

## MATRIX FORMATIVES IN N-DIMENSIONAL LINGUISTICS

Kenneth L. Pike

Adjunct Professor, University of Texas, Arlington  
And Summer Institute of Linguistics

A few years ago I was lecturing in Vietnam, and one of the scholars mentioned his malaise with what he called "Euro-centered linguistics". I have pondered that statement ever since, wondering if I could put my finger on the problem as perceived by him, but in relation to my own half century of working in America. This is my attempt to suggest the source of the difficulty, in relation to western linguistics from--say--1935 (when I started my work) into the forties, with suggestions as to how my own work has since then attempted to meet the problem by focussing on revised or additional approaches--some of which, of course, overlap with the work of other scholars, or were foreshadowed by them.

### UNITS VIEWED AS PARTICLES [CHUNKS] IN SEQUENCE OR SYSTEM

In grammar, emphasis in American linguistics has often been on languages with agglutinative morphology--with words which may have had various prefixes, plus a stem, and suffixes. For example, Nida, in his classic book on the analysis of morphology, says ([1946] 1949:101) that for Totonac (of Mexico) 'In the [verb] word kilila:pa:s^kí:qú:t "my necessity of loving them reciprocally" there are the following morphemes: kí-, first person possessive prefix added to nouns, li-...-t, a noun formative meaning "it is necessary," la:-, reciprocal prefix added to verbs, pa:s^kí:, the stem "to love," -qú:, third person object suffix.' ..The noting of the sequence of morphemes is typical of the focus of that time on a linear sequence of morphemes. Along with the emphasis on morphemes in linear sequence, there was also American emphasis on phonemes in linear sequence.

There was very little attention placed, however, on hierarchical arrangements of consonantal sequences within syllables (with some consonants more nuclear, versus others, more marginal to the sequence than others), plus hierarchical arrangement of vowels within those syllables (tied, in turn, to arrangements with tones), until Pike and Eunice Pike, for example, discussed such matters concerning Mazatec of Mexico (Pike and E. V. Pike 1947:81, where a word-initial cluster hnt- has hn subordinate to the t, and the three are subordinate to the following vowel or vowel set plus tone). Bloomfield, much earlier, had had substantial reference to syllables (e.g. 1933:120-25, 287-90), but--in my memory--this material did not seem to have much influence on a number of his immediate successors. Recently, however, scholars have worked on such materials in much greater depth. (See, for example, Hogg and McCully 1987:42, where the syllable has been 'organized hierarchically into Onset + Nucleus + Coda, where the latter two formed a Rhyme constituent.')

For the combination of English phonological hierarchical materials beyond the syllable, combined with the pitch of intonation on units which simultaneously include explicitly both paradigmatic and syntagmatic components for American English, In my book in 1945, there is included, above the syllable, rhythm units both simple and complex (1945:25-40, 44-106--"contours"); the material on pitch is there attached to and (in part comprises) the contours (and may be related to pauses, for example--1945:31, 40, 104, special contours 68-70, chants 71, and drift or spread of intervals 76-76). These items are syntagmatic. On the other hand, four phonemic levels--with paradigmatically replaceable contrastive pitch units--were treated there extensively (e.g. 1945: 25-26.44-75). The nucleus of a contour would have there been on a syllable which had one of the four contrastive pitch levels. Although a contour was made up of a sequence of paradigmatic (replaceable) bits, the total contour itself was in one sense viewable as syntagmatic, since it could occur as part of a sequence in larger unit; these larger units were themselves replaceable, hence were simultaneously paradigmatic as larger entities. Note the sentence He said he wanted to GO with me, which has high pitch and stress on the word go,

stepping down to low pitch on me, with the stressed syllable preceded by a sequence of mid unstressed syllables; then compare that with the same sentence with extra high pitch on the stressed syllable, or with low stressed pitch on that syllable followed by unstressed pitch rising on the end of the sentence. The sentences as wholes, also, can be substituted for each other (paradigmatically) for signalling different attitudinal overtones. But any one of these whole "normal" sentences is different from a chant such as SUSieIS a TATTLE TALE (1945:71). This chant begins with the high stressed starting syllable (shown by capital letters) of Susie, followed by high level unstressed end of that same word, followed by mid but stressed is, and then extra-high unstressed a, followed by the high stressed start of the word tattle which ends as unstressed high, followed by stressed tale which occurs on a level unglided mid pitch. The chant as a whole communicates a taunting complaint (and is well known by the children of the community). For an extensive summary of current viewpoints on British and American intonation, see Tench [1988]. For my own most recent discussion of paradigmatic versus syntagmatic views in relation to hierarchy, see Pike 1991, In Press.

#### UNITS OF STRUCTURE VIEWED AS WAVES

Thus far, I have been emphasizing units perceived as "chunks", that is, as particles which can be differentiated in relationship to their sequence one after another. The linguistic analyst, however, as observer of the data, can choose to look at the same units as overlapping (i.e. as merging, as non-separable units)--i.e. as waves of human behavior, with no actual physical gap between them. In phonology, one sound--before it is finished "in itself"--may in part anticipate the next one, partially merging with it. For example, in the words bit versus boy the /b/ of boy has the lips partly rounded in anticipation of the vowel following it. That is, the sounds may themselves be viewed as waves, with nucleus representing the most complete or psychologically important part of the sound plus the margin as the approach to it and/or the release from it. As I stated in 1943:107: 'A segment is a

sound...having indefinite borders but with a center that is produced by a crest or trough of stricture'.

Similarly, morphemes in sequence can partly affect one another phonologically (morphophonemically), as when the voiced ending of dog in English forces the plural /s/ to be replaced by /z/. Much of the technology for such a description came from the east--from India, via descriptions of Sanscrit, about three hundred B.C. (cf. Bloomfield 1933:11--'one of the greatest monuments to human intelligence').

It was not until 1959 that I introduced into linguistics the terms, from physics, of particle, wave, and field. I continue to find the terms very helpful--and am building the present article upon the assumption that they are metaphorically valid for this purpose. Note that, already, I have used a kind of chunking (particle) approach to mention sounds, morphemes, syllables, and larger intonation groups. But at the same time, I have already also referred to some of their wave characteristics, as nucleus and margin (e.g. a consonant as the margin of a syllable, with vowel as its nucleus), and the wave-like overlapping (partial fusion) between such units. (For a recent extensive discussion of rhythm units shown by various hierarchical notations, via metric phonology, see Hogg and McCully 1987.)

Further wave characteristics can be postulated for semantics--with a nuclear (or normal, or central, or 'proto-typical') meaning, along with more rare or marginal meanings, caused by wave-like fusion of central meanings to semantic contexts--not by fusion of sound to sound. For example, one may say run a race (with the normal usage of run) or run a business (with a marginal usage of the same word) in English. A wave view can also be applied to a story--with its climax as the nucleus of the story-as-wave, and its introduction as a margin of that same story.

A different kind of overlapping materials, from a different approach, can be seen when different levels (or tiers) of data merge, by having features or units from one of them move frontwards or backwards on to (or relative to) one of the others. Levels of segmental sounds, suprasegmental pitch, or subsegmental voice quality, interlock with

social situation, grammar, lexicon, and phonology (Pike 1963b:101-03), and may spread over each other (in changing patterns) by simple fusion, or by change of speaker attitude or focus (Pike 1945:101-03); or tones may be lost or moved to other morphemes by morphophonemic modification of lexicon under contact with other lexical items in sequence with them (Pike 1948:22-30, 77-92). The most extensive recent treatment of such matters is by Goldsmith (1990) who uses tree structures (relating tiers or grids or other graphs) to show by their branches a kind of assimilation, or harmony, or change of place in the larger structural sequence (e.g. Goldsmith 1990:22, for Mixtec, treating material from Pike 1948 in a new way).

#### **FIELD (OR MATRIX) STRUCTURES AND (PATTERNED) RELATIONS**

Unspoken patterns of units underlie spoken sequences of units, in relation to one another, stored somewhere in the brain. We draw on those patterns in order to speak, by putting units into hierarchical sequences. Many years ago patterns of sound systems, in phonetic charts, were made by scholars. I found it very revealing, as to the validity of the existence of such charts as psychologically valid systems, when someone pointed out to me (I thought it was Martinet, but I do not have an adequate reference--see, however, discussion in Martinet 1952:18-20) pointed out that if a sound system had--let us say--two sets of stops, one voiceless and the other voiced, but the voiceless one had stops in bilabial, alveolar and velar positions, whereas the voiced one had stops only in the bilabial and in the alveolar positions, then if new words were borrowed into the language there was a greater likelihood that one would be borrowed with a voiced velar stop than one with stops at a position totally new to that system. A chart of such sounds is a kind of field structure--or a matrix of patterned relations between sounds. And matrices, as wholes, have an impact on potential changes or growth of a system or its interlocking with other systems in language change.

But matrix structures can also have very important controls on morphological components, in relation to structural patterns and in relation to the resistance of

such patterns to change across dialects. I first felt this impact, strongly, in data concerning the Fore of Papua New Guinea, as seen in my article in 1963. In it, a set of object prefixes differentiates first, second, and third person, and at the same time indicates singular, plural, and dual. But no simple way allows us to separate these meanings in relation to their phonemic forms. Each of the three persons ends in /-a/ when singular--but so also does the first syllable of the first person when it is plural or dual. On the other hand, first and second persons begin with /t-/ when either plural or dual--but not when singular or third person. In addition, first singular (and only that form) begins with /n/, and second singular (and only that form) begins with /k-/.

So there is no simple identification of sequentially segmental forms of that matrix--as one can see in Figure 1a. Rather there is an "overlapping" of signals, in irregular ways, such that the total set of overlapping signals gives us the meanings unambiguously. (We might suggest that the interpretation of meaning must be by a kind of interlocking set of "Venn diagrams"--overlapping mathematical circles). Thus the complexity of forms gives the signal not by simple one-to-one relationship of items in linear sequence, but in a complex of interlocking data. (For more detail, see Pike 1963a, with relation to more fusions of other forms, and historical retention of the same relations in related languages). If one draws a line around the set of any items which contain one of the signals just mentioned, several such overlapping groups occur (as seen in Figure 1b). Each of these groups we might call a formative block, with the phonemically distinct items as formatives.

	1	2	3
s	na	ka	a
p	ta	ti	i
	-----	-----	-----
d	tasi	tisi	isi

Figure 1a. A matrix of Fore (Papua New Guinea) object prefixes, with rows of singular, plural, and dual, plus columns of first, second, and third person. The combination of the vector formative /a/ made by the /a/ occurring in each cell of row one, plus the vector formative /a/ made by the column of first person, is shown as a matrix formative by the "L" shape joining the two. The lower righthand section has a second matrix formative, comprised by the occurrence of /i/. A third is the /si/ below the dotted line. A fourth would be apparent, if the four cells containing /t/ in the lower left were linked together. Another, not easy to visualize here, is the matrix formative comprised exclusively by the upper left cell, with /n/--and another beside it with /k/. One more is made up of the zero consonant (not shown) in each row of the right hand column. (Data from Pike, 1963:23, provided by Graham Scott; these data basically provided the start toward Pike's work in developing matrix morphology.)

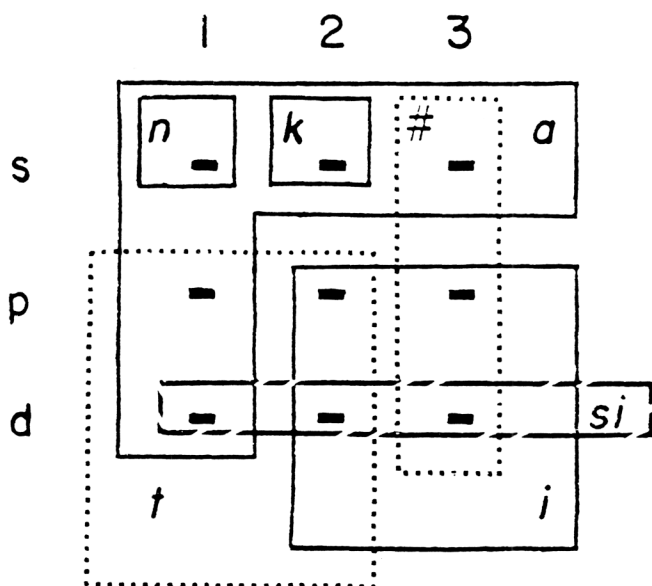


Figure 1b. A second diagram (from Pike 1963:26) of the same matrix formatives of the Fore object prefix as in Figure 1a, but with more of the matrix formatives surrounded by lines in order to show more clearly the "Venn diagram" character of the interlocking/overlapping field structure. The meaning is not carried by a one-to-one relation of morpheme to a particular meaning, but by the deduction of meaning on the basis of the multiple matrix formatives to which a cell belongs. (After one has seen such a description, one can perhaps see that lexical meanings must also be treated by such interlocking systems.)

But the implications of this matrix technology go far beyond a simple descriptive statement of a part of a morphological system. The formative blocks sometimes remain unchanged in shape, across several related languages, even when the particular phonemes may have been



altered. This leads to the theory (developed in Pike 1963a, Pike and Becker 1964, and more extensively in Pike and Simons, In press) that historical reconstruction which normally builds on lexical relations (with partial lexical meaning and partial phonemic shape retained after language change) might be built on matrix formatives (with the form being the shape of the formative blocks and the meaning being the interlocking of the meanings of the rows and columns of the matrix containing them).

But there might be a further important implication, which is crucial to the aim of this paper. Let us suppose that instead of using phonemes in linear sequence as a basic ("Euro-centered ") descriptive start, that one were to start with the syllable, but treating its structure not as first of all a sequence of phonemes, nor even of phonemes-plus-tone, but basically as a converging point in a hierarchical level for the interlocking of syllable matrix formatives--i.e. for syllable features which interlock to signal the syllables as wholes, but do not themselves necessarily each have a kind of separate, linear, semantically identifiable existence as morphemes? If this could be done, even partially, one might end up with an "irregular" syllable structure, but one describable in terms of overlapping feature formatives irregularly united, rather than with dreamed of (but unrealized) features which regularly contribute simple additive morphemes or phonemes.

Perhaps the most extensive attempt to apply this matrix approach to a syllable-morpheme complex is Pike and Becker (1964) for Navaho, based on former descriptive material by various scholars, such as Hoiijer (cf. Pike and Becker 1964:144 for some references). Navajo (a language of the Athapaskan family, USA) has numerous prefixes, which I shall ignore, here. Its verb stems, however, are themselves internally complex morphemically, even though they are always single syllables. Each stem is comprised of one or two initial consonants, followed by a short or long vowel plus tone, and by a single final consonant (or occasionally by zero). The current complexity of the stem syllable seems to have arisen, historically, by the fusion to the root of a varied sequence of suffixes.

Perhaps the point of view of the Pike and Becker article (with the Navaho matrix work largely the contribution of Becker, and the background theory taken from Pike 1963a) could most easily be seen starting from a matrix (see Figure 2) which lists eight rows of stem patterns, each of which occurs in five columns of modes meaning, respectively, 'future-progressive', 'repetitive-customary', 'imperfective', 'optative', and 'perfective'. Since every stem begins with a consonant(s), and these consonants do not affect the meaning of the grammar, they are indicated by /C/ for any consonant(s). The /v/, likewise, means any vowel--but with capital /V/ meaning that that vowel may be unstable, and can change. The vowel may be with or without high-tone mark; and the vowel may be shown as short or long. The /N/ means nasalized vowel (in contrast to lack of nasalization in the other vowels in the row). The stem seems to include three formatives--an uninflected stem initial /C-/, an inflected medial /-v-/, and an inflected final /-c/. The original root may have been consonant plus vowel, with inflectional suffixes of vowel and of consonant added and fused. Sample verbs, for the rows: A1: /ghé:ɪ [V:i]/ 'to handle a pack or load', A2 /ʔá:ɪ / 'to handle one round object', A3 /lé:ɪ [V:a]/ 'to handle one flexible object', A4 /ghǎɪ / 'to kill (dual-plural)', A5 /kil [V:e]/ 'to chew or eat one round object', A6 /tsʔoɪ / 'to make taut a rope-like object', A7 /tsol/ 'to feed one object', A8 /tsʔiɪ / 'to fall'.

We are dealing in this article only with the active verb stems. The samples in Figure 2 each occur with at least four different forms among the five in its row.

	F	R	I	O	P
A1	Cv̄·l	Cv̄·h	Cv·h	Cv̄·h	CV̄N
A2	Cv̄·l	Cv̄·h	Cv·h	Cv̄·l	CV̄N
A3	Cv̄·l	Cv̄·h	Cv·h	Cv̄·l	CV̄ <sub>#</sub>
A4	Cv̄·l	Cv̄·h	Cv̄ <sub>#</sub>	Cv̄·l	CV̄·?
A5	Cv̄i	Cv?	CV·d	CV·d	Cv̄d
A6	Cv̄l	Cv?	CV·d	CV·d	Cv̄·d
A7	Cv̄l	Cv?	CV̄·d	CV̄·d	Cv̄·d
A8	Cv̄l	Cv?	CV̄·d	CV̄·d	Cv̄d

Figure 2. Rows and columns of types of classes of Navaho verb stems are represented. The initial consonant is not significant to class identification, or to morphological meaning (but only to individual lexical items). Each stem has a vocalic element, short or long (and some have sub-class variability, indicated by capital "V"). The stem-final consonants form groups which themselves force differences in the classes of the stems. All rows differ somewhat. All columns do likewise. This set of sets has for each row four different forms. The columns are labelled as F(uture-progressive), R(epetitive-customary), I(mperfective), O(ptative), and (P)erfective. (The chart is taken from Pike and Becker 1964:146.)

Next, in Figure 3, we see these same sets, but represented just by the last consonant (or by /#/--zero). Note the uniformity of the first column. And note the group (formative block) of /-d/ formatives in the lower right section; with /?/ in the bottom of column R; /-N/ in upper right hand corner; /-h/ in upper part of second column; /#/ in row A3, column P., etc.

	F	R	I	O	P
A1	-ɬ	-h	-h	-h	-N
A2	-ɬ	-h	-h	-ɬ	-N
A3	-ɬ	-h	-h	-ɬ	-#
A4	-ɬ	-h	-#	-ɬ	-?
A5	-ɬ	-?	-d	-d	-d
A6	-ɬ	-?	-d	-d	-d
A7	-ɬ	-?	-d	-d	-d
A8	-ɬ	-?	-d	-d	-d

Figure 3. Here the Navaho consonants, final to the stems of Figure 2, are abstracted for easier sight. Note the lines around them, to indicate some formative sets involved. Note the first column, as a complete block, except for the three cells in column O. The /#/ is in two places; so is the /?/. The /d/ is a lower block to the right. (From Pike and Becker 1964:147.)

Compare, now, the formative blocks of Figure 3 with the formative blocks in Figure 4. In this one, the formatives are vowel types. But the first column no longer is uniform. The lower right no longer gives a single formative block. And other groupings occur in the implied "Venn diagrams". We suggest that the reader, with a pencil, draw lines around each formative block so that their areas can be seen easily.

	F	R	I	O	P
A1	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A2	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A3	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A4	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A5	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A6	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A7	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-
A8	-v̆'-	-v̆'-	-v̆'-	-v̆'-	-v̆'-

Figure 4. Here the vowels, instead of the final consonants of Figure 3, are abstracted from the same sets. Note that the short vowels are in general to the lower left (with a few scattered to the right); long vowels in general occur in the rest of the matrix (again, with some exceptions). (Data from Pike and Becker 1964:147.)

But theoretical emphasis must be made, here, for two opposite kinds of change in the vectors (rows or columns) of a matrix. In the one, phonological fusion of adjacent items can lead to phonologically distinct items in each cell of a row. In the other, analogical extension of one item in a row vector to others in that row can lead to having each cell in that row all alike. See, for example, Figure 5, where each row has just one form. In that matrix, every member of that particular class of stems has just one alternant, in Navaho. (For the theoretical discussion of these differences between ideal matrix (with maximum articulatory efficiency) versus simple matrix (with maximum lexical efficiency) note Pike 1963a:16-18, Pike 1965:204, and Pike and Simons, In press).

	F	R	I	O	P
D1	Cvh	Cvh	Cvh	Cvh	Cvh
D2	Cvs	Cvs	Cvs	Cvs	Cvs
D3	Cvɿ	Cvɿ	Cvɿ	Cvɿ	Cvɿ

Figure 5. Here is a class of active stems in which any one row has the same consonant and vowel units in every one of its cells. The matrix formatives are all row vectors. This implies that from an earlier historical diverse shape, with a squence of different suffixes in each column of that row, one of these shapes fused, and then spread from column to column by analogical replacement across columns rather than from phonological fusion between the suffixes themselves within the various cells. (Data from Pike and Becker 1964:149.)

In my experience, the most extraordinary instance of this difference (in data from Simons, in Pike and Simons, In press) is seen in the Solomon Islands, where in two Malaitan languages, just twenty miles apart, on opposite sides of the island, one of the languages has the fusion very advanced, and the other has analogy equally advanced. See, for example, Figure 6. And note there that the middle column suggests a reconstructed non-reduced, non-fused form, while the first column gives a reduced, fused form, and the third column gives the one developed by analogical extension. For example, /\*fukai/ 'future subject marker' fuses to /kwai/, and differs from all the other rows, but in column three it becomes /kai/ in all rows (with added words before it, e.g. /\*nau/ 'first singular, free pronoun', to allow for semantic differentiation of the meaning being communicated)

MAXIMUM ARTICULATORY EFFICIENCY		To'aba'ita	Proto-Malaitan	Fataleka	LEXICAL EFFICIENCY
		FutSubMrk	FutSubMrk	(FreeForm) FutSubl	
	1 sg	kwa <i>i</i>	*kukai	(nau) kai	
	2 sg	'oki	*'okoi	('oe) kai	
	3 sg	kai	*kai	(nia) kai	
	dl 1 in	koki	*garua kai	(koro) kai	
	dl 1 ex	meki	*mirua kai	(karo) kai	
	dl 2	moki	*murua kai	(kamoro) kai	
	dl 3	keki	*girarua kai	(keroa) kai	

Figure 6. These data are from Simons (in Pike and Simons, In press) concerning the Solomon Islands. In an astonishingly short distance apart (about twenty miles, on opposite sides of the island) two radically different historical changes have happened to the same starting data. In this chart, the reconstructed forms are in the middle column, with singular and dual personal pronouns. In the left column, for one of the dialects, fusion of the included morphemes has taken place, but the differences can still be detected (as /\*kukai/ has retained the /k-/ and the /ai/). But in the right hand column, (apart from the added independent elements in parentheses) all the forms, from each row, have been replaced by the single form /kai/--through analogy extending the usage of that particular form to all the rows.

### PHARYNX, TONE, VOWEL HARMONY

I have built the above material on data from the South Pacific, from the USA, and from Europe. Now we need to look at a few possible ties with material from Asia. Gregerson (1984), for example, discusses material from Vietnam, in relation to tongue root position (pharynx width). Gregerson (p. 211) relates this data (in accordance with

work by earlier scholars) to register--with first register as having sounds more clear and tense, and higher pitch, but second register being more breathy, and relaxed, with lower larynx and lower pitch.; he adds that the first register has retracted tongue-root and reduced pharynx space, whereas the second register has advanced tongue root with larger pharynx space. And he points out (p. 213) that is similar to the source of vowel harmony in some languages of West Africa. Further, the harmony is in part induced by the slower moving musculature of the root than that of the blade. Perhaps a "Venn diagram" here would show an overlapping of the low tongue positions and movements, with the blade positions and movements, to set up a small matrix of some kind, based on the syllable, or (e.g. when harmony covers a word) on larger rhythm groups of the phonological hierarchy. Here, again, fusion would enter, but with a very specific musculature as an impelling source.

Denlinger (1987a:21n) uses the term "boxes" (which he learned from Gedney, in Michigan, in reference to Thai). Denlinger has used the term (1989, manuscript, received from him before his death) to refer to "tone-classes" of Mandarin-related languages, in a way which seems to me to be somewhat analogous to matrices of sub-matrices (although I am not competent to discuss the detail). One set may end in nasals, and another in vowels. Each of the two has a comparable set of six sub-boxes. Three are 'clear' versus three 'muddy'. Each of the six sub-divide into two further subdivisions, dividing in turn into initial and final, with the initial as tone and the final as nuclear vowel. He considers this approach more fruitful, for historical purposes, than classical methods--and he does not want to exclude allophones from consideration (1984:201).

Various other approaches, in the past, might have overlap with the considerations above. Note, for example, work by Firth, who said (1949:136) that certain 'diacritica of the monosyllable are not considered as successive fractions or segments in any linear sense'; and in a lecture in Michigan claimed (if I recall correctly) that in an English word like hang that the h- and -ng were not phonemes, but prosodies, since they were related to places in the syllable (and cf. 1949:132). And (p. 133)



'We never met any unit or part which *had* to be called a phoneme, although a different analysis, in my opinion not so good, has been made on the phonemic principle.' On the other hand, note (p. 138) that he has used, earlier than I did, the terms syntagmatic and paradigmatic in ways that seem appropriate to me: 'The principle to be emphasized is the interrelation of the syllables, what I have previously referred to as the *syntagmatic relations*, as *opposed to the paradigmatic or differential relations* of sounds in vowel and consonant systems.'

### **A SAMPLE TEXT AS AN "ORIENTAL TAPESTRY"**

A Euro-centered view of the proto-typical desired shape of certain kinds of texts would view them as ideally made up of an introduction, with three points each of which is well illustrated, plus a conclusion. Perhaps this would be most frequently seen in western sermons. Some eastern sermons, for centuries, have had a radically different structure. Some of them may be viewed as "oriental rugs", or tapestries, with distinct colors on some of the rows (lines of thought), and other colors on the vertical dimension (intellectual principles interlocking with the others), and various "weaving of thought patterns" for communicating a basic idea set. The one where I discovered this pattern, with surprise, was in the "Sermon on the Mount" by Jesus (in Matthew, chapters 5-7). Where some person might consider it not a lecture, at all, but a random collection of bits, I would see it as built on an elegant oriental pattern. Note that in Figure 7 (from Pike 1987:6) there are three dimensions diagrammed, with contrast within each of them, plus contrasts between them. Vertically, there is contrast between the old and the new (with the implication "You have heard it said...of old...but I--now-- say to you"). From front to back, the contrast is between the good and the bad (compare helping someone, versus unnecessarily killing someone). From side to side the contrast is between the intention of the actor, and the physical action which the actor uses to carry out that intention (or to avoid it in fact--compare giving alms to be helpful, versus to get status).

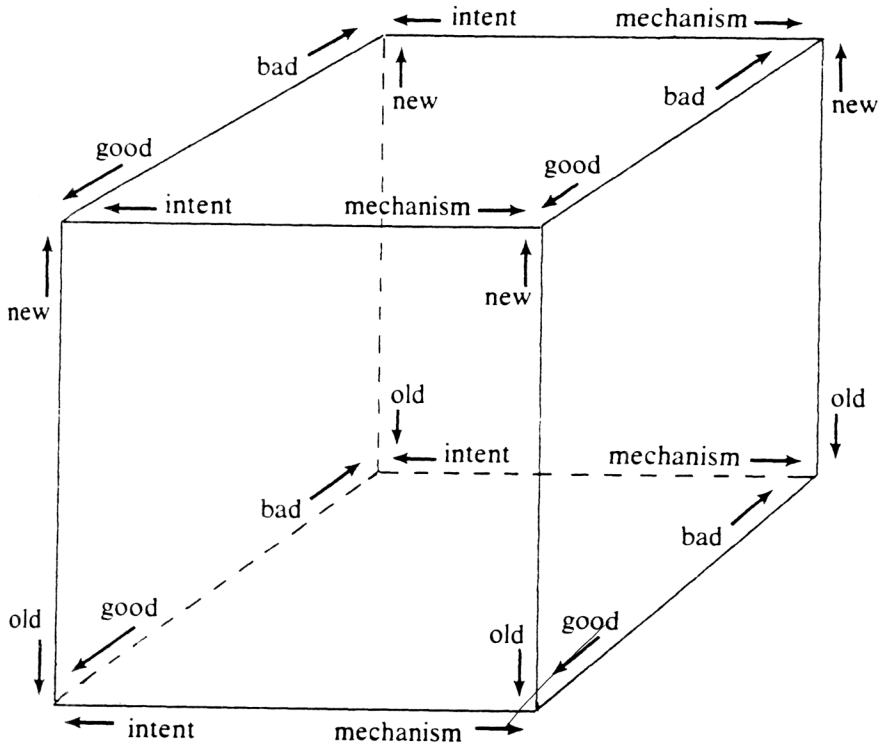


Figure 7. A text may have a pattern which is different from a simple outline with its sections. It may, in an analogue of an "oriental tapestry," have several "dimensions" or "colors," each of which is interwoven with the others in various ways to form the overall design. Here, in the Sermon on the Mount (from Matthew 5-7) is shown (from Pike 1987:6) three different contrasts: from old to new (bottom to top of the cube), good to bad (from front to back of the cube), and physical form of an action in contrast to the intent of the person so acting (from right to left of the cube). Goodness, newness, and intention (plus and minus) interlock in various combinations in the text.

## CONCLUSION

From my perspective it is important to emphasize that we should not lose either the hierarchical elements (phoneme and syllable and higher rhythm groups), or the paradigmatic replaceable components (whether replaceable sets of phonemes in syllables, or replaceable but contrastive contours or intonation patterns within sentences, etc.). Similarly, we should not lose the field components in phonology, when a chart gives its structured phonemic articulatory interrelations; nor the lower-level contrastive-feature relations, when the phonemes label the vectors of the matrix. (But, in my approach and conviction, consideration of these lower contrastive features should not force the deletion of the higher features of phoneme, syllable, contour and rhythm group, phonology of a total poem, or other). In addition, consideration of the possibility of historical reconstruction should leave room for the consideration of synchronic factors (of both current emic and etic description), as well as consideration of discoverable diachronic factors of emic and etic components, with change over time, or with the overlapping presence (to some degree) of items where one can see that change is in process, bringing in new items, or beginning the elimination of old ones. And one must have recourse not only to physically observable language data, but--where possible--to the observation of native reaction to those data. Both statements and intentions (when deducible) are important, if one is to assume that language is a component of hierarchically-complex purposeful human action. In some sense, for us as analysts, the top is "simpler"--more recognizable--than the bottom, at some levels of structure. Recognition of a dog as dog is easier for us than analyzing the separate molecules of its ear. Texts, as wholes (like syllables or words) may carry contrastive patterned characteristics which reflect contrastive high-level structures which are not easily discernable from low-level data. Excessive reductionism hides human intentions, without which human society is empty of reason. Truth, I insist in my philosophical view, lies in patterned interlocking hierarchies, not in rules, nor in low-level abstracted descriptions. Let me try to

concentrate this viewpoint in a (high level!) poem:

# ATOMS, OR PEOPLE?

I need atoms,  
 But I like people.  
 Atoms build me together,  
 But it's people  
 That hold us together.

...

Don't lose either--  
 Guard them both--  
 In patterns of living--  
 Not death up or down.

A suggestion, for future research: Let us assume that we need phonological matrix formatives, not just morphological ones. Then, for some syllable types, it might help to make more explicit a set of overlapping "Venn diagram" graphs of vowel-plus-consonant-plus-tone. A point of overlapping union might, for example, be a simple tone-plus-consonant (along with the same pitch overlapping with vowels before it); a volume by Brown (1985) gives, for Thai, much discussion and many charts related, in some degree, to these matters. We must not lose, synchronically, paradigmatically replaceable segmental units (including some phonemes and syllables) or we lose a source of native reaction to language (and synchronic psycho-linguistic reality). We must not lose diachronic (wave) fusion, or the articulatory explanation of "least effort" in linguistics will be lost. We must not lose attention to systems of relationships in synchronic-diachronic change, or pattern-linked (field) analogy would be lost. Since these systems overlap in time and place, irregularities enter, and confuse a "simple" synchronic picture--but that must be accepted as part of the price of understanding human nature as experienced now, but studied in relation to time.

## REFERENCES

- Bloomfield, Leonard. 1933. *Language*. New York: Henry Holt and Co.
- Brown, J. Marvin. 1985. *From Ancient Thai to Modern Dialects--And Other Writings on Historical Thai Linguistics*. Bangkok: White Lotus Co.
- Denlinger, Paul B.. 1987a. 'Tone in Sino-Tibetan.' in *Chinese -Western Encounter: Studies in Linguistics and Literature (Festschrift for Franz Giet, SVD on the Occasion of his 85th Birthday, ed. by S. Braumkoup, Yi-chin Fu, A. Sprenger, P. Venne. Chinese Materials Center Publication, Taipei, Taiwan. pp. 3-34.*
- . 1987b. 'Vowel Length in Mandarin.' *Monumenta Serica* 36:127-209.
- Firth, J. R. 1949. 'Sounds and Prosodies.' *Transactions of the Philological Society*, pp. 127-52.
- Goldsmith, John A. 1990. *Autosegmental and Metrical Phonology*. Oxford: Basil Blackwell.
- Gregerson, Kenneth. 1984. 'Pharynx Symbolism and Rengao Phonology.' *Lingua* 62:209-38.
- Hogg, Richard, and C. B. McCully. 1987. *Metrical Phonology: A Coursebook*. Cambridge: Cambridge University Press.
- Martinet, André. 1952. 'Function, Structure, and Sound Change.' *Word* 8:1-32.
- Nida, Eugene A. [1946] 1949, 2nd ed. *Morphology--The Descriptive Analysis of Words*. Ann Arbor: University of Michigan Press.
- Pike, K.L. 1943. *Phonetics: A Critical Analysis of Phonetic Theory and a Technic for the Practical Description of Sounds*. Ann Arbor: University of Michigan Press.
- . 1945. *The Intonation of American English*. Ann Arbor: University of Michigan Press.
- , and Eunice V. Pike. 1947. *'Immediate Constituents*

- of Mazatec Syllables.' *International Journal of American Linguistics* 13:78-91.
- . 1948 'Tone Languages: A Technique for Determining the Number and Type of Pitch Contrasts in a Language, with Studies in Tonemic Substitution and Fusion.' Ann Arbor: University of Michigan Press.
- . 1949. 'Language as Particle, Wave, and Field'. *The Texas Quarterly* 4:37-54.
- . 1963a. 'Theoretical Implications of Matrix Permutation in Fore (New Guinea)'. *Anthropological Linguistics* 5:8:1-23.
- . 1963b. The Hierarchical and Social Matrix of Suprasegmentals. *Prace Filologiczne* 18:95-104.
- , and J. Alton Becker. 1964. 'Progressive Neutralization in Dimensions of Navaho Stem Matrices.' *International Journal of American Linguistics* 30:144-54.
- . 1965. 'Non-Linear Order and Anti-Redundancy in German Morphological Matrices.' *Zeitschrift für Mundartforschung* 32:193-221.
- . 1967. "Teaching in His Image: The Structure of the Sermon on the Mount." *Arts and Letters* 1:2.3-11.
- , and Gary F. Simons. In Press: 'Toward the Historical Reconstruction of Matrix Patterns in Morphology'. *Voprosy Jazykoznanja*.
- . In press. 'Paradigmatic and Syntagmatic Features or Prosodies in Sound, Syllable, Word, or Poem.' A paper presented to a conference on intonation, in Freiburg, July 1991.
- Tench, Paul. 1988. *The Roles of Intonation in English Discourse*. Frankfurt am Main: Peter Lang.