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On the Grammar of Intonation

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Since the publication of my first structural studies of English intonation[1] various theoretical principles have developed in connection with my work with grammatical and phonological data. This paper suggests how these principles might illuminate, in retrospect, some of the empirical problems reported earlier. The over-all approach embodying these concepts I shall call tagmemic[2] theory.

1. *Particle, Wave, and Field*

Perhaps the assumption most crucial to the tagmemic approach is that language structure – and all of life's behavior – is far too complex to be seen completely through any one simple model. Three perspectives must be utilized. The same data at different moments are best seen as *particle*, and as *wave*, and as *field*.

Nor is one perspective independent of another. The insights gained are neither separable from each other, nor simply additive. When one approach comes into focus, the other two must necessarily comprise its background. No logical progression can lead from one – isolated – to the others. They complementarily reside simultaneously in permanent relation. If one is taken as starting point, the others are somewhere, in some sense, present as undefined terms or as unstated assumptions.

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[1] See Lit. 7, Vol. 1: Pronunciation; revised and incorporated in my *Intonation of American English* (Ann Arbor, 1945). Page references in this paper refer to the latter volume, unless otherwise specified.

[2] Named after one of the units of the theory, the tagmeme, for which see my *Language in Relation to a Unified Theory of the Structure of Human Behavior* (see Lit. 9).

1.1 *Intonation as Particle*

The particle perspective leads one to perceive intonation segments *as if* they were static bits. Through it one finds phonemes of intonation – if his assumptions leave room for any phonemes at all. From this implicit perspective come our four levels of contrastive pitch (§ 2.1), which we shall here symbolize as E(xtra-high), H(igh), M(id), L(ow)[3].

The particle perspective yields lexical and grammatical segments, as well as phonemes. Symbolization of a primary contour such as °M-H represents a lexical particle, a morpheme. Its formal character comprises pitch movement from mid to high over the marked segment, beginning with the primary stress represented by the degree sign. Its semantic components include 'incompleteness' and 'sequence'.

The re-casting of the intonation morphemes into classes of forms filling specific grammatical roles – the presentation of grammatical tagmemes each with its relevant functional slot and appropriate class of fillers in an intonation construction or set of constructions – constitutes one priority task for grammatical analysis. The "stem" tagmeme in intonational "words" (cf. § 3) may be one such tagmeme, one particle in intonation grammar.

1.2. *Intonation as Wave*

The wave perspective leads us to see units of intonation as *dynamic*, flowing morphemic contours, or as relevant phonemic points in such contours. Peaks of the waves comprise nuclei[4] of the contours; ends of waves, or troughs between them, comprise margins of the contour units. In L-°H-L-M, for example, the nucleus is marked by the degree sign before the stressed syllable (27–28); premarginal and postmarginal components occur at L- and -M. Change points – the intonation phonemes – occur at L-, °H-, -L-, and -M; a sequence of a dozen syllables might still have only these change points, with pitches of the other syllables fitting into the curve with indeterminate levels.

[3] To correspond to our numbers 1, 2, 3, 4 – high to low – of 1945. We avoid the numbers here to lessen confusion with the works of authors who represent these levels by the symbols 4, 3, 2, 1. A glide or step from one phonemic level to another is shown as a combination of symbols, such as M-L for mid to low.

[4] See Lit. 10.

Merging of two contours leads to a syllable in double function which occur as the end margin of first and beginning margin of second contour. Note the indeterminacy – the double function – of -M- in M-°H-M-°H-L, for *The 'book of 'stories* (37, 67) from slow M-°H-M M-°H-L (where an intonation break between -M and M- makes the juncture determinate).

1.3. *Intonation as Field*

A field perspective leads us to look for dimensions[5] of contrast in networks made by the intersecting of categories of form and of categories of meaning; for system resulting from intersecting hierarchies[6] of lexicon, phonology, and grammar; for style output resulting from intersecting dynamic and intonational factors; for the intersection of voice quality[7] with the emic structures of segmental and suprasegmental characteristics. Such a task cannot be attempted in a short paper, but one suggestion may be given for each of these kinds of data.

Intersecting dimensions: Matrix 1 is constructed of primary contours from a subset of primary contours which have no internal change point. Their contrastive beginning points comprise vectors of one dimension and their contrastive end points the other. Interesting semantic relations[8] show up as shared meanings of blocks of cells in the matrix. The diagonal matric elements are all level contours. These often have meanings of 'unification' and 'implication' (61, 64). All lower diagonal elements are rising contours, with a class meaning of 'incompleteness' (51–60). Upper diagonal elements – all falling – carry the class meaning of 'attention'. The upper row and lefthand column, with E, carry 'intensity' (47) or 'surprise' (49) as class meaning – but this may be weakened or idiomatically specialized in °H-E and °M-E to 'politeness' (51, 59). The lower row (with initial L) has class meaning of 'deliberateness' (54–55) possibly with weakening on the °L-L (cf. 62–63).

Intersecting hierarchies: The place where the nuclear, stressed syllable of a primary contour may fall is in general determined not

[5] See Lit. 11.

[6] See Lit. 9, Vol. 3, and Lit. 12.

[7] See (99–103), and Lit. 9, Vol. 3, §§ 13.4, 13.81.

[8] The semantic components are drawn from the 1945 volume since we are interested in studying the old data in the light of the newer outlook. If this task can be finished, new and profitable research tasks should then appear.

	-E	-H	-M	-L
°E-	°E-E	°E-H	°E-M	°E-L
°H-	°H-E	°H-H	°H-M	°H-L
°M-	°M-E	°M-H	°M-M	°M-L
°L-	°L-E	°L-H	°L-M	°L-L

Matrix 1. Primary contours. Internal blocks represent semantic groups, for which see text.

by the system of pitch contrasts but by the element of the lexical hierarchy (27, 77, 84, 118). Such placement of stress may be changed only by intersection with a further superimposed dimension of contrastive placement of stress (84, 124) (as in *I said 'divert not 'revert*, rather than normal *re'vert*, and *di'vert*). Breaks between intonation contours often reinforce breaks between grammatical constructions rather than interrupting them, illustrating intersection of intonation with the segmental grammatical hierarchy. Reinforcement occurs in such an instance as:

The manager sold him the book
M- °H -M °H- -M M- °H-L

in which each phrase included in the clause begins and ends with an intonation contour. Clash between grammar phrasing and intonation is exploited when the last syllable of a line of a poem is lengthened when the line is without grammatical relevance (11); or when the expected pause or juncture between sentences is delayed until after the first word of the second, to prevent an interlocutor from 'getting a word in edgewise'; or when a juncture occurs after a preposition or determiner but before its accompanying noun, so that attention falls most strongly on the noun (as in some advertising announcements).

Intersecting dynamics: We have already mentioned (§ 1.2) that two contours can fuse, sharing a syllable. Here we add that a speed change forcing such smearing can itself be viewed as an intersecting dynamic factor. When such fusion is in analytical focus, a wave perspective becomes dominant in relation to the manifestation of the units in sequence.

When a style with syllable timing (35, 71, 109) leads to syllables of approximately even length, it contrasts with a more normal American English style with stress-group timing (35, 109) in which primary contours (with or without precontours) are of approximately even length (unless a double nucleus is present in the contour). Style dynamics intersect with normal intonational structure.

To some extent special emphasis (85–86) can be viewed as a style change. Greater differences, however, are brought in where formal or deliberate or casual attitudes are reflected in assignment of primary contours or their internal manifestation. When two sentences are deliberately pronounced so as to be simultaneously present in a single homophonous utterance, puns may develop which require specific intonations for the coexistent actualizations (45–46).

Voice quality differences – harshness, and so on (99–104) – add further intersecting dimensions to the total field perspective of speech.

2. *Unit*

Closely related to the assumption about particle, wave, and field is one about the nature of units. Any unit – whether an event, a thing, or a concept – is assumed to be well-known if and only if the analyst knows[9] 1. its contrastive-identificational features, 2. its range of variability with concomitant physical manifesting components, and 3. its distribution (a) as a member of class, (b) in slots of an appropriate set of environments, (c) with relation to a network of intersecting vectors of an emic system (i.e., an emic matrix).

2.1. *Contrast*

A unit itself as thus defined becomes a particle perceived (or a construct conceptualized) by an observer. An observer component implies coordinates specified from within the system for an emic view, but from outside the system for an etic view. No "thing-in-itself", studied apart from an observer relationship, is treated by the theory.

It is an observer relationship that requires that a unit be

[9] For application of the criteria to constructions, see Dimensions... (Lit. 11).

contrastive. A unit is not perceived for what it is, until it is perceived for what it is not. This theory allows a component to be used as identificational in contexts where the contrast does not occur, after it has been established as emic through use of contrastive contexts. This specification of the theory allows the equating of units from one context to some others even when contrast is neutralized.

Four contrastive levels of intonation were postulated in my analysis. Fewer would not leave room for the difference of function within any one general height of speech, and within one style. More levels added no new contrasts within such a style. (But general voice height could change a style as a whole – 76–77 – with all levels changing with it to higher, lower, spread, and so on.)

Primary contours are seen as units of a different – lexical – hierarchy of the intonation system. These contrast with each other in form (e.g., °H-L versus °M-H) and in meaning (normal attention, 44, versus incomplete sequence, 51). Tagmemes of intonation contrast in their structural role (primary contour tagmeme as the stem of intonation "word", versus precontour as intonation "prefix"; see §§ 1.1, 2.3).

Since the contrastive levels as phonemes and the contrastive contours as morphemes were treated above (§ 1.1) as particles, it becomes evident that theoretical particle and theoretical unit overlap as constructs in the theory. Particles and units result from alternative perspectives to be exploited when changing purpose makes one or the other the more advantageous. The advantage, in turn, will be determined by desirability of further relating the elements in view to an immediate context which will profit more by relation to a discussion in terms of related wave and field, or one in terms of correlated variation and distribution.

2.2 *Variability*

Just as contrastive impact is in part closely integrated with perspective as particle, so the range of variability of a unit is closely integrated with a wave perspective. Units which merge or fuse at their borders must be identified, with the help of an observer component, as waves of physical activity against an emic background. The peak of the wave becomes the nucleus; segmentation may be indeterminate or arbitrary – see above, § 1.2, and fn. 4. Since the merging into varied environments (via anticipation or delayed decay of contrastive movements in sequence) leads to a

difference in manifestation for the unit in each of its environments, range of variability is correlated with the wave character of units.

The theory requires a physical component for each unit. Neurological activity may serve as the physical component of concepts.

Yet the overlapping of phoneme wave units (from the perspective of segmented particles) may lead either to a redundancy of contrastive features or to alternate analyses of the essential contrasts. Alternate analyses of phoneme segmentation may arise when a total unit-as-wave, including its anticipatory and decay components, is analyzed as unit-as-mere-physical-segment. In this instance, one or more anticipatory components of a first wave which are simultaneous with the peak of a second wave are treated as contrastive components of the first rather than being abstracted and treated as part of the second. In such analysis the underlying assumptions may include a particle view which is much too crude, with too-sharp physical, linear segmentation without adequate wave and field components in relation to observer. An adequate view must treat a particle as itself an emic abstraction, allowing for etic smear and overlap via wave form: under some conditions, transition characteristics of a vocoid segment must be attributed to the following contoid which it in part anticipates.

Assumptions concerning the nature of definition must be revised in order to leave room, within a well-defined unit, for range of variability, wave overlap, redundancy, and indeterminacy of borders or of class membership. Specification of a unit, by this theory, requires statement of variability of a unit. The theory parts company with any treatment of definition which is satisfied whenever the definition includes just enough data to specify membership within a class and differentiation of the members of the class. These latter elements are important but insufficient for specifying enough characteristics of units to allow a member of the community to act adequately within the roles of that community. Adequate theory must lead to possibility of adequate "accentless" action. It must be generative of adequate bits – e.g., sounds and sentences – and the much larger behavior elements within which these take their appropriate place.

Specification of the variability of units is highly relevant to intonation studies. Wave characteristics of a contour such as °H-L, coupled with its application to elements ranging from one to

several syllables in length, result in variant manifestations both of contour and of its included intonation phonemes. A one-syllable phrase manifests the contour as a down glide (24), a two-syllable phrase, as a down step (24). A multiple-syllable phrase appears either as a slow series of descending steps or as a series which varies from somewhat delayed – or somewhat earlier – drop (74), and so on (with indeterminacy as to the point where early drop or rise becomes contrastive).

Sound-wave frequency comprises the physical component of intonation. Relevancy, however, involves relativity to the observer (with speaker being a special instance of observer). General height of pitch (76–77) and spread of interval (76) differ according to general style or personal characteristics of the speaker, and affect the height manifestation of the intonation phonemes. These kinds of differences, also, enter the specification of the range of variation of an intonation unit.

2.3. *Distribution*

The distributional component of a well-defined unit is closely correlated with the notion of a perspective of language as field, or system. The system in which units are embedded may be considered both in a static subperspective, or in a dynamic one.

As elements of a static field the units might conceivably be defined in terms of forces of repulsion and of attraction. Emic contrast – opposition – involves psychological, observer forces which keep units apart. Negative definition[10] places units as points in such a field of forces.

Positive forces of psychological attraction would, on the contrary, draw etic elements into a single emic unit[11] as allo-units.

[10] See *Eugene A. Nida's* penetrating concept of the tokens of one morpheme as sharing a 'common semantic distinctiveness' from other morphemes (see Lit. 6). Compare *Leonard Bloomfield's* earlier negative definition, with contrastive morphemes bearing 'no partial phonetic-semantic resemblance' (Lit. 1).

[11] Which leads to *Nida's* earlier (p. 6) – and conceptually easier – use of a more traditional rule-of-thumb for morphemes as 'minimal meaningful units'. Compare *Bloomfield's* 'smallest meaningful [lexical] unit' (p. 264).

Perhaps the "positive" definition seems the simpler if one wishes purely a particle perspective. The essential nature of the negative definition becomes easier to grasp from the perspective of field. Both negative and positive are, however, necessary for well-defined particles, and both are necessary before field can be fully treated. Positive and negative perspectives become complementary in description, as do particle, wave, and field.

The allo-unit variants would be distortions of the emic units under diverse conditions of the field. The requisite conditions, in turn, would include specific orderings of the units in various sequences, where they affect one another.

Patterns of attraction may be represented as lists of emes accompanied by their respective allos. Patterns of repulsion show up as static charts in which contrastive vectors of dimensions represent a structural network.

A dynamic perspective of a unit's distribution leads to a treatment of units moving through a field. This concept is seen most easily in reference to the special case of a sequence of tones relevant to each syllable of a tone language. Let us suppose that there are four phonemic levels of tone. One tone occurs on each syllable. Each syllable may be viewed as a "fence" across the tone "field" which an utterance must pass through by way of one of the four "gates" (one of the four tones) which occur at possible choice sites – at any one syllable place – unless in some particular fence there are fewer, where contrast is "neutralized". The pitch melody picks its way through these gates[12].

English intonation units have distributional relations which can be viewed both statically and dynamically. Statically viewed, intonation contours are members of classes of contours. The primary contours comprise a class contrasting with precontours (29–30) and with composite units named as total contours (30). In a static view, also, one sees the units as appropriately filling slots in intonation constructions – as a total contour may be a construction made up of a precontour plus primary contour (e.g., M- plus °H-M for *It's a 'table*). The static view of distribution includes, furthermore, the place that a contour fills in an intonation matrix (see § 1.3).

Dynamically, on the other hand, the English intonation melody, like tone, may be treated as moving through a contrastive field of four alternative levels. At the same time, however, it moves through a set of grammatical and lexical intonational forces. The interlocking of segmental grammar with contrastive pitch, in which interpretation of segmental grammar-constituents or junctures is

[12] See figure 3 in my Operational Phonemics in Relation to Linguistic Relativity (Lit. 13). See, also, figure 5 for simultaneous multiple pathways through a complex of subsystems.

A related approach to this kind of problem is seen in *E. Colin Cherry, Roman Jacobson's* 'Distinctive Features' as the Normal Co-ordinates of a Language (Lit. 3, pp. 60–64).

affected by intonation constituents or junctures, points in this direction[13]. Similarly, the intonation system interlocks with the stress system in that primary contours of the intonation system begin with a stressed syllable. A stressed syllable is shared[14] by a unit of the rhythmic system, as a nuclear point of such a unit.

3. *Levels of Intonational Grammar*

The interlocking of intonation structure with the segmental grammar, however, should not be allowed to obscure the fact that *the intonation system has concursively a grammar of its own.* Intonation grammar involves its levels of construction, with tagmemic components in the sequence.

Morphemes (cf. 177, concerning *Harris*) of intonation, which comprise the classes of forms which fill the tagmemic slots, have contrastive forms and contrastive meanings. The formal component of an intonation morpheme is its phoneme sequence – the intonation of contrastive levels at key points in a contour. The semantic component of the intonation morphemes and of morpheme classes derive from the intersection of contrastive meanings of the semantic field (§ 1.3).

A primary contour such as °H-L typifies the "stem" of an intonation word; the precontour M-, an intonation "prefix"; the total contour M-°H-L, the "word". The stems are free, not requiring a prefix; the intonation prefixes are bound, occurring only with an intonation stem (or in a hesitation form, 32–33, 40). Intonation "suffixes" occur as resumed contours (72, 39, 41) which echo the end of a primary contour, without an additional primary stress, and without added semantic components; note *in the house* in *The class studies in the house (but...).* Postcontours are, similarly, M- °H- -L-M L- L-M

suffixes occurring after a slight pause (cf. 65, 74, 40).

Do it your way then, he said.
M- °H- -L / -L

Compound intonation words occur when two (or more) primary stresses occur in a single rhythm unit with no intervening junctural drawl or junctural decrescendo:

[13] I have further illustrated this phase of the intonational problem in The Hierarchical... (Lit. 12).

[14] See reference to article in fn. 6.

a 'big 'table; a 'big 'black 'bug
M-°H °H-L M- °H °H °H-L

(61–62, 78, 39). Within the style and dialect recorded here (normal to me) the first stressed syllable, in my continuing perception of it, is level in pitch and stress with the next syllable. Many American scholars, however, fail to hear any such level stresses, interpreting them all as sequences of secondary-primary, or primary-secondary; when they repeat these sequences aloud to me, they fail to satisfy me, as native speaker, but make one or the other too loud and high. (I also have a few such compounds in my speech on single segmental morphemes such as *'sar'dine*, or *'um'brella* or in *'fif'teen 'men*, 77, 62.) For compound pronunciation, the first stressed syllable must be pronounced short; when drawled it breaks the expression into two contours (and other scholars then are more likely to hear the two stresses as level, with juncture between). In relation to the dynamics of rhythm units, the level stresses are treated as a double nucleus[15].

Levels higher than that of the intonation word are still obscure. It is tempting to try to relate them to pause groups. This often fails, however, since a pause may come even within an intonation word (e.g., before an intonation suffix; 33, 40–41, 74–76). Presumably, therefore, intonation phrases, intonation clauses, intonation sentences, and intonation utterance-response and discourse levels (if some or all of these emerge in analysis) must turn up as some kind of functional interrelation of intonation words in sequence. Miscellaneous instances abound, but their over-all pattern is not yet clear.

Note, for example, the unity of the taunting chant (35, 71)

Susie is a tattle tale;
°H- -H °M- -E °H- -H °M- -M

or of a descending stress series with more than four levels (70) – perhaps to be treated as an idiom, since it does not otherwise seem to fit the system; or the singsong °M-H °M-L (72); or the double rise (73–75); recurrent level contours in threat (cf. 87) or in repeated fall-rise contours (cf. 87); of alternative proposals in sequence (47); of higher unities in mathematical oral bracketing (62).

When the sequence arrangements of these contours and others

[15] See fn. 4.

have been more fully understood, it should be possible to describe the tagmemes (with their manifesting classes of contours) and the larger constructions into which they fit.

In sum, I suggest that it is time for intonational structure to be restudied in view of newly-available theoretical perspectives. These should lead to discoveries and descriptions substantially beyond our earlier structural insights.

In addition to conceptual tools through complementarity of particle-wave-field and of unit as well-known through contrast-variation-distribution, search needs to be made to see how these approaches could profit from recent empirical work of scholars such as *R. Kingdon*[16] or *W. Jassem*[17]. The transformationalist[18] approach, furthermore, might help to illuminate some of our former problems concerning the relation of intonation to potential and partially suppressed stressed (11, 87, 189[23]), and the relation of intonation to length (96-98) or juncture (30–33, 37, 40–41) or to stress in lexical and grammatical forms (78–88, 188[118]).

The largest gap in theory, so far as I can see it now, is the need

[16] See Lit. 5. *Kingdon* by his symbolism more effectively keeps a close tie between stress placement and the nucleus of a primary intonation contour than do writers such as *George L. Trager* and *Henry Lee Smith* (Lit. 15). *Kingdon* also (68–99) discusses numerous instances of "tune combinations" which should be studied for suggestions as to structural groupings which could be used to illustrate intonational clauses or other levels than that of intonation word.

[17] See Lit. 4. *Jassem* (40, 45) has some criticism of my handling of rhythm units which would in part be met by a handling of intonation in hierarchical levels as we have suggested here. His compound tonal units (54) give suggestions which would contribute toward a level higher than intonation word, but his treatment does not go further; his texts, marked for intonation (63–82) are not analyzed for possibilities of still higher structural groupings. His nuclear tunes (57–58, 60) are closer to the model of *Palmer's* work than to my primary contours. He also treats (46–47) free and conditioned variation.

The work of *Dwight L. Bolinger* is less useful here, since his assumptions about the nature of intonational structure are further removed from ours, but his comments about pitch and stress (e.g., in A Theory of Pitch Accent in English, Lit. 2) cannot be ignored in further work.

[18] For an initial attempt to add an intonational component to generative and transformational formulas see *Robert P. Stockwell* (Lit. 14). Unfortunately, for our purposes, he has an a priori assumption that ties intonation breaks somewhat too closely to grammatical ones: 'the validity of transformations which do not thus neatly predict intonational breaks may be seriously questioned' (365). This fails to leave sufficient freedom for an adequate concursive intonational grammar in which intonationally well-placed junctures sometimes occur at segmentally awkward spots; and interrogatives occur with a large variety of contours (not exclusively a rise, only, for yes – no questions – see *Stockwell* 366, versus my extensive data in 1, 53–54, 163–168, 176[40]).

for adequate explanation of the reason why several native observers reach quite rapidly a high degree of consistent agreement on the contrastive phonetic content of a segmental sequence (even though their phonemic interpretation of these data may differ) but find it much more difficult to agree on or be consistent in hearing the contrastive intonational data. Even in hearing the contrastive pitches of a tone language several foreign observers – once agreed on an analysis – may reach greater agreement than on the details of their own intonation. Presumably some theoretical insight or technology should provide a model or method which one day will allow intonation agreement as well.

References

1. *Bloomfield, L.:* Language (New York 1933).
2. *Bolinger, D. L.:* A theory of pitch accent in English. Word *14:* 109–149 (1958).
3. *Cherry, C. F.: Roman Jakobson's* 'Distinctive features' as the normal co-ordinates of a language, in For *Roman Jakobson* (Mouton & Co., Gravenhage 1956), pp. 60–64.
4. *Jassem, W.:* Intonation of conversational English (Warsaw 1952).
5. *Kingdon, R.:* The groundwork of English intonation (London 1958).
6. *Nida, A.:* Morphology[2] 7 (Ann Arbor 1949).
7. *Pike, K. L.:* An intensive course in English for Latin-American students. Vol. *1:* Pronunciation (Ann Arbor 1942).
8. *Pike, K. L.:* Intonation of American English (Ann Arbor 1945).
9. *Pike, K. L.:* Language in relation to a unified theory of the structure of human behavior. Vol. *1* (1954), 2 (1955), 3 (1960) (Glendale – Santa Ana, Cal.).
10. *Pike, K. L.:* Practical phonetics of rhythm waves. Phonetica *8:* 9–30 (1962).
11. *Pike, K. L.:* Dimensions of grammatical constructions. Language *38:* 221–244 (1962).
12. *Pike, K. L.:* The hierarchical and social matrix of suprasegmentals, in For Professor *Doroszewski* (Warszawa Phon 1962).
13. *Pike, K. L.:* Operational phonemics in relation to linguistic relativity. JASA *24:* 618–625 (1952).
14. *Stockwell, R. P.:* The place of intonation in a generative grammar of English. Language *36:* 360–367 (1960).
15. *Trager, G. L.* and *Smith, H. L.:* An outline of English structure. Studies in Linguistics. Occasional papers 3 (Norman 1951).

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Discussion

Herdan (Bristol): I shall not discuss Mr. *Pike's* conception of the grammar of intonation, but I should like to say something about the three basic concepts he mentioned: particle, wave and field, because this will enable me to show how structuralism and mathematical linguistics are connected. In order to show how these are connected with the three levels of language, I shall show a diagram from a recent paper by *Longacre* which very aptly sums up the ideas and aims of structuralism. He calls it the 9-box schema.

	Particle	String	Field
Phonology	1	2	3
Grammar	4	5	6
Lexicon	7	8	9

When I looked at this, I realized that the structuralists call particle, string and field what the mathematicians call point, line, and relation between point and line in the plane respectively I believe that it is generally accepted among linguists that the combinatorial method which has been so fully applied on the phonemic level, does not work equally well on the other two. What is here meant by the combinatorial method is that morphemes can be conceived as random combinations of the basic phonemes as units, at least in first approximation, which must be supplemented by what we know about certain preferences between phonemes, that is, by digram, trigram, etc. analysis. But as I said, when structuralists tried to extend this to the combination of words, they were so far not very successful. In doing so they naturally tried to apply the combinatorics which had proved helpful on the first level. Now this is where they went wrong. The branch of combinatorics which is suitable for 26 alphabetic units of 40 phonemes, is not the right one for using with a vocabulary of perhaps 50,000 vocabulary items, as we have for English for example. Even as a first approximation, it would here be wrong to assume complete randomness of combinations, since words are not used randomly, but selected according to meaning, and this must here be taken into account right from the start. Such methods are available now, and I should like to demonstrate their usefulness for the linguist, but the time for my intervention is not enough for that. The same applies on the grammar level. There too, the branch of combinatorics must be exactly tailored, so to speak, to the peculiarity of the situation. Such a branch is also available.

I am quite aware of the possibility that some linguists will say that all this was perhaps not really useful to the linguist. It might interest the mathematician to express the relation in question in general terms as those of points and lines in a plane, but the linguist wants to go into detail. Well, I can only assure you, not having sufficient time for demonstration, that the new concepts are more than just new names put to old ideas. They are productive of new methods of research, and these methods are such that they will enable you to go into such details as you require.

In conclusion, I should like to say this. It was the non-mathematical linguist, as structuralist, who first used the terms particle, string, field, which, in this connection, I can show stand for what the mathematician calls point, line, and the point-line relation in the plane. From what I said it follows that if the linguist really means what he says when speaking about particle, wave, and field – and, clearly, if not he should stop using these terms –, there must come the time when combinatorial mathematics can no longer be avoided.

Buyssens (Bruxelles): Je voudrais d'abord dire à M. *Pike* que je trouve son exposé un des plus beaux que j'aie entendu depuis longtemps. D'autre part, je voudrais faire une remarque. J'attache une très grande importance à la terminologie que nous utilisons pour communiquer entre linguistes. M. *Pike* a employé les termes prefixes et suffixes pour désigner autre chose que ce que l'on désigne par là en grammaire; je trouve cela regrettable. Je préfèrais infiniment qu'il trouve des termes nouveaux pour ces notions nouvelles.

Kiparsky (Helsinki): Has Mr. *Pike* succeeded in establishing general patterns of intonation for American English only or do common patterns exist for several languages?

Jassem (Poznań): One may agree or disagree with Mr. *Pike's* paralells between the various levels of structural analyses, but there is no doubt that they are stimulating and

instructive. In this connection I should like to ask whether we would agree that on the level

1. of intonation there is only one hierarchic class, viz. the pitch phoneme to correspond to two hierarchic classes on the segmental level, viz. phonemes and distinctive feature. I suggest that while a segmental phoneme is, or may be, phonetically multi-dimensional, and thus form a bundle of distinctive features, a pitch phoneme is uni-dimensional because there is only one parameter to deal with, so that no need for the establishment of distinctive features arises. Or, alternatively, could we consider intervals, relations between pitches, quasi absolute pitch ranges, etc. as distinctive features of pitch phonemes?

2. By applying some of *B. Bloch's* postulates (see Set of Postulates, etc.) it is possible, I believe, to establish structural pitch constrats purely distributionally. Very roughly, different pitches and pitch configurations that are found in the same contexts (which have all contexts in common) are free variants. Different pitches and pitch configurations that never occur in the same contexts are contextual variants. Different pitches and pitch configurations that have some, but not all, contexts in common, are contractive. An attempt to apply these principles to the analysis of Polish intonation has been made by *M. Steffen-Batogowa* in Poznań. The study is now ready for publication.