PRELIMINARIES TO AN EXPLICIT THEORY OF GREEK METRE

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1. INTRODUCTION

Διαφέρει δὲ μέτρον ῥυθμοῦ. ὕλη μὲν γὰρ τοῖς μέτροις ἡ συλλαβὴ καὶ χωρὶς συλλαβῆς οὐκ ἂν γένοιτο μέτρον, ὁ δὲ ῥυθμὸς γίνεται μὲν καὶ ἐν συλλαβαῖς, γίνεται δὲ καὶ χωρὶς συλλαβῆς· καὶ γὰρ ἐν κρότῳ· ὅταν μὲν γὰρ τοὺς χαλκέας ἴδωμεν τὰς σφύρας καταφέροντας, ἅμα τινὰ καὶ ῥυθμὸν ἀκούομεν. καὶ ἵππων δὲ πορεία ῥυθμὸς ἐνομίσθη καὶ κίνησις δακτύλων καὶ μελῶν σχήματα καὶ χορδῶν κινήματα καὶ τῶν ὀρνίθων τὰ πτερυγίσματα. μέτρον δὲ οὐκ ἂν γένοιτο χωρὶς λέξεως ποιᾶς καὶ ποσῆς. Ἔτι τοίνυν διαφέρει ῥυθμοῦ τὸ μέτρον, ᾗ τὸ μὲν μέτρον πεπηγότας ἔχει τοὺς χρόνους, μακρόν τε καὶ βραχὺν καὶ τὸν μεταξὺ τούτων τὸν κοινὸν καλούμενον, ὃς καὶ αὐτὸς πάντως μακρός ἐστιν ἢ βραχύς· ὁ δὲ ῥυθμὸς ὡς βούλεται ἕλκει τοὺς χρόνους. πολλάκις γοῦν καὶ τὸν βραχὺν χρόνον ποιεῖ μακρόν.

(Longinus, *Proleg. in Heph.* 83.1–16 Consbruch)

In the above passage Longinus clearly formulates the distinction between rhythm and metre and indicates the nature of the linguistic units that are relevant to metrical structure; he makes a binary classification of syllables and notes the (correct) interpretation of *syllaba communis* as not a separate category but arising from variation of certain phonological sequences between the categories of light and heavy syllable. The traditional teaching of Greek (stichic) metre in schools and universities and the accounts in many handbooks reflect such an analysis of metre in terms of two metrically distinctive syllable weights and two corresponding metrical elements. For some years now, however, there has been an increasing tendency, particularly in the work of West[1]

[1] M. L. West, "A new approach to Greek prosody," *Glotta* 48 (1970) 185 ff.

and A. M. Dale,[2] but also in that of Irigoin,[3] Wifstrand,[4] and incipiently in that of Maas,[5] to go beyond this traditional binary classification into heavy and light syllable and *longum* and *breve* elements, replacing them with a multiplicity of supposedly metrically distinctive classes of syllable types to which are ascribed differences of phonetic duration and a multiplicity of metrical elements correlating with subsets of those classes. The resulting metrical schemes are, in complexity, reminiscent of the rhythmical constructs of Boeckh and Westphal. Although of course the latter were arrived at on the basis of quite other criteria, one may suspect that the ultimate goals and motivations of the two schools are not so disparate, and we shall argue in this paper that in one critical supposition the two schools are closer to each other than either is to traditional metrics. We refer to this modern school as the metrical-rhythmical (MR) school.

2. DISTINCTION BETWEEN METRE AND PERFORMANCE

In any discussion of metre and rhythm it is essential to distinguish clearly between the structurally relevant properties which determine what are and what are not acceptable lines, on the one hand, and the variable, structurally irrelevant effects of performance on the other. Since even the same line may be performed with different rhythmical characteristics without its metre being changed thereby, it follows that the requirements of the metrical pattern are independent of and more abstract than the concrete, phonetic variations of individual performances. Accordingly our discussion will not be directed towards performance factors. Similarly, at a higher level of generalization, different styles of performance may have different rhythmical patterns, whether these be close reflections of the metrical pattern or more divergent, externally imposed rhythmicizations. The rhythmical patterns of standard performance styles are again not directly relevant

[2] A. M. Dale, *The Lyric Metres of Greek Drama* (Cambridge 1968[2]) and *Collected Papers* (Cambridge 1969) = *Coll. Pap.*

[3] J. Irigoin, review of L. Rossi, *Metrica e critica stilistica* (Roma 1963), in *GGA* 217 (1965) 224 ff.

[4] A. Wifstrand, *Von Kallimachos zu Nonnos* (Lund 1933).

[5] P. Maas, *Greek Metre*, trs. H. Lloyd-Jones (Oxford 1962[2]).

to metrical structure: unmetrical sequences may be rhythmicized, but they do not thereby become metrically acceptable. Accordingly our discussion will not be concerned with rhythmical pattern in this sense. We discuss these distinctions elsewhere and draw attention to the confusions that have arisen from neglecting them.[6] As indispensable as they are, however, they deal only with the initial clarification of procedures in metrical analysis. Our concern in this article is with the principles and determinants of metricality in the fundamental sense of the characteristics that are inherent in all acceptable verses (of a given metrical type) and the rules that generate (or define) all and only acceptable verses.

3. ANALYSIS OF THE ORIGINS AND DEVELOPMENT OF MR THEORY

Beginning in the early part of the nineteenth century the major emphasis in metrical theory centered on the elucidation and application of the doctrines of Aristoxenus and the ancient rhythmicians to metrical structures that were, in effect, treated as given (at least from the point of view of metricality as defined above). One of the primary objects of this tradition in metrical scholarship was the reconstruction of the rhythmical values of the standard performances of Greek verse. Boeckh is generally regarded as the primary founder of this rhythmical tradition, and his procedures and assumptions are instructive for an understanding of all later elaborations of this orientation. He was the first modern scholar to make the connection between "long *anceps*" and the *alogia* of Aristoxenus and was characteristically concerned with the problem of the durational values that were assigned to the syllables of a spondaic foot in an iambic context in order to preserve the durational ratios characteristic of that rhythm. He proposed that the ratio of $\bar{S}$ to $\bar{S}$ in such a spondee would have been 9/7 to 12/7. A basic axiom of his theory was: "necesse est, ut versibus per varia rhythmica genera compositis adhibitum sit remedium qualecunque, quo iis aequalis insereretur temporum divisio."[7] The attempt to determine these *remedia* constituted a central and constant goal of the rhythmical

[6] A. Devine and L. Stephens, "Greek metrics: methods and goals," to appear in *GRBS*.
[7] A. Boeckh, *De metris Pindari* (Berlin 1811) 105.

tradition from Voss, Apel, and Westphal to Kral and del Grande, however the individual representatives might differ on such issues as the use of modern music, the strength of the *Takteinheit*, the sharpness of the dichotomy between *gesungener* and *gesagter Vers*, and so on. For metres consisting, as it was thought, of "mixed feet," and for Aeolic in particular, the suggested *remedia*, rhythmicizations, χρόνοι τῆς ῥυθμοποιίας ἴδιοι, plasma, etc., led to elaborate and complicated durational schemes. But it should be understood that, quite unlike the modern MR analyses, all these proposed rhythmical schemes took the metrical structure in the sense of the arrangement of linguistic heavy and light syllables as its starting point: this is clear since the rhythmical tradition never attempted to work out the additional rules for and constraints on rhythmicization or plasma in relation to linguistic units that would be necessary if the metrical structure were to be deducible from a scheme of rhythmical durations. It should be kept in mind that the 19th century rhythmical theories tacitly assumed the relation:

$$\text{arrangement of linguistic units} \xrightarrow[\pi\lambda\acute{\alpha}\sigma\mu\alpha]{} \text{durational values/context}$$

whereas, as we shall see, the MR theories dominant in the 20th century explicitly assume the contrary:

$$\text{durational values} \rightarrow \text{arrangement of linguistic units}$$

that is, they seek to explain (and therefore predict) the distribution of linguistic units in metre as a consequence of the durational requirements of a quasi-rhythmical pattern.

Just like the modern MR theorists, most scholars of the rhythmical tradition were interested in differences of phonetic duration between syllables depending on segmental structure and word boundary. They were, however, never explicit about the relation between these assumed phonetic durations and the durational values or ratios of their rhythmical schemes; for some this was simply not a relevant question, for others, although perhaps relevant in some regards, clearly a secondary issue. For example Westphal, Rossbach and Gleditsch[8] accepted in a modified form the remarks of Choeroboscus in Hephaestion (180 Consbr.),

[8] R. Westphal and H. Gleditsch, *Theorie der musischen Künste der Hellenen*, dritter Band, erste Abtheilung: *Allgemeine Theorie der griechischen Metrik* (Leipzig 1887³) 95 ff. [This work is identical in title to that cited in note 17; the text matter is identical to that of the work cited in note 19 which contains different prefatory matter by Westphal.]

Dionysius of Halicarnassus (*De Comp. Verb.* 576 UR) and Aristides Quintilianus (41 f. W-I) on the fractional durations of consonants and recognized 5 syllable "quantities" in the Greek language; however, in contrast to the MR approach, these five quantities were supposed to have been reorganized for metrical purposes into 2, so that it would seem none was individually relevant to metrical structure or, even, to rhythmical plasma. In as much as Westphal had come to insist strongly on the separation of *gesungener* from *gesagter Vers*, claiming that the latter, unlike the former, did not function in terms of the χρόνος πρῶτος, that it did not have χρόνοι γνώριμοι τῇ αἰσθήσει, but χρόνοι ἄγνωστοι, and consequently was not structured in *feste Takte* but *Versfüsse*, it might be thought that the 5 assumed durational categories of the language would have played an important role in the analysis of spoken verse. But this analysis in the Westphal school remained performance oriented and left *gesagter Vers* a less stable and precise version of *gesungener Vers*, in the treatment of which there is no hint of the relevance of such sub-categories of linguistic syllables. In Gleditsch's traditional discussions of prosody the ἄγνωστοι χρόνοι were not mentioned, even in regard to the asymmetry between the dactylic arsis and thesis in the matter of hiatus, failure of epic correption, digamma, resonant lengthening, etc.[9] The ἀλογία of Dionysius of Halicarnassus was explained diachronically in performance terms in the discussions of the hexameter. It was simply asserted that *kyklische Messung* was to be assumed for *die Hexameter der Bukoliker* and no data from the metrical use of language items were offered; similarly Ludwich in his excursus on Nonnus never sought to relate the many word boundary restrictions to constraints on phonetic duration motivated by the verse rhythm.[10] For the Westphal school, even Porson's bridge was treated non-durationally, being explained by quasi-phonetic assumptions about ictus:

$$\textit{Nebeniktus} \rightarrow \textit{Hauptiktus} \;/\; \bar{S}\#[\,\bar{\bar{S}}\,]$$

[9] The asymmetry between arsis and thesis was not accounted for, but the variation between the syllable weights S̄ and S̆ of sequences involving these phenomena was given sound, diachronic linguistic explanation, in marked contrast to the untenable theories current in this century.

[10] A. Rossbach and R. Westphal, *Theorie der musisichen Künste der Hellenen*, dritter Band, zweite Abtheilung: *Specielle Griechische Metrik, Griechische Metrik mit besonderer Rücksicht auf die Strophengattungen und die übrigen melischen Metren* (Leipzig 1889³) 12–78.

so that # had to be excluded after S̄ in the fifth foot of the trimeter because the fifth foot must, as was assumed, receive only the *Nebeniktus* (note 10, 223).

Other rhythmists, however, made different assumptions about the relevance of assumed phonetic differences in syllable durations, although they never received more than cursory or incidental notice. Shorey[11] believed in 7 quantities and apparently considered them somehow metrically relevant; Goodel[12] speculated that the rhythmicization of "mixed feet" might vary depending on the segmental structures of the light and heavy syllables implementing them. For example, the syllables of a trochee in a dactylic context would be assigned different durations as follows:

$$\bar{V}CC(C)\breve{V} \rightarrow \llcorner \cup / — \cup\cup$$

$$\bar{V}C\breve{V}TR \rightarrow — > / — \cup\cup$$

Obscure remarks such as Herodian's (2.709 Lehrs) *τὸ φύσει μακρὸν μεῖζόν ἐστι τοῦ θέσει μακροῦ* were sought out as explanatory principles. The general concern was to establish their programmatic assumption that a binary distinction of syllables was mechanistic and inadequate, whether for describing the rhythms of verse performance or the language itself. It is easy to understand, given the concerns and assumptions of the rhythmical tradition, that no attempt should have been made to elaborate a system of correlations between the two.

With the rise of the "New Metric" at the end of the nineteenth century, the emphasis was shifted to a concern with the historical origins and development of Greek metre and a classificatory analysis of lyric on the basis of constituent subsequences. The more preliminary and fundamental questions of metrical theory, however, remained largely unexamined. In particular, metrists continued to assume, if tacitly, that metricality was basically a matter of time-values. But with the decline of interest in external rhythmics, these time-values assumed a new status: they no longer referred to the durational relations of musical notes but came to be associated with the elements of the metrical pattern itself.

[11] P. Shorey, "Choriambic dimeter and the rehabilitation of the antispast," *TAPA* 38 (1907) 63.

[12] T. Goodell, *Chapters on Greek Metric* (New York 1901) 212.

By this time a considerable body of detailed philological work had developed on the metrical distribution of linguistic phenomena. Scholars from Porson and Hermann to Naeke, Hilberg and Meyer[13] had observed a disconcertingly large number of restrictions on word boundaries. Apparent restrictions on the sorts of intervocalic consonants permitted in resolutions had been collected by Seidler, Müller, Witkowski,[14] et al. Wernicke[15] and Hilberg had also noted restrictions on positional lengthening. For the most part this work was done purely at the observational level and in conjunction with textual criticism, but there grew with it an explanatory framework: these phenomena were to be accounted for in terms of phonetic duration—"ut in efferendo anapaestus facile fluat" (Witkowski, note 6).

The full consequences of this work and orientation, however, were not articulated into a theory of *metre* until the 20th century. The decisive step appears to have been taken by Maas, for he assumed that metrical elements were defined directly in terms of time values rather than merely rhythmicized into those values, in his attempt to define the phenomena of *anceps* and *biceps*. Thus he was drawing upon constructs of the old rhythmical school, but attributing to them a metrical rather than a rhythmical status. Maas's *anceps* with a "time value somewhere between that of *longum* and that of *breve*" and West's 1.4:1 ratio[16] are

[13] R. Porson, *Euripidis Hecuba*, supplementum ad praefationem (Cambridge 1802²) xxx–xxxiii; G. Hermann, *Orphica* (Leipzig 1805) 692; A. Naeke, "Callimachi Hecale IV, V," *RhM* 3 (1835) 517; J. Hilberg, *Das Prinzip der Silbenwaegung und die daraus entspringenden Gesetze der Endsilben in der griechischen Poesie* (Vienna 1879); W. Meyer, "Zur Geschichte des griechischen und lateinischen Hexameters," *Sitzb. Bay. Akad.* (1884) 979–1089.

[14] A. Seidler, *De versibus dochmiacis tragicorum graecorum* II (Leipzig 1812) 385; C. F. Müller, *De pedibus solutis* (Berlin 1866); W. Kopp, "Ueber positio debilis und correptio attica im iambischen Trimeter der Griechen," *RhM* 41 (1886) 258 ff.; S. Witkowski, "Observationes metricae in Herodam," *Analecta Graeco-Latina philologis Vindobonae congregatis* (Krakow 1893) 1 ff.

[15] F. Wernicke, *Tryphiodorus* (Leipzig 1819) 173.

[16] West (note 1, 191) uses the term "mean-time" erroneously: the figures he gives are the mid-points between the extreme values of his parameters. The mean is the expected value and measure of the central tendency of a frequency distribution; for West's scheme it is the expected value of the "duration" of a position. To calculate the mean-time of a Westian position correctly, one would need to know the frequency distribution of his posited syllable types in that position, information which West does not provide or even consider. Thus if syllable type i had duration d_i and relative frequency p_{ij} in position j, the mean-time of position j, $\bar{d}_j$, is given by

$$\bar{d}_j = \sum_i d_i p_{ij}$$

clear descendants of Boeckh's 12/7:9/7, Westphal's 2:1.5[17] and of widespread identification of *anceps* with the ἄλογος χρόνος and quite in contrast with, e.g., Hermann[18] §§33 and 65–66 which allow free variation of the distinct *metrical* elements *longum* and *breve*. Likewise, the postulation of a distinct metrical element *biceps* grows out of the rhythmical ἀλογία of the cyclic dactyl.

Now a fundamental distinction was drawn by 19th century scholars between rhythmical analysis and metrical analysis. Hermann warns against the confusion of the former with the latter: "prorsus diversae sunt;" Westphal treats them "getrennt" as "selbständige Discipline,"[19] following the ancients, as he remarks. Thus for Westphal in *anceps* position "Die Thesis kann sich daher[20] . . . im *Metrum* durch eine lange Silbe ausgedrückt werden, dem *Rhythmus* nach ist sie jedoch nur ein ἄλογος χρόνος (tempus irrationabile) von $1\frac{1}{2}$ Moren" (our italics) (note 10, 180). At first sight, it might appear that in attributing metrical status to the old rhythmical units, the school of metrics founded on Maas was not achieving an advance, but, on the contrary, merely blurring a previously recognized distinction. This is probably a valid criticism, but it misses the essential methodological innovation: evidence was now sought in the metrical distribution of linguistic units for the hypothesized additional metrical elements. The philological foundations of this approach had already been laid, as we have seen, by the distributional studies of the 19th century. It was finally possible for the metrist to escape from the rigid constraints of the "entweder—oder" (Shorey, note 11, 59) of the "print-and-paper-limited fashion" longs and shorts (Dale, note 2, *Coll. Pap.* 191), and for the rhythmist to

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West, however, bases his conclusions on the formula

$$(\max d_{ij} - \min d_{ij})/2$$

which can readily be seen not to give a mean value.

[17] R. Westphal and H. Gleditsch, *Theorie der musischen Künste der Hellenen*, dritter Band, erste Abtheilung: *Allgemeine Theorie der griechischen Metrik* (Leipzig 1887[3]) 132.

[18] G. Hermann, *Epitome doctrinae metricae* (Leipzig 1844) 13, 21.

[19] R. Westphal, *Theorie der musischen Künste der Hellenen*, erster Band: *Griechische Rhythmik* (Leipzig 1885[3]) xiii.

[20] Because of certain performance characteristics attributed to Westphal's postulated *Hauptiktus*.

"rise in revolt against syllable-counting metrists" (Shorey, note 11, 63) on the basis of philological data rather than of musical speculation.

It was Wifstrand who began to articulate this theory to its full potential. He endeavoured to explain "die Unauflösbarkeit der longa" in the hexameter by assuming that *metrically* the first element of the dactylic foot (in this metre) was shorter than the second element (the *biceps*) and thus shorter than two light syllables. Most importantly, he attempted to support this contention by adducing additional linguistic data such as the limitation of positional lengthening before initial digamma to the *longum* and similar restrictions. This approach, which saw in duration the prime explanation for distributional differences in all conceivable circumstances, reached its culmination or *reductio* in the theory of West. Although, in fact, it is distinct both from the purely rhythmical tradition of Westphal, and from the purely metrical tradition of Hermann, this general approach operates with the same sort of data as the latter but, as we shall argue, uses those data to establish a pattern that is both formally and substantially a rhythmical and not a metrical pattern. This is why we refer to this approach as the metrical-rhythmical (MR) theory.

4. GENERAL CHARACTERISTICS AND DIFFERENT VERSIONS OF MR THEORY

The metrical-rhythmical theory of Greek metre is idiosyncratic in a number of ways. Its distinctive elements are greater in number and implemented at a lower level of phonological abstraction than is to be expected on the basis of what we know of other metrical systems of languages throughout the world, where there are never more than two metrical elements and these elements are always implemented by major phonological classes or superclasses. This makes the MR analysis typologically suspect. A related point is that the evidence for the independent existence of the posited multiple classes of durations as distinctive and functional classes in the language, rather than heterogeneous *ad hoc* classifications or subdivisions, is not as strong as it is for the traditional binary classes of heavy and light syllable, which function as such in important rules of the phonology and the morphology. Nor do the posited metrical elements always appear to have single, firmly

substantiated correlates in the language. We shall see that these idiosyncrasies are symptoms of major shortcomings both in the evaluation of the data on which MR theory is based and in the theoretical assumptions with which it operates.

There are two major categories of MR theory, distinguished by the way in which the pattern elements are defined. They are the "Ideal Values" theory and the "Parameter" theory. Within the Ideal Values theory two subtypes should be distinguished, the "distortion" theory and the "standard ideal values" theory for which distortion is not an essential characteristic of metricality. In the first, less sophisticated version of the Ideal Values theory the claim is made (implicitly) that metre is a set of instructions for and limits to the modification or distortion of language required to satisfy the ideal values of the multiple metrical elements. For instance, in the view of A. M. Dale "a short vowel followed by mute + liquid [represents a linguistic sequence] which in a given context could be *adapted* to the *required* length by *modifying* the pronunciation"[21] (our italics). The second version operates with a less performance-oriented conception of metricality and either assigns fixed ideal durations to its multiple elements or specifies the durational ratios in which those elements ideally stand. The Parameter theory, on the other hand, specifies not a value or ratio as the ideal to be aimed at, but an interval or parameter of durations defined by the minimum and maximum permissible durations: each metrical element is thus described in terms of a parameter.

5. MAJOR DIFFERENCES BETWEEN MR THEORY AND TRADITIONAL METRICS

MR theories of all types differ from traditional metrical analysis on two fundamental and distinct points. Firstly MR theories assume more than two structurally relevant metrical elements, and often more than two metrically relevant linguistic categories: we shall examine below the philological and theoretical evidence that has been, or might be, adduced to substantiate the hyperbinary durational categories ascribed to the Greek language and assumed to be metrically relevant in MR theory, and the hyperbinary metrical elements that depend in part

[21] A. M. Dale, "Observations on dactylic," *Coll. Pap.* 185.

on the metrical relevance of those categories. Secondly, and less obviously but equally importantly, MR theories tend to operate with a quite different understanding of the perception of metricality by poet and audience. Let us consider this latter point first.

5.1. Model of Perception of Metricality

Traditional metrics works in terms of feature matching, i.e., the distinctive phonological syllable feature values *heavy* and *light* (or ± heavy) are matched with or mapped onto the metrical elements which are likewise defined by some comparable metrical feature values,[22] *longum* and *breve* (± *longum*). For MR theory, on the other hand, the syllables of a particular language sequence are measured individually according to their duration and then assigned to the correct metrical element (ideal value or parameter). Thus syllables are assumed not to be evaluated for metricality on the basis of categorizations preassigned by the language, but to be examined singly and directly in order to ascertain which metrical element or elements they satisfy the durational requirements of. An important consequence of this model of the perception of metricality is that it does not necessarily depend on *linguistic* categorizations; it could, potentially, be a rhythmical pattern of external nature to which language is being versified, and we shall argue below that this is the implicit conception of the metrical pattern in MR theory. Such a conception of metricality would be consonant with the very physicalist interpretation of the function of duration in metre, which is implicit in the work of some MR theorists. But it is easy to see that physical duration at the level of the utterance cannot be the metrically relevant property, and that this idea would never have been entertained if certain empirically necessary distinctions in levels of phonological abstraction[23] had been properly and consistently drawn.

Let us briefly consider these levels, starting with the most physical level and proceeding towards the more abstract.

(a) Is the criterion of metricality the duration of any given syllable at the level of its actual physical duration in the nonce utterance? No: if

[22] This is a fundamental principle of all metrical systems, and we discuss it in detail in "The abstractness of metrical patterns," *Poetics* 16 (1975) 411 ff.

[23] Autonomous, not morphophonemic, abstraction.

it were, unmetrical *stichoi* would be accepted as metrical. This is so because at this level, although the physical durations of phonologically heavy and light syllables typically follow normal or Gaussian curves with different means and variances,[24] the tails of these curves overlap; i.e., some long vowels are in actual utterances shorter than some short vowels and some short vowels longer than some long ones. Although we have no measurements for syllables, we feel that (here and below) the same relationships would most likely apply also outside monosegmental syllables. Therefore, if this were the metrically relevant level of phonological abstraction, the requirements of the *elementum longum* would be satisfied by at least some instances of the phonologically light syllable (and vice versa those of the *breve* by the heavy): but they are not.[25] Therefore some abstraction (i.e., *ceteris paribus* correction or normalization) must be applied.

(b) Is the criterion of metricality the duration of any given syllable when allowance is made for difference of tempo (ratio theory)?[26] No, because the curves of the frequency distribution of actual durations still overlap even with normalized tempo. For instance, in Hungarian, a language with quantitative metre *inter alia*, vowel duration has been

[24] It is interesting to note that the variance of the distribution for long vowels is uniformly greater than that for short vowels: $\sigma_{\bar{V}}^2 > \sigma_{\breve{V}}^2$. Cf. N. Trubetzkoy, "Quantität als phonologisches Problem," *Actes du IV^ème Congr. Int. des Linguistes* (Copenhagen 1938) 117 ff.

[25] $\bar{S} \rightarrow \breve{S}$ due to sandhi processes, etc., is, of course, not relevant here. A sandhi rule either applies or does not apply; the abstract, pre-sandhi representation is never to be considered a third quantity.

[26] Gordon Peterson (reported by A. Rosenzweig, *A Spectrographic Analysis of Consonant Length in Standard Italian*, PhD diss. University of Michigan, 1965) has developed a procedure for normalizing segment durations, so that tokens from different utterances can be compared as if they were all spoken at constant tempo. For syllables the procedure would be as follows: (1) define the tempo of an utterance (respectively verse performance) as the average duration of a syllable in that utterance; thus if d_i is the duration of utterance i and there are n_i syllables in that utterance, the tempo t_i is $t_i = d_i/n_i$. (2) Determine the average tempo, $\bar{t}$, of all utterances in question,

$$\bar{t} = 1/N \sum_{i=1}^{N} t_i$$

(3) the normalized duration of a syllable token in any given utterance i then is its actually measured duration multiplied by the normalizing factor $\bar{t}/t_i$, i.e., the normalized duration $\$_{ij}$ of syllable j with actual duration s_{ij} in utterance i is

$$\$_{ij} = (s_{ij} \times \bar{t})/t_i.$$

shown to be critically dependent on length of the word.[27] (In one instance an initial long vowel is shorter than a final short vowel by almost 30% of its own duration; and in final syllables of words of different length, we find that a short vowel in the final syllable of a dissyllabic word is longer than a long vowel in the final syllable of a tetrasyllabic word.) Therefore, at this level of phonological abstraction too unmetrical *stichoi* would be generated, because the requirements of the *elementum breve* would be satisfied by at least some instances of the phonologically heavy syllable (or those of the *longum* by the light). Likewise the duration of syllables is influenced by their position in the larger discourse units such as the sentence and even the paragraph.

(c) Is the criterion of metricality the duration of any syllable when allowance is made for factors covered by (a) and (b) above? Even this is arguable, because there is some evidence to suggest that the actual durations of phonologically heavy and light syllables at a normalized tempo in comparable discourse environments may overlap for certain segmental structures. Although phonetic measurements on typologically comparable languages have not been published, available data indicate the possibility of overlap for such pairs as *στρᾰ-τ . . .* vs. *ἴπ- . . .* or the like. If sufficient typological confirmation were obtained, such data would establish the complete impossibility of defining the metrically relevant categories in terms of purely durational magnitudes. At all events, even apart from this possibility, it is clear that metricality can only be defined at a considerably abstract phonological level, a conclusion which emphasizes its linguistic basis and contradicts the physicalist view of duration in metre. Thus the model of metrical perception that denies the matching of linguistic with metrical features and assumes direct durational measurement of syllables will have to operate at the above specified level of abstraction, to which it is not entirely appropriate.

5.2. The Metrically Relevant Linguistic Categories

Now that we have discussed the terms in which duration is metrically assessed, let us turn to the other difference between traditional and MR

[27] T. Tarnoczy, "Can the problem of automatic speech recognition be solved by analysis alone?" *Rapp. du 5ème Congr. Int. d'Acoustique* (Liege 1965) 371 ff.

metrics, namely the number of metrically relevant linguistic categories and the number of metrical elements. We shall take the former first.

In discussing the opinions of the MR school in this matter, one is generally faced with the problem that a properly worked out theory explaining the status and number of metrical elements posited is never offered. The main exception is for the parameter theory of West, the presentation of which is, however, overly concise and opaque. But the major difficulty is that no author is willing to explain why the assumption of an additional durational category is the only explanation, or even the best explanation, for the distributional asymmetry he claims to have discovered. The durational explanation is not discussed, it is simply assumed, and this constitutes a *petitio principii*.[28]

When we examine the various proposed additional metrically relevant categories of linguistic duration, we find that most of them rest either on wrongly posited distributional asymmetries or on real distributional asymmetries which, however, are better explained without assuming additional durational categories. In the simplest situation, the distributional asymmetry claimed is simply not statistically significant: this is the case with the claim that *muta cum liquida* is not permitted between the vowels of a resolution (Zielinski, Snell, Irigoin, West [note 1], Parker);[29] the small differences between frequencies of *muta cum liquida* after the vowels of light syllables implementing resolutions and those of light syllables implementing the ordinary *breve* element are purely random fluctuations due to chance.

In other cases the distributional asymmetry is statistically significant, but due to the simple fact that Greek verse, being written in Greek, must reflect the natural distribution of syllable types within the Greek

[28] For instance West (note 1, 186) writes: "The beginner is told that a hexameter is made up of dactyls . . . the advanced metrist knows that this is incorrect . . . There would be no reason why a short final vowel in arsis should make a long syllable with following mute and liquid far more often than in thesis." In fact the "advanced metrist," if he is to deserve his title, should explicitly state why the durational hypothesis should be superior to other conceivable explanations.

[29] T. Zielinski, *Tragodoumenon libri tres* (Krakow 1925) 150 *et passim*; B. Snell, *Griechische Metrik* (Göttingen 1962[3]) 11, 13; J. Irigoin, "Lois et règles dans le trimètre iambique et le tétramètre trochaïque," *REG* 72 (1959) 75; L. Parker, "Greek metric, 1957–1970," *Lustrum* 15 (1971) 68.

For discussion of the linguistic and metrical issues involved and a statistical demonstration of the falsity of this claim see L. Stephens, "The myth of the *lex de positione debili*," *Phoenix* 29 (1975) 171 ff.

language. This factor (together with Wernicke's Law, which too can be explained without duration) accounts for the distributional asymmetry of $C\breve{V}C$ vs. $C\bar{V}(C)$ in the hexameter, which was used as a basis for an additional durational category and metrical element by Irigoin.[30] In such cases, it would in fact be *equal* distribution that would be evidence for metrical distinctiveness. Anyone positing additional durational categories cannot afford to neglect either the factor of simple statistical significance, or the factor of automatic, reflex asymmetries forced by the statistical structure of the language.

A third large group of additional durational categories is posited by West in his parameter theory (in some instances anticipated by other scholars such as Wifstrand and Snell) on the basis of asymmetrical distributions involving word boundaries, digamma, *muta cum liquida*, sequences subject to "epic correption" ($\bar{V}\#V$) and "failure of metrical sandhi" ($\breve{V}C\#V = \bar{S}\#V$). In all these cases satisfactory alternative explanations are available that do not entail new durational categories, and in some cases the proposed durational explanation is simply absurd and contradicts banal facts both of language *per se* and of its use in a traditional *Kunstsprache*. One of the most striking characteristics of *Kunstsprachen* in general, irrespective of whether they are implemented in quantitative verse or not, is the coexistence of variants at all linguistic levels, lexicon, syntax, morphology, phonology. Phonological variation originates *inter alia* in dialect mixture, phonostylistic variation, archaism and its analogical hyper-extensions. There seems no reason to go out of one's way to deny phonological variation (but not variation at other linguistic levels) in, e.g., Homer, especially as, unlike the assumption of phonological variation, the new monolithic durational categories posited in its place are *ad hoc* and typologically as unique as variation is well attested.

Thus if, e.g., short vowel plus *muta cum liquida* may implement either *longum* or *breve*, while certain other sequences may implement only one and not the other, this is because in the one case it is a heavy syllable and in the other case a light syllable and the poetic language in question accepts this variation. Thus the assumption of an intermediate category of duration, as, e.g., by Snell (note 27, 55), is unnecessary, and

[30] Irigoin (note 3). We discuss this fully in "The Homeric hexameter and a basic principle of metrical theory," *CP* 71 (1976) 141 f.

the same is true for all distributional asymmetries of the form in which the same linguistic sequence implements both the *elementum longum* and the *elementum breve*. Since two different syllable types are involved (e.g., V̆-TR vs. V̆T-R), there is no longer any distributional asymmetry in these cases, since only light syllables implement *brevia* and only heavy syllables *longa*.

However linguistic variation by itself does not account for all of the distributional asymmetries invoked as a basis for new durational categories. The remaining asymmetries all involve word boundary, often acting in conjunction with segmental differences.

West's version of the MR approach to these data is the one presented in the most detail, although, even in its own terms, it is not entirely satisfactory. For instance, it is claimed (note 1, 191) that "the absolute difference . . . should be equal [when] it depends on the same factor;" it is therefore hard to see why the durational difference between digamma and any other consonant should be almost three times as much after a short vowel as after a long vowel (0.55 versus 0.2 difference in West's units). The assumption is rather strange anyway: was the durational difference between *w* and any other consonant so much greater than that between any two of the other consonants that it could be metrically relevant in the environment V̆C#— when all other durational differences between consonants are not metrically relevant in that environment? In at least one instance the posited parameters for metrical positions seem to be inaccurately stated: the maximum value for position 5β in the hexameter is given as ⏑ x̆ (versus x̆x̆ in other β positions), which is contradicted by instances like *ἀπέκρυψεν δέ μοι ἵππους Il.* 11.718, *οὐδὲ μὲν ἔργον Il.* 9.374, since lengthening before resonants at the appositive boundary, epic correption and V̆C#*F* are x̆. Another weakness is the necessity for *ad hoc* explanations for data that lead to embarrassing consequences if the durationalist interpretation is applied with consistency: a more accurate statement of categories x̆ (1) and x̆ (2) would have to exclude the consonants in question in a considerable number of individual lexical items: *F* (digamma) in *ἰδ-*, λ in *λείπω*, *λέχος*, etc. Now it would be absurd to assume that in these words the digamma is longer than in other words such as *ἔργον*, and that λ is shorter in these words than in words such as *λαμβάνω*; nevertheless, if the durationalist interpretation is not to beg the question by

picking and choosing its *explananda*, it will lead to just such a *reductio*.

But perhaps the most serious inconsistency lies in the interpretation of word boundary by the MR school, which turns out to be contradictory both from one scholar to another and self-contradictory within the work of one and the same scholar in two major versions of the theory. For Ferdinand Sommer[31] word boundary subtracts duration from final $\breve{V}C$, making it too short for the (non-ictus bearing) *biceps*, whence Wernicke's Law. Therefore, for Sommer a durational interpretation of Porson's bridge is not possible without a contradiction of his basic premise. For Wifstrand (note 4, 33) word boundary both after and before a syllable adds duration to that syllable, a theory which makes the durational interpretation of bridges impossible since word initial syllables would also violate bridges. For Porter[32] the word boundary added duration, thus making long word final syllables so long that they were avoided in the contracted *biceps*. For Irigoin, on the other hand, *biceps* restrictions reflect the insufficient duration of the avoided syllable to fill the contracted *biceps* position: since word-final $\breve{V}C$ is more strictly avoided than word-medial $\breve{V}C$ (the latter is in fact not avoided at all (see Devine & Stephens, note 30)), a durationalist interpretation of the word-boundary would have to assume that it subtracted duration; however, for resolutions and Porson's bridge, it is assumed by all MR theories to add duration.

Similarly, in West's scheme, word boundary regularly *adds* duration, by moving a sequence into the next higher durational category (so $\breve{V}C = \overset{|}{\smile}$, $\breve{V}\#C = \overset{||}{\smile}$; $\bar{V} = \overset{|}{-}$, $\bar{V}\# = \overset{||}{-}$; but in the case of the sequence short vowel plus resonant or σ an intervening word (or appositive) boundary has the effect of shifting the sequence up 3 categories, from $\overset{|}{\smile}$ to $\overset{|}{x}$): on the other hand, in the case of the sequences short vowel plus *muta cum liquida* and long vowel followed by any vowel, word boundary is assumed to *subtract* duration, shifting the former down to one category lower, the latter to two categories lower. That word boundary should add duration before initial stop plus vowel and subtract it before initial stop plus certain resonants is *prima facie* phonological nonsense (whereas the explanation invoking the relation

[31] F. Sommer, "Zur griechischen Poesie I: die Positionsbildung bei Homer," *Glotta* 1 (1909) 193.

[32] H. Porter, "The early Greek hexameter," *YCS* 12 (1951) 1 ff.

between the boundary and the syllable division rests on well founded and solidly documented principles of phonology).

At all events, there is an alternative explanation available for the distributional asymmetries of the hexameter (such as spondee zeugma, Wernicke's Law, epic correption, digamma etc.), and this explanation seems to us consistent and convincing. That the avoidance of word end after contracted *biceps* in general, and in particular in the coda, is not due to durational factors is widely admitted even by durationalists (e.g., by Snell (note 27, 9–11), and by West (note 1, 190 note 6)). That durational factors are also unnecessary to explain the particular rarity of positional lengthening of $\breve{V}C$ before digamma and of $\breve{V}$ before *muta cum liquida* has not been so widely recognized, even though the alternative explanatory principle was formulated already in 1924 by Thea Stifler,[33] and applied with considerable acumen by Sidney Allen.[34] All word boundaries are avoided after the contracted *biceps*, and the greater the potential of any particular word-final—word-initial sequence for occurrence elsewhere in the line, the easier it is for that sequence to be avoided at the contracted *biceps*. Now the categories most avoided (see the list above), which form the basis of many of the posited intermediate durations, are just those categories that offer the greatest latitude for location elsewhere because of the possibility of different syllable weights in other sandhi environments (e.g., $\breve{V}C\#V$, $\breve{V}C\#C$) combined in most cases, with additional options due to some inherent variation (e.g., F vs. $F \rightarrow \phi$, $\bar{V}\#V$ vs. $\bar{V}\#V \rightarrow \breve{V}\#V$).[35] This concept of the avoidance hierarchy explains these distributional asymmetries in the hexameter without positing (a) durational distinctions in the language for which there may be no general linguistic or language particular phonological support, and (b) the metrical relevance of the so posited categories.

There remain to be discussed the durational categories posited to account for resolution bridges and Porson's bridge. There have been some recent developments in the field of English metrics that might support the view, probably implicitly held by many metrists, that the

[33] T. Stifler, "Das wernickesche Gesetz und die bukolische Dihärese," *Philologus* 79 (1924) 323 f.

[34] W. Sidney Allen, *Accent and Rhythm* (Cambridge 1973) 290 f.

[35] We discuss this further at note 30.

resolution bridge is motivated by a requirement that the complication introduced into the metrical structure by resolution should not be added to by a boundary mismatch between language unit and metrical unit. Whatever the true explanation, it remains clear that word boundary is a metrically relevant linguistic property. Thus we conclude that of all the linguistic properties for which metrical relevance has been claimed by MR theory, only syllable weight (two values, heavy and light) and word boundary (two values) are in fact metrically relevant. (It should be remembered that there are other metrically relevant phonological properties that have not been under discussion; rules such as the constraints against hiatus or (as in some Latin poets) against the sequence V#sT entail the metrical relevance of certain aspects of the segmental structure of syllables.)

5.3. The Metrical Elements

Having established which phonological properties are metrically relevant, we must now turn to the problem of what and how many metrical elements must be posited to produce a metrical "grammar" that will generate all and only metrically acceptable *stichoi*. It will be immediately clear that in this too traditional metrics and MR theory operate with quite different analytical criteria, postulates and procedures.

There are, theoretically, various different ways of organizing the metrically relevant linguistic categories into the metrical elements that are arranged into verse patterns. These different organizations arise from different attitudes to the criteria of "biuniqueness" and "predictability." The criterion of predictability blocks assignment of element status to (sets of) metrically relevant categories that, wherever they occur, may always be derived from other sets by rules specifying the metrical environment to which they are limited. Biuniqueness is simply the requirement that metrical elements correspond one for one with mutually exclusive sets of metrically relevant linguistic categories. Thus, according as these two criteria are or are not admitted into a theory, there will be four principal analyses of the elements of Greek metre and their relation to the metrically relevant categories. In the following discussion it should be kept in mind that all the analyses treated go beyond simply enumeration of facts; they are part of theories

of Greek metre and as such the abstract entities they posit and the additional consequences they imply must be evaluated both with regard to the theoretical structure into which they fit and to all other metrical data, i.e., according to the principle of the hypothetical-deductive method of scientific explanation: no theory can be acceptable from which unacceptable implications may logically be deduced.

(1) Traditional metrics has implicitly recognized the criteria of biuniqueness and predictability and also the fact that, for reasons noted in (4) below, restrictions of word boundary such as Porson's bridge, are predictable. Therefore it has posited only two elements, *longum* and *breve*, and has accounted for word boundary restrictions by context sensitive rules. The resulting theory not only accounts for the facts of distribution of the metrically relevant linguistic categories but does so in a way that takes into account the difference in status between the features ± word boundary and ± syllable weight, a factor discussed below.

(2) The second type of analysis maintains biuniqueness but dispenses with predictability. It is not represented in the literature, and it is instructive to make the reason explicit. It posits at least 4 metrical elements (one for each syllable weight with and without word boundary) and extensive free variation between elements in all positions. As in all the analyses discussed, such elements are abstract entities connected with observed verse tokens by postulates, but in this case no simplification, much less explanation, is achieved; it is merely a translation of the *explananda* directly into theoretical entities and rules. Implicitly recognizing that no explanatory advance would be obtained in this way, scholars naturally never entertained this second type of analysis as a serious alternative.

(3) The third analysis maintains the criterion of predictability but dispenses with biuniqueness. This is the position of Maas, for whom *anceps* and *biceps* are elements (overlapping with *longum* and *breve* in their linguistic implementations) but for whom word boundary restrictions do not give rise to additional elements. This position is examined below in the discussion of biuniqueness.

(4) The final analysis dispenses with both biuniqueness and predictability; this would be West's theory modified by the removal of the

falsely posited metrically relevant linguistic categories, a separate parameter being set up for all positions where word boundary is restricted (unless of course other theoretical considerations force a different analysis, see below for discussion). But it should be noted that restrictions on + word boundary are always predictable[36] from context-sensitive rules, except where + word boundary implements a metrical boundary such as *stichos* end (and in its function as a boundary marker it is hardly an element). Since word boundary is always either predictable or a boundary marker, many metrists have tended not to set up distinctive elements on the basis of word boundary distributions alone. Those who feel that despite its predictability word boundary is the basis for distinguishing metrical elements will have to account for various anomalies in the resulting system. For, as noted above, there is a difference in status between word boundary and syllable weight: -word boundary syllables for instance are never the only implementations of metrical elements, but are always positional variants. Whereas by changing the values of syllable weight in a *stichos*, a different type of *stichos* can be produced, only unacceptable instances of the same *stichos* will result from changing the value of the feature word boundary. The traditional analysis better characterizes the secondary nature of word boundary in metrical structure, and this suggests that the criterion of predictability is a relevant one.

Let us now turn to the criterion of biuniqueness. To start with it will be necessary to make a basic three-fold distinction: this is between linguistic class and metrical element on the one hand, and metrical element and position or environment in the *stichos* on the other. In the

[36] Predictability is one of the principles of structural analysis which were worked out thirty or forty years ago; although reference to such principles has for some time been out of vogue, they are relevant and enlightening in this question. Metrical patterns contain two types of redundancy: one type occurs in periodic *stichoi* and is comparable to the sort of redundancy exhibited linguistically in vowel harmony and the "prosodies." A closer linguistic parallel to the periodic *stichos* would be a language in which a portion of the lexicon was characterized by reduplication of the entire word (for instance in Snohomish *saq'^{w}* "fly," *saq'^{w}saq'^{w}* "fly slowly in circles" (Hess, *IJAL* [1966] 350). The other type of redundancy in language structures manifests itself in contextually predictable and therefore non-distinctive or "etic" features, such as aspiration in English stops. Word boundary constraints in Greek metre are predictable in this latter sense and thus not a basis for assuming additional metrical elements. Similarly aspiration is a phonetically relevant category but not the basis for a phonological distinction in English.

terms of traditional metrics, a light syllable is the implementation of the *breve* in the second foot of the trimeter, and so forth. For the proponents of MR theory, the ideal values, slots, quantity tolerances ARE the elements which occur in different positions in *stichoi*: positions and elements are not different terms for the same thing, because both are needed to produce a unique definition of a *stichos*.

In MR theory, only one element can stand in any position, whereas in traditional metrics alternation, such as *anceps* and *biceps*, is allowed. MR theory operates with many metrically relevant linguistic categories, and these categories are not biuniquely correlated (i.e., do not correspond one for one, as in traditional theory) with the metrical elements. To explain the resulting alternations MR theory adopts an analytical principle according to which each different class of alternants (i.e., all the metrically relevant categories that can stand in any metrical position) is defined intentionally as an invariant or metrical "eme," which is described by the property that uniquely characterizes the class and no other class, namely an ideal durational value or an interval containing the durations of the alternants. The appeal of this approach lay in its providing an inherent, direct and general explanation for the existence of alternation, as well as for certain hitherto unclear aspects of metrical structure such as the absence of resolution of the *longum* in the hexameter.[37] Removal of the biuniqueness constraint allows the metrical pattern to be expressed by single elements with no alternation of elements (*sic*) in a given position, at the expense of course of multiplying the metrical elements. West, for instance, has approximately a dozen different metrical elements for the hexameter and the Ionic trimeter alone, most of which occur exclusively either in the hexameter or in the trimeter! The reader is reminded of the distinction between metrically relevant linguistic categories and metrical elements; (under the strong ordering condition required for West's durational interpretation, seven metrically relevant linguistic categories—and ten possible linear sequences of them in a single position—the theoretical maximum

[37] In fact not so very general, since even apart from "rhythmical" bridges, non-durational explanations will still be required for constraints against, e.g., tribrach plus anapaest in the comic trimeter; this is clearly a non-durational constraint since anapaest plus tribrach is permitted. In fact the very occurrence of anapaests in even numbered feet in the comic trimeter leaves a hole in the parameter of permissible durations (i.e., no spondees) and so requires *ad hoc* explanation in a parameter theory.

number of different metrical parameters, i.e., elements, can be calculated by the formula

$$E_{\max} = \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

where $n = 17$, i.e., all the possible values from ⏑ to ¯¯).[38] This gives a maximum of 153 elements, while the traditional biuniquely constrained binary classification, which West terms "too crude for the detailed understanding of Greek metre," gives just two!

Likewise, on the ideal values approach, additional elements have been

[38] In a purely distributional analysis of metrical positions each distinct, non-empty subset of the set of metrically relevant syllable types and distinct linear sequences of those types will, if it occurs uniquely in at least one metrical position, define a metrical element. Thus if m metrically relevant syllable types are posited and s different linear sequences of them are also posited as metrically relevant, there will be a set of $n = m + s$ distinct items $\{\sum_i\} = \{S_j\} U \{\langle S_k, S_1 \rangle_p\}$ $(j = 1, 2, \ldots, m;\ p = 1, 2, \ldots, s)$, each distinct, non-empty subset of which can define a metrical element. (If sequences of maximum length r can occur in a position the maximum value of s is

$$s_{\max} = \sum_{i=2}^{r} m^i$$

Note that not all of these sequences may be possible: e.g., a word medial syllable cannot follow a word final syllable. This sort of redundancy will reduce the actual value of s below that of $s_{\max}$ permitted by the theoretical formula.) The maximum number of such distinct, non-empty subsets of $\{\sum_i\}$ is $2^n - 1$ (i.e., the power set of $\{\sum_i\}$ with the empty set removed). However, the majority of these subsets will not be describable in terms of durational parameter, since they do not necessarily contain all the members of $\{\sum_i\}$ with "duration" intermediate between the minimum and maximum "durations" of their members. Thus the parameter theory imposes a constraint on a purely distributional analysis of metrical elements. (If in fact intermediate durations are excluded from certain positions, the parameter theory must introduce *ad hoc*, non-durational explanations, and such parameters with apparent holes in them are not considered distinct, and thus do not increase the number of metrical elements. West, of course, follows this practice.) First of all the number of distinct linear sequences of the relevant syllable types may be fewer in number on a parameter theory. Thus, although "allophonic durational rules" sensitive to linear order are conceivable in a parameter theory (so that $d(\langle S_i S_j \rangle) \neq d(\langle S_j S_i \rangle), i \neq j$), West (note 1, 188) requires that the duration of each syllable type be constant in all environments so that the duration of each sequence equals the sum of the duration of the individual members; linear order is therefore not distinctive in sequences. Thus if sequences of maximum length r are permitted, the maximum number of metrically relevant, distinguishable sequences becomes $s'_{\max}$

$$s'_{\max} = \sum_{i=2}^{r} C(m + i - 1, i) = \sum_{i=2}^{r} \frac{(m+i-1)!}{(m-i)!\,i!}$$

To obtain the formula in the text for the maximum number of metrical elements on a

posited to explain away alternation. For instance, the ideal value of *anceps* was assumed to lie between the ideal value of *longum* and the ideal value of *breve*. Such a hypothesis is unfounded both in the framework of physicalist approaches to duration and in the framework for which all durational distinctions below the level of heavy vs. light syllable are irrelevant. For the latter see on Maas in the next paragraph. In the former framework the hypothesis is liable to empirical refutation. This takes the form of deducing a test implication from the "ideal values" hypothesis. It will be shown that this implication is falsified by the data, and thus, by the *modus tollens*, that the "ideal values" theory cannot be true for positions of alternation. An ideal value, by definition, is unique and does not cover the full range of variation in durations which implement any particular metrical position. Thus the postulation of an ideal value presupposes a statistical preference for linguistic implementations which are closer to it among those which are permitted. If such a preference does not exist, the assumption of an ideal value is unfounded. Now in fact, we know that, *ceteris paribus*, the ratios obtaining in actual speech between the variously structured heavy and light syllables are not constant. There are longer and shorter varieties, *ceteris paribus*, of both syllable types. If metricality depended on how well ratios based on phonetic parameters fitted the ideal values of the ratios of pattern elements, it would follow that, according to a common interpretation of *anceps*, for instance, there would be a tendency for shorter long syllables to be chosen for *anceps* positions. But on the contrary in actual verses there is no statistical evidence to indicate any such preference.

In any case, we have argued at length above that the multiple metrically relevant categories of duration posited in MR theory are groundless and that the only relevant features are syllable weight and word boundary, the latter being metrically predictable. However,

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parameter theory such as West's, we must take the set $\{\sum_i\}$ of $n = m + s'$ members and put it in strict order according to duration:

$$S_1 < S_2 < \cdots < \langle S_i S_j \rangle_n$$

We then allow only those subsets $\{\sum_j : k \leq j \leq l\}$ for all choices of upper and lower bounds of the durational indices k and l. The maximum number of such subsets is just the number of ways of choosing substrings of length 1, 2, . . . , n from the above string, and this is just the sum of the integers from 1 to n.

even working with two categories (heavy and light syllable) only, it would be possible to apply the MR analysis in terms of parameters or ideal values in order to eliminate alternations of elements. In fact, this is just what the less extravagant versions of MR theory do, as e.g., Maas for *anceps* and *biceps*. However, it is a fallacy in structural analysis to assume that alternation between two items necessarily implies a third compromise item as the ideal aimed at: as Lionel Pearson wrote:[39] ". . . as though in a restaurant which offered the alternation of tea or coffee they [some metricians] would be content if offered something in between tea and coffee to drink." The mere fact of alternation in *anceps*, *biceps* (and resolution) positions does not require or justify the assumption of a metrical element distinct from the occurring alternating elements, whether the definition of the posited additional element be in terms of a single ideal value or in terms of a parameter of permitted values. (In the latter case, there is a clear difference between a position filled by a single parameter (i.e., metrical element) implemented by a range of linguistic categories and a position filled by an alternation of metrical elements each implemented by its corresponding linguistic category).

Apart from the fact that the posited additional metrical element is superfluous and consequently unfounded, there is a fundamental aspect of alternations that the MR approach quite fails to account for. Considerations of frequency and periodicity (internal responsion) point clearly to one of the responding variants being basic; this fact constitutes the motivation for the traditional process terms such as "resolution" and "contraction;" the tribrach is assumed to replace the basic iamb, etc. In the parameter approach there is no inherent mechanism to capture the hierarchical relationship holding between unresolved and resolved elements, etc.; an additional "marking" component would have to be added to the description, and this component would have to deal with individually defined members of the parameters implementing the positions, i.e., to all practical purposes with *longa* and *brevia*, since there is no advantage to rewriting two *brevia* as a durational value. The parameter analysis has taken an obviously hierarchical structure and flattened it into a single level of representation. The ideal values analysis fares no better. Since a compromise ideal value would be, we

[39] L. Pearson, "Catalexis and anceps in Pindar," *GRBS* 15 (1974) 173 ff.

have argued, unfounded, such a value could only represent a reformulation of a "marking" device in durational terms: yet three values are not needed to express a hierarchy with two members, and, in any case, the ideal value would probably have to be closer to the duration of the more frequent alternant, which is not always the basic one; this is the case with long *anceps* in the trimeter which is more frequent but less basic.

Finally, if the traditional alternations are to be accepted and maintained, then the only metrical elements will be *longum* and *breve*, and the only metrically relevant categories will be heavy and light syllable (± word boundary). Such a situation strongly suggests the traditional feature-matching model for the perception of metricality as superior to the MR model positing numerical measurement of the duration of each occurrence of a syllable. Numerical values or ratios of duration would carry superfluous information and therefore would constitute an improbable representation of the psychological organization of the relevant information: it is hardly likely that we would go to the effort of resorting items that come already sorted correctly by our organization of language.

6. CONCLUSION

At this point we can see how far the MR and the traditional theories diverge in their conception and models of metricality. In support of the latter there is the fact that feature matching is the most economical and psychologically immediate (direct) model for a theory that maintains biunique correspondence between metrical element and its linguistic implementation. Furthermore biuniqueness and the feature matching model constitute in a specific metrical description the formal and psychological-substantive expressions of the metrical metatheoretic proposition that metrical systems are based on independent, pre-existing, linguistically relevant major classes defined at the level of organization of categorical (non-parametric) feature values. In other words, metre is a patterned arrangement of LANGUAGE units and not a random searching through language for units that possess a property required by some externally structured pattern. It is not clear that the multiple ideal values or parameters that constitute the MR metrical

elements correlate with any phonological classes that are natural and function as a single class in the rules of the language; insofar as they do not, then the fact that they are supposed to constitute equivalence classes for the metre must entail the assumption that the property functioning as the criterion of classification is non-linguistic; and if it is non-linguistic, it is presumably rhythmical. In other words the motivation for there being just the posited overlapping intervals of duration or ideal values and not others seems not to lie in the language but elsewhere. The fact that MR theory finds evidence for its posited elements in language classes does not change this state of affairs, since the linguistic items are so chosen because, it is assumed, they contain the externally defined classificatory property, and not because the metrical elements are closely and essentially bound to established linguistic feature classes. The fact that traditional metrical theory uses the feature-matching model and MR theory the duration-checking model is symptomatic of this fundamental difference in their conceptions of the nature of metrical patterns.

To sum up: we have argued (1) that the attribution of metrical relevance to linguistic categories other than heavy and light syllable (± word boundary) is unfounded and rests on undetected question-begging, neglect of basic statistical tests and various shortcomings of language analysis and scientific method in general; (2) that the assumption of metrical elements other than *longum* and *breve* is unwarranted, resting as it does in part on the shortcomings under (1), and in part on a mistaken evaluation of the structural significance of alternation in responsion; (3) that the metrical patterns posited as a consequence of (1) and (2) are not metrical at all but really rhythmical, and thus in a sense more in the tradition of Boeckh and Westphal than in that of Hermann. That such an approach could be so widespread in the twentieth century seems to be due partly to the failure of traditional metrics to make an explicit and psychologically realistic case for its transformational approach to responsion and partly also because of a failure to distinguish between a pattern inherent in certain arrangements of language (i.e., metre) and a pattern derived from music or marching or dance into which language is fitted (i.e., an externally imposed durational "tune").