60

*Offprint from*

# PROGRESS IN LINGUISTICS

## A COLLECTION OF PAPERS

*selected and edited by*

MANFRED BIERWISCH

*and*

KARL ERICH HEIDOLPH

MOUTON

MORRIS HALLE

# ON METER AND PROSODY

## INTRODUCTION

The utterances that make up a piece of metrical verse exhibit regularities in the sequential arrangement of their phonetic, morphological or syntactic components which are not found consistently in normal everyday language. In composing a poem in a particular meter, the author may, therefore, be said to select from among the utterances of the language those that conform to the meter which he has chosen for his poem. By characterizing in this manner the poet's activity — or rather one aspect of this activity — I intend to bring out the distinction between the METER of a poem, which is a sequential pattern of abstract entities, and the MAPPING or ACTUALIZATION of this meter by concrete sequences of words, syllables, or sounds that make up the lines of the poem. This distinction is absolutely fundamental to an understanding of metrics and should constantly be kept in mind. In what follows I shall consider each of the two aspects in turn.

## MAPPING RULES

Perhaps the simplest sequential pattern of the type that interests us here is one in which the pattern is constituted by entities of a single type and only their number is subjected to some constraint. Examples of such patterns are

(1)

| | | |
|---|---|---|
| xxx | xxxx | xxxxxx |
| xxx | xxxx | xxxxxx |
| xxx | xxxx | xxxxxx |

It is obvious that there is an infinity of arrangements of physical objects that can be said to exhibit these patterns: flowers in a flower bed, desks in a classroom, windows on the side of a house, *etc.*

The examples just cited are all of spatial arrangement objects, but it is equally easy to visualize the same patterns implemented in temporal sequences: a series of drum

beats; a rudimentary dance consisting of four steps followed by a pause; a series of light flashes; and finally, lines of verse each with an identical number of syllables; as for example the lines in Verlaine's well known

(2a)

O bruit doux de la pluie
Par terre et sur les toits!
Pour un coeur qui s'ennuie
O le chant de la pluie!

all of which are six syllables long. Thus, we may say that the metrical scheme underlying this poem is

xxxxxx

by virtue of a mapping rule that establishes a one: one correspondence between syllables of the lines and the *x*'s of the metrical pattern.

This, however, is only a first approximation of the correct rule mapping the abstract pattern onto the actual line of verse. One sees this readily if one compares the stanza cited with the one that precedes it in the poem:

(2b)

Il pleure dans mon coeur
Comme il pleut sur la ville,
Quelle est cette langeur
Qui pénètre mon coeur?

If we count the syllables in the first line we notice that there are only five, and the same is true of the third and fourth line of the poem. We note, however, that lines 1 and 4 would be regular if the reduced vowel — the e-*muet* — were to count as a syllable. Unfortunately if we count the e-*muet*, then lines 2 and 3 of the above stanza are irregular: the second line would have eight syllables, and the third line seven. This irregularity, however, is only apparent, not real, for in French verse a reduced vowel is not counted if it immediately precedes another vowel, or if it is the last vowel in the line. It is clear from the preceding, which incidentally does not exhaust all the complications of the subject, that the mapping rule must establish a one: one correspondence NOT between the *x*'s of the meters and the syllables of the line, but rather between the *x*'s of the meters and CERTAIN syllables of the lines. The mapping rule for the main type of French verse would, therefore, read:

(3) Each element of the meter (each *x*) must correspond either to an e-*muet* followed by consonant or to a vowel other than e-*muet* regardless of context.

Since metrical patterns are separate from the rules that map these patterns onto actual lines of verse, we must expect to find cases where by virtue of totally different mapping rules a given metrical pattern is implemented by totally different verbal material. Compare from this point of view the lines from Hugo's "Le pas d'armes du roi Jean" given in (4a) and the English nursery rimes (4b):

(4a)

Ma vieille arme
Enrageait
Car ma lame
Que rongeait
Cette rouille
Qui la souille
En quenouille
Se changeait

(4b)

A swarm of bees in May
is worth a load of hay;
A swarm of bees in June
is worth a silver spoon;
A swarm of bees in July
is not worth a fly

In the French example the mapping rule is that of (3). In the English example the mapping rule is

(5) Each element of the meter must correspond to a fully stressed vowel which is neither preceded nor followed directly by a fully stressed vowel that has greater stress.

We see readily that the rime in (4b), has three stressed vowels per line and, therefore, satisfies the same metrical pattern as the Hugo poem, but in a totally different way, by virtue of a totally different mapping rule.

In the nursery rime (4b) that we have just examined, each fully stressed vowel is flanked by unstressed vowels and/or the verse boundary. It would, therefore, seem that the special qualification in (5) concerning the absence of an adjacent vowel with greater stress is not necessary. We see the need for this constraint when we examine the examples (6a) and (6b):

(6a)

Rain, rain, go away
Come again another day
Little Johnny wants to play

(6b)

Ride a cock-horse to Banbury Cross
To see a fine lady upon a white horse
Rings on her fingers, bells on her toes
She shall have music wherever she goes

As the line

Rings on her fingers, bells on her toes

clearly shows, (6b) is a poem consisting of four-unit lines. There are, however, additional stressed vowels in other lines; *e.g.*

To see a fine lady upon a white horse

where we find six fully stressed vowels. We note, however, that *fine* is subordinate in stress to *lady*, and *white* is subordinate in stress to *horse* by the normal rules of English

stress. Hence in line with the qualification in (5) no metrical entity (no *x*) corresponds to *fine* or to *white*. The line, therefore, has four metrically relevant stresses and can be regarded as being an instance of the pattern *xxxx*.

The situation is somewhat different in (6a). Here in the first line we have three fully stressed monosyllables in a row, but since these are two vocatives followed by an imperative, they all have main stress, as the rules for stress subordination do not operate across major syntactic boundaries. As a result each of the vowels in the first three words is metrically significant and the line is a regular actualization of the pattern *xxxx*.

The meters of English nursery rimes commonly allow one optional *x*; thus, in addition to the patterns in (6) we have also patterns such as (7) where one of the *x*'s is optional.[1]

(7a) *(x)xx*

Three wise men of Gotham
Went to sea in a bowl
If the bowl had been stronger
My song had been longer

(7b) *(x)xxx*

Thirty days hath September,
April, June and November;
February has twenty eight alone,
All the rest have thirty one,
Excepting leap year, that's the time
When February's day's are twenty nine.

The mapping rules examined thus far have operated on metrical patterns that are constituted by entities of a single type. There are numerous metrical patterns, however, that are made up of entities of two distinct types, and, as one would expect, the associated mapping rules differ accordingly. The following metrical patterns (to which we return below) illustrate this.

(8)(a) w w s w w w w s — Serbo-Croatian epic decasyllable
(b) s w s w s w s w s w s s — Classical hexameter
(c) w s w s w s w s w s — Iambic pentameter

The first meter is that underlying the Serbo-Croation epic decasyllable [2] This poetry, which is still a live form of folk art, has been studied in great detail by R. Jakobson (1932), among others. Jakobson established that the constraints of the so-called epic decasyllable are: the obligatory occurrence of a word boundary after the fourth and the tenth syllable, and the obligatory absence of a word boundary (*zeugma*) after the third and the ninth syllable. This is tantamount to requiring that the third and fourth, and the ninth and tenth syllables in the line be occupied by the last two syllables of a

[1] For a discussion of the meter of the Old English alliterating verse which provides instructive parallels to the above, see S. J. Keyser (1968) and Halle and Keyser (1970).
[2] The formulation (8a) was suggested to me by S. Anderson.

word. More formally we may state that the mapping rule for the Serbo-Croatian epic decasyllable is:

(9)(a) the *w*'s of the meter must correspond one: one to the syllables in the line of verse
(b) the *s*'s of the meter must correspond to a sequence of two syllables which terminate a word.

The mapping rule (9) applies also in other languages. It appears to be operative in the Lithuanian decasyllabic *dainas* (Jakobson, 1952:65). In a slightly modified form it appears to apply in the Russian epic verse, the *byliny* (Jakobson, 1952) and a rule quite similar to (9) applies in the so-called 'trochaic' folk songs of Latvian (of which more, directly below). In the Latvian folk song, moreover, the metrical pattern is not (8a), but rather (10)

(10) wws wws

This meter, however, is also found in other Slavic languages; *e.g.*, in the Serbo-Croatian laments (*tùžbalice*) (Jakobson, 1935). Finally, in an unpublished study, S. Anderson has noted that the meter of the Icelandic Skalds must be assumed to have the form wwwws and a mapping rule that is quite reminiscent of (9). To what extent these parallels are due to a common source appears at present to be an open question. While the similarities are quite striking and thus would argue in favor of a common source, it must not be overlooked that the similarities concern extremely rudimentary properties of words (mapping rules) and of sequential arrangements of abstract entities (meters). In view of their rudimentary character it is not *a priori* implausible that the parallels are the accidental result of identical inventions made independently in a number of places and periods.

As noted above the mapping rule of the Latvian 'trochaic' folksong is related to (9), but not identical with it. This meter was studied by Zeps (1963), whose discussion is briefly summarized below. If rule (9) had applied to the metrical pattern (10) each well formed line of these songs would have been eight syllables long. Even a very cursory examination of Latvian folksongs reveals numerous lines that are shorter than the required eight syllables [*cf.* (10)]. Modern Latvian (see Halle and Zeps, 1966) is subject to a synchronic phonological rule that truncates a vowel in word final position (and in certain other contexts). As a result a significant proportion of Latvian morphemes appear in a shorter form in word final position than elsewhere. For example, the infinitive suffix is /ti/ and it appears in this form in the middle voice *mazgā*+*ti*+*es* 'wash' (*es* is the middle voice marker), whereas in the active voice the vowel of the infinitive suffix is lacking; *e.g.*, *mazgā*+*t*. The word final reflex of the infinitive suffix /ti/ is derived with the help of the truncation rule (as well as other relevant phonological rules). Zeps (1963) has shown that in the Latvian folk song, many lines that appear to lack syllables would be regular if the words are spelled in their abstract representations; *i.e.*, with the truncated vowels of all morphemes written out:

Forms having a smaller number of syllables after the application of the truncation rule than

they had before the application of the truncation rule, are counted as having the larger number if they occur at the end of a colon (half-line —MH); otherwise they may be considered as having either the larger or the smaller number of syllables... (p. 125).

Thus *Rīga dimd* is a correct half-line as it derives from the abstract /Rīgaa dimda/ as is *redzēt Rīgu* 'to see Rīga' from the abstract /reʒēti rīgua/; but *Rīgu redzēt* 'to see Riga' from an abstract /rīgua reʒēti/ is an incorrect half-line as the truncated /i/ at the end of the half-line must be counted, thus yielding one syllable too many. The Latvian folk song meter requires therefore a somewhat more complicated mapping rule than (9):

(11)(a) The *w*'s of the meter must correspond one:one to the syllables of the line of verse either in their surface or in their underlying representation, provided that no more than one syllable be truncated by the truncation rule.

(b) The *s*'s of the meter must correspond to a word final sequence of two syllables in the underlying representation.[3]

The metrical pattern (8b) is that of the classical (Greek) hexameter. It is customary to say that Greek verse is quantitative in that it distinguishes between long and short syllables. It must, however, be noted that 'length' here is not a simple phonetic property. Thus, for instance, the last syllable of a word such as πετρός is metrically long when followed by a word that begins with a consonant, but is metrically short otherwise. There is, of course, no claim intended about the phonetic length of the syllable, which remains the same in all contexts. The mapping rule of the classical hexameter requires therefore a special definition:

(12)(a) *Definition*: A syllable containing a lax vowel separated from the following vowel or from the verse boundary by no more than a single consonant or liquid (but not glide) is METRICALLY SHORT; all other syllables in the line are METRICALLY LONG.

(b) *Mapping rule*: The syllables in the line must correspond to the *s* and *w* of the metrical pattern (8b) in such a way that to each *w* there corresponds either one metrically long syllable or two consecutive metrically short syllables, and a long syllable corresponds to each *s*.

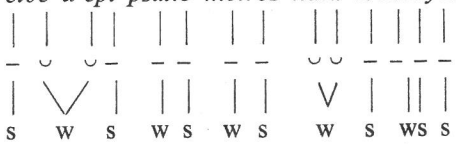
(c) The last syllable of the line may be metrically either short or long.[4]

[3] In a recent study of the meter of the Kalevala, Paul Kiparsky (1968) has discussed an even more elaborate example of mapping rules that require reference not to the surface (phonetic) representation of the words, but rather to their abstract (phonological) representation. At the present time I do not know of similar examples from other parts of the world, but it is hardly likely that mapping rules referring to abstract representations quite remote from the surface phonetics should be restricted to a few languages spoken in the Baltic area. As the rest of this paper will hopefully make clear, metrical conventions are of an extremely abstract nature and it is, therefore, to be expected that they may require reference to quite abstract representations of the linguistic material.

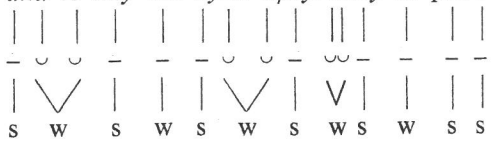
[4] As we are not interested here in a detailed examination of the hexameter, I have omitted certain further complications such as the obligatory appearance of a sequence of two metrically short syllables (rather than a single metrically long syllable) in the fifth *w* of the line.

In (13) below I scan two Homeric lines. I have utilized the traditional symbols, the *makron* for metrically long syllables, and the *breve* for metrically short syllables:

(13) *elθe d'epi psūxē mētros kata teθnēuyēs* (λ 84)




*alla te kay tōn ayen aφayreetay līs petrē* (μ 64)




The third metrical pattern illustrated in (8) is that of the iambic pentameter, the favorite meter of English poets from Chaucer to the beginning of the twentieth century. The discussion here is quite summary as a more detailed discussion of the problems of this meter has been given by Halle and Keyser (1966), Keyser (1968) and Halle and Keyser (1970). Perhaps the most widely held view concerning the mapping rule of this meter is that:

(14a) Each *s* and *w* of the metrical pattern corresponds to a single syllable of the verse line.

(14b) The stress on a syllable corresponding to a given *s* must be greater than the stress on the syllables corresponding to the *w* that precedes and follows the *s* in question.

It takes little familiarity with the canon of English iambic pentameter verse to discover that the proposed mapping rules are inadequate. As they are somewhat more obvious I shall first examine violations of (14b) and only then turn to violations of (14a). Consider to this end (15)

(15) The beauty *of* the morning: silent, bare,
*Ships*, towers, *domes*, theatres, and temples lie
*Open* unto the fields, and *to* the sky,...

Above in the three lines from Wordsworth's sonnet we find six violations of the rule (14b). In the first line an unstressed syllable corresponds to the second *s*; in the second line, the stressed syllables *Ships* and *domes* correspond to the first and second *w* of the meter; and in the third line the first *w* corresponds to a stressed syllable, the first and the fourth *s* correspond to unstressed syllables. These violations of (14b) in a poem by one of the best poets of the language show that (14b) does not correctly characterize the English iambic pentameter; it must be replaced by (16):

(16) *w* may not correspond to a stress maximum *i.e.*, to a syllable that by the normal English rules of stress subordination carries more stress than the two vowels adjacent to it.

The mapping rule (16) does not require that a stress minimum correspond to a *w*; it only prohibits a stress maximum from corresponding to a *w*. Hence the unstressed fourth syllable in the first line of (15) is not a violation. The second line of (15) is a list of nouns. Hence the rules of stress subordination do not apply here, and the four first words have all the same stress. Since none is a stress maximum the line does not violate the mapping rule (16). Note, moreover, that the first syllable in a line can never be a stress maximum as it is not adjacent to two syllables. This fact is important in the third line where the stress on the first syllable is greater than that on the second. Since the first syllable is not a stress maximum however, the line does not violate the mapping rule (16).

The concept of the stress maximum makes it possible, thus, to account for the fact that a considerable variety of stress configurations in lines of verse are lawful instances of the iambic pentameter. In more traditional treatments of metrics these facts are accounted for differently. Lines satisfying (14b) are regarded as basic; stress configurations that are not covered by (14b) yet are found in metrically regular iambic pentameter lines are treated by being included in a list of 'allowable deviations'. The disadvantage of listing such phenomena as 'allowable deviations' in this way is that it provides no general characterization of the set of 'allowable deviation'; *i.e.*, it fails to provide criteria for deciding whether or not a given deviation will be 'allowable'. That the formulation (16) provides the criteria for making this decision has been illustrated by the discussion of the lines from Wordsworth quoted in (15), and this is a point in favor of the proposed formulation.

The formulation (16) fails, however, to draw another distinction that plays an important role in metrics; it does not differentiate between a rudimentary and a complex, highly unusual actualization of a given metrical pattern. *E.g.*, if we compare the two lines (17a) and (17b):

(17a) the curfew tolls the knell of dying day

(17b) of man's first disobedience and the fruit

It is obvious that (17b) is a much more complex, a much more marked line than (17a), yet looked upon from the point of view of the mapping rule (16) both are lawful actualizations of the iambic pentameter and nothing more.

These differences in complexity can be brought out if (16) is restated so as to spell out its positive consequences:

(18) *w* may not correspond to a stress maximum; it may, therefore, be occupied by a $\left\{\begin{matrix}\text{unstressed}\\ \text{stressed}\end{matrix}\right\}$ syllable

(a) in verse medial position which has $\left\{\begin{matrix}\text{lower stress than}\\ \text{the same stress as}\end{matrix}\right\}$ $\left\{\begin{matrix}\text{both}\\ \text{one}\end{matrix}\right\}$ of the syllables adjacent to it.

(b) in verse terminal (*i.e.*, absolute initial or final) position which has $\left\{\begin{matrix}\text{lower stress than}\\ \text{the same stress as}\\ \text{greater stress than}\end{matrix}\right\}$ the syllable adjacent to it

The phrases enclosed in braces represent different alternatives. The formulation (18a) describes, therefore, eight separate regular actualizations of *w* in verse medial position, and the formulation (18b) describes six regular actualizations of *w* in verse terminal position. At first sight (18) may appear to be superior to a list of 'allowable deviations' only in that it includes in its preamble an abstract characterization of the set of 'allowable deviations'. But this overlooks the fact that (18) contains a formal means for judging the complexity of different actualizations, for the alternatives in the braces have been arranged so that later alternatives are more complex than earlier ones. The eight alternatives contained in (18a) are:

(19) (i) *w* is occupied by an unstressed syllable that has lower stress than both of the syllables adjacent to it: *e.g.*,

Enfolding *sunny spots* of greenery (Coleridge, "Kubla Khan")

(ii) *w* is occupied by an unstressed syllable that has lower stress than one of the syllables adjacent to it; *e.g.*,

Not charioted by *Bacchus and his pards*
(Keats, "Ode to a Nightingale")

COMMENT 1: Since any line satisfying (19i) will also satisfy (19ii), it will be assumed that the different alternatives are disjunctively ordered, so that in evaluating a given part of a line of verse the statements in (19) are applied in the order given and the first applicable statement is taken as the proper characterization of the part of the line under consideration. *Cf.* Comment 2 below.

(iii) *w* is occupied by an unstressed syllable that has the same stress as both syllables adjacent to it; *e.g.*,[5]

Young Lycid*as*, *and hath* not left his peer (Milton, "Lycidas")

(iv) *w* is occupied by an unstressed syllable that has the same stress as one of the syllables adjacent to it,

COMMENT 2: Since in case (iv) *w* is occupied by an unstressed syllable, a syllable that has the same stress will also be unstressed, hence (iv) will always be a special instance of either (ii) or (iii). In view of the principle of disjunctive ordering (*cf.* Comment 1 above) the situation in which (iv) is applied can never arise.

[5] We shall assume that in evaluating stress differences for purposes of the mapping rules the non-main stresses on full words as well as on monosyllabic auxiliary verbs, pronouns, prepositions, and conjunctions are treated on a par with totally stressless syllables.

(v) *w* is occupied by a stressed syllable that has lower stress than both of the syllables adjacent to it; *e.g.*,

(Driving sweet *buds like flocks* to feed in air)
(Shelley, "Ode to the West Wind")

(vi) *w* is occupied by a stressed syllable that has lower stress than one of the syllables adjacent to it; *e.g.*,[6]

The course of *true love ne*ver did run smooth
(Shakespeare, "A Midsummer Night's Dream", I, 1.)

Ere half my days in *this dark world* and wide
(Milton, "On his Blindness")

(vii) *w* is occupied by a stressed syllable that has the same stress as both of the syllables adjacent to it; *e.g.*,

Rocks, *caves, lakes, fens,* bogs, dens, and shades of death
(Milton, "Paradise Lost", ii, 621)

(viii) *w* is occupied by a stressed syllable that has the same stress as one of the syllables adjacent to it; *e.g.*,

O, *wild West Wind,* thou breath of Autumn's being
(Shelley, "Ode to the West Wind)

COMMENT 3: In view of the principle of disjunctive ordering (see comment 1) the only instances covered by (viii) will be lines where the equally stressed syllables adjoin a syllable that has lower stress, since all instances where they adjoin a syllable that has greater stress are covered by (vi).

Since it is perfectly self-evident I shall not expand (18b). It must, however, be remarked that because of the principle of disjunctive ordering only five of the six possible cases will ever be applicable.

As noted above later alternatives among the statements in (19) describe more complex actualizations. As a first approximation one might propose that (19i) be assigned a complexity of zero, (19ii) a complexity of one, *etc.*, and that a parallel scale be associated with (18b). Given such a scale the complexity of a line of verse can readily be computed. To illustrate such a computation consider the lines in (17). In (17a) all verse medial *w*'s are occupied by unstressed syllables that have less stress than the two syllables adjacent to them. The complexity of these *w*'s is therefore equal to zero. The verse initial *w* is occupied by an unstressed syllable that has lower stress than the syllable following. It has, therefore, also a complexity of zero. The line (17a) is, therefore, a totally unmarked line, a line that is metrically as 'simple' as possible.

The situation is somewhat different in (17b). The verse initial *w* is occupied by the word *of* which has lower stress than the immediately following *man's*. The complexity of this *w* is, therefore, zero. The second *w* in the line is occupied by *first* which is stressed, but its stress is lower than that on the following syllable *dis*, but metrically

[6] We assume here that adjective+noun collocations are not subject to stress subordination; *i.e.*, have "level stress"; see Halle and Keyser (1966).

equal to that of the preceding *man's*; it is, therefore, an instance of (19vi) and its complexity is 5. The third *w*, which corresponds to the *o* in *disobedience*, is an instance of (19ii). Since it has less stress than the following but not the preceding syllable its complexity is one. The fourth *w*, corresponding to the syllable *ience* in *disobedience* is again an instance of (19ii) and has, therefore, a complexity of one. Finally, the fifth *w* of the line *the* must again be assigned a complexity of one, as it has less stress than the following *fruit* but not less stress than the preceding *and*. The complexity of (17b) is, therefore, equal to eight, whereas that of (17a) was zero. The numbers in this case correctly reflect the different complexities of the two lines. It is, however, still an open question whether as the proposal is applied to a larger body of data the complexity assignments will properly reflect the intuitive judgments of complexity made by qualified readers of poetry.

Violations of (14a); *i.e.*, of the convention that there be a one:one correspondence between the syllables of the line of verse and the *w* and *s* of the metrical pattern can readily be found in the standard iambic pentameter verse.

(20a) All other loving *being* estranged or dead
(W. B. Yeats "After long silence")

(20b) Yet dearly *I* love *you* and would be lovèd fain
(J. Donne, Holy Sonnet XIV).

(20c) His temple right against the temp*le of* God
(J. Milton, "Paradise Lost", I, 402)

To account for these examples it is necessary to modify (14a) to:

(21) each *s* and *w* of the metrical pattern corresponds to a single syllable of the verse line except that they may correspond to two consecutive syllables if the syllabic phonemes of these syllables are {directly adjacent to / separated by a sonorant from} each other

Hence (20b) is scanned as follows:

yet dearly I love you and would be lovèd fain
w s w s w s w s w s

It should be noted that only if the syllables of the verse are placed in correspondence with the *s* and *w* of the metrical pattern in the above manner can it be shown that the condition on stress distribution (16) is satisfied. In addition, there is the possibility of letting the first *w* in the line be unactualized thereby creating the so-called HEADLESS LINE:

(22) twenty bokes clad in blak or redd (Chaucer, CT, A. Prol, 294)
while their hearts were jocund and sublime
(J. Milton, "Samson Agonistes", 1669)

Finally, extrametrical syllables are freely admitted at the end of the line and, very infrequently, before major syntactic breaks within the line.

(23) of rebel angels, by whose aid aspir*ing* (J. Milton, "Par. Lost", I, 38)
farewell thou art too dear for my possess*ing*
(Shakespeare, Sonnett 87)
and as I past I wor*shipt*: if those you seek (Milton, "Comus", 302)
from mine own know*ledge*. As nearly as I may
(Shakespeare, "Anthony and Cleopatra", II, 2.)

These facts can be readily accounted for by appropriate extensions of the mapping rule, but as they appear to have only little general theoretical interest we shall not do so here.[7]

## ABSTRACT METRICAL PATTERNS

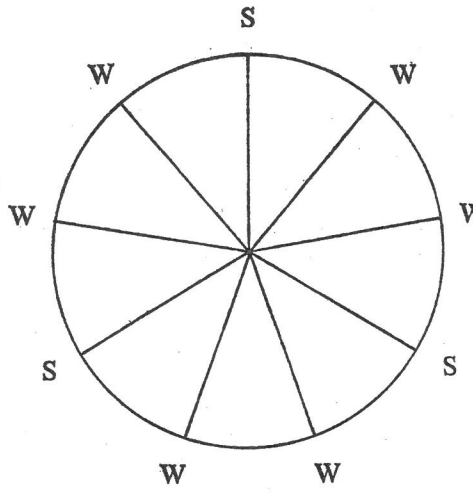
In the construction of the metrical patterns a number of quite obvious constraints are at work. First, the length of the verse line is limited; it can probably be safely restricted to a maximum of twenty or thirty sequential entities of which patterns in excess of twelve or fifteen are quite rare. Moreover, metrical patterns are composed of entities of one, two, or, at most, three types. Patterns composed of entities of a single type were illustrated above in our discussion of the meters of standard French poetry and of English pure stress verse. Patterns composed of entities of two types were illustrated in (8) above and the discussion following. Patterns composed of entities of three distinct types are exceedingly rare; the only meters of this kind known to me are certain of the meters of pre-Islamic Arabic poetry (*i.e.*, the meters of the so-called fourth cycle; *cf.* M. Halle (1966)).

Meters composed of entities of a single type can restrict only the number of entities per line. Meters composed of entities of two types exhibit additional regularities. One may first distinguish meters that are PERIODIC from those that are APERIODIC. Periodic meters consist of repetitions of relatively simple subsequences, traditionally called FEET. Periodic meters are familiar from much of Western poetry; *e.g.*, the favorite meters of English and Russian poetry are periodic, as are those of classical antiquity.

Since the number of entities in a foot is restricted — apparently this number must not exceed four (hyper-dactyls, *etc.*) — the variety of feet, and hence, also of periodic meters, is severely restricted. Moreover, we usually find that if a given poetic tradition utilizes periodic meters it will utilize all possible feet that can be generated by cyclical permutation from the basic type of foot. This fact was explicitly recognized over a thousand years ago by the founder of Arabic prosody, Al Xalil, who represented the sixteen traditional meters of pre-Islamic Arabic poetry with the help of five circles such as the one shown in (24).

To obtain an actual meter one can start at any point along the circumference of the circle and copy the entities in the order given. Thus to generate the meter termed *hazaǰ* one must begin with an *s* and follow the procedure just outlined. The mapping

[7] Since this was written in 1967 we have had occasion to go over much of the above material again. This review has led us to modify some of the theoretical formulations. The new results will be found in Halle and Keyser (1970).




| | |
|---|---|
| *raǰaz* | wws wws wws |
| *hazaǰ* | sww sww sww |
| *ramal* | wsw wsw wsw |

rules for this type of verse are quite different from those discussed above, and hence the phonetic configurations that one finds in Arabic verse lines are quite different from those found in Western verse. Nonetheless the underlying metrical pattern of the *hazaǰ* is the same as that of the dactylic trimeter.

While periodic meters are composed of identical subsequences, the component parts of aperiodic meters are different one from another. Thus, the meter of the Serbo-Croatian epic verse exemplified above in (8a) and repeated here as

(25) wws wwwws

consists of the two parts separated above by a space. These two parts are identical in their terminations but differ in the number of *w* that precede the terminal *s*.

The Vedic meters, *jagatī* and *triṣṭubh*, are aperiodic meters of a different type. They differ from one another in that the former is twelve, whereas the latter is eleven syllables long. While the quantity of the first seven syllables of the line is free, the quantity of the remaining syllables 8, 9, 10, 11, (12), presents the alternation '*short*, *long*, *short*, *long*, (*short*) where length and shortness of syllables is defined as in (12a) and the quantity of the last syllable is free as noted in (12c). Assuming the mapping rule (26)

(26) *s* must correspond to a metrically long syllable, *w* must correspond to a metrically short syllable
*x* must correspond to a single syllable without limitation as to its quantity;

the metrical pattern of the Vedic meters is

(27) x x x x x x x w s w s (w)

*i.e.*, a metrical pattern consisting of two parts, one in which only the number of syllables is regulated and the second, in which both the number of syllables and their quantity is subject to rule.

A somewhat higher degree of organization is to be found in the Greek Alcaic and

Sapphic meters, which according to Meillet (1923) are genetically related to the two Vedic metres just discussed. The Alcaic and Sapphic are subject to mapping rules that are practically identical to (26). The lines of the verse are eleven syllables long and reflect the metrical patterns

(28) *Alcaic* w s w s w w s w s w s
*Sapphic* s w s w s w w s w s w

The first observation to be made about these two meters is that the latter can be derived from the former by moving the initial *w* to the end of the line (cyclical permutation). As pointed out to me by J. R. Ross, the two metrical patterns are mirror images of each other; both are structured around the verse central *w*. This *w* is flanked on both sides by subsequences of five units which are made up of alternations of *w* and *s*. In the Alcaic the alternation begins with a *w* in the initial subsequence and with *s* in the subsequence following the verse central *w*. In the Sapphic, on the other hand, the alternations begin with *s* to the left of the verse central *w*, and with *w* to the right of it. The Vedic meters show the same type of alternation of *w* and *s*, except that there the alternation began with the eighth position in the verse [*cf.* (27)]. The Vedic meter is thus less highly structured than the Alcaic and the Sapphic, since in the latter the quantity of all syllables in the verse is regulated, whereas in the former the quantity of the first seven syllables is free.

The most complicated of the aperiodic meters known to me is that of the Regulated Verse of Chinese poetry of the Tang dynasty. Before examining the metrical pattern it is necessary to sketch briefly the mapping rule of this meter. This language of the Tang poets had four tones, of which two were level (*pyng*) and two, deflected (*tsê*). I assume that in the operation of the mapping rules a feature was associated with each syllable which classed it as either [+ level] or [− level]. The question as to the phonetic nature of this feature must remain open for the present, since there is yet very little understanding of the nature of the framework of the prosodic features. We shall, however, adopt here the convention standard in phonological descriptions of representing the coefficients of features by variables, utilizing to this end the lower case Greek letters. The variables can assume the two values, '+' or '−', and can be negated in the standard fashion so that if '$\alpha = -$', then '$-\alpha = +$', and if '$\alpha = +$' then '$-\alpha = -$'.

Unlike the verse that has been examined to this point the lines of a Tang poem are not composed of a single meter. However, although the metrical patterns differ in different lines, all the lines are constructed in accordance with the same rule (29):[8]

(29) In every line let the second position be occupied by a syllable with tonal value [$\alpha$ level], and the fifth position by a syllable with tonal value [$\beta$ level]. The first position must then be occupied by a syllable with tonal value [$\alpha$ level], and the

[8] These comments are restricted to five syllable verses. Longer verse types are constructed in accordance with the same principles.

fourth position by a syllable with tonal value [$-\alpha$ level], whereas the third position must be occupied by a syllable with tonal value [$-\beta$ level].

The values of $\alpha$ and $\beta$, moreover, are free only in the second line of the poem. If '$\alpha = \gamma$' in the second line, then '$\alpha = \gamma$' also in lines 3, 6, and 7; and '$\alpha = -\gamma$' in lines 1, 4, 5, and 8. If '$\beta = \delta$' in the second line, then '$\beta = \delta$' in all even numbered lines (since these must rime), and '$\beta = -\delta$' in all odd numbered lines except for the first line where $\beta$ may also equal $\delta$.

Utilizing these rules one can generate eight distinct metrical patterns for a poem, of which (30) illustrates one:

(30)

$$
\begin{array}{ccccc}
+ & + & - & - & + \\
- & - & + & + & - \\
- & - & - & + & + \\
+ & + & + & - & - \\
+ & + & - & - & + \\
- & - & + & + & - \\
- & - & - & + & - \\
+ & + & + & - & +
\end{array}
$$

## CONCLUSION

In the preceding we have illustrated a number of metrical patterns from a variety of languages and poetic traditions, and we also have examined several different kinds of mapping rules; *i.e.*, rules that relate the abstract metrical patterns to concrete lines of verse. Perhaps the main conclusion to be drawn from the study of metrical patterns is that these are of an extreme simplicity and that as a consequence there appear to be few important restrictions other than those limiting the length of the line and/or the foot as well as the number of different kinds of entity that constitute the pattern. I was struck by the similarity between the metrical patterns and the patterns used in threading looms or those encountered in certain very rudimentary types of ornament. Because of the utter simplicity of these patterns it is hardly surprising that they are found in the most diverse languages and in widely separated areas. A consequence of this observation is that extreme caution must be exercised in postulating genetic relationships between meters in even genetically related languages.

Unlike the metrical patterns, the mapping rules which relate the patterns to concrete instances of verse are of considerable variety. Nonetheless some important regularities may be observed here. Metrical entities are apparently mapped into syllables, morae, or sequences of syllables or of morae. In the simplest cases there is a one:one relationship between the entities of the meter and the syllables of the line of verse. In more complicated cases additional conditions are imposed; *e.g.*, the syllable must possess some phonetic property such as a particular stress, pitch or length; or the metrical

entity must be mapped into more than one syllable; or the syllable must occupy a particular position in the word; or it must begin with a particular consonant (alliteration). *etc*, It is surely no accident that the so-called prosodic features of stress, pitch or length invariably play a primary role in the mapping rules, and it is obvious that one must try to find reasons for these observations.

As every reader of poetry knows not all actualizations of a given meter are equal. Donne's and Milton's pentameters are considerably more elaborate, less simple than those of Pope or Gray. Accordingly, I have attempted to advance some suggestions as to how the mapping rules might be formulated so as to distinguish not only metrical from unmetrical lines but also less complex from more complex mappings of a given metrical pattern. These suggestions are obviously in need of much further study. In particular, these phenomena must now be explored in languages other than English, for without such information it will be impossible to gain insights into the general properties of metrical 'markedness' or complexity.

Beyond this there remain questions of general interest such as the relation between the mapping rules favored by a particular language and the phonetic properties of the language, or the limitations that the human perceptual mechanism imposes on the variety and complexity of the metrical patterns and of the mapping. Even our present, rudimentary knowledge of these facts makes it appear that the relatively simple answers that have been given to these questions in the past are inadequate. There is, for instance, no direct relationship between the phonetic features that function to distinguish minimal pairs in a language and the phonetic features that play a role in the mapping rules of that language. However, it is clearly no accident that in French, *e.g.*, stress plays no role either in the mapping rules or in the rules that determine the phonetic constitution of words. At present not much is known about the reasons for these and similar facts. There is, however, little doubt that the attempt to find these reasons will lead to new and fruitful insights.

This work was supported in part by the National Institutes of Mental Health (Grant MH-13390).

## REFERENCES

Halle, M.,
1966 "On the metrics of pre Islamic Arabic poetry", MIT–RLE, *QPR* 83: 113-6.
Halle, M. and S. J. Keyser,
1966 "Chaucer and the study of prosody", *College English*, 28: 187-219.
Halle, M. and S. J. Keyser,
1970 *English Stress: Its Form, Growth and Utilization in Verse*
Halle, M. and V. J. Zeps,
1966 "A Survey of Latvian Morphophonemics", MIT – RLE, *QPR* 83: 105-13.
Jakobson, R.,
1952 "Studies in Comparative Slavic Metrics", *Selected Writings* IV: 414:465.
Jakobson, R.,
1932 "Über den Versbau der serbokroatischen Volksepen", *Selected Writings* IV: 51-60.

Keyser, S. J.,
1968 "The Linguistic basis of English Prosody", in: S. Schane and D. Reibel, eds., *Modern Studies in English*.

Kiparsky, P.,
1968 "Metrics and Morphophonemics in the Kalevala", *Studies Presented to Professor Roman Jakobson by His Students*.

Meillet, A.,
1923 *Les origines indo-européennes des mètres grecs* (Paris).

Zeps, V. J.,
1963 "The meter of the so-called trochaic Latvian folksongs", *Journal of Slavic Linguistics and Poetics*, 7: 123-8.