suffice as a documentation of earlier descriptions and a rough characterisation of the pattern. These contours are phonetically somewhat isolated, and are, partly on this account, rather easy to identify. They are conspicuously different from other intonation patterns found both in conversational and formal delivery; structurally they are also isolated from other patterns since they tend not to co-occur with different patterns in the same dialogue contribution; from the point of view of placement, they tend to occur with formulaic or distributionally relatively isolated items, too (e.g. apostrophically usable items like proper names), though not exclusively; finally, they occur in fairly easily identifiable contexts. Thus, although they are in some sense exceptional, they provide a refreshing change for the intonation analyst, since of all intonation patterns they come near-

est to forming the kind of "clear case" which Chomsky (1967:14) described as being the most useful place to start a systematic description (1967:14). This being the case, the risk that the results of an examination of such contours may not be too widely generalisable is one which is worth taking. The following sub-sections will take advantage of this ease of characterisation in the discussion below of the functional aspects of call contours.

4.3.1. Initial enumeration of roles

It will be convenient to present the roles associated with call contours in an informal classification and nomenclature before going on towards an explication of the factors involved in the role classification. The items classified are either documented in the literature or observed by me; in no case have I constructed examples. For simplicity's sake, the items are given in orthographic segmental representation with tonetic pitch icons, but with the explicit rider that the segmental representation is not intended to imply a particular account of placement, and that the pitch representation is only to be understood in terms of a definition in use by feature representations such as those of examples (151)ff. The sole reason for using this transcription is typographical (cf. §2.4.2. above for discussion of this kind of question). The situational categories used are cover terms for more or less complex syntagmatically definable dialogue situations which will be examined more systematically in the following section.

A. Hailing:

- (159) "Coo-ee!"
- (160) "Yoo-hoo!" (cf. Wells, 1945(1972:138), "Woman's call to hail a person"; formerly a well-known catch-phrase in a tea advertisement)
- (161) "Hal-lo!" (= [ha:lo:], German; this formula is not used for hailing in English - cf. the next category below)

B. Calling:

- (162) "John-nee!" (in English, also with rise or level)
- (163) "Manu-e-la!" (in German, occasionally also with level)
- (164) "Hel-lo-o!" (in English, presuppositionless call, quasi-question to find out if anyone is there; also on telephone; especially characteristic of American English)

C. Greeting:

- (165) "Mor-ning!" (English, also with rise or level)
- (166) "By-ye!" (especially American, more recently British English)
- (167) "Mor-gen!" (also with level - cf. Trim's German level contour mentioned in the previous subsection)
- (168) "Wieder-sehen!" (German; also: "Wie-der-sehen!")
- (169) "Her-einmar-schier!" (German; also: "Her-einspaz-iert!")

D. Formulaic Shouting:

- (170) "Where 'are -you?"
- (171) "Come 'o-on!" (esp. American English)
- (172) "Dinner's -ready!"
- (173) "Com-ing!"
- (174) "Va-ter, 'Aufstehen!" (In combination with Calling)
- (175) "Wo 'bist -du?"
- (176) "Ich 'kom-mel (reply to call)
- (177) "Kom-men!" (instruction by foreman of gang of labourers to start hauling on rope to raise a flag-pole)
- (178) "Schnei-der ... Achtund'zwan-zig ... 'Bre-men ... (listener phoning radio can-I-help-you programme, giving personalia)

E. Talking to babes-in-arms:

- (179) "Was 'macht er -denn?" (also: "Was 'macht 'er -denn?" - cf. example (168); also: "Wo 'ist 'er -denn?")

F. Recapitulation (cf. Gunter, 1966; Firbas, 1961):

- (180) "Lau-ter!" (German, exhortation in formal gathering - e.g. classroom - to speak louder)
- (181) "'Jo-hann" hab' ich gesagt! (i.e. [f][ll](Jo)[l](hann hab' ich gesagt)) with long scope for second part of contour)
- (182) "Auf-hörn!" (also iterated; request to speaker or similar performer to shut up)

G. Transaction:

- (183) "Bit-tel" (said by girl at till as accompaniment to change-giving)
- (184) "Dan-ke!" (said especially by shop-assistants).

This inventory of examples contains both English and German specimens for comparative purposes, which will be spelled out in detail in the subsequent discussion. It should be noted, as an initial and primitive generalisation, that the contour, which is phonetically quite similar in the two languages, has a far wider range of use in German than in English, and a very slightly wider range of use in American than in British English (the evidence is too slender to be required to bear any conclusions about the relations between American and British intonation on the one hand, and American and German intonation on the other). On the side of types, however, German contours are more restricted than English contours, having no rise of the type found in English, and only relatively rarely and in slightly different contexts a level contour of the same basic type.

4.3.2. Discussion of roles

It was suggested above (§4.1.) that a discovery function mapping utterances on to representations (and, on a broader perspective, collections of linguistic data on to grammars) would have to contain a number of method-

ological categories among its arguments; the three main kinds of category mentioned there were hypotheses about linguistic structure (i.e. a linguistic metatheory, including notational system), descriptive categories to which utterances are assigned on the basis of primitive empirical decisions (whereby the definition of 'empirical' is broad, covering types and roles in the manner of non-positivistic empiricism), and finally, means of establishing the validity and reliability of conclusions. The present study is not concerned with the formulation of such an overall discovery function; such a task could only be undertaken within the framework of a methodological discussion of the principles and heuristics of concept formation. One of the most fruitful approaches in the last quarter of a century, particularly in linguistics, has been the notion of explication, borrowed from the programme of analytic philosophy (cf. Carnap, 1947(1958:7f.), and §1.3.2. above; Chomsky, 1957:13; Quine, 1960:258ff.). Carnap's characterisation of the term as the "task of making more exact a vague or not quite exact concept used in everyday life or in an earlier stage of scientific or logical development" (p. 7) was itself given a kind of further clarification (the initial phase of explication) by Quine, within his own characteristic discussion of ontological matters (1960:260); his catch-phrase "explication is elimination" is informally sketched in the following way:

We have, to begin with, an expression or form of expression that is somehow troublesome. It behaves partly like a term but not enough so, or it is vague in ways that bother us, or it puts kinks in a theory or encourages one or another confusion. But it also serves certain purposes that are not to be abandoned. Then we find a way of accomplishing those same purposes through other channels, using other and less troublesome forms of expression.

The route of an explication may be lengthy or devious, depending on the degree of vagueness of the explicandum; the final goal will depend in no small measure on the availability of a precise metatheoretical framework within which formulation of the explicans is possible. A good illustration of the Quinean programme, but within linguistics, is provided by Chomsky (1957:Ch. 2), who eliminates the ballast attaching to the intuitively grasped term 'grammatical' by pointing out different terms which could be confused with it and proceeds to replace the old term by a new one, 'grammatical-in-L', with a precise definition within the framework of an explicit metatheory; the cumbersome new term is abbreviated (cf. Quine, 1960:261, for a remark on this kind of procedure) by the old word, which does not, however, lead to confusion since the metatheoretical framework is new. The full route of explication, similar to the route mapped out by Chomsky, will not be traced in the present discussion; despite the ever-growing contributions from logical semantics and pragmatics, there remains a good deal to be done in bridging the gap between these fields and linguistic analysis before a full explication of semantic and pragmatic terms used, for instance, in intonation analysis, can be made. Conspicuous by its absence is a suitable metatheory for relating discussion of roles developed in such terms and discussion of type-based transcriptions, particularly linguistic forms and structures. Nevertheless, an attempt will be made to progress as far as possible along the route of explication in one area of intonation. (Cf. also discussion above, §1.3.2., pp. 40ff.)

The previous discussion of roles in §1.2.4. provided a wide range of possible explicanda for intonation analysis, which in turn stood in various relations to one another along a scale of explicitness. One of the most

fundamental of these terms is 'speaker attitude', used in particular by Pike (1945); it is fundamental in the sense that it is so vague that practically all other accounts of the semantics of intonation may be regarded as explications of it. The problems of using role labels have been pointed out by many scholars, and were mentioned above on several occasions; most of these labels are attempts to capture particular species of speaker attitude, generally without much increase in explicitness (though not always; cf. Uldall, 1960; 1964). The term clearly has psychological and psychiatric implications, which have also received attention (cf. Crystal, 1969:§§2.10.1.-2.). Even those approaches which claim direct intonation-grammar correspondences may be regarded as attempts at partial explication of 'speaker attitude' in view of the vagueness of the term, in so far as they also postulate (or leave implicit) relations between speaker attitude and grammar; these relations, which clearly exist, are not generally made explicit, however. One of the few attempts at detailed explication in these terms is the work of Halliday (esp. 1967; 1966-8). A further approach which may be seen retrospectively as an attempt to explicate the term 'speaker attitude' in one limited respect is the approach in which intonations are seen as illocutionary force indicating devices. This view is akin to the traditional notion that certain intonation roles are closely associated with the morpho-syntactic mood systems by way of what are traditionally referred to as 'utterance types' (cf. the pairs command-imperative, question-interrogative, &c.), and thus embodies claims (in the sense discussed in §4.2.2. above) about system congruence between intonation and the lexico-syntactic mood system. In the following discussion, the main focus of attention will be on attempts to use the notion of illocutionary force in the course of an explication of the notion of speaker attitude.

The immediate plausibility of the descriptions of call contours given in the preceding sub-section lies primarily in the ease with which the utterance types involved can be isolated and named; since this ease of accessibility of role criteria of analysis for call contours (and, over and above this, the ease of accessibility of the type criteria used) is far in excess of that of the criteria required for the analysis of any other contour - an observation borne out by the relative harmony of views on the subject insofar as they existed prior to the enumeration in the previous subsection of the present study - and, secondly, since the kinds of utterance involved appear prima facie to be just the kind of thing for which the term 'illocutionary force' was coined, whereas other intonations are less easily characterised and tend to be more promiscuous in their behaviour, these call contours may, in conclusion, be regarded as good candidates for examining the thesis that intonations may be seen as illocutionary force indicating devices. If these intonations are not to be regarded in this way, there is a good chance that others should not be thus regarded, either, though that case will not, of course, have been proven. It is possible, should the illocutionary analysis prove to be inappropriate, that contextual and situational factors may have led to a distorted interpretation of the role of intonation, as in countless other cases (cf. Crystal, 1969:284ff.).

The first step to be taken after the enumeration made in the previous subsection is to enquire about the kinds of context and situation which the utterance-types of the initial classification have in common. It may be the case that there is one major factor, or perhaps a set of interwoven factors yielding a family resemblance rather than common characteristic.

As far as the spoken context is concerned, all uses share decidedly formulaic or stereotyped lexico-syntactic items; what little is conveyed

by these tends to be highly situation-dependent, even in the fourth category, and therefore low in information value. The longest item, (181), also contains only a simple metalinguistic frame ("—" hab' ich gesagt), with a *verbum dicendi*, where the slot is filled by something which has occurred previously in the dialogue. This shared contextual characteristic is paralleled by similarity in situational characteristics, too (the fifth and seventh categories being apparent exceptions, and the third and sixth intermediate cases). The most compact formulation of this similarity of role has been given by Abe (1962:522), partly following Pike (1945:187n):

... the genuine call invariably ends in a mid-suspended tone whenever and wherever distance matters. This long, level stretch of tone is admittedly an effective means to carry one's voice far or to ring it above other types of sound - e.g. noise - even in case the person being called is within easy touching distance.

Only small extensions of this principle are necessary to cover more categories than the first two and the fourth of §4.3.1., to which Abe's remarks apply. The principle is, in fact, a highly natural one (cf. §2.4., esp. Fig. 4 above), which may be characterised by the following chain of descriptive statements: (1) difficulty of communication is present at the physical level; (2) this difficulty is surmounted by increasing the carrying power of the utterance. The means by which this is accomplished may be characterised by extending the chain: (3) increased carrying power means, in particular, increased intensity; (4) increased intensity is achieved principally (in speech, cf. §2.2.) by higher pitch/frequency; (5) the increase in intensity is supported by sustention rather than being allowed to taper away (note that in some varieties of call contour, pitch actually increases in the final - 'normally' unstressed, i.e. unstressed in non-chromatic contours, syllable); (6) this sustention is aided by the stability of phonation provided by the feature Chroma (cf. the introduction to the present section, §4.3.); (7) the stability of phonation also provides a qualitatively distinctive signal which stands out against any background noise. It is of interest that such communicative activities as yodelling and the few genuine speech surrogates to be found in English are also used in this way (cf. Gibbon, to appear); the natural basis for the latter is even clearer: the extreme stridency of most kinds of whistling supports the stability of the highly periodic signal still further.

The exceptions to this interpretation in terms of a natural type-role relation are categories C (greetings), E (talking to babes-in-arms), F (recapitulations), and G (transactions). The point of contact between categories E and F and the other, naturally interpreted, categories is, however, not hard to find: they all classify situations where difficulty is experienced in getting across to the communication partner; in the basic cases, this difficulty occurs at a physical level, but in these two cases it is at a different level of comprehension (cf. §1.1. above). The adult baby-talk register is essentially monologic, thus containing the extended communication barrier principle practically in its definition: the question of understanding, in a linguistically interpretable sense, on the part of the listener does not arise; communication does not arise, either, except on a primitive level of awareness of familiar and unfamiliar surroundings. The distance may, in this case, also be said to be social: there appears to be a tendency for the contour to be used in this context by those (such as elderly matrons) who are not in day-to-day contact with the addressee. The category of greetings may be understood partly in natural terms, since it

is often the case that greetings are given from the middle distance; the category may, however, also be understood in a transferred sense: where a greeting is not simply a passing acknowledgment, it is either a prelude or a coda to a dialogue. In other words, it is part of a procedure for setting an appropriate scene for a dialogue, and as such is clearly related to the category of hailing; calling, and formulaic shouting are less extreme categories falling into the same general grouping. These categories are clearly extensions of the same kind of principle in terms of role categories to the same kind of means in terms of type categories. A particularly interesting case of transference is that of the purely metalinguistic contexts of the sixth category (recapitulations): in this case, the listener is either uncertain or slow on the uptake (as in (181), and, perhaps, in (182)), or the speaker has not been able to make himself heard, and consequently understood (whereby the actual reasons may be quite varied, in the case of the request (180); they may range from indistinct articulation or quiet delivery on the part of the speaker, to - a bluff, this - inattentiveness on the part of the listener). A more obscure transference occurs in the case of the seventh category (transactions), perhaps to be understood in terms of dialogue setting, as mentioned for the category of greetings: example (183) provides a transition from non-dialogue or non-transactional circumstances to favourable circumstances for a transaction (here, non-verbal); example (184) on the other hand, like a farewell, terminates a transaction (also non-verbal).

After this preliminary clarification of the use of the kind of call contour under consideration, the question arises whether the above remarks provide a starting point for explicating the use of these contours in terms of 'illocutionary force indicating devices', as much current opinion would seem to suggest. In order to answer this question, it will be necessary to examine the kinds of condition which contribute towards the constitution of illocutionary acts, and which form the basis for the formulation of semantic rules (the distinction between 'semantic' and 'pragmatic' is of no consequence here) for the interpretation of the illocutionary force indicators, which are of course characterised in non-role terms. This is not the place to provide a detailed account of the notion of illocution as a linguistic or a non-linguistic category; the framework of the present study suggests an interpretation in Austinian, rather than Searlean, terms as a pre-linguistic category to be explicated, ultimately, in terms of its reflexes in sentence structure and dialogue. Nevertheless, the use of paradigmatic role criteria of the performative paraphrase type has a useful function to perform within the framework of a linguistic description. In addition, the detail and coherence of Searle's account (1969) have not been surpassed in more recent work, despite numerous suggestions for extending, refining, or modifying it, or concerning its value as a tool for solving philosophical problems. For this reason, his account will serve well as the concrete starting point for the present discussion. Before starting on Searle's account, it will be useful to have a coarse characterisation of the term 'illocution': the illocutionary force of an utterance may be said to be the status of the utterance as a form of verbal transaction. The meaning of 'transaction' in English allows this characterisation to come close to being a useful definition; nevertheless, it is not so much a definition as a reminder, in view of the richness of the terms used and the status of 'illocution' and related items as theoretical terms which are only definable within a particular theory. More precision will come in the following discussion, where the obvious ambiguities of the characterisation just given will be avoided.

Searle has provided a number of conditions which contribute towards the constitution of illocutionary acts, developing his analysis from earlier contributions and controversy by Austin, Grice and Strawson, and illustrating it by means of specific kinds of illocutionary act such as promising (a classic example, with a history in this context dating at least to Austin, 1946). The conditions which he postulates, which may be partially related to Austin's felicity conditions (1962:26ff.), fall into a number of related categories; not all the categories apply to all illocutionary acts.

The first condition specifies (or would specify, if formulated in full) "normal input and output conditions" which have to obtain for a successful illocution; Searle adds the following elucidation (1969:61):

I am construing condition 1 broadly enough so that together with the other conditions it guarantees that H understands the utterance, that is, together with 2-9 it entails that the illocutionary effect K is produced in H by means of H's recognition of S's intention to produce it, which recognition is achieved in virtue of H's knowledge of the meaning of T. This condition could always be stated as a separate condition, and if the reader thinks that I am asking too much of my input and output conditions that they should guarantee that the hearer understands the utterance, then he should treat this as a separate condition.

This may be taken as an addition to what might be called the 'extended Gricean condition' (referring to Grice, 1957), that S should intend K to be produced, ... &c., and is indeed distinct from the first condition proper. Then come two "propositional content" conditions, relating in effect to the collocational structure of the sentence; in the case of the call contours, most kinds of utterance type would not be affected by these conditions (especially the first three and the seventh categories of §4.3.1.). The fourth and fifth conditions, "preparatory conditions", cover certain pragmatic aspects of appropriateness and what might be termed 'non-obviousness' (e.g. there is no call for a promise if the speaker intends to do the act in question in any case). The sixth condition, the sincerity condition, would appear to apply only when propositional content conditions are involved. The seventh, the "essential condition", is the nucleus of the set: this is the condition which states the constitutive factors for a particular kind of illocutionary act; promising, for instance, involves the condition that the speaker intends that the utterance of a certain sentence will place him under an obligation to do a certain thing. The eighth condition, mentioned above as the 'extended Gricean condition', represents Searle's attempt to explicate Austin's notion that illocutionary acts are conventional and involve the 'securing of uptake', by way of Grice's analysis of meaning. Finally, the ninth condition stipulates the dependency of the semantical rules for the use of forms of a language on the preceding conditions. The conditions might be said to represent a hypothesis about the substantive universals involved in a theory of language use.

The semantical rules themselves are five in number. The first four, which Searle regards as "quasi-imperatives" (p. 63), are based on conditions two to six. The fifth, based on the seventh condition, is said to take the form of a constitutive rule. Wunderlich (1972:20) takes the first four rules to be regulative (in contrast to constitutive - cf. Searle, 1969:33ff.). This, however, is clearly incorrect, and is based on a fundamental misunderstanding: if regulative rules "regulate a pre-existing activity, an activity whose existence is logically independent of the rules" (Searle, 1969:34), then the first four rules in question cannot possibly be regulative;

the reason for this is that there is a logical dependence of the constituted activity on the "quasi-imperatives" (Searle, 1969:63):

These rules are ordered: rules 2-5 apply only if rule 1 is satisfied, and rule 5 applies only if rules 2 and 3 are satisfied as well.

Searle makes no further comment on this point.

Now if the intonation patterns under consideration here are to be regarded as illocutionary force indicating devices, it must be possible to formulate rules for their use, based on those enumerated in the preceding paragraph. If this is not the case, then they cannot be regarded as illocutionary force indicators, since their interpretation in terms of illocutionary force is defined by these rules. It is only when this concrete task is broached that the subtlety of the use of the intonations in question becomes clear: the conditions under which they are used are the precise contradictory of the very first of Searle's conditions. Far from it being the case that "normal input and output conditions obtain", it is the case that normal input and output conditions do NOT obtain, as the discussion above has shown. Since it is clear from the context of Searle's discussion that the input and output conditions are to be defined in general terms for all kinds of communication, it is also clear that such conditions cannot be relativised to the use of particular items as a possible counter-objection. If the conditions which Searle gives are to be taken seriously, therefore, the call contours under discussion cannot be functioning as illocutionary force indicating devices in the contexts outlined above. Since the first of Searle's conditions is violated, the rules based on the other conditions are a *fortiori* inapplicable in view of the rule ordering, and it is not necessary to go further than this in examining the relations between illocutionary force and the use of call contours.

If the contours, along with other intonation contours, are nevertheless classed along with the illocutionary force indicators (cf. §1.2.4. above for a documentation and discussion of such claims), then clearly the term 'illocutionary force' is not being used precisely in Searle's sense; the indications are, on the contrary, that the term is not being used precisely at all, with reference to intonation. The choice of intonations does make a difference to the utterance, but there is no reason why this difference should be labelled 'illocutionary' any more than accentual or thematic differences between utterances should be labelled 'illocutionary'; the distinction is made within an entirely different set of role variables. The other possibility for accounting for an approach which kept to the term 'illocutionary force indicator' for intonations was briefly mentioned in the preceding paragraph: an interpretation of the term 'normal input and output condition' which diverges from that given by Searle in relativising such conditions to individual items. But the few contributing factors which Searle mentions simply fall under the heading of general, pre-theoretical abstractions from the possible universe of discourse which are made in all linguistic descriptions. Searle mentions four such factors in detail: that the speaker and the hearer both know how to speak the language; that both are conscious of what they are doing; that they have no physical impediments to communication, such as deafness, aphasia or laryngitis; that they are not acting in a play or telling jokes, &c., i.e. in metalinguistically complex contexts (p. 57). Compare Bloomfield's "derived types of speech and response" (1939:28), Austin's "etiolations of language" (1962:22), or Chomsky's competence vs. performance distinction (1965:3), as well as discussion in §1.3. above, in this respect. There is no reason to suppose

that intonations, in particular call contours, are best treated as exceptions of this kind and provided with a different account of "input and output conditions"; even if they were best so treated, they would then, by definition, fall outside the theory of illocutions in any current formulation, and their place in the theory in some extended form would still lack demonstration.

So far, discussion has run against the illocutionary explication of 'speaker attitude', as things turned out. An interesting heuristic device, proposed by Austin for limiting the proliferation of illocutionary forces, is the criterion of conventionality. The assignment of heuristic status to the criterion is designed, for the present discussion, to sidestep Strawson's problem of the relative status of intention vs. convention (1964) in the definition of illocutionary acts, since these two categories are, at least from the linguist's point of view, quite different in status within linguistic theory, and hardly amenable to discussion on the same level, even if the former be admitted into linguistics at all. Austin's criterion is designed to distinguish, in particular, between illocutionary and perlocutionary acts, the latter being in effect consequences of the way the hearer takes the illocutionary act in terms of his later "actions, thoughts, or beliefs, etc." (Searle, 1969:25). The criterion is formulated as follows (Austin, 1962:103):

[An illocutionary act, as opposed to a perlocutionary act] may, for rough contrast, be said to be conventional, in the sense that at least it could be made explicit by the performative formula; but the latter could not.

Searle has a related, but more generally applied notion, in his "principle of expressibility" (1969:19ff.). The criterion enables perlocutions, and other non-illocutions, to be excluded from illocutionary analysis; for instance, insulting (presumably a perlocution, though Austin does not make this explicit - cf. 1962:30f.) and mendacity (which would, in addition, bring obvious paradoxes - cf. Searle's sincerity condition, *inter alia* - if admitted as illocutionary):

(185) *I hereby insult you ((in) that ...)

(186) *I hereby lie to you ((in) that ...)

This brake on illocutionary over-population can be usefully applied to the categories of use enumerated in the previous section:

(187) *I hereby hail you ((in) that ...)

(188) *I hereby call you ((in) that ...)

(189) ?I hereby bid you good morning ((in) that ...)

(190) ?I hereby bid you good-bye ((in) that ...)

(191) *I hereby call out to you that dinner's ready.

It is likely, of course, that the paraphrase criterion is best regarded as a sufficient, but not a necessary condition on the illocutionary status of a role category; Austin himself mentions (1962:69) that "'reduction' to an explicit performative does not seem always possible", an understandable point of view in the light of Austin's evolutionary theory of the development of explicit performatives as later clarifications of primary (non-

explicit) performative utterances. Even if the absence of an explicit performative version be justified, for instance in view of the formulaic character of the texts involved, which makes it a stylistic absurdity to formulate what message there is in explicit terms, there is no reason to suppose that the intonation marks the illocution involved, rather than performing some other role. First, such a claim would admit a tremendous amount of ambiguity of interpretation for the intonational device under discussion here; this applies to English, but in the case of German the ambiguities would be greater still, as the examples given in the previous sub-section show. There is no point in using the term 'indicator' or 'indicating device' with respect to intonations if specific illocutionary forces are not marked in this way; since practically anything can be said under the fourth category (formulaic shouting), which covers a wider range of illocutions in the received sense than the others (cf. examples (170)-(178) above), the intonation-illocution relation, if any, appears to be so generic as to cover most, if not all, non-institutional types of illocution. If this is the case, then the category marked by intonations, whatever it may be, is not illocutionary in the strict sense. Intonations would appear to mark some category which is not illocutionary, but which cross-classifies utterances in terms of a role variable independent of the illocutionary force variable. Carrying power matters in this particular case, not illocutionary force.

If this is the case with the fairly easily identifiable call contours, it is also likely to be the case with the other, more elusive intonation patterns. This kind of cross-classification is nicely illustrated by Kingdon's discussion of different kinds of interrogation (1958:245); not only are questions associated with all tunes, the adverbs which Kingdon uses to subclassify questions are of a kind which are not selected by performative verbs:

(192) *I hereby ask you insistently whether ...

(193) *I hereby ask you quizzically whether ...

The fact that they select with descriptive or constative, but not performative uses of such verbs is a further indication that intonational patterning marks an independent cross-classification of illocutions rather than illocutions themselves. This is not to say that there may be no connexion at all between intonations and illocutionary force indicating devices; if there are relations, they hold by way of the notion of system congruence discussed at some length in §4.2.2. above, which can be formulated in the terms used in the present discussion as an intersection of the conditions on roles which form the semantical rules for the systems concerned. Intonations have, among other roles, more to do with modality and thematic structure in dialogue than with mood; there are, however, grounds for supposing interrelations between modality and mood, for instance, to exist, and intonations could be related in this more devious way to illocutionary force indicating devices. System congruence is not correspondence, however; if intonation patterns help point to the appropriate interpretation of illocutions (in particular displaced illocutions such as that in the hackneyed example of *It's draughty*, interpreted as *Shut the door, dammit*) on occasion, this occurs via non-illocutionary categories.

An approach to a more positive characterisation of the roles associated with call contours may be sketched in the following terms. If the role variables available for the description of utterances are regarded as de-

fining (in a metaphorical manner of speaking) a functional space within which particular utterances are located, then fulfilment of the kind of condition, with associated semantical rules, which Searle postulates for illocutionary acts may be seen as specifying standard positions in this space, i.e. certain kinds of stock use (cf. §1.2.5.3. above). There are various interpretations which may be given to the term 'stock use', but the one which is most pertinent here is close to Austin's 'felicitous': patterns are used infelicitously in various ways depending on which of the conditions for felicitous use are not fulfilled. To take Searle's sincerity condition by way of illustration: a felicitous use of a declarative sentence as a statement will be sincere, while an infelicitous use in terms of this condition will be a mendacious statement (questions of truth and falsity are, of course, semantic questions and as such distinct from the pragmatic considerations of mendacious statements, though closely related). In a less restricted model, a third, or a fourth, &c., variant, or a re-analysis as a system of other variables, could be used (cf. the complexity of the notion of white lie). The only way this kind of distinction could be marked in communication (apart from reconstruction of inconsistencies) would be at a fairly primitive level of self-betrayal by signs of uncertainty or embarrassment. Such naturally-based marking relations would clearly have connexions with illocution-marking, but these connexions would be considerably more abstract than has generally been held.

This approach is particularly useful in the description of call contours. These contours index the non-stock use of a number of linguistic forms, i.e. the presence of a non-stock or marked variant of the role variable, in respect to the condition that normal input and output conditions obtain (Searle's first condition). A fuller analysis of this condition than given above would reveal it to be a whole system of role variables; the particular variable involved here may be referred to as the 'earshot condition'. This condition specifies the stock value of a role variable as being face-to-face communication with low noise background; in non-stock cases, the addressee would be taken to be almost out of earshot, but still reachable without non-verbal aids. Other role variables may be related to phonetic types in similar ways; with some of these, there will be a scale of variation within the role variable, reflected directly by the parallel scales of type variables; call contours of the kind under discussion tend to be discretely different from other kinds, because of the stability of phonation in their production, but some gradient variation occurs towards the end of the contour, optionally, and is in a natural relation (cf. §1.2.4. above) with role variation. Gradient parallelism of role and type may be thought of as iconic signification; if there is a more direct relation than simply structural parallelism, then indexical elements may be said to be also present, the two categories of index and icon being regarded as mutually compatible terms (cf. §1.2.4., esp. Fig. 4, above). Such patterning has been described particularly by Bolinger (e.g. 1961), Trim (1964, 1970), and Crystal (1969:201ff.). As the present analysis of call contours has shown, however, it is not necessary for natural type-role relations to be accompanied by gradience.

The second part of Searle's first condition, and Searle's elucidation, was given some prominence above; it is a development, via Grice, of what Austin termed "securing of uptake" (1962:115f.):

Unless a certain effect is achieved, the illocutionary act will not have been happily, successfully performed. This is to be distinguished from

saying that the illocutionary act is the achieving of a certain effect. I cannot be said to have warned an audience unless it hears what I say and takes what I say in a certain sense. ... Generally the effect amounts to bringing about the understanding of the meaning and of the force of the locution. So the performance of an illocutionary act involves the securing of uptake.

Searle's explication of the notion of illocution makes it clear that the securing of uptake is a prerequisite for a successful illocution, and thus provides a more precise way of conceiving it than is given by Austin's "involves"; it is not to be identified with the illocution itself. What was referred to above as the 'earshot condition' is clearly one of the many aspects of securing uptake, and the indexing of the marked status of an utterance with respect to this variable by means of call contours may be interpreted in terms of an overall strategy for the securing of uptake. The same applies to those contexts in which the chromatic call contours are used without any urgent physical necessity, in German; the basic principle is simply generalised to other aspects of the securing of uptake. No longer is physical distance, i.e. the earshot condition, the only variable which is relevant; a further variable, or indeed a further system of variables, which it is convenient to refer to as the 'uptake condition' on successful illocutions, comes into play.

The present interpretation of call contours in terms of marked variants of a role variable defined in terms of the uptake conditions can easily be extended to the analysis of other forms than call contours, and other systems than intonation. It is sufficient for present purposes, however, to have pointed out for this particular corner of English (and of German) that the function of call contours is to be understood within the overall strategy of securing uptake - in effect, as markers of the speaker's opinion that uptake is not yet regarded as satisfactorily secured, a status quite different from that of an illocutionary force indicating device. What progress the present discussion has made along the route of explication of the term 'speaker attitude' is therefore to be seen, it could be added, as a plea for a more subtle approach to the description of the ways in which intonations contribute to speech acts than has hitherto been followed. Further, it may be seen as a plea for a less cavalier treatment of the intonational facts than has been meted out on many occasions on the past in the name of linguistic analysis, particularly with regard to the explicitness of formulations of syntagmatic role criteria of analysis.

5. CONCLUSION

In the preceding four chapters a general strategy for intonation analysis was developed; the major elements of this strategy were on the one hand a flexible framework of categories for formulating a wide variety of criteria of analysis for intonation, and on the other a close reading of a large number of earlier analyses in a search for received methodological and empirical insights and observations. The further development involved the application of the basic analytic framework to the treatment of three specific problems. The first, the question of levels and contours, prompted the formulation of a flexible notational system for intonational and accentual patterns; illustrations of the use of this system in various systems, and with a number of minor modifications, had already been given in the presentation of earlier accounts. One of the open questions in this connexion is that of the syntax of intonation and accent systems, i.e. their structure; apart from the reductionistic theories which relate intonation structure to syntactic structure, in the linguistic sense of 'syntax', and which are not adequate to account for the majority of intonational facts, there has been little work done in the field. As a pointer to further work, a number of important and similar (though in several respects conflicting) accounts of intonational sequences and hierarchies were juxtaposed in Ch. 3, from Kingdon's "harmonious sequences" through Crystal's theory of subordination to Bolinger's ideas on relative height. In the treatment of the second problem, that of the analysis of fall-rise contours, a fairly small segment of the problem was examined; the important issue, from the point of view of method, was the finding of different selections of criteria of analysis, defining different levels of analysis for the analyses of users of these different selections, leading on to a discussion of some of the major aspects of system congruence. In treating the last of these three specific problems, an attempt was made to explicate the term 'speaker attitude' in one small, clearly delineated corner of intonation, that of call contours.

Although one important neighbouring area of prosodic analysis, accent, was not in the forefront, the present study provides a useful starting point for further investigation in this area. On the side of methods, the wide range of quantitative methods available were neglected, both in the phonetic field and in the field of functions; although such studies date back a considerable time, going back at least to the phonometricians, they must nevertheless, in comparison with other areas of linguistics, be regarded as only just emerging from their infancy. The past decade has seen great progress in this field, however, and quantitative methods will undoubtedly provide the key to a good deal of progress in intonation research in the future.

The main categories introduced in the first chapter for intonation analysis, designated 'type' and 'role', with the derived categories of 'structure' and 'form', provided a useful organising principle for the internal organisation of that chapter and for the organisation of subsequent chapters. Although the distinction between the two main categories is, in other, less neutral terminology, a commonplace of linguistic analysis, it is not always clearly made in the area of prosodic analysis, as was pointed out in introducing these terms; many terms used in prosodic analysis have an unfortunate type-role ambiguity in everyday usage which is all too often transferred to linguistic description, especially in the case of those descriptions which treat intonation as a fringe phenomenon. This ambiguity

makes it essential for the investigator to be aware of what type criteria of analysis are available in order to avoid slipping into the twin errors of overgeneralisation and the over-hasty postulation of type-role correspondences by the use of role categories in description where type categories belong. Although relatively little systematic work has hitherto been done on the formulation of explicit role criteria of analysis, a good deal of work on types, and perhaps even more on the structures based on intuitively grasped paradigmatic role and type criteria has been done; discussion of the type side in the second chapter provided a starting point for discussion of accounts of intonation structure in the third chapter, where a wide variety of different approaches (it might almost be said that every investigator has his own metalinguistic idiolect in this respect) was found, but also a fair degree of consensus on important matters. Although the degree of consensus should not be overemphasised, it was sufficient to provide a range of explicanda for further discussion, in the fourth chapter, of some of the role criteria of analysis on which the accounts of intonation structure were, in part, based. In this chapter, the problems of making the criteria of analysis incorporated into discovery procedures for intonation as explicit as possible were analysed. In the course of discussion, useful distinctions between paradigmatic and syntagmatic role criteria were developed; certain aspects of the selection of criteria, including the notion of system congruence as a step towards an explication of simplistic notions of correspondence between intonational and other systems, were treated; finally, the possibility of taking certain primitive role categories at least a certain distance along the road of explication was demonstrated.

It is the last of these aspects which is likely to prove most fruitful for intonation analysis. Although the range of intonations dealt with was quite limited, both in number and in characteristics, the partial explication offered at the end of the previous chapter can be seen within the wider context of intonation description, in which intonational and other prosodic forms may be interpreted as fairly direct markers of a range of characteristics of the utterance and the utterer, rather than as vehicles for a message of the kinds conveyed by lexico-syntactic items. This conception is incipiently present in Bloomfield's conception of intonations as secondary phonemes, or modifications; related ideas can be traced, not only in relation to intonation, but also in relation to other systems, prosodic and lexico-syntactic, in linguistics as well as in writings on the philosophy of language, and may be summarised in the words of Wang, which have already been quoted (p. 15), but which may be repeated here for convenience of reference (1971:274): "... intonation provides the speaker with another channel of communication by means of which he can express a more personal commentary on the sentence he is producing". Similar views can be found elsewhere (cf., e.g., Nehring, 1946; Jassem, 1952:27, quoted above on p. 156; Sharp's "conphonational formulae", 1960:108 in the context of word stress; and many others). This is an initial step towards explication of the notion of speaker attitude; it was shown in §4.3.2. above that explication can be taken much further than this, however. The items described in such an explication can be seen in certain relations to speech acts which are fairly exactly specifiable; for items described at this degree of explicitness I propose the term 'metallocutionary indicator', which, in the company of the by now well-known terms 'locutionary', 'illocutionary' and 'perlocutionary', has a fairly obvious interpretation, which may be made clearer by reference to the discussion of the roles of call contours in the preceding chapter: metallocutionary indicators mark the status of an ut-

terance or part of an utterance within a dialogue, in certain limited ways which can be defined in terms of conditions on successful performance of speech acts. As it stands, the thesis is very general; it can be given further precision, but only by further detailed discussion and explication of the role categories used in intonation analysis. This task must be reserved for a separate study (in preparation), though an indication of the themes which such discussion would tackle is in order here. The prime candidates for further explication are the accentual and emphatic systems which mark out dialogue structure, and for which the old terms 'integrative function' and 'delimitative function' may serve to indicate useful explicanda; further kinds of metalocution, which are more closely related to those discussed in §4.3. above, are the quotation and dequotation markers, and the notion of editing devices, discussed by Hockett (1968:91ff.), as well as the whole field of tags and adjections (Kingdon, 1958), which have not been treated in the present study; the difference between neutral and appraisive apposition, for instance, would fall into this category. As part of an overall discovery strategy it is also useful to entertain such notions as Cantrall's suggestion (1969) that pitch levels are used as referential tags; this is an imaginative, though empirically quite unmotivated (cf. in particular §4.2.1. for the problems involved) hypothesis about one possible metalocutionary function of pitch patterning, and (cf. Feyerabend, 1963) without imaginative new hypotheses progress is inconceivable.

Beyond this perspective, there is the wide open field of intonation universals, formal and substantive. There is a considerable quantity of literature on the latter, mainly in the form of comparative and contrastive studies relating two or three languages; the most stimulating review and discussion of this field has been given by Bolinger (1962). As far as the former are concerned, much work remains to be done before the kind of explicitness is reached which can be found in generative studies of syntax. That there are universals of both kinds in intonations can hardly be doubted; such universals are generally presupposed even in the heuristics of structuralist analysis (albeit implicitly, in most cases) for the initial identification of linguistic forms (via the notion of utterance). An interesting case of such heuristic use occurs in Chomsky's list of operational criteria for grammaticality (1957:16). Many aspects of the universals discussion have been touched on above, particularly in the first and second chapters (esp. §§1.3., 2.3.-4.), but also in the fourth chapter in the discussion of componentialisation. The framework of categories of analysis introduced as an organising principle in the present study embodies, in fact, claims about the various kinds of intonation universal, including rudimentary formal universals concerned with the internal structure of intonation variables (e.g. gradience vs. discreteness), or the type-role relations which obtain (e.g. iconicity, indexical relations, &c.). It would be attempting to do more than is at present possible to try to give an explicit account of intonation universals, or to outline a theory of explanatory adequacy for intonation within which they would have their place, as pointed out in §1.3.2. above. It is to be hoped, however, that the present study has provided a sufficiently solid basis, and enough pointers towards fruitful approaches to intonation analysis to bring such a goal at least into the middle distance.

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