ARISTOXENUS *ELEMENTS OF RHYTHM*: TEXT, TRANSLATION, AND COMMENTARY
WITH A TRANSLATION AND COMMENTARY ON *POXY* 2687

by

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ABSTRACT OF THE DISSERTATION

Aristoxenus' *Elements of Rhythm*: Text, Translation, and Commentary

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Aristoxenus of Tarentum makes productive use of Aristotelian concepts and methods in developing his theory of musical rhythm in his treatise *Elements of Rhythm*. He applies the Aristotelian distinction between form and material and the concept of hypothetical necessity to provide an explanation for why musical rhythm is manifested in the syllables of song, the notes of melody, and the steps of dance. He applies the method of formulating *differentiae*, as described in Aristotle's *Parts of Animals*, to codify the formal properties of rhythm.

Aristoxenus' description of the rhythmic foot presents several interpretive challenges. Our text is fragmentary, and we lack Aristoxenus' definitions of several key terms. This study seeks to establish the meanings of these terms on the basis of a close examination of the structure of Aristoxenus' argument. Parallel passages in Aristides Quintilianus' *On Music* are considered in detail for

their consistency or lack thereof with Aristoxenian usage. Parallel passages in *POxy* 2687 are cited as illustrations for several rhythmic constructions and principles Aristoxenus mentions; because these involve original interpretations of some points in *POxy* 2687, they are supported by a thorough presentation of *POxy* 2687 in a separate chapter.

One central conclusion of this study is that Aristoxenus viewed rhythmic feet as musical functions, analogous to the theory of melodic functions he had presented in his *Elements of Harmony*. Only limited conclusions about the applicability of Aristoxenus' theory to the history of ancient Greek music can be justified. While some of the extant remains of Greek music are in accord with Aristoxenian theory, others contradict it. Much of ancient poetry is more rhythmically complex than what is presented in our text of *E.R.*, but regular poetic forms such as the anapestic dimeter and the stately rhythms of religious hymns may have provided the original starting points for subsequent rhythmic developments Aristoxenus seeks to explain.

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Thanks also to Oxford University Press for permission to reproduce the scores of ancient Greek music found on pages 93, 168, 271, 274, 277 and 278.

Table of Contents

List of Illustrations



*DAGM* = Pöhlmann, E. and Martin, M. L. 2001. *Documents of Ancient Greek Music*. Oxford.

## CHAPTER 1: THE LIFE AND WORKS OF ARISTOXENUS

Our most important source for Aristoxenus's biography is the *Suda*:

> Aristoxenus: the son of Mnēsias and of Spintharus the musician, was from Tarentum in Italy. While living in Mantineia he became a philosopher, and did not miss the mark in applying himself to music. He was a student of his father, and of Lamprus of Erythrae, then of Xenophilus the Pythagorean, and finally of Aristotle. He insulted Aristotle, when Aristotle died, because Aristotle made Theophrastus, rather than himself, head of the school, though Aristoxenus had acquired a great reputation among the students of Aristotle. He lived at the time of Alexander, and the period following; thus he lived from the 111th Olympiad (336 B.C.) and was a contemporary of Dichaearchus the Messenian. He composed musical and philosophical works, of history and pedagogy of every sort. His books are numbered at 453.[1]

The *Suda's* identification of Aristoxenus's father τοῦ Μνησίου, τοῦ καὶ Σπινθάρου has been variously interpreted: Müller (1898) emends the text, suppressing καὶ and supplementing the text with ἤ, concluding that the *Suda* recorded both versions of a fact about which its sources conflicted: "the son of Mnēsias or of Spintharus."[2] Visconti (1996) attributes the name Μνήσιας to a

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[1] Fr. 1 Wehrli = Suda s.v. Ἀριστόξενος: υἱὸς Μνησίου, τοῦ καὶ Σπινθάρου, μουσικοῦ, ἀπὸ Τάραντος τῆς Ἰταλίας. διατρίψας δὲ ἐν Μαντινείᾳ φιλόσοφος γέγονε καὶ μουσικῇ ἐπιθέμενος οὐκ ἠστόχησεν, ἀκουστὴς τοῦ τε πατρὸς καὶ Λάμπρου τοῦ Ἐρυθραίου, εἶτα Ξενοφίλου τοῦ Πυθαγορείου καὶ τέλος Ἀριστοτέλους. εἰς ὃν ἀποθανόντα ὕβρισε, διότι κατέλιπε τῆς σχολῆς διάδοχον Θεόφραστον, αὐτοῦ δόξαν μεγάλην ἐν τοῖς ἀκροαταῖς τοῖς Ἀριστοτέλους ἔχοντος. γέγονε δὲ ἐπὶ τῶν Ἀλεξάνδρου καὶ τῶν μετέπειτα χρόνων, ὡς εἶναι ἀπὸ τῆς ρια᾽ Ὀλυμπιάδος, σύγχρονος Δικαιάρχῳ τῷ Μεσσηνίῳ. συνετάξατο δὲ μουσικά τε καὶ φιλόσοφα, καὶ ἱστορίας καὶ παντὸς εἴδους παιδείας. καὶ ἀριθμοῦνται αὐτοῦ τὰ βιβλία εἰς υνγ′. Trans. Marchetti.

[2] Müller *FHG* II: 269. Laloy 1904: 2 raised the possibility that Spintharus could have been the father of Mnēsias, before concluding that Müller's emendation should be adopted in the light of

Pythagorean tradition that assigned names based on the root μνᾱ/μνη to prominent Pythagoreans. Thus, Aristoxenus's father was really named Spintharus, though at some point the honorific name was added. Cyrillus quotes Aristoxenus as citing Spintharus's first-hand account of Socrates, which indicates that Spintharus would have known of contemporary music at Athens.[3] Spintharus is also mentioned by Iamblichus as the source for an anecdote about Archytas.[4]

Tarentum was one of the towns that came under the influence of Pythagoras and the Pythagoreans during the sixth century B.C. In the fourth century B.C., Pythagoreans in Tarentum and Metapontum held out against the tyrant Dionysius the Elder of Sicily, though he conquered or dominated other major cities of southern Italy. The Pythagorean mathematician and music theorist Archytas served as general of Tarentum for seven terms, and sent a ship to Syracuse to rescue Plato from Dionysius the Younger in 361 B.C. Aristoxenus wrote a biography of Archytas (Fr. 47-50 Wehrli)[5]; Aristoxenus's biography of Pythagoras and his works on Pythagorean ethics further argue for a continued influence on him of Pythagorean moral ideals. Visconti (1999: 52) argues that for

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two additional testimonia that Spintharus was Aristoxenus's father; Sextus Empiricus *Against the Mathematicians* VI: 356 and Diogenes Laertius II, 20. Wehrli 1967: 47 argues that Mnēsias was more likely Aristoxenus's father, while Spintharus was Aristoxenus's teacher.

[3] Fr. 54a Wehrli = Cyrillus. *Against Julian* VI 185.

[4] Fr. 30 Wehrli = Iamblichus *On the Life of Pythagoras* 197.

[5] Fr. 47 Wehrli = Diogenes Laertius VIII 79; Fr. 48 Wehrli = Diogenes Laertius VIII 82; Fr. 49 Wehrli = Iamblichus 197; Fr. 50 Wehrli = Athenaeus XII 545a.

Aristoxenus, Archytas represents a model combining philosophical inquiry in the Pythagorean tradition and practical or political action.

Lamprus and Xenophilus, named by the *Suda* as teachers of Aristoxenus before Aristotle, are both mentioned in Aristoxenus's writings. Ps.-Plutarch *On Music* 1142b quotes Aristoxenus as including Lamprus among lyric composers who composed good songs. A music teacher named Lamprus is also mentioned by Socrates in Plato's *Menexenus* 236a. However, Laloy (1904: 11) has pointed out that Socrates' Lamprus would have died too early to have been Aristoxenus's teacher. Either this is a Lamprus of whom we know nothing else, or the reference has been added to the biographical tradition in order to emphasize Aristoxenus's connection with traditional ancient Greek music as opposed to the "New Music" of the late fifth and fourth centuries.

Diogenes Laertius lists Xenophilus among the last of the Pythagoreans, "whom indeed Aristoxenus knew," (Fr. 19 Wehrli = Diogenes Laertius VIII 46) and cites Aristoxenus's *Educational Customs* for Xenophilus's remark that the best education is to be born in a well-regulated city (Fr. 43 Wehrli = Diogenes Laertius VIII 15). Lucian (Fr. 20a Wehrli = [Lucian] *On Long-Lived People* 18,221) cites Aristoxenus for the statement that "Xenophilus the musician" lived to be over one hundred and five years old, at Athens. Bélis (1986: 17n7) points out that Aulus Gellius treats Xenophilus as a near contemporary of Pythagoras. If the

*Suda* is correct about Xenophilus having been Aristoxenus's teacher, Aulus Gellius must be wrong about the time in which he lived. Whether or not Xenophilus was a contemporary of Pythagoras, he figures as a source who linked Aristoxenus to the teachings of a generation earlier than his father. As Visconti (1996: 440) points out, this 'datum' could have been added to the biographical tradition to bolster the credibility of Aristoxenus's writings on Pythagoras and Pythagoreanism (Fr. 1, 19, 20a-b, 25, 29 Wehrli).[6]

Aristoxenus's statements on the soul show the limits of his adherence to Aristotelian doctrine. As attested by Cicero and Lactantius (Fr. 118-121 Wehrli), Aristoxenus taught that the soul is a harmony. For Aristoxenus, this description is metaphorical (Wehrli 1967: 84). Aristoxenus could have intended this as an extension of Aristotle's definition of the soul as a form, in that harmony implies form. Movia (1968: 79) discusses modern scholars who have taken this view of Aristoxenus's idea. As a metaphor, Aristoxenus's description of the soul could stand as a prelude to Aristotle's more rigorous definition without contradicting it. Indeed, the tuning of a musical instrument could even be seen as the purpose, the τοῦ ἕνεκα, of the instrument.

[6] Fr. 19 Wehrli = Diogenes Laert. VIII 46; Fr. 20a Wehrli = [Lucian] *On the Long-Lived* 18, 221; Fr. 20b Wehrli = Valerius Maximus VIII 13 Ext. 3, Fr. 25 Wehrli = *Attic Nights* IV 11; Fr. 29a Wehrli = Diogenes Laert. VIII 20.

The accounts in Cicero and Lactantius raise other issues that contradict Aristoxenus's account of the soul. Lactantius (Fr. 120c Wehrli) cites Aristoxenus as claiming that the power of perception *vim sentiendi* arises from the proper association of parts of the body, while Gottshalk (1971) and Caston (1997) have seen this as an ancient expression of epiphenomenalism. As Bélis (1985) points out, Aristoxenus's metaphor denies the priority Aristotle gives to soul as the form.

Cicero (Fr. 118 Wehrli = Dichaearchus Fr. 8e Wehrli) and Lactantius (Fr. 120c Wehrli) state that Aristoxenus denied the existence of the soul altogether. While the concept of form remains latent in the condition that the body must be composed in a certain way, such a statement on Aristoxenus's part would have emphatically denied the soul's immortality. In his *Eudemos*, a dialogue lost to us but known to Cicero, Aristotle had written of the immortal soul. Cicero (*Tusculan Disputations* 1.10.22) quotes Aristotle as teaching that mental actions including love, hate, desire, and fear have their existence not in any of the four mundane elements but in the imperishable fifth element. This contradicts Aristotle's statement at *On the Soul* 408b25-27 that thinking, loving, and hating pass away with the body. Aristotle's statement at 430a17-19 that mind νοῦς is imperishable seems limited only to knowledge of eternal truths (Wilkes 1992).

The testimony of Cicero and Lactantius, if it can be trusted, would indicate that Aristoxenus did not allow even this attenuated sense of immortality for the soul.

Nevertheless, Aristoxenus attributes a central role in music theory to perception, which, for Aristotle, was part of the study of the soul. Aristoxenus follows Aristotle in discussing the soul in terms of its faculties. Aristotle discusses the faculties of the soul, including the nutritive faculty, sense-perception, thinking, perceiving, and imagination, in *On the Soul* books 2 and 3. Aristoxenus defines musical intuition, ξύνεσις, at *E.H.* 2.38-9 (= 48.11-18 Da Rios) and 2.41 (= 51.13-52.3 Da Rios), as the faculty of soul, combining sense-perception, intellect, and memory, that is specifically involved with the appreciation of music (Levin 1972, Pereira 1995). In particular, Aristoxenus describes ξύνεσις at *E.H.* 2.41 (= 51.16 Da Rios) as being (lit., having plunged) deep within the soul, τὴν ψυχήν που καταδεδυκός. Levin (1972: 230) argues that for Aristoxenus, musical intuition is a function that mediates between hearing and reason. As such, it can account both for a composer's ability to create music and a hearer's ability to respond. Though Aristotle does not mention such a faculty of mind, it is analogous to the faculty of imagination that Aristotle describes at *On the Soul* 428a4-429a9. In developing the role of perception in music theory, Aristoxenus extends Aristotle's method in *On the Soul* of isolating the functions of the soul.

That Aristoxenus had expected to succeed Aristotle as the head of the Peripatetic school when Aristotle died in 322 B.C. justifies an estimate of 350 B.C. for the *terminus ante quem* of Aristoxenus's birth (Belis 1986). Visconti (1999) points out that Aristoxenus's report of having heard the story of Damon and Phintias directly from Dionysius II when he was in exile in Corinth (Fr. 31 Wehrli = Iamblichus *De vita Pythagorei* 233) indicates an earlier date of birth, around 370-365 B.C.; Visconti finds Pearson's (1990) estimate of 379 to be too early. The importance of Pythagoreanism in several of his works suggests that Aristoxenus's philosophical career had reached a high level of achievement even before he joined the Peripatetics.

No surviving text of Aristoxenus records any invective against Aristotle; on the contrary, Aristoxenus praises Aristotle at *E.H.* 2.30-31 (= 39-40 Da Rios). Eusebius, citing Aristocles, also records a biographical tradition that contradicts the *Suda* on this point. After making that Aristoxenus's *Life of Plato* is not credible in reporting that during Plato's travels, some friends/guests, ξένους, revolted from him and fortified the Peripatus against him, this source goes on to say that while some think Aristoxenus intended this anecdote this with reference to Aristotle, Aristoxenus actually always spoke well of Aristotle.[7]

[7] Fr. 64 Wehrli = Eusebius *Preparation for the Gospel*. XV 2 (attributed to Aristocles): τίς δ' ἂν πεισθείη τοῖς ὑπ' Ἀριστοξένου τοῦ μουσικοῦ λεγομένοις ἐν τῷ βίῳ τοῦ Πλάτωνος; ἐν γὰρ τῇ πλάνῃ καὶ τῇ ἀποδημίᾳ φησὶν ἐπανίστασθαι καὶ ἀντοικοδομεῖν αὐτῷ τινας Περίπατον

Aristoxenus's works on musical history and the musical customs of different parts of Greece and Italy served as a source for Athenaeus and Ps.-Plutarch.

Aristoxenus wrote two books about Mantineia, the people of which were widely known for their musical customs. Philodemus cites him as the author of a *Mantineian Customs* and an *Encomium of the Mantineians* (Fr. 45 Wehrli = Philodemus Περὶ εὐσεβείας 18 p. 85 Gomperz). Xenophon *Anabasis* VI, 1.12 describes an armed dance performed by Mantineian and Arcadian soldiers. Philodemus cites a passage in which Aristoxenus praises the piety of the poet Diagoras. Aristoxenus quoted Diagoras's poem in honor of Nicodorus, who had participated in the establishment of Mantineia's constitution, and had disputed the attribution to Diagoras of a less pious verse. Visconti (1999) attributes Aristoxenus's interest in Mantineian music and customs to the fact that music there retained its ethical power in a musical context supported by the laws of the city involving, among other things, initiation rites. This is contrasted to the New

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ξένους ὄντας. οἴονται οὖν ἔνιοι ταῦτα περὶ Ἀριστοτέλους λέγειν αὐτόν, Ἀριστοξένου διὰ παντὸς εὐφημοῦντος Ἀριστοτέλην. 'Who could be persuaded by the things said by Aristoxenus the musician in his *Life of Plato*? For he says that while (Plato) was traveling away from home, some rebelled and fortified the Peripatus against him, even though they were bound by ties of friendship. Some think that he (Aristoxenus) said these things about Aristotle, but Aristoxenus always spoke well of Aristotle.' (Trans. Marchetti.) For further discussion of the source and significance of this story, see Düring 1957:256-7, 318-9, 387. Reinach 1902: 77 proposes emending εὐφημοῦντος to δυσφημοῦντος.

Music that arose in the late fifth century in Athens, which was dedicated to the audience's pleasure rather than its moral education.

The Ps-Plutarchean treatise *De Musica* 1142b (Fr. 76 Wehrli) cites Aristoxenus for an anecdote that demonstrates Aristoxenus's conservatism in music. According to Aristoxenus, a composer named Telesias the Theban, whom Aristoxenus describes as his contemporary, had been educated in the traditional style of lyric poetry, represented by such poets as Pindar. Later, Telesias became infatuated with the new style associated with Timotheus and Philoxenus. However, Telesias was unable to compose successfully in the style of Philoxenus; and, as Aristoxenus concludes, "the reason for this was his most excellent training from childhood." This anecdote attests to the spread of the New Music from Athens to other areas of Greece. Visconti (1999) argues that Mantineia was one of the last places where a traditional musical training was supported by state institutions. Finally, the anecdote shows the activity of traditionalist composers in the fourth century B.C. even after the New Music had been introduced, though such traditionalists may not have passed their training on to the next generation of composers.

Aristoxenus's aesthetic conservatism, summed up by his taking Pindar as a model of good music, contrasts with technical progressivism apparent in what we have of Aristoxenus's harmonic and rhythmic theories. According to West

(1992a), the goal of Aristoxenus's harmonic theory is to give a comprehensive framework for melodic modulation, the increased importance of which was one of the hallmarks of the New Music. Aristoxenus's theory of rhythm, as seen in *E.R.*, readily explains phenomena such as the prolonged syllable durations attested in the Hellenistic *Song of Seikilos*, but does not jibe well with the full range of rhythms of Archaic or Classical poetry.[8]

Certain comments by Aristoxenus would lead us to believe that he wanted to preserve traditional qualities of music. His remarks about the enharmonic scale in *E.H.* illustrate Aristoxenus's desire to go against the current trend of musical practice. Plutarch *Sympotic Questions* VII, 8, 1 (Fr. 85 Wehrli) quotes Aristoxenus's characterization of poorly educated youths who "vomit black bile when they hear the enharmonic genus." Themistius *Orations* 33: 364b1 (Fr. 70 Wehrli) says that Aristoxenus sought to restore strength to music, exhorting his students to excise softness and pursue manliness in music. When a

[8] Ps.-Plutarch *On Music* 1138b records a comment, perhaps attributable to Aristoxenus, that older music was more rhythmically complex than subsequent Hellenistic music: τῇ γὰρ περὶ τὰς ῥυθμοποιίας ποικιλίᾳ οὔσῃ ποικιλωτέρᾳ ἐχρήσαντο οἱ παλαιοί· ἐτίμων γοῦν τὴν ῥυθμικὴν ποικιλίαν, καὶ τὰ περὶ τὰς κρουσματικὰς δὲ διαλέκτους τότε ποικιλώτερα ἦν· οἱ μὲν γὰρ νῦν φιλομελεῖς, οἱ δὲ τότε φιλόρρυθμοι. 'The forms of rhythmic composition used by ancient composers were more complex, since they had a great respect for rhythmic complexity, and their patterns of instrumental idiom were also more complicated: for nowadays people's interest is in the melody, whereas in the past they concentrated on the rhythm.' (Trans. Barker 1984b:227) This statement is consistent with what we have of Hellenistic music in that the rhythms do not approach the complexity seen in Classical lyric poetry, though some Hellenistic music features manipulation of syllable lengths for rhythmic effect. Therefore, technical progressivism in Aristoxenus's rhythmic theory refers to the aptness of his theory to rhythms characteristic of Hellenistic music. This does not entail that Hellenistic rhythms represented progress in the sense of greater complexity or sophistication than that found in Classical song.

student asked what response could be expected, Aristoxenus answered "You'll sing less often in theaters." These anecdotes portray Aristoxenus as one who sought to preserve a more authentic type of music than that of his own time.

However, the regular scales described in *E.H.* raise complications regarding Aristoxenus's fidelity to an authentic performance of Pindar's works. Aristides Quintilianus 1.9 (= 18.6-19.5 W-I) provides a list of scales used by the most ancient poets, οἱ παλαιότατοι. In the absence of evidence that Pindar himself used regularized scales consistent with Aristoxenus's theory, we must assume that he used traditional, more irregular scales.[9] In any case, Aristoxenus can be assumed to have been aware of scales like those attested by Aristides Quintilianus; Mountford (1923) argues that Aristoxenus was a source for this list. Perhaps Aristoxenus, in a now-lost passage or work, explained any discrepancies between the system described in *E.H.* and authentic performance of a more traditional repertoire. Yet the problem of how to reconcile the attention Aristoxenus gives to a progressive technical system with his avowed aesthetic conservatism would still remain.[10]

[9] Franklin 2002a: 685 describes the scales preserved by Aristides Quintilianus as of the "high enharmonic period." He argues that earlier Greek music utilized regular seven-note diatonic scales, and that Aristoxenus's system is an extension of this earlier style. The weakness of Franklin's model is that it treatss the scales attested by Aristides Quintilianus merely as isolated peculiarities, when in fact they represent the most detailed evidence we have for scales in use prior to Aristoxenus.

[10] Franklin 2002a: 695 suggests that Aristoxenus sought to give a theoretical basis for music that used modulation in a way consistent with conservative tastes. The evidence Franklin presents for

Hagel (2000) gives an analysis of the Delphic paean by Athenaeus (*DAGM* 20), preserved on a stone tablet dedicated in 128 B.C., which shows how Aristoxenus's theory of modulation can be applied to make sense of what are otherwise melodic anomalies. The hymn's rhythm also fits well with the system described in *E.R.* The solemn purpose of the hymn makes it reasonable to consider its composer as having aimed for an elevated musical ethos. Thus, the hymn can be seen as fulfilling a program consistent with both Aristoxenus's aesthetic conservatism and technical progressivism.

**ARISTOXENUS'S WORKS ON HARMONY**

Aristoxenus's *Elements of Harmony* is preserved in a manuscript tradition with other, later ancient musical works. What we have of *E.H.* is incomplete; there are gaps and repetitions that suggest our text may incorporate two overlapping treatises (Macran 1902). Belis (1986) argued for the unity of the work; Gibson (2005) suggests that the first of the three books is an earlier draft which was revised and extended in what are labeled books two and three in the manuscript tradition. Mathiesen (1999: 297) adduces citations from Porphyry's commentary on Ptolemy's Harmonics that indicate book I of *E.H.* is from a separate preliminary work *De principiis* while books 2 and 3 of *E.H.* represent the

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the presence of some modulation in the Classical period is convincing; however, a gap remains between the regular harmonic system Aristoxenus presents and what should presumably have been his interest, as a musical conservative, in preserving or at least acknowledging irregular scales such as those presented by Aristides Quintilianus.

*Elementa harmonica* proper. Be this as it may, editors including Westphal, Macran, and Da Rios refer to books 1, 2 and 3 of *E.H.*; for ease of reference, this division will be followed here.

To provide context for the argumentation Aristoxenus uses in *E.R.* as well as to facilitate commentary on references in *E.R.* to *E.H.* three major concepts that Aristoxenus claims in *E.H.* to be his own contributions to harmonic science deserve introductory exposition: the role of perception, the principle of musical function, and the law of consecution.

**I. The Role of Perception, αἰσθήσις**

The starting point of Greek harmonic theory is the association, attributed to Pythagoras, of simple ratios with four of the intervals appearing in Greek music: the ratio 2:1 corresponds to the octave, 3:2 with the fifth; 4:3 with the fourth, and 9:8 with the tone. In modern terms, these ratios apply to the frequencies of the sound waves for notes comprising these intervals; for the Greeks, they could be seen in the lengths of strings giving these notes.

The first three intervals, the octave, the fifth, and the fourth, are considered concords, σύμφονα. They are so named because the two pitches seem to blend into a single sound, though ancient theorists debated the physical and psychological grounds for such a sensation. The tone is the difference between the fourth and the fifth. Dividing the ratio of the fifth, 3/2, by the ratio of the fourth, 4/3, yields the ratio associated with the tone, 9/8. However, because of the confusion in ancient Greek mathematics regarding what we call irrational numbers, Pythagorean theorists held that the tone could not be divided exactly in half. A major goal of the Pythagorean theorists was to establish or identify the correct ratios for intervals less than a tone used in Greek music. The size of the fourth was measured as two tones plus an interval called the *leimma*, which could be calculated arithmetically as 256/243: 9/8 x 9/8 x 256/243 = 4/3.

At *E.H.* 2.32 (= 41.19-42.7 Da Rios) Aristoxenus rejects such ratios as irrelevant to his undertaking, saying that he will start from principles that are grounded in musical perception. At *E.H.* 2.44 (= 55.16 Da Rios) Aristoxenus posits that the distinction between a concord and a discordant interval is reducible to the distinction of size, *megethos*. However, the concords still gain a special status when Aristoxenus says that they admit of much less variation than the other intervals: *E.H.* 2.55 (= 66.12 Da Rios): ἤτοι ὅλως οὐκ ἔχειν δοκεῖ τόπον...ἢ παντελῶς ἀκαριαῖον τινα, 'either they have no range of variation at all, or an absolutely infinitesimal one'.[11]

For this reason, the concords can stand as reference points for the determination of other intervals. This line of argument culminates in Aristoxenus's proof that a fourth is equal to two and one-half tones. The

[11] Trans. Marchetti

structure of Aristoxenus's proof is as follows: assume that a fourth does equal two and one-half tones; performing a sequence of quasi-geometrical operations (to be detailed below) on the upper and lower notes of the fourth yields an interval which perception will recognize as a concord, the fifth: the fact that perception accepts the result as a fifth validates the original assumption, since if the starting assumption were untrue the geometrical operations would not have generated a true result.

Aristoxenus builds his proof on procedures that apply geometrical concepts to musical phenomena (Bélis 1986). A pitch one tone higher than any given pitch can be found by taking a reference pitch a fifth above the given pitch, then finding the pitch a fourth below the reference pitch. Repeating the process yields a pitch a ditone above the original given tone; the process could be reversed to find intervals below any given pitch. An interval of a *leimma* above a given pitch could be found by going down a ditone, then up a fourth; a *leimma* below a given pitch by going up a ditone, down a fourth. Given two pitches that comprise a fourth, says Aristoxenus, find the pitch one *leimma* up from the higher pitch given and the pitch one *leimma* down from the lower pitch given. If perception finds that these new pitches comprise a concord, the fifth, then the two *leimmata* must equal the difference between a fourth and a fifth, one tone, and the *leimma* must equal a semitone. Aristoxenus claims that perception will find this to be true.

Litchfeld (1988) points out that in practice this method yields an interval audibly smaller than a pure fifth. Litchfeld adduces Aristoxenus's statement that the concords are heard precisely with little or no variation in arguing that Aristoxenus was thinking in terms of the fourth and fifth as pure intervals. According to Litchfeld, Aristoxenus did not anticipate the tempered intervals of modern Western music. Rather, despite his overt recourse to perception, he overlooked empirical discrepancies in his pursuit of a theoretical science.

Using a reconstructed monochord, Litchfeld (1988: 64) has tested the proof: "The results of this method vary. Each time it is applied, certain small errors naturally occur in various places (depending on the skill of one's ear), yielding a different sounding fifth every time. In general, depending on how many and how large the errors may be, the fifth can sound perfect. This approximate perfection is the exception and not the rule."[12]

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[12] Plato *Philebos* 56a3-7 provides an intriguing parallel to the inaccuracy of Aristoxenus's proof: οὐκοῦν μεστὴ μέν που μουσικὴ πρῶτον, τὸ σύμφωνον ἁρμόττουσα οὐ μέτρῳ ἀλλὰ μελέτης στοχασμῷ, καὶ σύμπασα αὐτῆς αὐλητική, τὸ μέτρον ἑκάστης χορδῆς τῷ στοχάζεσθαι φερομένης θηρεύουσα, ὥστε πολὺ μεμειγμένον ἔχειν τὸ μὴ σαφές, σμικρὸν δὲ τὸ βέβαιον. 'In the first place, then, music is full of it (τῆς στοχαστικῆς), getting its concordance in tune (i.e. setting up the accordatura of an instrument) not by measurement, but by taking a shot at it on the basis of practice, and so too is the whole art of pipe-playing, hunting the proper pitch of each note (i.e. of each and every note during actual performance) by shooting at it as the note moves, so that it has a great deal of uncertainty mixed into it, and little that is sure.' Trans. Barker 1987: 109. However, this contrasts starkly with Aristoxenus's own claims about the validity of sense-

The tempered tuning of modern Western music is most accurately notated in terms of cents; a cent is 1/1200 of an octave, or 1/100 of a tempered half-tone. Given a starting pitch, customarily defined as A = 440 Hz, the frequency of a pitch at a desired interval from the starting pitch can be found by the following formula:

desired pitch = starting pitch x $2^{\mathbf{n}/1200}$, where **n** is the desired interval expressed in cents. Intervals of tempered scales use multiples of 100 for **n**. For a tempered fourth, comprising five tempered half-tones, **n** = 500 cents; for a perfect fourth, however, **n =** 498 cents. For a tempered fifth, **n** = 700 cents; for a perfect fifth, 702 cents. A true tone, the difference between a perfect fourth and a perfect fifth is 204 cents; a tempered tone is 200 cents. The deviation between a true tone and a tempered tone is 1/50 of a tempered tone or 1/51 of a true tone. For the fourth and the fifth, the deviation is 1/100 of a tempered tone or 1/102 of a pure tone.

Aristoxenus's construction would result in an error between 1/8 and 1/9 of a true tone, if he used acoustically perfect fourths and fifths at each stage of the demonstration. Let **p** = the original lower pitch; the original upper pitch = 4**p**/3. The new upper pitch would be given by:

4**p**/3 x 4/3 (up a fourth) x 2/3 (down a fifth) x 4/3 (up a fourth) x 2/3 (down a fifth) x 4/3 (up a fourth) = 1024**p**/729.

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perception as a basis for musical science at *E.H.* 2.32 (= 41.17-42.7 Da Rios) and the importance of accurate hearing and *E.H.* 2.33 (= 42.21-43.2 Da Rios).

The new lower pitch would be given by:

**p** x 3/4 (down a fourth) x 3/2 (up a fifth) x 3/4 (down a fourth) x 3/2 (up a fifth) x 3/4 (down a fourth) = 243**p**/256.

The interval between them would be [(1024**p**/729)/( 243**p**/256)] = 262144/177147 = 1.4798. This is approximately 678 cents: the gap between this and the perfect fifth is 24 cents, between 1/8 and 1/9 of a true tone, and greater than the 1/12 tone interval that Aristoxenus cites as the difference between the enharmonic quarter tone and the soft chromatic third of a tone. Since Aristoxenus cites a difference of this size as distinguishing the enharmonic genus from the chromatic genus, he should have been able to hear a discrepancy of this size in his construction.

In order to produce a consonant fifth, Aristoxenus would have to use tempered intervals at every step, consistently making the fourths a little too large and the fifths a little too small. If he had consciously developed a method for tempering his concords, some technique similar to that used in the modern development of tempered tuning, he would be arguing in bad faith. If he had such incredible hearing accuracy as to be able to temper his intervals spontaneously, he still would be arguing opportunistically and exploiting such prodigious acuity. Nevertheless, he could have found a way to exploit the little room there was for variation in the concords, which he does attest and acknowledge, as cited above, at *E.H.* 2.55 (= 66.12 Da Rios). It is more consistent with Aristoxenus's reputation as a musical expert to assume that he was willing to perform a stacked demonstration than to assume with Litchfeld that Aristoxenus's demonstration was entirely theoretical and never attempted in practice, neither by Aristoxenus nor by his students or rivals.

Franklin (2003: 21) notes that Aristoxenus's proof is off "very audibly," and goes on to comment:

> This exposé is not really fair, since it pits the merciless precision of a computer against the ear's judgement of ten successive *symphoniai*, which would of course lead to a slightly different result every time; indeed, Aristoxenus may have been perfectly satisfied with his experiment given his position that the *symphoniai* could tolerate a slight *topos* of variation (footnote Winnington-Ingram 1932:198f.)—although more likely this admission was intended to blur the problem. The whole procedure would be ideally suited to an experimental instrument of 21 strings. This doubtless reflects the structure of Aristoxenus's *diagramma polytropon*."
>
> The conception did not originate with him, but was deeply rooted in the ancient and widespread practice of diatonic music, being encountered already in the Old Babylonian "Returning Text."

The full significance of the position that a fourth equals two and one-half tones emerges in the light of Aristoxenus's theory of the *tonoi*, described in Cleonides *Introduction to Music*. Here, Aristoxenus presents a set of scales that provides a full theoretic framework for melodic modulation. Such a theoretic framework would be impossible under Pythagorean theory (Hagel 2000: 20-21). By incorporating the measurement of the fourth as two and one-half tones with a theoretical framework for modulation, Aristoxenus has prefigured two essential features of Bach's tempered tuning, though Aristoxenus does not give a practical method of achieving this tempered tuning.

**II. The Principle of Musical Function, δύναμις**

The second major concept of *E.H.* is the principle of musical function, δύναμις, underlying the structure of the Greek scales. Aristoxenus cites one of his predecessors, Eratocles, as having studied the different sequences of intervals that may appear in Greek music within a one-octave span, also known as the species of the octave. Eratocles thus plays a major part in the regularization of earlier, less regular scales such as those preserved by Aristides Quintilianus 1.9 (= 18.6-19.5 W-I), who describes them as the scales Plato had referred to in the *Republic*.[13]

Because our evidence for pre-Aristoxenian theory is so sparse, the extent to which we can securely identify whether specific details of the system are pre-Aristoxenian are limited.[14] Barker (1978b) and Solomon (1984) do identify some features as pre-Aristoxenian. The terminology Aristoxenus uses for the concords implies an eight-note scale covering an octave range. The term for the octave, διὰ πασῶν, "through all", specifies the range of an implied normative scale. The

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[13] Franklin 2002a presents an alternative view of the development of Greek musical scales: see above, chapter 1 notes 9 and 10. In my judgement Franklin relies too much on inferential arguments such as the relationship of different meanings of the word τόνος to conclude that early seven-tone scales were diatonic (p. 675), while giving the specific, detailed testimony of Aristides Quintilianus short shrift.

[14] Barker 1978b: 9-10 argues that *dunamis* was implicit in the nomenclature of notes prior to Aristoxenus.

other concords have names that are the etymologic roots for their modern names: the fourth, διὰ τεσσάρων, and the fifth, διὰ πέντε. These terms identify the fourth and fifth intervals encompassed by the named number of scalar steps, provided that the implied scale was an eight-note scale to which applied something like Aristoxenus's principle of melodic succession (see below). Since his scales would have fit these criteria, Eratocles may have been the originator of these terms. Earlier Pythagorean terms for these intervals are preserved in Porphyry fr. 6. Barker (1978b: 11) argues that the *harmonikoi* were "doubtless beginning also the process of standardization and artificial rigidifying which over the next half-century seems gradually to have been reflected back to the music of practice."

Aristoxenus claims he will improve upon the earlier theorist Eratocles' work by giving a reasoned account of why only certain scale structures are acceptable. Aristoxenus focuses not on the octave as a whole but on the structure of the tetrachord, a sequence of four notes spanning the interval of a fourth. In *E.H.*, the lowest and highest notes of each tetrachord are presented as fixed at the consonant interval of a fourth from each other, while the second and third notes are considered moveable, meaning that their position may vary from one scale to another. Aristoxenus claims it is a matter of nature that after singing two intervals that together span less than a fourth, one must complete the fourth with the third interval sung. Thus, the four-note structure of the tetrachord is axiomatic.

Aristoxenus takes as paradigmatic the tetrachord whose notes are named, in ascending order, *hypatē*, *parhypatē*, *lichanos*, and *mesē*. The *hypatē* and the *mesē* are the fixed notes, while the *parhypatē* and the *lichanos* are the moveable notes. The observations Aristoxenus makes about this tetrachord will apply to all other tetrachords in the Greater Perfect System. The Greater Perfect System, a harmonic construct spanning two octaves, is found not in *E.H.* but in later sources, one of which, Cleonides' *Introduction to Harmonics*, also summarizes much material that is in *E.H.*[15] Solomon (1984: 249) argues that the Greater Perfect System was Aristoxenus's regularization of earlier analyses of Greek scales.

Aristoxenus's theory of musical function, δύναμις, states that the notes of a tetrachord are recognized not by their absolute pitch, but by their place within the scale structure. *E.H.* focuses on how different values for the moveable notes establish three main melodic genera as well as shades within the genera. The

[15] The label "Greater Perfect System" derives from Cleonides 10.25-6 (= 205 Jan): τέλεια δέ ἐστι συστήματα δύο, ὧν τὸ μὲν ἔλαττον, τὸ δὲ μεῖζον 'there are two complete systems, of which the one is the lesser, the other the greater'. As described in Cleonides 8 (= 193-202 Jan), the Greater Perfect System consists of four tetrachords, with a "gap" tone between the second and third tetrachord and an additional note appended one tone below the lowest note of the lowest tetrachord. The Lesser Perfect System is the same as the Greater Perfect System from the lowest note to the highest note of the second tetrachord, but without any gap tone between the second and third tetrachord and without the fourth tetrachord. Cleonides also refers to the ἀμετάβολον 'Immutable' system, which includes the notes of both the Greater and the Lesser Systems.

three main genera are the enharmonic, the chromatic, and the diatonic. The basic characteristic of the enharmonic genus is that the *parhypatē* is a quarter-tone above the *hypatē*, and the *lichanos* a quarter-tone above the *parhypatē*, leaving a ditone interval between the *lichanos* and *mesē*. For the basic chromatic genus, the *parhypatē* is a semitone above the *hypatē*, and the *lichanos* a semitone above the *parhypatē*, leaving a one-and-one-half tone interval between the *lichanos* and *mesē*. For the diatonic genus, the *parhypatē* is a semitone above the *hypatē*, and the *lichanos* a tone above *parhypatē*, leaving one tone between the *lichanos* and *mesē*. Aristoxenus says that the dividing line between the enharmonic and the chromatic *parhypatē* is actually at one-third tone above *hypatē* and that the chromatic *lichanos* can vary from one-third to one-half tone above its corresponding *parhypatē*. The chromatic and diatonic genera are differentiated by the value of the *lichanos*; the dividing line between the chromatic and the diatonic *lichanos* is one and a quarter tone above *hypatē*.

Aristoxenus's theory of melodic function allows him to formulate principles of harmonic science that would apply over diverse styles of musical performance.

### III. The Law of Consecution, τὸ ἑξῆς

At the end of *E.H.* book two, Aristoxenus proposes his law of consecution. This principle says that for any note in a musically acceptable scale, either the interval of a fourth appears four scale steps away or the interval of a fifth appears five scale steps away. This principle is implied in the terminology used for the concords of the fourth and the fifth, but Aristoxenus makes it explicit. In book three of *E.H.*, Aristoxenus uses the law of consecution with the structure of the tetrachord to explore allowable sequences of intervals. As in the proof that a fourth equals two and one-half tones, the process follows quasi-geometric reasoning.

In presenting the science of harmonics as paradigmatic, Aristoxenus also lays claim to other laws or theories besides the law of consecution. One is that, in the terms we have been using, the interval between *lichanos* and *parphypatē* must be equal to or greater than that between *parhypatē* and *hypatē*.

Another important technical term in *E.H.* is *puknon*, a singular term that includes two intervals taken together; the interval from *hypatē* to *parhypatē* and the interval from *parhypatē* to *lichanos*. Properly speaking, these two intervals can be referred to as a *puknon* when their combined compass is equal to or less than the interval from *lichanos* to *mesē*. In the enharmonic and chromatic genera, this will always be true, but in the diatonic genus, the intervals *hypatē-parhypatē* and *parhypatē-lichanos* exceed the interval *lichanos-mesē*. Despite this terminological shortcut, Aristoxenus uses the term *puknon* to formulate ideas that nonetheless hold true of the diatonic genus.

The role of perception in determining intervals is key for understanding Aristoxenus's references to perception in *E.R.* The concept of melodic function will come up when we consider Aristoxenus's conception of the rhythmic foot and the use of the term ῥητός in melody and rhythm. (N.B.: In addition to our discussion in the commentary, a glossary of rhythmical terms has been provided after the commentary.) *E.R.* will also refer to laws of order in melody, of which the law of consecution is the most prominent in *E.H.*

## CHAPTER 2: THE MANUSCRIPTS AND SCHOLARSHIP FOR *E.R.*

*E.R.* exists in three manuscripts. The earliest text is in Venetus Marcianus gr. app. cl. VI/3, a twelfth-century manuscript referred to as codex M. It consists of 95 large quarto folios, and contains Cleonides *Introduction to Music*, Euclid *Division of the Canon*, Aristoxenus *E.H.*, Alypius *Introduction to Music*, and *E.R.* The final folios are missing, cutting short the text of *E.R.* Three hands can be distinguished: Ma, the original copyist; Mb, a corrector not much later than Ma, and who seems to have followed the same original as Ma; and Mc, a corrector of the 14th or 15th century. As Marquard (1868) has shown, the corrector Mc worked from a different archetype of *E.H.* than that used by Ma and Mb. This second archetype, Marquard's δ, includes material that was omitted from M. It is impossible to know with certainty whether δ included *E.R.* The codices containing manuscripts of *E.H.* that derive from δ do not contain the *E.R.* Most of the changes made by Mc to our Marcianus codex of *E.R* involve the insertion of articles and conjunctions omitted by Ma; however, several changes are more substantial. In paragraph 8, Mc restores καὶ τὸ ἄρρυθμον to a sentence which would otherwise leave the word ἀμφότερα with only one of its two referents. In paragraph 14, Mc reverses Ma's placement of the adjectives σύνθετος and ἀσύνθετος, a change necessary for the sentence to be comprehensible in terms of the comparison Aristoxenus wishes to make. There are marginal additions that clarify the comparison by making it more explicit, and which complete the sentence structure; these additions are mentioned only by Morelli and are overlooked without comment by subsequent editors. However, Morelli's description of them is consistent with Marquard's description of Mc's additions.

Our second manuscript of *E.R.*, in Vaticanus gr. 191, referred to as R, was copied from M in the thirteenth century. This large codex includes a variety of works on astronomy, arithmetic, and music; it contains the same sequence of musical works that the Venetus manuscript contains, as well as Ptolemy's *Harmonics*. Marquard (1868: xiii-xv) has demonstrated that this copy was made directly from M, after the corrections of Mb had been made, but before those of Mc. Where we have both M and R as sources for *E.R.*, the readings of M are to be preferred because the differences between M and R are copying errors by the scribe of R. The importance of the Vaticanus manuscript is that it contains more of *E.R.* than M does. A comparison of the amount of material included only in R with the words per line and lines per page of M indicate that M had two more folia when it was copied than it does now. However, it was already truncated then; even in R our text breaks off abruptly in mid-sentence.

The third manuscript of *E.R.*, a 16th century copy of R, is contained in the Vaticanus Urbinas gr. 77. While it is beautifully written, and incorporates into its main text things that appear as marginal corrections in R, it adds many spelling errors to the errors already found in R. Its usefulness in establishing the text of *E.R.* is very limited.

The problems of editing *E.R.* arise not from difficult choices between different manuscript readings, but from addressing flaws common to all three manuscripts. In some cases, though the meaning of the passage is clear enough, the idiom contained in the manuscripts leaves something to be desired. The proposed emendations of earlier editors will be discussed as appropriate in the commentary. In other cases, context shows that a word or phrase has been omitted, or that an incorrect word has replaced the logically necessary word. Such emendations are credited in the apparatus to the appropriate scholars.

Four points of textual uncertainty carry significance. In paragraph 7, should the reading ἐν ῥυθμοῖς be left as is, or emended to ἔνρυθμος = ἔῤῥυθμος, or to εὔρυθμος? Should the other appearances of these words, εὔρυθμος in paragraphs 8, 21, and 24, and ἔῤῥυθμος in paragraphs 32, 33, 34, and 35, be emended? In paragraph 9, how should the phrase σῆμα σημαῖνον be emended? In paragraph 13, should the phrase οὐτε μελοποιΐα be emended or deleted? In paragraph 28, how should the phrase μὴ ὡσαύτως ᾗ be supplemented?

**SCHOLARSHIP ON *E.R.***

The first edition of *E.R.* was published by Morelli in 1785. His text is based on both M and R, although he did not collate them systematically. He did not provide a critical apparatus, but noted some of the alternative readings found in Aristides Quintilianus and Psellus, who quote from or summarize sections of *E.R*. His notes do not comprise a thorough exegesis, but briefly address some philological issues.

Morelli's work was utilized by August Boeckh in his *De metris Pindari* (1811). Boeckh was the first scholar to adduce ancient sources for a system of setting Greek meters to modern musical notation. Boeckh does not treat Aristoxenus systematically, but creates a synthesis of passages culled from *E.R*., Aristides Quintilianus, Psellus, and other writers on rhythm and meter.

Hermann (1815, 1824) criticized Boeckh's theory of rhythm, arguing that ancient rhythm "iacet in tenebris." In an exchange of articles, Hermann and Boeckh debated the theory. Though Hermann criticized Boeckh's interpretations and the texts of individual passages in order to show that Aristoxenus's teachings are actually beyond modern comprehension, he did help establish some correct readings of the text.

Feussner's edition of 1840 incorporates the textual emendations of Hermann, Boeckh, and some of his own. While not giving a critical apparatus, Feussner does indicate and defend his readings where they deviate from Morelli's. He reproduces Morelli's notes along with his own, and replaces Morelli's Latin translation of Aristoxenus with a German translation. This allows Feussner to take advantage of the technical vocabulary of the German language for music theory.

Johannes Bartels produced his study of Aristoxenus in 1854. He offers a text based on Marquard and Feussner, with some emendations of his own. His commentary examines aspects overlooked by Feussner, particularly the references in *E.R.* to harmonic theory.

The first truly scholarly edition of the text of *E.R.* was produced by Marquard in 1868. This text was included as an appendix in Marquard's edition of Aristoxenus's *Elements of Harmony.*

Rudolf Westphal produced several studies of Aristoxenus and rhythm in Greek poetry during a span of over thirty years, from the 1850's to the 1880's. This body of work represents by far the most extensive investigation of *E.R.*

Westphal provides illustrations for many of his points from modern composers, particularly Bach. One strength of Westphal's study is his use of evidence from ancient musical texts, the collection known as the *Anonymous Bellermann* and the *Hymn of Mesomedes*. Westphal also includes texts of Psellus, the fragment of Aristoxenus's *On the Primary Time* preserved in Porphyry's commentary on Euclid's *Harmonics*, and selections from the so-called *Fragmenta Parisina*, a miscellany of musical information preserved in five manuscripts, and entitled *Excerpta Neapolitana* in Jan's *Musici Scriptores Graeci* (1895).

Westphal's study of *E.R.* is only one part of his larger theory of Greek metrics, produced in collaboration with Rossbach. Having adduced *E.R.* to determine the rhythmical value of individual feet and metra, Westphal and Rossbach examined the configuration of larger structures, particularly the strophes of the tragedians and the lyric poets Pindar and Bacchylides. They looked for and found patterns of symmetry and numerical balance in the construction of strophes, utilizing the method of examining smaller metrical units established through Westphal's interpretation of *E.R.*

Bernhard Brill's study (1870) finds fault with Westphal. Brill reads Aristoxenus to accommodate the rhythmic theory of Lehrs, who sought to reduce all Greek rhythm to modern four-four rhythm. Brill's study is methodologically weak, mixing snippets of *E.R.* and the other writers on rhythm to support what seem to be pre-conceived conclusions.

Laloy (1904) gives the most effective critique of the line of interpretation running from Boeckh to Westphal. Laloy's main point is that the fragment we have of *E.R.* does not apply to complex lyric meters. Laloy argues that we have only the introductory section, dealing with the most regular meters, and that more complex meters would have been dealt with in subsequent explanations, now lost. Laloy argues that this is the pattern of development Aristoxenus followed in the *Elements of Harmony*. Laloy is most emphatic in arguing that *E.R.* does not give evidence for the assumption that Greek rhythm utilized musical measures of equal duration in the complex lyric meters.

Laloy's treatment develops the arguments that underlie Wilamowitz's dismissal of *E.R.* as a useful source for the study of Greek poetry. As evidence of his knowledge of Aristoxenus, Wilamowitz (1921: 67) offers several textual emendations. The position that *E.R.* is irrelevant to the study of Greek metrics was followed by subsequent scholars such as Maas (1962), Dale (1968), and West (1982a).

Pighi's (1959) edition of *E.R.* consists of Westphal's text (1867) with an outline and Italian translation.

Neumaier (1989) accepts Westphal's interpretation of *E.R.*, and summarizes it along with other ancient metrical and rhythmical writings to produce a synthesis of ancient metrical theory that can be posed as a set of axioms in the notation of mathematical set theory.

Pearson's (1990) edition includes texts, translations, and commentaries of *E.R.*, the fragment of *On the Primary Time*, the *Fragmenta Neapolitana*, and *POxy* 2687, which Pearson argues was written by Aristoxenus or a follower. Pearson's main goal is to rehabilitate Aristoxenus as an important source for the study of Greek rhythm and metrics. Pearson makes it clear that Aristoxenus's concept of rhythmic composition, *ῥυθμοποιία*, refers to the performance of a poem, rather than its metrical composition. He accepts the assumption that metrical feet were set to musical measures of equal duration, and gives examples of how he believes Greek poems may have been set to temporal rhythm. However, Pearson (1990: 60) sidesteps the main issues that Feussner, Bartels, Westphal, and Laloy debated. For instance, he suggests that the irrational foot may simply have been one that was performed less carefully than others, or with a deliberate variation in tempo.

Gibson (2005) treats *E.R.* in her overview of Aristoxenus's works; her proposals are discussed in the notes to Aristoxenus theory of the foot, paragraphs 17-19.

Several recent studies on Greek metrics and music include discussions of *E.R.* Barker (1989a) gives a translation, but forgoes his customary commentary. Jesus Luque-Moreno (1995) accepts Westphal's interpretation in his summary of *E.R.*, but does not comment on controversial issues. Katherina Glau (1998), in the introduction to her recording of several Greek odes, also cites Westphal as the authoritative work on *E.R.* Mathiesen (1999: 334-344) offers a paraphrase of *E.R.*

# CHAPTER 3: TEXT AND APPARATUS

## ΑΡΙΣΤΟΞΕΝΟΥ

## ΡΥΘΜΙΚΩΝ ΣΤΟΙΧΕΙΩΝ Β΄

**1.** [p. 266 Morelli] Ὅτι μὲν τοῦ ῥυθμοῦ πλείους εἰσὶ φύσεις καὶ ποία τις αὐτῶν ἑκάστη καὶ διὰ τίνας αἰτίας τῆς αὐτῆς ἔτυχον προσηγορίας καὶ τί αὐτῶν ἐκάστῃ ὑπόκειται, ἐν τοῖς ἔμπροσθεν εἰρημένον. [268] νῦν δὲ ἡμῖν περὶ αὐτοῦ λεκτέον τοῦ ἐν μουσικῇ ταττομένου ῥυθμοῦ.

**2.** Ὅτι μὲν οὖν περὶ τοὺς χρόνους ἐστὶ καὶ τὴν τούτων αἴσθησιν, εἴρηται μὲν καὶ ἐν τοῖς ἔμπροσθεν, λεκτέον δὲ καὶ πάλιν νῦν, ἀρχὴ γὰρ τρόπον τινὰ τῆς περὶ τοὺς ῥυθμοὺς ἐπιστήμης αὕτη.

**3.** Νοητέον δὲ δύο τινὰς φύσεις ταύτας, τήν τε τοῦ ῥυθμοῦ καὶ τὴν τοῦ ῥυθμιζομένου, παραπλησίως ἐχούσας πρὸς ἀλλήλας ὥσπερ ἔχει τὸ σχῆμα καὶ τὸ σχηματιζόμενον πρὸς αὑτά.

**4.** Ὥσπερ γὰρ τὸ σῶμα πλείους ἰδέας λαμβάνει σχημάτων, ἐὰν αὐτοῦ τὰ μέρη τεθῇ διαφερόντως, ἤτοι πάντα ἤ τινα αὐτῶν, οὕτω καὶ τῶν ῥυθμιζομένων ἕκαστον πλείους λαμβάνει μορφάς, οὐ κατὰ τὴν αὑτοῦ φύσιν, [270] ἀλλὰ κατὰ τὴν τοῦ ῥυθμοῦ. ἡ γὰρ αὐτὴ λέξις εἰς χρόνους τεθεῖσα διαφέροντας ἀλλήλων λαμβάνει τινὰς διαφορὰς τοιαύτας, αἵ εἰσιν ἴσαι αὐταῖς ταῖς τοῦ ῥυθμοῦ φύσεως διαφοραῖς. ὁ αὐτὸς δὲ λόγος κατὰ τοῦ μέλους καὶ εἴ τι ἄλλο πέφυκε ῥυθμίζεσθαι τῷ τοιούτῳ ῥυθμῷ ὅς ἐστιν ἐκ χρόνων συνεστηκώς.

**5.** Ἐπάγειν δὲ δεῖ τὴν αἴσθησιν ἐνθένδε περὶ τῆς εἰρημένης ὁμοιότητος, πειρωμένους συνορᾶν καὶ περὶ ἑκατέρου τῶν εἰρημένων, οἷον τοῦ τε ῥυθμοῦ καὶ τοῦ ῥυθμιζομένου. τῶν τε γὰρ πεφυκότων σχηματίζεσθαι σωμάτων οὐδενὶ οὐδέν ἐστι τῶν σχημάτων τὸ αὐτό, ἀλλὰ διάθεσίς τίς ἐστι τῶν τοῦ σώματος μερῶν τὸ σχῆμα, γινόμενον ἐκ τοῦ σχεῖν πως ἕκαστον αὐτῶν, ὅθεν δὴ καὶ σχῆμα ἐκλήθη· ὅ τε ῥυθμὸς ὡσαύτως οὐδενὶ τῶν ῥυθμιζομένων ἐστὶ τὸ αὐτό, ἀλλὰ τῶν διατιθέντων πως τὸ ῥυθμιζόμενον καὶ ποιούντων κατὰ τοὺς χρόνους τοιόνδε ἢ τοιόνδε.

**6.** Προσέοικε δὲ ἀλλήλοις τὰ εἰρημέ-[272]να κατὰ τὸ μὴ γίνεσθαι καθ' αὑτά. τό τε γὰρ σχῆμα, μὴ ὑπάρχοντος τοῦ δεξομένου αὐτό, δῆλον ὡς ἀδυνατεῖ γενέσθαι· ὅ τε ῥυθμὸς ὡσαύτως χωρὶς τοῦ ῥυθμισθησομένου καὶ τέμνοντος τὸν χρόνον ού δύναται γίνεσθαι, ἐπειδὴ ὁ μὲν χρόνος αὐτὸς αὑτὸν οὐ τέμνει, καθάπερ ἐν τοῖς ἔμπροσθεν εἴπομεν, ἑτέρου δέ τινος δεῖ τοῦ διαιρήσοντος αὐτόν. ἀναγκαῖον <οὖν> ἂν εἴη μεριστὸν εἶναι τὸ ῥυθμιζόμενον γνωρίμοις μέρεσιν, οἷς διαιρήσει τὸν χρόνον.

**7.** Ἀκόλουθον δέ ἐστι τοῖς εἰρημένοις καὶ αὐτῷ τῷ φαινομένῳ τὸ λέγειν, τὸν ῥυθμὸν γίνεσθαι, ὅταν ἡ τῶν χρόνων διαίρεσις τάξιν τινὰ λάβῃ ἀφωρισμένην, οὐ γὰρ πᾶσα χρόνων τάξις ἐν ῥυθ-[274]μοῖς.

**8.** Πιθανὸν μὲν οὖν καὶ χωρὶς λόγου, τὸ μὴ πᾶσαν χρόνων τάξιν εὔρυθμον εἶναι· δεῖ δὲ καὶ διὰ τῶν ὁμοιοτήτων ἐπάγειν τὴν διάνοιαν καὶ πειρᾶσθαι κατανοεῖν ἐξ ἐκείνων, ἕως ἂν παραγένηται ἡ ἐξ αὐτοῦ τοῦ πράγματος πίστις.

Ἔστι δὲ ἡμῖν γνώριμα τὰ περὶ τὴν τῶν γραμμάτων σύνθεσιν καὶ τὰ περὶ <τὴν> τῶν διαστημάτων, ὅτι οὔτ᾽ ἐν τῷ διαλέγεσθαι πάντα τρόπον τὰ γράμματα συντίθεμεν, οὔτ᾽ ἐν τῷ μελῳδεῖν τὰ διαστήματα, ἀλλ᾽ ὀλίγοι μέν τινές [276] εἰσιν οἱ τρόποι καθ᾽ οὓς συντίθεται τὰ εἰρημένα πρὸς ἄλληλα, πολλοὶ δὲ καθ᾽ οὓς οὔτε ἡ φωνὴ δύναται συντιθέναι φθεγγομένη, οὔτε ἡ αἴσθησις προσδέχεται, ἀλλ᾽ ἀποδοκιμάζει. διὰ ταύτην γὰρ τὴν αἰτίαν τὸ μὲν ἡρμοσμένον εἰς πολὺ ἐλάττους ἰδέας τίθεται, τὸ δὲ ἀνάρμοστον εἰς πολὺ πλείους.

Οὕτω δὲ καὶ τὰ περὶ τοὺς χρόνους ἔχοντα φανήσεται· πολλαὶ μὲν γὰρ αὐτῶν συμμετρίαι τε καὶ τάξεις ἀλλότριαι φαίνονται τῆς αἰσθήσεως οὖσαι, ὀλίγαι δέ τινες οἰκεῖαί τε καὶ δυναταὶ ταχθῆναι εἰς τὴν τοῦ ῥυθμοῦ φύσιν.

Τὸ δὲ ῥυθμιζόμενόν ἐστι μὲν κοινόν πως ἀρρυθμίας τε καὶ ῥυθμοῦ· ἀμφότερα γὰρ πέφυκεν ἐπιδέχεσθαι τὸ ῥυθμιζόμενον τὰ συστήματα, τό τε εὔρυθμον καὶ τὸ ἄρρυθμον. καλῶς δ᾽ εἰπεῖν [278] τοιοῦτον νοητέον τὸ ῥυθμιζόμενον, οἷον δύνασθαι μετατίθεσθαι εἰς χρόνων μεγέθη παντοδαπὰ καὶ εἰς ξυνθέσεις παντοδαπάς.

**9.** Διαιρεῖται δὲ ὁ χρόνος ὑπὸ τῶν ῥυθμιζομένων τοῖς ἑκάστου αὐτῶν μέρεσιν. ἔστι δὲ τὰ ῥυθμιζόμενα τρία· λέξις, μέλος, κίνησις σωματική. ὥστε διαιρήσει τὸν χρόνον ἡ μὲν λέξις τοῖς αὑτῆς μέρεσιν, οἷον γράμμασι καὶ συλλαβαῖς καὶ ῥήμασι καὶ πᾶσι τοῖς τοιούτοις· τὸ δὲ μέλος τοῖς ἑαυτοῦ φθόγγοις τε καὶ διαστήμασι καὶ συστήμασιν· ἡ δὲ κίνησις σημείοις τε καὶ σχήμασι καὶ εἴ τι τοιοῦτόν ἐστι κινήσεως μέρος.

**10.** Καλείσθω δὲ [280] πρῶτος μὲν τῶν χρόνων ὁ ὑπὸ μηδενὸς τῶν ῥυθμιζομένων δυνατὸς ὢν διαιρεθῆναι, δίσημος δὲ ὁ δὶς τοῦτο καταμετρούμενος, τρίσημος δὲ ὁ τρίς, τετράσημος δὲ ὁ τετράκις. κατὰ ταὐτὰ δὲ καὶ ἐπὶ τῶν λοιπῶν μεγεθῶν τὰ ὀνόματα ἕξει.

**11.** Τὴν δὲ τοῦ πρώτου δύναμιν πειρᾶσθαι δεῖ καταμανθάνειν τόνδε τὸν τρόπον. τῶν σφόδρα φαινομένων ἐστὶ τῇ αἰσθήσει τὸ μὴ λαμβάνειν εἰς ἄπειρον ἐπίτασιν τὰς τῶν κινήσεων ταχυτῆ-[282]τας, ἀλλ᾽ ἵστασθαί που συναγομένους τοὺς χρόνους, ἐν οἷς τίθεται τὰ μέρη τῶν κινουμένων· λέγω δὲ τῶν οὕτω κινουμένων, ὡς ἥ τε φωνὴ κινεῖται λέγουσά τε καὶ μελῳδοῦσα καὶ τὸ σῶμα ἐμβαῖνόν τε καὶ ὀρχούμενον καὶ τὰς λοιπὰς τῶν τοιούτων κινήσεων κινούμενον.

Τούτων δὲ οὕτως ἔχειν φαινομένων, δῆλον ὅτι ἀναγκαῖόν ἐστιν εἶναί τινας ἐλαχίστους τῶν χρόνων, ἐν οἷς ὁ μελῳδῶν θήσει τῶν φθόγγων ἕκαστον. ὁ αὐτὸς δὲ λόγος καὶ περὶ τῶν ξυλλαβῶν δῆλον ὅτι καὶ περὶ τῶν σημείων.

**12.** Ἐν ᾧ δὴ χρόνῳ μηδὲ δύο φθόγγοι δύνανται τεθῆναι κατὰ μηδένα τρόπον, μήτε δύο ξυλλαβαί, μήτε δύο σημεῖα, τοῦτον πρῶτον ἐροῦμεν χρόνον. ὃν δὲ τρόπον λήψεται τοῦτον ἡ αἴσθησις, φανερὸν ἔσται ἐπὶ τῶν ποδικῶν σχημάτων.

**13.** Λέγομεν δέ τινα καὶ ἀσύνθετον χρόνον πρὸς τὴν τῆς ῥυθμοποιΐας χρῆσιν ἀναφέροντες. ὅτι δ᾿ ἐστὶν οὐ τὸ αὐτὸ ῥυθμοποιΐα τε καὶ ῥυθμός, σαφὲς μὲν οὔπω ῥᾴδιόν ἐστι ποιῆσαι, πιστευέσθω δὲ διὰ τῆς ῥηθησομένης ὁμοιότητος. ὥσπερ γὰρ ἐν τῇ τοῦ μέλους φύσει τεθεωρήκαμεν, ὅτι οὐ τὸ αὐτὸ σύστημά τε καὶ μελοποιΐα, [284] οὐδὲ τόνος, οὐδὲ γένος, {οὔτε μελοποιΐα} οὕτως ὑποληπτέον ἔχειν καὶ περὶ τοὺς ῥυθμούς τε καὶ ῥυθμοποιΐας, ἐπειδήπερ τοῦ μέλους χρῆσίν τινα τὴν μελοποιΐαν εὕρομεν οὖσαν, ἐπί τε τῆς ῥυθμικῆς πραγματείας τὴν ῥυθμοποιΐαν ὡσαύτως χρῆσίν τινά φαμεν εἶναι. σαφέστερον δὲ τοῦτο εἰσόμεθα προελθούσης τῆς πραγματείας.

**14.** Ἀσύνθετον δὲ χρόνον πρὸς τὴν τῆς ῥυθμοποιΐας χρῆσιν βλέποντες ἐροῦμεν· οἷον τόδε τι χρόνου μέγεθος <ἐὰν> ὑπὸ μιᾶς συλλαβῆς ἢ ὑπὸ φθόγγου ἑνὸς ἢ σημείου καταληφθῇ, <ἀσύνθετον> τοῦτον ἐροῦμεν τὸν χρόνον· ἐὰν δὲ τὸ αὐτὸ τοῦτο μέγεθος ὑπὸ πλειόνων φθόγγων ἢ συλλαβῶν ἢ σημείων καταληφθῇ, σύνθετος ὁ χρόνος οὗτος ῥηθήσεται.

Λάβοι δ' ἄν τις παράδειγμα ἐκ τῆς περὶ τὸ ἡρμοσμένον πραγματείας· καὶ γὰρ ἐκεῖ [286] τὸ αὐτὸ μέγεθος ἡ μὲν ἁρμονία σύνθετον, τὸ δὲ χρῶμα ἀσύνθετον, καὶ πάλιν τὸ μὲν διάτονον ἀσύνθετον, τὸ δὲ χρῶμα σύνθετον, ἐνίοτε δὲ καὶ τὸ αὐτὸ γένος τὸ αὐτὸ μέγεθος ἀσύνθετόν τε καὶ σύνθετον ποιεῖ, οὐ μέντοι ἐν τῷ αὐτῷ τόπῳ τοῦ συστήματος.

Διαφέρει γὰρ τὸ παράδειγμα τοῦ προβλήματος τῷ τὸν μὲν χρόνον ὑπὸ τῆς ῥυθμοποιΐας ἀσύνθετόν τε καὶ σύνθετον γίνεσθαι, τὸ δὲ διάστημα ὑπ' αὐτῶν τῶν γενῶν ἢ τῆς τοῦ συστήματος τάξεως. περὶ μὲν οὖν ἀσυνθέτου καὶ συνθέτου χρόνου καθόλου τοῦτον τὸν τρόπον διωρίσθω.

**15.** Μερισθέντος δὲ τοῦ προβλήματος ὡδί, ἁπλῶς μὲν ἀσύνθετος λεγέσθω ὁ ὑπὸ μηδενὸς τῶν ῥυθμιζομένων διῃρημένος· ὡσαύτως δὲ [288] καὶ σύνθετος ὁ ὑπὸ πάντων τῶν ῥυθμιζομένων διῃρημένος· πὴ δὲ σύνθετος καί πη ἀσύνθετος ὁ ὑπὸ μέν τινος διῃρημένος, ὑπὸ δέ τινος ἀδιαίρετος ὤν. ὁ μὲν οὖν ἁπλῶς ἀσύνθετος τοιοῦτος ἄν τις εἴη, οἷος μήθ' ὑπὸ ξυλλαβῶν πλειόνων, μήθ' ὑπὸ φθόγγων, μήθ' ὑπὸ σημείων κατέχεσθαι· ὁ δ' ἁπλῶς σύνθετος, ὁ ὑπὸ πάντων καὶ πλειόνων ἢ ἑνὸς κατεχόμενος· ὁ δὲ μικτός, ᾧ συμβέβηκεν ὑπὸ φθόγγου μὲν ἑνός, ὑπὸ ξυλλαβῶν δὲ πλειόνων καταληφθῆναι, ἢ ἀνάπαλιν ὑπὸ ξυλλαβῆς μὲν μιᾶς, ὑπὸ φθόγγων δὲ πλειόνων.

**16.** Ὧι δὲ σημαινόμεθα τὸν ῥυθμὸν καὶ γνώριμον ποιοῦμεν τῇ αἰσθήσει, πούς ἐστιν εἷς ἢ πλείους ἑνός.

**17.** Τῶν δὲ ποδῶν οἱ μὲν ἐκ δύο χρόνων σύγκεινται τοῦ τε ἄνω καὶ τοῦ κάτω, οἱ δὲ ἐκ τριῶν, δύο μὲν τῶν ἄνω, ἑνὸς δὲ τοῦ κάτω, ἢ ἐξ ἑνὸς μὲν τοῦ ἄνω, δύο δὲ τῶν κάτω, <οἱ δὲ ἐκ τεττάρων, δύο μὲν τῶν ἄνω, δύο δὲ τῶν κάτω>.

**18.** Ὅτι μὲν οὖν ἐξ ἑνὸς χρόνου ποὺς οὐκ ἂν εἴη φανερόν, ἐπειδήπερ ἓν σημεῖον [290] οὐ ποιεῖ διαίρεσιν χρόνου· ἄνευ γὰρ διαιρέσεως χρόνου ποὺς οὐ δοκεῖ γίνεσθαι.

Τοῦ δὲ λαμβάνειν τὸν πόδα πλείω τῶν δύο σημεῖα τὰ μεγέθη τῶν ποδῶν αἰτιατέον. οἱ γὰρ ἐλάττους τῶν ποδῶν, εὐπερίληπτον τῇ αἰσθήσει τὸ μέγεθος ἔχοντες, εὐσύνοπτοί εἰσι καὶ διὰ τῶν δύο σημείων· οἱ δὲ μεγάλοι τοὐναντίον πεπόνθασι, δυσπερίληπτον γὰρ τῇ αἰσθήσει τὸ μέγεθος ἔχοντες, πλειόνων δέονται σημείων, ὅπως εἰς πλείω μέρη διαιρεθὲν τὸ τοῦ ὅλου ποδὸς μέγεθος εὐσυνοπτότερον γίνηται. διὰ τί δὲ οὐ γίνεται πλείω σημεῖα τῶν τεττάρων, οἷς ὁ ποὺς χρῆται κατὰ τὴν αὑτοῦ δύναμιν, ὕστερον δειχθήσεται.

**19.** Δεὶ δὲ μὴ διαμαρτεῖν ἐν τοῖς νῦν εἰρημένοις, ὑπολαμβάνοντας, μὴ μερίζεσθαι πόδα εἰς πλείω τῶν τεττάρων ἀριθμῶν. μερίζονται γὰρ ἔνιοι τῶν ποδῶν εἰς διπλάσιον τοῦ εἰρημένου πλήθους ἀριθμὸν καὶ εἰς πολυπλάσιον. ἀλλ᾽ οὐ καθ᾽ αὑτὸν ὁ ποὺς εἰς τὸ πλέον τοῦ [292] εἰρημένου πλήθους μερίζεται, ἀλλ᾽ ὑπὸ τῆς ῥυθμοποιίας διαιρεῖται τὰς τοιαύτας διαιρέσεις. νοητέον δὲ χωρὶς τά τε τὴν τοῦ ποδὸς δύναμιν φυλάσσαντα σημεῖα καὶ τὰς ὑπὸ τῆς ῥυθμοποιίας γινομένας διαιρέσεις· καὶ προσθετέον δὲ τοῖς εἰρημένοις, ὅτι τὰ μὲν ἑκάστου ποδὸς σημεῖα διαμένει ἴσα ὄντα καὶ τῷ ἀριθμῷ καὶ τῷ μεγέθει, αἱ δ᾽ ὑπὸ τῆς ῥυθμοποιΐας γινόμεναι διαιρέσεις πολλὴν λαμβάνουσι ποικιλίαν. ἔσται δὲ τοῦτο καὶ ἐν τοῖς ἔπειτα φανερόν.

**20.** Ὥρισται δὲ τῶν ποδῶν ἕκαστος ἤτοι λόγῳ τινὶ ἢ ἀλογίᾳ τοιαύτῃ, ἥτις δύο λόγων γνωρίμων τῇ αἰσθήσει ἀνὰ μέσον ἔσται. γένοιτο δ᾽ ἂν τὸ εἰρημένον ὧδε καταφανές· εἰ ληφθείησαν δύο πόδες, ὁ μὲν ἴσον τὸ ἄνω τῷ κάτω ἔχων καὶ δίσημον ἑκάτερον, ὁ δὲ τὸ μὲν κάτω δίσημον, τὸ δὲ ἄνω ἥμισυ, τρίτος δέ τις ληφθείη ποὺς παρὰ τούτους, τὴν μὲν βάσιν ἴσην αὐτοῖς ἀμφοτέροις ἔχων, τὴν δὲ ἄρσιν μέσον μέγεθος ἔχουσαν [294] τῶν ἄρσεων. ὁ γὰρ τοιοῦτος ποὺς ἄλογον μὲν ἕξει τὸ ἄνω πρὸς τὸ κάτω· ἔσται δ᾽ ἡ ἀλογία μεταξὺ δύο λόγων γνωρίμων τῇ αἰσθησει, τοῦ τε ἴσου καὶ τοῦ διπλασίου. καλεῖται δ᾽ οὗτος χορεῖος ἄλογος.

**21.** Δεῖ δὲ μηδ᾽ ἐνταῦθα διαμαρτεῖν, ἀγνοηθέντος τοῦ τε ῥητοῦ καὶ τοῦ ἀλόγου, τίνα τρόπον ἐν τοῖς περὶ τοὺς ῥυθμοὺς λαμβάνεται. ὥσπερ οὖν ἐν τοῖς διαστηματικοῖς στοιχείοις τὸ μὲν κατὰ μέλος ῥητὸν ἐλήφθη, ὃ πρῶτον μέν ἐστι μελῳδούμενον, ἔπειτα γνώριμον κατὰ μέγεθος, ἤτοι ὡς τά τε σύμφωνα καὶ ὁ τόνος ἢ ὡς τὰ τούτοις σύμμετρα, τὸ δὲ κατὰ τοὺς τῶν ἀριθμῶν μόνον λόγους ῥητόν, ᾧ συνέβαινεν ἀμελῳδήτῳ εἶναι· οὕτω καὶ ἐν τοῖς ῥυθμοῖς ὑποληπτέον ἔχειν τό τε ῥητὸν καὶ τὸ ἄλογον. τὸ μὲν γὰρ κατὰ τὴν τοῦ ῥυθμοῦ φύσιν λαμβάνεται ῥητόν, τὸ δὲ κατὰ τοὺς τῶν ἀριθμῶν μόνον λόγους.

Τὸ μὲν οὖν ἐν [296] ῥυθμῷ λαμβανόμενον ῥητὸν χρόνου μέγεθος πρῶτον μὲν δεῖ τῶν πιπτόντων εἰς τὴν ῥυθμοποιΐαν εἶναι, ἔπειτα τοῦ ποδὸς ἐν ᾧ τέτακται μέρος εἶναι ῥητόν· τὸ δὲ κατὰ τοὺς τῶν ἀριθμῶν λόγους λαμβανόμενον ῥητὸν τοιοῦτόν τι δεῖ νοεῖν οἷον ἐν τοῖς διαστηματικοῖς τὸ δωδεκατημόριον τοῦ τόνου καὶ εἴ τι τοιοῦτον ἄλλο ἐν ταῖς τῶν διαστημάτων παραλλαγαῖς λαμβάνεται.

16 Φανερὸν δὲ διὰ τῶν εἰρημένων, ὅτι ἡ μέση ληφθεῖσα τῶν ἄρσεων οὐκ ἔσται σύμμετρος τῇ βάσει· οὐδὲν γὰρ αὐτῶν μέτρον ἐστὶ κοινὸν εὔρυθμον.

**22.** Τῶν δὲ ποδικῶν διαφορῶν ἐκκείσθωσαν αἱ ἑπτά· πρώτη μέν, καθ᾽ ἣν μεγέθει διαφέρουσιν ἀλλήλων· δευτέρα δέ, καθ᾽ ἣν γένει· τρίτη δέ, καθ᾽ ἣν οἱ μὲν ῥητοί, οἱ δ᾽ ἄλογοι τῶν ποδῶν εἰσι· τετάρτη δέ, καθ᾽ ἣν οἱ μὲν ἀσύνθετοι, οἱ δὲ σύνθετοι· πέμπτη δέ, καθ᾽ ἣν [298] διαιρέσει διαφέρουσιν ἀλλήλων· ἕκτη δέ, καθ᾽ ἣν σχήματι διαφέρουσιν ἀλλήλων· ἑβδόμη δέ, καθ᾽ ἣν ἀντιθέσει.

**23.** Μεγέθει μὲν οὖν διαφέρει ποὺς ποδός, ὅταν τὰ μεγέθη τῶν ποδῶν, ἃ κατέχουσιν οἱ πόδες, ἄνισα ᾖ.

**24.** Γένει δὲ ὅταν οἱ λόγοι διαφέρωσιν ἀλλήλων οἱ τῶν ποδῶν, οἷον ὅταν ὁ μὲν τὸν τοῦ ἴσου λόγον ἔχῃ, ὁ δὲ τὸν τοῦ διπλασίου, ὁ δ᾽ ἄλλον τινὰ τῶν εὐρύθμων λόγων.

**25.** Οἱ δ᾽ ἄλογοι τῶν ῥητῶν διαφέρουσι τῷ τὸν ἄνω χρόνον πρὸς τὸν κάτω μὴ εἶναι ῥητόν.

**26.** Οἱ δ᾽ ἀσύνθετοι τῶν συνθέτων διαφέρουσι τῷ μὴ διαιρεῖσθαι εἰς πόδας, τῶν συνθέτων διαιρουμένων.

**27.** Διαιρέσει δὲ διαφέρουσιν ἀλλήλων, ὅταν τὸ αὐτὸ μέγεθος εἰς ἄνισα μέρη διαιρεθῇ, ἤτοι κατὰ ἀμφότερα, κατά τε τὸν ἀριθμὸν καὶ κατὰ τὰ μεγέθη, ἢ κατὰ θἄτερα.

**28.** Σχήματι δὲ διαφέρουσιν ἀλλήλων, ὅταν τὰ αὐτὰ μέρη τοῦ αὐτοῦ μεγέθους μὴ ὡσαύ-[300]τως ᾖ <τεταγμένα>.

**29.** Ἀντιθέσει δὲ διαφέρουσιν ἀλλήλων οἱ τὸν ἄνω χρόνον πρὸς τὸν κάτω ἀντικείμενον ἔχοντες. ἔσται δὲ ἡ διαφορὰ αὕτη ἐν τοῖς ἴσοις μέν, ἄνισον δὲ ἔχουσι τῷ ἄνω χρόνῳ τὸν κάτω.

**30.** Τῶν δὲ ποδῶν <τῶν> καὶ συνεχῆ ῥυθμοποιΐαν δεχομένων τρία γένη ἐστί· τό τε δακτυλικὸν καὶ τὸ ἰαμβικὸν καὶ τὸ παιωνικόν. δακτυλικὸν μὲν οὖν ἐστι τὸ ἐν <τῷ> ἴσῳ λόγῳ, ἰαμβικὸν δὲ τὸ ἐν τῷ διπλασίῳ, παιωνικὸν δὲ τὸ ἐν τῷ ἡμιολίῳ.

**31.** Τῶν δὲ ποδῶν ἐλάχιστοι μέν [302] εἰσιν οἱ ἐν τῷ τρισήμῳ μεγέθει· τὸ γὰρ δίσημον μέγεθος παντελῶς ἂν ἔχοι πυκνὴν τὴν ποδικὴν σημασίαν. γίνονται δὲ ἰαμβικοὶ τῷ γένει οἷον ἐν τρισήμῳ μεγέθει· ἐν γὰρ τοῖς τρισὶν ὁ τοῦ διπλασίου μόνος ἔσται λόγος.

**32.** Δεύτεροι δ' εἰσὶν οἱ ἐν τῷ τετρασήμῳ μεγέθει· εἰσὶ δ' οὗτοι δακτυλικοὶ τῷ γένει· ἐν γὰρ τοῖς τέτρασι δύο λαμβάνονται λόγοι, ὅ τε τοῦ ἴσου καὶ ὁ τοῦ τριπλασίου· ὧν ὁ μὲν τοῦ τριπλασίου οὐκ ἔρρυθμός ἐστιν, ὁ δὲ τοῦ ἴσου εἰς τὸ δακτυλικὸν πίπτει γένος.

**33.** Τρίτοι δέ εἰσι κατὰ τὸ μέγεθος οἱ ἐν πεντασήμῳ μεγέθει· ἐν γὰρ τοῖς πέντε δύο λαμβάνονται λόγοι, ὅ τε τοῦ τετραπλασίου καὶ ὁ τοῦ ἡμιολίου· ὧν ὁ μὲν τοῦ τετραπλασίου οὐκ ἔρρυθμός ἐστιν, ὁ δὲ τοῦ ἡμιολίου τὸ παιωνικὸν ποιήσει γένος.

**34.** Τέταρτοι δέ εἰσιν οἱ <ἐν> ἑξασήμῳ μεγέθει· ἔστι δὲ τὸ μέγεθος τοῦτο δύο γενῶν κοινόν, τοῦ τε ἰαμβικοῦ καὶ τοῦ δακτυλικοῦ, ἐν γὰρ τοῖς ἓξ τριῶν λαμβανομένων [304] λόγων, τοῦ τε ἴσου καὶ τοῦ διπλασίου καὶ τοῦ πενταπλασίου, ὁ μὲν τελευταῖος ῥηθεὶς οὐκ ἔρρυθμός ἐστι, τῶν δὲ λοιπῶν ὁ μὲν τοῦ ἴσου λόγος εἰς τὸ δακτυλικὸν γένος ἐμπεσεῖται, ὁ δὲ τοῦ διπλασίου εἰς τὸ ἰαμβικόν.

**35.** Τὸ δὲ ἑπτάσημον μέγεθος οὐκ ἔχει διαίρεσιν ποδικήν· τριῶν γὰρ λαμβανομένων λόγων ἐν τοῖς ἑπτὰ οὐθείς ἐστιν ἔρρυθμος· ὧν εἷς μέν ἐστιν ὁ τοῦ ἐπιτρίτου, δεύτερος δὲ ὁ τῶν πέντε πρὸς τὰ δύο, τρίτος δὲ ὁ τοῦ ἑξαπλασίου.

**36.** Ὥστε πέμπτοι ἂν εἴησαν οἱ ἐν ὀκτασήμῳ μεγέθει. ἔσονται δ' οὗτοι δακτυλικοὶ τῷ γένει, ἐπειδήπερ…

## APPARATUS 1: PARALLEL TEXTS

### SIGLA

AQ = Aristides Quintilianus, Περὶ μουσικῆς (Winnington-Ingram 1965)

*E.H.* = Aristoxenus, ἁρμονικὰ στοιχεῖα (Da Rios 1954)

Neap. = *Fragmenta Neapolitana* (= *Fragmenta Parisina*) (Pearson 1990: 28-31)

Porph. = Porphyry, εἰς Πτολεμαίου Ἁρμονικά (Pearson 1990: 32-35)

Psel. = Michael Psellus, Προσλαμβανόμενα εἰς τὴν ῥυθμικὴν ἐπιστήμην (Pearson 1990: 20-27)

### PARAGRAPH 1

Plato *Philebos* 17d

Plato *Cratylus* 424c

Plato *Laws* 653e

Aristotle *Poetics* 1448b20-22

Aristotle *Rhet*. 1408b28-29

*E.H.* 2.34 (= 41.7 Da Rios)

AQ 1.13 (= 31.3-7; 31.18-32.10 W-I)

Bacchius *Isagoge* 93 (= 313.1-6 Jan)

Syrianus *in Hermogenem de formis Orationem* (18.18 Rabe)

**PARAGRAPH 2**

Aristotle *Posterior Analytics* 99a20-100b17

*E.H.* 2.33 (= 42.21-43.28 Da Rios.)

**PARAGRAPH 3**

Aristotle *Physics* 194b23-29

Psel. 2 (= 20.18-19 Pearson)

Psel. 13 (= 24.20-22 Pearson)

**PARAGRAPH 4**

*POxy* 2687 ii.1-7 (= 37.1-7 Pearson)

Dionysius of Halicarnassus *De Comp. Verb.* par. 11 p. 80

Longinus *Commentary on Hephaestion's Handbook* (133 Consbruch)

Quintilian *Orator* 9.4.90

Psel. 1 (= 20.2-17 Pearson)

Psel. 13 (= 24.22-24 Pearson)

**PARAGRAPH 5**

*desunt comparanda*

**PARAGRAPH 6**

Aristoxenus *Physics* 218b14, 220b15

Psel. 13 (= 24.25-31 Pearson)

**PARAGRAPH 7**

Plato *Laws* 653e

Plato *Laws* 660a7

Aristotle *Metaphysics* 1078a36-b2

Ps.-Aristotle *Problems* 919b33

AQ 1.13 (= 31.9-10 W-I)

Psel. 3 (= 20.20-22 Pearson)

**PARAGRAPH 8**

Plato *Philebos* 17a-e

Plato *Republic* 400c-d

Plato *Cratylus* 424c

Plato *Laws* 655a5

Aristotle *Rhetoric* 1408b21-27

Aristotle *Poetics* 1456b20-38

Ephorus (Fr. 6 = 2a.70.6 Jacoby)

Dionysius of Halicarnassus *On Literary Composition* VI.25, 11-12 (= 212 Usher = 125 Usener-Radermacher)

AQ 1.14 (= 32.30-33.11 W-I)

Psel. 3 (= 22-23 Pearson)

**PARAGRAPH 9**

Plato *Philebos* 17d

Aristotle *Poetics* 1456b20-21

Aristotle *Metaphysics* 1035a9-12

Psel. 3 (= 20.23-25 Pearson)

Psel. 5 (= 22.3-5 Pearson)

Neap. 20 (= 30.14-19 Pearson)

**PARAGRAPH 10**

Aristotle *Physics* 235a32-236b24

AQ 1.14 (= 32.11-24 W-I)

Porph. (32-34 Pearson)

Anon. Bellermann 2.21

Psel. 6 (= 22.6-19 Pearson)

**PARAGRAPH 11**

Aristotle *On Perception and Perceptibles* 437b3

**PARAGRAPH 12**

Psel. 7 (= 22.20-21 Pearson)

**PARAGRAPH 13**

*E.H.* 2.38 (= 48.5-8 Da Rios)

AQ 1.14 (= 32.25-28 W-I)

Ps.-Plutarch *On Music* 1141b

**PARAGRAPH 14**

Cleonides *Introduction to Harmony* (9 Meib. = p. 188 Jan)

AQ 1.14 (= 32.25-27 W-I)

**PARAGRAPH 15**

Plato *Laws* 812d

**PARAGRAPH 16**

Aristophanes *Frogs* 1323

Plato *Republic* 399e

*E.H.* 2.34 (= 43.19-20 Da Rios)

AQ 1.14 (= 33.12-13 W-I)

Neap. 9 (= 28.1-3 Pearson)

**PARAGRAPH 17**

AQ 1.14 (= 33.13 W-I)

Psel. 14 (= 26.1-3 Pearson)

Neap. 12 (= 28.14-17 Pearson)

**PARAGRAPH 18**

*POxy* 2687 iii.30-iv.5 (= 41.7-17 Pearson)

Psel. 4 (= 22.1-2 Pearson)

Psel. 14 (= 26.3-5 Pearson)

**PARAGRAPH 19**

*POxy* 2687 iii.30-iv.5 (= 41.7-17 Pearson)

AQ  1.14 (= 34.4-14 W-I)

Psel. 12 (= 24.8-19 Pearson)

Neap. 14 (= 28.21-30.6 Pearson)

**PARAGRAPH 20**

Archytas fr . 2 Diels-Kranz

AQ 1.14 (= 33.21 W-I)

Psel. 15 (= 26.6 Pearson)

Neap. 10 (= 28.4-7 Pearson)

Scholia to Hephaestion (426 Consbruch)

**PARAGRAPH 21**

Aristotle *On Indivisible Lines* 968b15-21

AQ 1.14 (= 34.15-18 W-I)

**PARAGRAPH 22**

Aristotle *Parts of Animals* 642-645

AQ 1.14 (= 33.14-28 W-I)

Psel. 16 (= 26.7-14 Pearson)

**PARAGRAPH 23**

Neap. 15 (= 30.7-13 Pearson)

**PARAGRAPHS 24-25**

*desunt comparanda*

**PARAGRAPH 26**

Plato *Republic* 400b

AQ 1.15-17 (= 35-38 W-I)

**PARAGRAPHS 27-29**

*desunt comparanda*

**PARAGRAPH 30**

Plato *Republic* 400a

Aristotle *Rhetoric* 1408b

AQ 1.14 (= 33.35-34.4 W-I)

Psel. 9 (= 24.1-3 Pearson)

Psel. 17 (= 26.15-16 Pearson)

Neap. 13 (= 28.17-20 Pearson)

**PARAGRAPHS 31-36**

Hephaestion *Handbook on Meters* 3 (10-12 Consbruch)

AQ 1.18 (= 38.17-39.25 W-I)

**APPARATUS 2: ALTERNATE READINGS**

**SIGLA**

M Venetus Marcianus gr. app. cl. VI/3 (saec. XII)

R Vaticanus gr. 191 (saec. XIII)

D Vaticanus Urbinas gr. 77 (saec. XVI), ex R descriptus

Psel. Michael Psellus, Προσλαμβανόμενα εἰς τὴν ῥυθμικὴν ἐπιστήμην (Pearson 1990: 20-27)

**EDITORS**

Bar. = Bartels, I. 1854. *Aristoxeni elementorum rhythmicorum fragmentum*. Bonn.

Boe[1]. = Boeckh, August. 1811. "De Metris Pindari: Liber I." In Pindar. *Opera quae supersunt. Textum in genuina metra restituit et ex fide librorum manuscriptorum doctorumque coniecturis recensuit, annotationem criticam scholia integra interpretationem Latinam commentarium perpetuum et indices adiecit Augustus Boeckhius. Tomus I.* Leipzig. 1-109.

Boe[2]. = Boeckh, A. 1825. "Proemium semestris aestivi a. MDCCXXV (De Doriis epitritis)." In Boeckh, A. and F. Ascherson (1874) *August Boeckh's gesammelte kleine Schriften 4. Opuscula Academica Berolinensia*. 213-227.

Brinkman = Brinkmann, A. 1916. "Lückenbüsser" *RM* 71: 288.

Caes. = Caesar, J. 1841. *Zeitschrift für die Alterthumswissenschaft* 8: 22-27. Cited in Bartels (1854: 9, 12, 16) and Pearson (1990: xvi).

Feu. = Feussner, H. 1840. *De Aristoxeni Tarenti Elementis Rhythmicis*. Leipzig.

Franz = Jan, K. von. 1861. Review of Westphal 1861. *Neue Jahrbücher für Philologie und Paedagogik* 83: 443-448. Jan (445-446) reports alternative readings from a transcription of R produced by Franz; Jan gives no other identification or year for this scholar.

Her[1]. = Hermann, G. 1815. "De Metrorum Quorumdam Mensura Rhythmica." Reprinted in Fritzsche, T. ed. 1827. *Godofredi Hermanni Opuscula II*. Leipzig. 105-123.

Her[2]. = Hermann, G. 1824. "De Doriis epitritis." Reprinted in Fritzsche, T. ed. 1828. *Godofredi Hermanni Opuscula III*. Leipzig. 83-97.

Her[3]. = Hermann, G. 1837. "Kritische Beurteilungen in Feussneri De Antiquiquorum metrorum et melorum discrimine" *Jahnscher Jahrbücher für Philologie und Paedagogik*. 19: 37-380.

Marq. = Marquard, P. 1868. *ἈΡΙΣΤΟΧΕΝΟΥ ἈΡΜΟΝΙΚΩΝ ΤΑ ΣΩΖΩΜΕΝΑ: Die Harmonischen Fragmente des Aristoxenus*. Berlin.

Mor. = Morelli, Jacopo. 1785. *Aristidis oratio adversus leptinem libanii declamatio pro Socrate; Aistoxeni rhythmicorum elementorum fragmenta: Libanii Declamatio pro Socrate Aristoxeni Rhythmicorum elementorum fragmenta*. Venice.

Pear. = Pearson, Lionel. 1990. *Aristoxenus Elementa Rhythmica: the Fragments of Book II and the additional evidence for Aristoxenean rhythmic theory*. Oxford.

Westphal[1] = Westphal, R. 1861. *Die Fragmente und die Lehrsatze der griechischen Rhythmiker*. Leipzig.

Westphal[2] = Westphal, R. 1867. *Griechische Rhythmik und Harmonik nebst der Geschichte der drei musischen Disciplinen*. Leipzig.

Westphal[3] = Westphal, R. 1893. *Aristoxenus von Tarent: Melik und Rhythmik des Classischen Hellenismus II*. Leipzig.

Wil. = Willamowitz- Moellendorff, U. 1921. *Griechische Verskunst*. Berlin.

**TITLE**

B′ MR: Γ′ D

**PARAGRAPH 1**

2 τίνας αἰτίας] τίνα αἰτίαν Franz

3 εἰρημένον M: εἰρημένοις RD

4 ῥυθμοῦ om. D

**PARAGRAPH 2**

**PARAGRAPH 3**

1 ῥυθμοῦ MR: ῥηθμοῦ D

2 post ἔχει inser. ἀλλήλας (sic) D

3 σχῆμα καὶ τὸ σχηματιζόμενον] σχῆματιζόμενον (sic) D

3 αὑτά] αὐτὸ ex αὐτὰς Mc: αὐτὰ (sic) R: αὐτὰ D: αὑτά vel ἑαυτά in Psel.: αὑτά Marq., Westphal[1]: ἑαυτό Bar.: αὐτό Pear.

**PARAGRAPH 4**

4 αὐτοῦ] ῥηθμοῦ D, αὑτοῦ Marq.

4 ἡ] εἰ RD

4 αὐτὴ MR: αὐτῆ D

6 ἴσαι] ἶσαι codd.

6 αὐταῖς ex αὐτῆς Mc. αὐτῆς RD: ταῖς τῆς Wil.

6 ῥυθμοῦ MR: ῥηθμοῦ D

6 διαφοραῖς] διαφοραὶ RD

7 κατὰ τοῦ] καὶ ἐπὶ τοῦ Feu.

7 τι] τοι D

7 ῥυθμίζεσθαι] ῥυθμήζεσθαι D

8 τοιούτω ex τοιοῦτο D

**PARAGRAPH 5**

2 πειρωμένους] πειρομενος (sic) ω supra ο D

3 ῥυθμοῦ καὶ] καὶ supra lin. add. M$_c$., om. RD

5 διάθεσις Feu.: διάδεσις codd.

6 πως] πῶς RD

8 πως] acc. eras. M, πῶς RD

9 ἣ ex ἤ M$_b$.

**PARAGRAPH 6**

1 κατὰ τὸ vel καὶ <κατὰ> τὸ Pear.: καὶ τὸ codd., καὶ τῷ Bar.

2 τὸ ex τοῦ M$_c$. ut vid. τοῦ RD

2 σχῆμα ex σχήματος M: σχήματος RD

4 ῥυθμισθησομένου M: ῥυθμισομένου R: ῥυθμησομένου D

5 ἐπειδὴ] ἐπεὶ δὴ Bar., novam sententiam hic indicans

6 δεῖ] δεῖται sed ται sup. lin. add. M$_c$.

7 οὖν Mor.: om. codd.

**PARAGRAPH 7**

1 τῷ om. D

1 φαινομένῳ] φαινο (sic) R

3 ἐν ῥυθμοῖς] εὔρυθμος Psel.: ἔνρυθμος vel ἔρρυθμος Bar.: vid. comm. ad loc.

**PARAGRAPH 8**

1 χρόνων Feu.: λόγου codd.

2 εὔρυθμον MR: εὔριθμ. D: ἔῤῥυθμον Mor.: vid. comm. ad 8.19.

3 τοῦ] τοῦ sup. lin. add. $M_c$., om. RD

4 πίστις MR: πίστιν D

5 post δὲ add. καὶ D

5 τὴν sup. lin. add. $M_c$., om. RD

6 <τὴν> add. Feu.

8 συντίθεται MR: συντίθενται (sic) D

10 συντιθέναι] συντίσεσθαι Mor.

10 φθεγγομένη] η scriptum sup. οι D

10 οὔτε ἤ] οὐτ ε scriptum sup. η (sic) D

11 τὸ R: τὸ sed ras. post ὁ M: τὸν D

17 ἀρρυθμίας] ἀρυθμίας RD

18 ῥυθμοῦ] ῥυ in ras. R

19 εὔρυθμον] ἔῤῥυθμον Mor.: vid. comm. ad loc.

19 καὶ τὸ ἄρρυθμον in marg. add. $M_c$., om. RD

19 καλῶς ex καλοῦ $M_c$., καλοῦ RD: καθόλου Brinkman: ἁπλῶς Wil.

**PARAGRAPH 9**

3  τοῖς] τοῖς ex τῆς ut vid. R, τῆς D

3  αὐτῆς] αὑτῆς RD

**PARAGRAPH 10**

2  διαιρεθῆναι] post διαιρεθῆναι in marg. M add. σχῆμα corr. ex σχήματα

2  τοῦτο vel το<σο>ῦτο Pear.:  τούτων an τούτου an τούτῳ incert. M: τούτων R: τούτῳ Her$^3$.

4  ταὐτὰ Her$^3$.:  ταῦτα codd.

**PARAGRAPH 11**

1-2  τόνδε τὸν] τόνδε ex τὸν δὲ M$_{c.}$, alterum τὸν in marg. add. M$_{c.}$, τὸν δὲ RD

5  οὕτω]  ς post ω eras. M., οὕτως RD

6  λέγουσά τε] λέγουσαται (sic) cum ε sup. ται D

6  σῶμα ἐμβαῖνόν Feu.: σῆμα σημαῖνόν codd.:  σῶμα σῆμα σημαῖνόν Marq.: σῶμα σημαῖνόν Pear.:  vid. comm. ad loc.

10-11  ὅτι καὶ περὶ] καὶ om. D

**PARAGRAPH 12**

1  μηδὲ Pear.:  μὴ δὲ codd.: μήτε Feuss.:  Marq. in M vidit μηδὲ

1  φθόγγοι Feu.: χρόνοι codd.

**PARAGRAPH 13**

3  δὲ in marg. add. M$_{c.}$ , om. RD

4  ῥηθησομένης] ῥηθ ex ῥυθ D

5  μελοποιΐα] μελῳποια (sic) ο sup. ῳ D

6  {οὔτε μελοποιΐα} seclusit Pear.:  οὔδε M, οὔτε RD:  μελῳποιΐα D:  τε καὶ μελοποιΐα Caes.: αὖ καὶ μελοποιΐα Feu.:  οὐδὲ μεταβολὴ Bar.:  μελοποιΐα Wil.

**PARAGRAPH 14**

1  δὲ] δὴ Bar.: ante χρόνον add. καὶ συνθετον Marq.

2  οἷον τόδε τι]  οἷον ὅταν τι Feu.:  οἷον τοιόνδε˙  ὅταν τι Bar.: οἷον τόδε τι˙ ἐἄν τι Marq.: ἐάν post μέγεθος add. Pear.

3  καταληφθῃ] καταληφθέν Her$^{3}$., Caes.

3  <ἀσύνθετον> add. Bar.

5  σημείων $M_b$:  σημεῖον RD

8  ad μέγεθος Mor. vidit in marg. M ἤτοι τὸ ἡμιτόνιον

9  σύνθετον ex ἀσύνθετον M:  ἀσύνθετον RD

9  ἀσύνθετον ex σύνθετον $M_c$.:  σύνθετον RD

9  in marg. M ἢ μὲν ἁρμονία vidit Mor.

10  τὸ δὲ χρῶμα] om. δὲ D:  post χρῶμα add. sup. lin. καὶ τὶ διάτονον $M_c$

11  τε] δὲ RD

14  ῥυθμοποιΐας] ῥυθμῳποιΐας (sic) ο sup. ῳ D

15  τῶν] τῶν τῶν RD

17  διωρίσθω ex διορ. M:  διορ. RD

**PARAGRAPH 15**

3-4 πὴ...πη codd.: πῂ...πῃ Mor.: πῇ...πῇ Bar.

4 ἀσύνθετος] ἀσύνθετον D

6 οἷος Mor.: οἷος ὁ codd.

7 κατέχεσθαι codd.: κατέχεται Feu.

9 καταληφθῆναι Mor.: καταλήφθη codd.

**PARAGRAPH 16**

**PARAGRAPH 17**

2 ἢ Psell.: ἡ δὲ M: οἱ δὲ R: *καὶ πάλιν* proposuit Feu.

2-3 δύο μὲν τῶν ἄνω, ἑνὸς δὲ τοῦ κάτω, ἢ ἐξ secl. Bar.

3-4 <οἱ δὲ...τῶν κάτω> add. Mor. ex Psel.: vid. comm. ad loc.

**PARAGRAPH 18**

8 δέονται Her[1]., Feu.: δὲ ὄντες R: incert. M

9 διαιρεθὲν τὸ Her[1]., Feu.: διαιρεθέν M διαιρεθέντος R

10 γίνηται Feu.: γίνεται codd.

11 *αὑτοῦ* Her[1].: *αὐτοῦ* codd.

**PARAGRAPH 19**

2 ἀριθμῶν] ἀριθμὸν Her[1].

7 ῥυθμοποιΐας] hic desinit M

9 *ἴσα*] *ἶσα* R

**PARAGRAPH 20**

2 γένοιτο δ᾽ ἄν] δὲ ἄν Mor.: δὲ Feu.

3 ἴσον] ἶσον R

6 δὲ ἄρσιν Boe[1].: διαίρεσιν R: τὴν δὲ διαίρεσιν Mor.: vid. comm. ad loc.

8 τὸ κάτω] τὸν κάτω R

9 χορεῖος] χωρεῖος R

**PARAGRAPH 21**

1 μηδ᾽] μὴ δ᾽ R

3 μέλος] μέρος R

6 τοὺς τῶν ἀριθμῶν μόνον λόγους] τοῦτον ἀριθμῶ μόνους λόγω R

9 τὸ] τὰ R

17 ἄρσεων] εἰρημένων R

18 εὔρυθμον] ἔνρυθμον vel ἔῤῥυθμον Mor., Boe[2]: post hoc verbum a linea inseritur inscriptio: διαφορὰ (διαφοραὶ D) τῶν ποδῶν, deinde quae sequuntur a linea R

**PARAGRAPH 22**

2 οἵ δ᾽] οἳ δ᾽ R

**PARAGRAPH 24**

1 διαφέρωσιν codd.: διαφέρουσιν Mor.

2 διπλασίου, ὁ δ᾽] ὃ δ᾽ R: διπλασίονος Feu.

3 εὐρύθμων R: ἐνρύθμων Marq.

3 λόγων scripsi: χρόνων codd.

**PARAGRAPH 26**

1 οἱ δ′] οἳ δ′ R

**PARAGRAPH 28**

2 ᾗ τεταγμένα Psel: ᾗ codd.: ᾗ διῃρημένα Marq.: ᾗ τεταγμένους Westphal[1]: ᾗ διῃρημένα Westphal[2]: σχηματισθῇ Westphal[3].: vid. comm. ad loc.

**PARAGRAPH 29**

2-3 ἄνισον δὲ ἔχουσι τῷ ἄνω χρόνῳ τὸν κάτω] ἄνισον δὲ τάξιν ἔχουσι τῶν ἄνω χρόνων καὶ τῶν κάτω Marq.

**PARAGRAPH 30**

1 <τῶν> add. Her[2].

1 δεχομένων] ἐπιδεχομένων Marq.

3 <τῷ> add. Marq.

**PARAGRAPH 31**

1 οἱ ἐν τῷ Her[1]., Feu.: πέντε codd.

2 δίσημον Feu.: διάσημον codd.

3 τῷ γένει om. Her[1].

3 οἷον ἐν D, Franz: incert. R: οὗτοι ἐν Mor., Feu.: οὗτοι οἱ ἐν Her[1], Bar.

4 τρισὶν Mor.: τισὶν codd.

**PARAGRAPH 33**

1 οἱ Feu.: οἷον codd.

1 post μεγέθει add. εἰσὶ δ' οὗτοι παιωνικοὶ τῷ γένει Caes.

2-3 τετραπλασίου (bis) Bar.: τριπλασίου codd.

**PARAGRAPH 34**

1 <ἐν> add. Feu.

3 ἕξ Her[1].: ἐκ codd.

3 λαμβανομένων Her[1]., Boe[2]: λαμβανομένοις codd.

5 λοιπῶν Her[1].: λεγομένων codd.: πρότερον λεγομένων Boe[2].

**PARAGRAPH 35**

2 οὐθείς Franz, Bar.: οὔθ' εἵς codd.: οὐδείς Her[1].

2 ὧν] ὁ Her[1].

3 ἐπιτρίτου Feu.: ἐπὶ τρίτου codd.

# CHAPTER 4: TRANSLATION

## ELEMENTS OF RHYTHM

1. That rhythm has many natures, of what sort each of these is, for what reasons they have received this same name, and what underlies each of them, has been discussed above. Now we must speak of rhythm as assigned to music.

2. That it is concerned with time intervals and their perception, has already been stated; this is, however, to be repeated now, for it is in a way the fundamental principle of the study of rhythm.

3. One must observe that there are these two natures, that of the rhythm and that of the rhythmized, related to each other very much as the shape and that which is shaped in regard to one another.

4. For just as a body takes on many types of shapes, if its parts are differently arranged, whether all parts or some of them, so also each of the rhythmized objects receives many forms, not by its own nature, but by the nature of the rhythm. The same text, arranged into time intervals differing from each other, takes on variations, such as are equivalent to those very variations of the nature of the rhythm. The same account holds for melody and anything else of such a nature as to be rhythmized by the sort of rhythm that is organized in time intervals.

5. One must apply perception from here regarding this analogy, striving to see, concerning each of the things mentioned, of what sort is the rhythm and of what sort the rhythmized object. For none of the bodies such as can be shaped naturally is the same thing as the shapes, but rather the shape is an arrangement of the parts of the body, arising from its having each of them in some certain way, whence it is called a shape. So too the rhythm is not the same thing as any one of the rhythmized objects, but is something arranging the rhythmized object in a certain way or in another way and making it thus or so in respect to time intervals.

6. The aforementioned things relate to each other also in that they do not come to be in and of themselves. For the shape, if that which receives it is not present, clearly cannot come to be. In the same way, rhythm cannot come to be in the absence of that which will be rhythmized and which divides time, since time does not divide itself, as we said above, but requires something that will divide it. Therefore it is necessary that the rhythmized object be divisible into recognizable parts, with which it will divide time.

7. This formulation follows upon what has been said and the phenomenon itself: rhythm arises whenever the distribution of time intervals takes on some definite arrangement, for not every arrangement of time intervals is included among rhythms.

8. Thus it is credible even without an explanation, that not every arrangement of time intervals is rhythmical. But one must both induce thought through analogies and try to learn from them, until a proof can arise from the matter itself.

Well-known to us are the matters concerning the combination of letters and of musical intervals, that neither in speaking do we combine letters in every way, nor, in singing, the intervals. Rather, there are just a few ways according to which these things are combined with each other, and many that the voice is not able to combine in utterance, nor can perception accept it, but rejects. For the same reason, a well-constructed melody is made in rather fewer forms, a poorly constructed one in rather more.

So also will appear those things relating to time intervals: for many are the proportions and arrangements of them that are clearly foreign to perception, and few are those that are proper and can be arranged into the nature of rhythm.

The rhythmized object is, in a way, common to both arrhythmia and rhythm, for it is naturally able to receive both constructions: the rhythmical and the arrhythmic. Suffice it to say that the rhythmized object should be thought of as such a thing that it is able to be arranged into all sorts of time interval durations and all kinds of combinations.

9. Time is divided by the rhythmized objects, by means of the parts of each of them. The rhythmized objects are three: text, melody, and bodily motion. Thus the text will divide time with its parts, such as letters and syllables and words and all such things; melody will divide it by its notes and intervals and scales; bodily motion by signals and poses and if there is any other such part of motion.

10. Let the primary time interval be defined as that which is not able to be subdivided by any of the rhythmized objects; the diseme as that which is measured out by two of these, the triseme as that measured out by three, the tetraseme as that measured out by four. The names of all remaining durations will follow analogously.

11. One must try to understand the meaning of the primary time in this way: it is characteristic of things that appear vividly to perception not to take the speeds of their movements to the point of an unlimited intensification, but for the compressed time intervals, in which the parts of the moved objects are arranged, to be fixed somewhere. I am speaking of things moved, as the voice is moved speaking and singing and the body walking and dancing and executing the rest of movements of this kind.

These things appearing to be so, clearly it is necessary that there be some smallest time intervals, in which the singer will place each of his notes. The same account obviously holds concerning syllables and bodily gestures.

12. This time interval, into which in no way can be placed two notes, two syllables, nor two steps, we will call the primary time interval. How perception will grasp this will be clear upon the discussion of the configurations of feet.

13. With respect to the usage of rhythmic composition, we speak of a certain uncompounded time. That rhythmic composition is not the same as rhythm is not easy to make clear, but let it be trusted through the following analogy. For just as we have seen in the nature of melody, that neither a scale, nor a mode, nor a genus is the same thing as melodic composition, we must suppose this to hold also concerning rhythms and rhythmic composition. Since indeed we see that melodic composition is a sort of usage of melody, so also in the investigation of rhythm we say that rhythmic composition is a sort of usage. We will see this more clearly as the investigation proceeds.

14. Considering the usage of rhythmic composition, we will speak of an uncompounded time; as, if this sort of duration of time is taken up by one syllable or one note or one step, we will call this an uncompounded time. If the same duration is taken up by more notes or syllables or steps, this time interval will be labeled compounded time.

One may take a paradigm from the matters concerning musical scales. For there, the enharmonic genre makes the same size of interval compound, which the chromatic genre makes uncompounded; or again, the diatonic makes it uncompounded, the chromatic makes it compound. Sometimes the same genre makes the same size of interval uncompounded and compound, though not in the same place in the scale.

The paradigm differs from our problem in that the time interval becomes uncompounded or compound through the process of rhythmic composition; the interval, by the genres themselves or by its place within the scale. Concerning the uncompounded and compound time interval altogether, let it be so defined.

15. With the problem thus reckoned, let an interval divided by none of the rhythmized objects be called absolutely uncompounded. In the same way, that divided by all of the rhythmized objects will be compounded. Partly compounded and partly uncompounded will be the interval divided by some one, and undivided by some other one of the rhythmized objects. The absolutely uncompounded would be such a sort as to be occupied by neither more syllables, nor more notes, nor more steps. Absolutely compounded would be the one that is occupied by more than one of each type of rhythmized object. Mixed, the one which happens to be occupied by one note but more syllables, or again by one syllable, and more than one note.

16. That by which we mark the rhythm and make it comprehensible to perception is the foot, or more than one.

17. Of the feet, some are composed of two time intervals, the *arsis* and the *thesis*, others of three, two *arses* and one *thesis* or one *arsis* and two *theses*, <others out of four, two *arses* and two *theses*>.

18. It is apparent that there cannot be a foot of one time interval, since indeed one signal does not make a distribution of time. For it does not seem that a foot exists without a distribution of time.

That a foot may take more than two signals, the magnitudes of the feet are responsible. For smaller feet, being of a size easily grasped by perception, are easily comprehensible through two signals. The opposite happens to large feet; for, being a size hard for perception to grasp, they require more signals, in order that the extent of the whole foot, divided into more sections, might be more easily comprehended. Why it does not happen that there be more than four signals, which a foot, in and of its own quality, makes use of, will be explained later.

19. One must not misunderstand what is now being said and infer that a foot is never apportioned into a count of more than four. For some feet are divided into a count double the aforesaid amount, and into many times more. But a foot is not apportioned into more than the aforesaid amount in and of itself, but it is

distributed into such divisions by the process of rhythmic composition. It is to be kept in mind that the markers that keep the function of a foot are different than the divisions arising through rhythmic composition. It is to be added to what has been said, moreover, that the markers of each foot remain equal both in their number and in their size, but the divisions arising through rhythmic composition take on a great variety. This will become clear in what follows.

20. Each foot is bounded by a ratio or an irrationality of a sort in between two ratios recognizable to perception. What has been said will become quite clear thus: suppose two feet are taken, the first having its *arsis* equal to its *thesis*, both diseme; the second with a diseme *thesis*, the *arsis* half that. Suppose then a third foot is taken up, having its *thesis* equal to both of those, but its *arsis* with a duration between that of the two other *arses*. Such a foot has its *arsis* irrational in regard to its *thesis*. This irrationality is between two ratios recognizable to perception, the equal and the double. This is called an irrational *khoreios* [= trochee].

21. One must not err here, failing to perceive how the legitimate and the irrational are incorporated into the matter of rhythms. Just as in the elements of melody, the legitimate according to melody is apprehended, which is first melodic, then recognizable by its size; for instance, the concords and the tone and the things commensurate with these things. Then there is that which is

legitimate only according to the ratios of numbers, which happens not to be melodic. Thus in rhythms are to be understood the legitimate and the irrational. The one is apprehended as legitimate by the nature of the rhythm, the other only by the ratio of the numbers.

The time duration that is taken to be legitimate in rhythm must first be one of those falling under rhythmic composition; then, a legitimate part of the foot into which it has been placed. That which is taken to be legitimate only according to the ratios of numbers must be understood to be such a thing as is the twelfth-tone in intervals, and if there is any other such thing in the comparisons of intervals.

It is clear from what has been said that the *arsis* taken in between the others is not commensurate to its *thesis*. For there is no rhythmic measure common to them.

22. Let these seven distinctions among feet be set out:

First, that by which they differ from one another in size;

Second, that by which they differ in genus;

Third, that by which some are legitimate, other feet are irrational;

Fourth, that by which some are uncompounded, others compounded;

Fifth, that by which they differ from one another in division;

Sixth, that by which they differ from one another in *skhēma*;

Seventh, that by which they differ by antithesis.

23. A foot differs from another foot in size, when the durations of the feet, which the feet comprise, are unequal.

24. In genre, when the ratios of the feet differ from each other, such as when the one has the ratio of equality, the other that of double, a third has some other of the rhythmical time ratios.

25. The irrationals differ from the legitimate by their not having the *arsis* legitimate with respect to the *thesis*.

26. The uncompounded differ from the compounded by their not being divided into feet, the compounded being divided.

27. They differ in division, when the same magnitude is divided into unequal parts; parts unequal in regard both to their count and their durations, or in regard to either.

28. They differ from one another in *skhēma*, when the same parts of the same magnitude are not arranged in the same way.

29. They differ from each other by antithesis, which have their *arsis* and *thesis* contrarily assigned. This distinction will be in feet that are equal to each other, but have the *thesis* unequal to the *arsis*.

30. There are three genres of feet that admit of continuous rhythmic composition: the dactylic and the iambic and the paionic. The dactylic is that in the equal ratio, the iambic in the double, the paionic in the one-and-a-half.

31. The smallest of feet are those in the triseme duration, for the diseme duration would have an altogether compressed marking of feet. Those in the triseme duration are iambic by genus. For in the number three, the only proportion is the double.

32. Second are those in tetraseme duration. These are dactylic by genre. For in the four, there are two proportions, that of the equal and that of the triple. Of these, the triple is not rhythmical, that of the equal falls into the dactylic genre.

33. Third according to size are those in the pentaseme duration. In the five are two proportions, the quadruple and the three-to-two. Of these, the quadruple is not rhythmical, the three-to-two will produce the paionic genre.

34. Fourth are those in the hexaseme duration. This duration is common to two genres, the iambic and the dactylic, for in six there are three proportions, the equal and the double and the quintuple. The last named is not rhythmical; of the others, the proportion of the equal falls into the dactylic genre, that of the double into the iambic.

35. The heptaseme duration does not have a division into feet, for of the three proportions received in seven, not one is rhythmical. Of them, the first is four-to-three, second is five-to-two, third the sextuple.

36. Thus, fifth would come those in the octaseme duration. These will be dactylic by genre, since indeed…

# CHAPTER 5: COMMENTARY

## PARAGRAPH 1

### τοῦ ῥυθμοῦ

The word ῥυθμός, with its variant form ῥυσμός, had a wider range of meanings in ancient Greek than its English derivative *rhythm*.[16] In our earliest citation, Archilochus (Fr. 128 West) uses it of the alternation of good and bad fortune. It is used by Democritus (Fr. 266 D-K) of the state of political affairs: he says that the archons cannot but commit injustice in τῷ νῦν καθεστῶτι ῥυθμῷ, 'the now established rhythm'. Theognis (963-4, 219 West) lists rhythm as one aspect of a man's character, and Anacreon (60 West) refers to people's manners as their rhythms.

Democritus (Fr. 38 D-K) and Leucippus (Fr. 6 D-K) had used ῥυθμός as a technical term for the shape of an elementary particle of matter.[17] The word ῥυθμός is attested in Xenophon *Memorabilia* 3.10.10 in the sense of the shape of a piece of armor, and in Aeschylus (Fr. 78 *TGF*) of a ceiling decoration in the shape of waves; in Pindar *Paean* B2, ῥυθμός is used of visual patterns in the craftworks of Hephaistos and Athena. Aristophanes (Fr. 140 Kock) uses ῥυθμός of the man's gait, while Thucydides *Histories* 5.70 refers to troops marching with

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[16] Etymological studies of the word rhythm include Sauvanet 1999, Benveniste 1951, Wolf 1955, Petersen 1917, Schroeder 1918, Plüβ 1920.
[17] See Wolf 1955: 112 for discuusion.

rhythm. Ion of Chios (Fr. 42 Snell) and Xenophon *Symposium* 147.9.27 provide early references to rhythm in music, without providing technical information. See the note on **τοῦ ἐν μουσικῇ ταττομένου ῥυθμοῦ** below for a discussion of the term ῥυθμός in other authors prior to Aristoxenus.

**πλείους εἰσὶ φύσεις**

Aristotle *Metaphysics* 1014b16-1015a19 offers six definitions of the term φύσις, nature; we have here the sixth, an imprecise general reference to a thing's essence, without consideration of the distinctions made in the first five definitions.[18] Aristoxenus' use of the term φύσις in other senses over the course of *E.R.* will be discussed at notes 3.1.1-3, 4.1.6-7, 8.6.1.2, and 21.[19]

Aristides Quintilianus 1.13 (= 31.4-7 W-I) notes that there are three senses of rhythm:

> ῥυθμὸς τοίνυν καλεῖται τριχῶς· λέγεται γὰρ ἐπί τε τῶν ἀκινήτων σωμάτων (ὥς φαμεν εὔρυθμον ἀνδριάντα) κἀπὶ πάντων τῶν κινουμένων (οὕτως γάρ φαμεν εὐρύθμως τινὰ βαδίζειν) καὶ ἰδίως ἐπὶ φωνῆς·
> Rhythm is spoken of three ways: it is said of static objects, as we say 'a well-rhythmed statue'; of all moving things, as we say someone walks with good rhythm, and particularly of the voice.

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[18] W. D. Ross in McKeon *The Basic Works of Aristotle* 1941: 755-6: The six meanings of φύσις are: 1) the genesis of growing things; 2) That immanent part of a growing thing, from which its growth first proceeds; 3) The source from which the primary movement in each natural object is present in it in virtue of its own essence; 4) the primary material of which any natural object consists or out of which it is made; 5) the form or essence, which is the end of the process of becoming; 6) every essence in general has come to be called a 'nature', because the nature of a thing is one kind of essence.

[19] Buchheim (2001) explores the development of the meaning of the word φύσις in Aristotle's *Metaphysics*.

Each of these is prefigured by earlier citations (see above; their inclusion by Aristides in this form suggests that Aristoxenus may have treated these topics in the lost first book of the treatise (Westphal 1883: 6).

**τῆς αὐτῆς ἔτυχον προσηγορίας**

The phrase τυγχάνειν προσηγορίας is found in Aristotle, with reference to the reason why something is called a certain name.[20] Aristotle asserts that the common names things have is an important starting point for natural philosophy at *Parts of Animals* 643b10-12, where he says that the division of the animal kingdom should be organized not by a dialectical method of dichotomy, but according to the way common people distinguish the genera of animals. (See further at par. 22.)

**τοῦ ἐν μουσικῇ ταττομένου ῥυθμοῦ**

As pointed out by Lohmann (1970: 51-54), the word ἁρμονία in Homeric usage could include rhythm; at *Odyssey* 8.250, dancers are referred to as 'harmony-steppers', βητάρμονες. The first attestation of rhythm and harmony being distinguished as a complementary pair that makes up music is the title of a work by Democritus (Fr. 15c D-K) *On Rhythms and Harmony*, Περὶ ῥυθμῶν καὶ ἁρμονίης.

[20] *Politics* 1275a6; *Eudemian Ethics* 1214a16, 1215b11, 1216a24, 1248b12.

Citations prior to Aristoxenus regarding the interplay of musical rhythm and language in song can be grouped into three categories. In the first group, the term rhythm is used for the study of poetic meters. At Plato *Cratylus* 424c1-2, the term rhythm is applied to syllable sequences: "they who undertake rhythms start with the values of the letters, then syllables."[21] At *Categories* 4b32-37, Aristotle lists language as a discrete quantity, ποσόν, on the grounds that καταμετρεῖται γὰρ συλλαβῇ βραχείᾳ καὶ μακρᾷ, 'for it is measured by long and short syllables.'[22] At *Rhetoric* 1408b28-29 he defines rhythm as "the number of the shape of the word" calculated by taking two shorts as equal to one long.[23] Aristotle *Rhetoric* 1408b21-1409b25 defines meters as the units by which rhythms are measured, but still uses the term rhythm of poetic feet and meters.

In the second group of citations of the term rhythm, a distinction is made between rhythm and meter whereby rhythm includes or subsumes meter; rhythm is a generic term, while meter is a specific term. Giving this sort of broad definition, both Plato and Aristotle describe the capacity to appreciate rhythm as a human trait. Plato *Laws* 653e3-5 identifies appreciation of rhythm as a divine gift to humans; the passage is cited below in the notes to **τάξιν τινὰ λάβῃ**

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[21] A treatment of this sort appears in Dionisius of Halicarnassus *On Literary Composition* 14-15.

[22] *Categories* 4b33-37. It is a discrete quantity because there is no common boundary at which its parts, the syllables, join. A line, by contrast, is continuous because a point that divides two line segments is part of each line segment.

[23] Our earliest full explanations of the Greek system of prosody are in Dionysius of Halicarnassus, Hephaestion, and Aristides Quintilianus.

**ἀφωρισμένην** in paragraph 7. In Aristotle's *Poetics*, giving an overview of literary history to his time, Aristotle begins with the characteristic human affinities which provided the impetus for the earliest poetry. Along with a natural appreciation of imitation in art, people have a natural sense of harmony and of rhythm. Explaining further, he says here that meters are parts of rhythm:

> (Aristotle *Poetics* 1448b20-22) κατὰ φύσιν δὲ ὄντος ἡμῖν τοῦ μιμεῖσθαι καὶ τῆς ἁρμονίας καὶ τοῦ ῥυθμοῦ (τὰ γὰρ μέτρα ὅτι μόρια τῶν ῥυθμῶν ἐστί, φανερόν) ἐξ ἀρχῆς οἱ πεφυκότες πρὸς αὐτὰ μάλιστα κατὰ μικρὸν προάγοντες ἐγέννησαν τὴν ποίησιν ἐκ τῶν αὐτοσχεδιασμάτων. Imitation, then, being natural to us—as also the sense of harmony and rhythm, the metres being obviously species of rhythms—it was through their original aptitude, and by a series of improvements for the most part gradual on their first efforts, that they created poetry out of their improvisations.[24]

Aristotle will go on to discuss the development of poetic genres; his statement here that the meters are parts of the rhythms justifies his transition from innate human characteristics to the specific forms of Greek poetry and song. The meaning of the word rhythm in the singular in the beginning of the sentence differs from the word rhythm in the plural in the next clause; in the singular, rhythm is a natural human affinity; the term in the plural, on the other hand, must refer to a catalogue of rhythms, cognate with, but somehow more broadly conceived than, the meters that measure them.

[24] Trans. I. Bywater in McKeon 1941: 1458.

The third category of citations defines rhythmics as a study with a domain separate from the domain of the study of metrics. Scholars including Visconti (1999) and Gibson (2005) have argued that Aristoxenus was the first to develop a theory of rhythm not based on syllable values; that is, a theory of rhythm separate from poetic meters. However, Plato at *Philebos* 17d already attests that students of dance found παθή, properties (LSJ III.3), which they called ῥυθμοὺς καὶ μέτρα. Since dance is not composed of syllables, it is clear that these researchers had developed a theory of rhythm distinct in scope from poetic meters, though appropriating its terminology.

Another Platonic passage in which rhythm is contrasted with both poetic meter and a melody is *Gorgias* 502c5-6: εἴ τις περιέλοι τῆς ποιήσεως πάσης τό τε μέλος καὶ τὸν ῥυθμὸν καὶ τὸ μέτρον, ἄλλο τι ἢ λόγοι γίγνονται τὸ λειπόμενον 'if someone were to strip all poetry of its melody, rhythm, and meter, just words would be left'. Here, the temporal characteristics of music are divided between meter, which refers to syllable sequences, and rhythm, which is added to meter in a full musical performance. Landels (1999: 14) suggests that the term rhythm refers specifically to dance; though he does not cite this passage, it is one that fits well with his suggestion.

At *E.H.* 2.34 (= 41.7 Da Rios), Aristoxenus lists ῥυθμική, μετρική, and ὀργανική as parts of musical science coordinate with ἁρμονική. For

Aristoxenus, the science of rhythm has a different domain than the study of meter, though, as we will see, it is broader than just dance.

**PARAGRAPH 2**

**τοὺς χρόνους καὶ τὴν τούτων αἴσθησιν**

At *Categories* 6b3-36, Aristotle classifies perception as a relative term, πρός τι; perception is relative to that which is perceived. Aristoxenus will give examples of what is perceived in rhythm: notes of a melody, syllables of language, dance steps or movements. Aristotle discussed the perception of time at *Physics* 218b21-24; while making the point that time is associated with motion, though not motion itself, Aristotle states that when we are not aware of any motion or change, we are not aware of time passing.

At *Categories* 4b24 and 5a6, Aristotle lists time as a quantity, ποσόν. At *Physics* 219a33-b3, he defines time as the number of motion; that is, time allows us to count or number motion. At *Metaphysics* 1077b15-1078a5, Aristotle discusses the existence of mathematical ideas and concludes that they do exist, but with a qualified definition of existence: they are inseparable from sensible objects, but do have qualities and attributes of their own and can therefore be legitimate objects of a science. The sense in which time exists is therefore essentially linked to the mental activity of someone who perceives and tries to understand motion.

The plural form of the noun χρόνος indicates that Aristoxenus is referring to time intervals defined by movements or events that determine their boundaries, rather than an undifferentiated notion of time in general. Aristotle uses the plural in this sense at *Physics* 237b28-30, arguing that when a motion is divided into parts, there will be time intervals related to each part of the motion.

**ἀρχὴ…τῆς περὶ τοὺς ῥυθμούς ἐπιστήμης**

At *Posterior Analytics* 99a20-100b17, Aristotle discusses the relationship of sense perception to knowledge. When repeated perception yields experience, we are led by induction through knowledge of particulars to knowledge of universals by the force of intuition, νούς. These universals provide the primary premises ἀρχαί from which scientific demonstrations can proceed.

Aristoxenus emphasized the importance of accurate perception at *E.H.* 2.33 (= 42.21-43.28 Da Rios):

> τῷ δὲ μουσικῷ σχεδόν ἐστιν ἀρχῆς ἔχουσα τάξιν ἡ τῆς αἰσθήσεως ἀκρίβεια, οὐ γὰρ ἐνδέχεται φαύλως αἰσθανόμενον εὖ λέγειν περὶ τούτων ὧν μηδένα τρόπον αἰσθάνεται.
>
> For the student of musical science, accuracy of sense perception is a fundamental requirement. For if his sense perception is deficient, it will be impossible for him to speak intelligibly about those matters that lie outside the sphere of sense-perception altogether.
>
> See the notes to paragraph 12, 16, and 31-36 for further discussion.

**PARAGRAPH 3**

**δύο τινὰς φύσεις**

Here Aristoxenus will contrast the fourth and the fifth of the six meanings of φύσις listed by Aristotle at *Metaphysics* 1014-15: φύσις can refer to the primary material, πρώτη ὕλη, of which an object is made, or its form and essence, εἶδος καὶ οὐσία.[25] In defining the primary material as the raw, unformed matter of which an object consists, Aristotle describes it as ἀρυθμίστου, 'unrhythmed.'[26]

**τὴν [φύσιν] τοῦ ῥυθμοῦ**

This refers to rhythm as a form; see the references at paragraph 1 for the word ῥυθμός in the sense of shape or form. Aristotle *Physics* 194b23-29 gives a succinct account of the distinction between material and form:

> ἕνα μὲν οὖν τρόπον αἴτιον λέγεται τὸ ἐξ οὗ γίνεταί τι ἐνυπάρχοντος, οἷον ὁ χαλκὸς τοῦ ἀνδριάντος καὶ ὁ ἄργυρος τῆς φιάλης καὶ τὰ τούτων γένη, ἄλλον δὲ τὸ εἶδος καὶ τὸ παράδειγμα· τοῦτο δ᾽ ἐστὶν ὁ λόγος ὁ τοῦ τί ἦν εἶναι καὶ τὰ τούτου γένη, οἷον τοῦ διὰ πασῶν τὰ δύο πρὸς ἕν, καὶ ὅλως ὁ ἀριθμὸς καὶ τὰ μέρη τὰ ἐν τῷ λόγῳ.
> In one sense, then, (1) that out of which a thing comes to be and which persists, is called 'cause',e.g. the bronze of the statue, the silver of the bowl, and the genera of which the bronze and the silver are species. In another sense (2) the form or the archetype, i.e. the statement of the essence, and its genera, are called 'causes' (e.g. of the octave the relation of 2:1), and generally number, and the parts in the definition.[27]

[25] πρώτη ὕλη *Metaphysics* 1014b33, 1015b7; εἶδος καὶ οὐσία: 1015b10-11.
[26] *Metaphysics* 1014b27
[27] Trans. R.P. Hardie and R. K. Gaye in McKeon 1941: 240.

The example Aristotle gives of the octave διὰ πασῶν containing the ratio 2:1 is particularly relevant to *E.R.* At *E.H.* 2.32 (= 41.19-42.3 Da Rios), Aristoxenus criticizes predecessors who posited numerical ratios as being part of harmonic science. As Barker (1978b: 4) puts it, "Aristoxenus did not consider Pythagorean analyses as falling within the territory he was investigating." Barker (1978b: 3) framed the issue:

> The central part of the Pythagorean programme seems to have been the analysis of the primary intervals of the scale in terms of mathematical ratios. Given this preoccupation it was natural for them to ask what these ratios are ratios of, and this question leads directly to the analysis of sound in terms of movement... But Aristoxenus dismisses all such speculations out of hand... His point, emphasized several times on Meibom's pages 9-11, is that such considerations have no bearing on the proper subject of harmonics, which is the character of musical sound as heard.

Aristoxenus' attitude toward the ratio theory of the musical concords seems to have been like the attitude expresses at *De Anima* 403a30-b1 towards the physicist's account of anger. Finding the nature or form of the octave or of any concord in a ratio of some aspect of its acoustic production would be analogous to the physicist's definition of anger as a ζέσιν τοῦ περὶ καρδίαν αἵματος καὶ θερμοῦ, 'a boiling of the blood or warm substance surrounding the heart',[28] in that it is focused on physical conditions.

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[28] Trans. J.A. Smith in McKeon 1941: 537.

On the other hand, at *De Anima* 403b1-2 the dialectician's definition of anger gives the εἶδος καὶ τὸν λόγον, 'form or formulable essence'.[29] Rather than being concerned with the ratios of the concords, Aristoxenus puts forward the concept of musical function, δύναμις, as the primary explanation for the musical scales. In *E.R.*, Aristoxenus does use ratios in discussing rhythms. As will be argued in the notes to paragraphs 16, 30, and 35, Aristoxenus treats the rhythmic genera as being named by their constituent ratios, but requiring explanation analogous to the concept of harmonic δύναμις developed in *E.H*.

**τὴν [φύσιν] τοῦ ῥυθμιζομένου**

At *Physics* 245b9, Aristotle uses the pleonastic phrase τὸ ῥυθμιζόμενον καὶ σχηματιζόμενον, 'a thing formed and shaped'. Here, the two words are synonyms: both refer to the material that receives a form. Similarly, Aristoxenus here intends ῥυθμιζόμενον as the material in which rhythm as a form can be realized. For the three types, λέξις, μέλος, κίνησις σωματική, see par. 9. Each of these has a form insofar as it is an entity καθ' αὑτό 'in and of itself'. A syllable's form would be the sequence of sounds that comprise it; Aristotle uses the syllable as a paradigm for one concept of form at Metaphysics 1035a9-12. The form of a musical note, φθόγγος, would be its function vis-à-vis its melodic context or scale (Busch 1998: 56-57). A dance step would have a form insofar as it

[29] Trans. J.A. Smith in McKeon 1941: 537.

is a well-defined movement from a specified starting position to a specified finish position. The science of rhythmics is not concerned with each object's nature καθ' αὐτό, but only with its nature τί κατά τι with regard to time; how each object of rhythmic composition can be associated with time intervals. Busch (1998: 57) highlights the role of the Aristotelian distinction between τί καθ' αὐτό and τί κατά τι in Aristoxenus' use in *E.H.* of the key terms φθόγγος and διάστημα, reinforcing Aristoxenus' acceptance of Aristotelian methodology.

**παραπλησίως…ὥσπερ ἔχει το σχῆμα καὶ τὸ σχηματιζόμενον**

At *Categories* 11a5-14, Aristotle uses the term σχήματα of geometric shapes such as circles, triangles and rectangles. Things that have these shapes are called τὰ ἐπιδεχόμενα τὸν [τοὺ σχήματος] λόγον, 'things receiving the definition of the shape'. At *Physics* 245b9-246a4, Aristotle distinguishes the form, σχῆμα, from the material in which the form exists, τὸ γεγονὸς ἐν ᾧ ἐστὶ τὸ σχῆμα, of more complex examples: a statue, a candle, a bed.

The simple expressions τὸ σχῆμα and τὸ σχηματιζόμενον, are counterparts to Aristoxenus' pleonastic expressions τὴν τοῦ ῥυθμοῦ φύσιν and τὴν τοῦ ῥυθμιζομένου φύσιν. The nature of rhythm, τὴν τοῦ ῥυθμοῦ φύσιν, considered as a form, is not entirely parallel to shape, σχῆμα, because it applies to a sequence of activities or events all of which have some form themselves. Aristoxenus will develop the meaning of the word σχῆμα further in paragraph 4.

**PARAGRAPH 4**

**Ὥσπερ τὸ σῶμα**

Pearson (1990: 49) argues that σῶμα means a general body, not a human body. He provides an Aristotelian parallel for σῶμα with the definite article referring to "body" in a general, abstract sense at *Cat.* 1a27-8. However, the term σῶμα, body, usually refers to the human body. As we will see, Aristoxenus develops this passage in a way emphasizing this possibility.

**πλείους ἰδέας λαμβάνει σχημάτων**

The term ἰδέας σχημάτων, types of shapes, would refer to different abstract shapes, if σῶμα is taken in reference to an abstract concept of body. If σῶμα is taken as the human body, σχημάτων refers to dance steps or poses, making a much more powerful analogy, as well. Plato *Laws* 672e uses σχῆμα clearly and explicitly as a dance term: Τὸ δέ γε κατὰ τὴν τοῦ σώματος κίνησιν ῥυθμὸν μὲν κοινὸν τῇ τῆς φωνῆς εἶχε κινήσει, σχῆμα δὲ ἴδιον 'the (sc. part of the study of dance) concerned with the motion of the body includes rhythm, in common with the movement of the voice; and σχήμα, as its particular attribute'. Aristotle *Poetics* 1447a27 uses a derived verb form to describe mimetic dance: διὰ τῶν σχηματιζομένων ῥυθμῶν μιμοῦνται καὶ ἤθη καὶ πάθη καὶ πράξεις 'they imitate characters and emotions and deeds through their shaped rhythms'. Lawler (1954: 150-155) examines the use of σχῆμα as a dance term in a range of other ancient Greek sources, concluding that the term is used loosely of a wide variety of movements and poses, by individual dances and groups.[30]

**ἐάν αὐτοῦ τὰ μέρη τεθῇ διαφερόντως**

This phrase is more consistent with the interpretation of σῶμα as a human body and σχῆμα as a dance step than with taking σῶμα as an abstract body and σχῆμα as an abstract shape. To be sure, the idea of rearranging the parts of an abstract body into different shapes is possible and comprehensible in terms of Aristotle's observation that all bodies are continuous, and his inclusion of physical bodies in the category of continuous quantities whose parts have some relationship of place, *Cat.* 4b20-5a14. However, Aristotle characteristically considers material in a state of formlessness receiving form, rather than material changing from one form to another; see particularly *Physics* 245b2-246a17. See also at par. 5, **διάθεσίς τίς ἐστι τῶν τοῦ σώματος μερῶν τὸ σχῆμα**.

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[30] Plato *Laws* 654e and 655a also use σχῆμα as a dance term. A diminutive form, σχημάτια, is found at Herodotus *Histories* 6.129. Other early examples of σχῆμα used as a dance term include Euripides *Cyclops*. 221 ἐπεὶ' μ' ἂν ἐν μέσῃ τῇ γαστέρι πηδῶντες ἀπολέσαιτ' ἂν ὑπὸ τῶν σχηματῶν 'since kicking me in the pit of my stomach you will kill me with your σχήματα; Aristophanes *Peace* 323 μηδαμῶς πρὸς τῶν θεῶν, πρᾶγμα κάλλιστον διαφθειρῆτε διὰ τὰ σχήματα 'by the gods, in no way destroy the finest undertaking through your σχήματα; Aristophanes *Peace* 324 ἀλλ ἔγωγ' οὐ σχηματίζειν βούλομ', ἀλλ' ὑφ' ἡδονῆς οὐκ ἐμοῦ κινοῦντος αὐτὼ τὼ σκέλει χορεύτον 'but I at least do not wish to σχηματίζειν, but my legs must dance stirred up by pleasure, not by me; Xenophon *Symposium* 7.5 εἰ δὲ ὀρχοῖντο πρὸς τὸν αὐλὸν σχήματα 'if he should dance σχήματα to the aulos'; cf. Xenophon *Symposium* 2.15-16. Later sources, discussed or quoted by Lawler (1954) as giving more detailed but somewhat divergent definitions, include Plutarch *Sympotic Questions* 747a-748b, Pollux 1.405, and Athenaeus books 11.467f and 14.629d-630a.

The customary Greek word for part of an animal's body is μόριον, but the word μέρη is used by Plato of the parts of the body, in the context of dance as a part of gymnastic education, as at *Laws* 795e.[31]

**τῶν ῥυθμιζομένων ἕκαστον** See par. 9 and notes.

**πλείους λαμβάνει μορφάς**

The word μορφή, outward shape, is contrasted with the word εἶδος, definitive form, at Plato *Republic* 380d: ἀλλόττοντα τὸ αὑτοῦ εἶδος εἰς πολλὰς μορφάς.

**οὐ κατὰ τὴν αὐτοῦ φύσιν**

Each object of rhythmic composition has its own nature or form, as discussed above at the note to **τὴν φύσιν τοῦ ῥυθμιζομένου** in paragraph 3. However, its own form or essence alone does not explain the different rhythmic arrangements it may take on, which add a super-ordinate level of form. Compare the usage at *POxy* 2687 col. v of ῥυθμοποιΐα παρὰ φύσιν, 'rhythmic composition in violation of nature' in reference to the prolongation of syllables beyond their normal prosodic value.

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[31] In Plato *Laws* 795e, in describing the parts of education, the Athenian stranger distinguishes two types of dancing: one which serves the Muses, and another which is pursued for 'the proper flexibility and extension of the limbs and parts of the body': τῶν τοῦ σώματος αὐτοῦ μελῶν καὶ μερῶν τὸ προσῆκον καμπῆς τε καὶ ἐκτάσεως.

**ἀλλὰ κατὰ τὴν τοῦ ῥυθμοῦ**

The nature of rhythm, then, is a form that can be actualized in other things that have form; both types of form will exist simultaneously. Aristoxenus wants to establish that there are aspects of rhythm that are separable from the concrete embodiment of rhythm in musical performance. His procedure is consistent with what Aristotle says in regard to the existence of mathematical objects. Aristotle says at *Metaphysics* 1077b17-20 that while the objects of mathematical knowledge do not exist apart from quantified sensible objects, mathematical principles are concerned with magnitudes and numbers in general, without regard to whether the objects are quantified as magnitudes or as numbers. This distinction between magnitudes and numbers can be clarified with reference to the discussion of types of quantities, at *Categories* 4b20-5a37; magnitudes are values of continuous quantities, numbers are values of discrete quantities. Aristotle's point can be illustrated by the following example: four is twice two, no matter whether this mathematical relationship is actually embodied in magnitudes such as four miles being twice two miles, or in discrete quantities such as four cows being twice two cows. At par. 31-36, Aristoxenus develops one quality of numbers: the ratios they can accommodate.

At *Metaphysics* 1077b20-30, Aristotle extends his point in a way that makes clearer its applicability to Aristoxenus' procedure. There are, Aristotle says, many accounts (λόγοι) and demonstrations (ἀποδείξεις) concerning perceptible quantities, not insofar as they are perceptible but insofar as they are quantities. Thus, says Aristotle, there are many accounts of moving objects insofar as they are moving, and another set of accounts for the same objects insofar as they are bodies or planes, divisible or indivisible. Aristoxenus applies this logic to actions rather than material objects: the objects of rhythmic composition have one nature insofar as they are certain types of motions, and another insofar as they may be rhythmic.

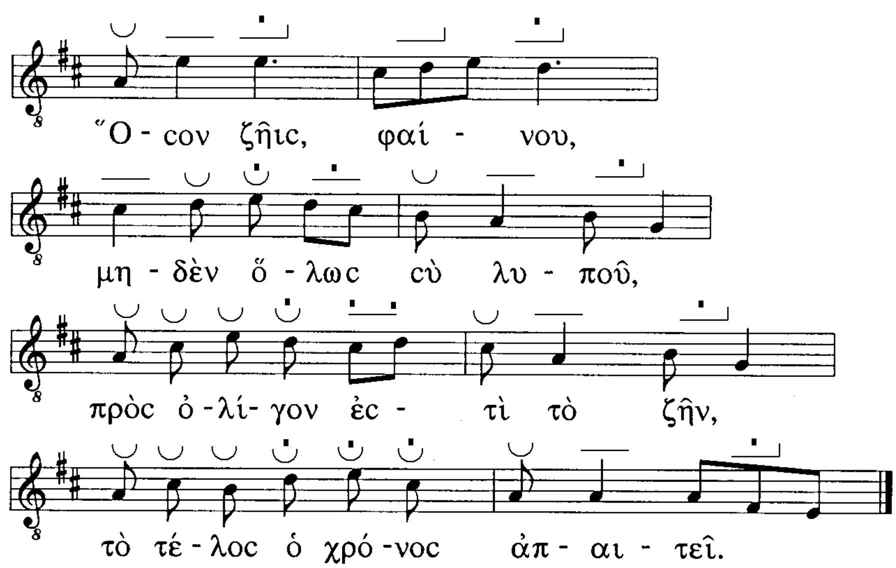
**ἡ αὐτὴ λέξις**

The word λέξις carries different significations. At Plato *Republic* 397b, λέξις refers to a poem's style vis-à-vis whether it is a simple third-person narrative or written in an imitative style that includes direct speeches from characters.

At *Rhetoric* 1408b28-30, Aristotle defines rhythm as 'the number of the shape of the diction' ὁ δὲ τοῦ σχήματος τῆς λέξεως ἄριθμὸς ῥυθμός ἐστιν. He defines poetic *lexis* in regard to poetic meter at *Poetics* 1449b34: λέγω δὲ λέξιν μὲν αὐτὴν τὴν τῶν μέτρων σύνθεσιν 'I speak of lexis as the composition itself of the meters'. *POxy* 2687 ii.22 uses the term τοιαύτη λέξις, such a *lexis*, in reference to different poetic texts with the same metrical form. In contrast, Aristotle uses λέξις of an individual word at *Rhetoric* 1406b1. Modern scholars have offered a variety of interpretations of this line, reflecting the different meanings of λέξις, as will be discussed below.

**εἰς χρόνους τεθεῖσα διαφέροντας λαμβάνει τινὰς διαφορὰς**

Aristoxenus' goal of distinguishing rhythm from poetic meter is most fully advanced if we interpret λέξις as a series of words exhibiting a fixed metric pattern. In this case, one way *chronoi* can vary is in their duration. Change in duration could refer to unnatural syllable settings, that is, manipulations in the durations of syllables. The Song of Seikilos, *DAGM* 23 (Pöhlmann and West 2001: 89), shows the elongation of syllables to triseme length in order to make isochronous six-timed measures:




Other documents of ancient Greek music showing the manipulation of syllable durations to achieve isochronous measures include *DAGM* 17.18-19, and *DAGM* 50; *POxy* 2687 also discusses the manipulation of syllable lengths to achieve isochronous measures.[32] Several other extent pieces show the rhythmic manipulation of syllables, though not so as to yield isochronous measures; these include *DAGM* 17.16, *DAGM* 24 (Mesomedes *Hymn to the Sun*), *DAGM* 25 (Mesomedes *Hymn to Nemesis*), and *DAGM* 42. That the time values of syllables may vary is attested also by several literary sources.[33]

Another example of variation in duration could be irrationality in hexameters; see paragraphs 20 and 21. Examples of variation in syllabic durations highlight the distinction between rhythm and the syllable sequence to which it is applied.

Pearson (1990: 50) recognized the possibility of non-formulaic variation of syllable durations:

> ...for example, when Odysseus in *Odyssey*, book ix, begins his narrative with Ἀλκίνοε κϱεῖον, ¯ ˘ ˘ ¯ ¯ ¯ , in Homer's verse this is in four-time, ¯ ˘ ˘ | ¯ ¯ | ¯, but it could be rhythmized as six-time, ¯ ˘ ˘ ¯ | ◎ ◎, slowing down on κϱεῖον. (N.B.: I have replaced Pearson's musical notation with the ancient notation ◎for the triseme, or duration of three short syllables.)

Feussner (1834) suggested even more radical freedom, namely that ancient musicians had the same freedom as modern composers to manipulate syllabic durations. Goodell (1901: 102-3) also believes that syllables are manipulated in

32 Both *DAGM* 17 and 50 are from the same physical fragment, *PBerlin* 6870.
33 Dionysius of Halicarnassus *On the Composition of Words* 11.80, Longinus *Commentary on Hephaestion's Handbook* (133 Consbruch), Michael Psellus *Introduction to the Study of Rhythm* 5 (= 22.5-7 Pearson), Marius Victorinus (2484 Keil), and in the *Fragmenta Neapolitana* 21 (= 30.20-24 Pearson).

lyric poetry, but by a formula that leaves no flexibility in the rhythmic performance of a given verse. He gives the example of the phrase μοι κλῦθι, which appears in Theognis *Elegies* both in a hexameter line (1.13 Young) and in a pentameter (1.4 Young). According to Goodell's theory, the μοι appearing before the central caesura in the pentameter verse would be protracted to a double-long syllable (equal to four short syllables). Thus, the same λέξις, μοι κλῦθι, would set into time intervals differently in different poems; the word μοι would have its normal length in the hexameter, but double its normal length in the pentameter.

Another way time intervals can differ is in their value as arsis or thesis in a rhythmic foot. This interpretation still takes λέξις as exhibiting a fixed pattern of long and short syllables in a poetic meter. In setting an anapestic tetrameter, the reconstruction in Pearson (1990: xxxv) maintains a simple 2:1 ratio between long and short syllables, but varies the placement of stress or ictus within the line. Pearson also allows the possibility of incorporating pause within a period, adding another way the rhythm of a λέξις can vary without any variation from the principle that a long syllable is twice the duration of a short syllable. In the Roman period, *DAGM* 39 and *DAGM* 59 attest anapests with pause. Zaminer (1988) argues that classical anapests did not incorporate pause, and that shifts in the apparent arsis and thesis of feet were an important part of the rhythmic individuality of any given example of anapestic lyric.

Scholars who associate dynamic with poetic meters elaborate further. Extending the idea of variation in the assignment of arsis and thesis beyond anapests, Westphal (1883: 10) offers a lyric example of a *lexis* put into times in different ways. Boeckh (1811) had scanned the first phrase of Pindar *Pythian* 2 as a dochmiac: Μεγαλοπόλιες ὦ = ⏑ ⏑́⏑ ⏑⏑ ⏑ –́ , with an ictus or stress on the second and seventh syllables. Westphal (1883: 10) scans the verse as trochaic: Μεγαλοπόλιες ὦ = ⏑́⏑ ⏑ ⏑́⏑ ⏑ –́ , with ictus on the first, fourth, and seventh syllables. Westphal and Rossbach (1885: 1.70) offer an additional example: Sophocles *Antigone* 1268, ἔθανες ἀπελύθης = ⏑⏑ ⏑ ⏑⏑ ⏑ — could be scanned as trochaic, with ictus on the first and fourth syllables; as iambic, with ictus on the second and fifth syllables; as a dochmiac, with ictus on the second and seventh syllables; or, as Westphal believes was Sophocles' intention, as an anapestic dimeter with stress on the third and seventh syllables. Westphal believed that syllabic durations did vary, but he did not consider this variation relevant to this line of *E.R.* because he posited a rigid formula for how syllable durations in lyric poetry would be manipulated to fit isochronous measures.

Though both Pearson and Westphal pursue interpretations of this line of *E.R.* in terms of variation in the assignment of arsis and thesis, they differ in that Pearson regards this freedom as free variation within individual compositions of the same poetic type; Westphal believes that the correct metrical analysis of a poem/composition will determine the assignment of arsis and thesis as well as manipulation of syllable lengths. However, Westphal believes that the assignment of arsis and thesis will vary for the same syllable sequence in different poetic contexts. In the terms proposed by Setti (1963: 145), Pearson believes that ictus is external to the poetic meter, while Westphal believes that it is internal to the poetic meter. Pearson's interpretation gives a sense for this line that better promotes Aristoxenus' purpose in this passage of distinguishing rhythm from poetic meter.

All these interpretations take λέξις as a fixed poetic verse, as fits Aristoxenus' purpose in this paragraph. However, Aristoxenus does not always consider the object of rhythmic composition τὸ ῥυθμιζόμενον regarding syllables or words in the sense of a fixed verse or pattern of long and short syllables. At paragraph 8.17, we must take ῥυθμιζόμενον as something lacking temporal order in and of itself, which would be a strained concept to apply to a fully formed poetic verse. Furthermore, the term λέξις does not generally refer to a specific poetic meter, but rather either to a single word or to a style of speaking. These considerations make it worthwhile to consider alternative interpretations based on different senses of the word λέξις.

Caesar (1861: 157) takes λέξις in this line as referring to a single word; the same λέξις in different time intervals means that the same word can be used in different rhythmic contexts, or in different *Theile*. However, this interpretation does not entail a break with the interpretations described above where the difference is expressed either in a variation of syllable duration or in assignment of arsis and thesis.

Bartels (1856: 23) interprets λέξις in a way consistent with though not identical to Plato's usage at *Republic* 397b; the λέξις for him is more than one word, but a group of words chosen by the poet but which may be composed into different verses in different word order. Bartels adduces Quintilian's citation (9.4.90) of a poet who composed a hexameter verse that scans as a Sotadean if the word order is reversed, and a Sotadean verse that scans as an iambic trimeter with the word order reversed. The Sotadean is an ionic tetrameter cataclectic, with the basic form ‒ ‒ ˘ ˘ | ‒ ‒ ˘ ˘ | ‒ ‒ ˘ ˘ |‒ ‒ .

Quintilian's first example is the hexameter

‒ ˘ ˘ | ‒ ‒ |‒ ˘ ˘ |‒ ‒ |‒ ˘ ˘ | ‒ ‒
astra tenet caelum, mare classes, area messem:

with the word order reversed, a Sotadean results:

‒ ‒ ˘ ˘ | ‒ ‒ ˘ ˘ | ‒ ‒ ˘ ˘ |‒ ‒
mess(em) area, classes mare, caelum tenet astra.

Quintilian's second example is the Sotadean

˘ ˘ ‒ ˘ ˘|‒ ‒ ˘ ˘ |‒ ‒ ˘ ˘|‒ ‒
caput exseruit mobile pinus repetita:

with the word order reversed, it becomes an iambic trimeter (allowing two resolved anceps positions):

˘ ˘ – ˘ –| – – ˘ – | ˘ ˘ – ˘ –
repetita pinus mobil(e) exseruit caput.

Bartels' solution provides a good sense for this line of *E.R.* without resorting to manipulations of syllable duration or application of ictus. While it cannot be absolutely ruled out, Aristoxenus' discussion of compound feet in paragraphs 19 and 26-28 favors the idea that Aristoxenus is referring to syllable manipulation and the application some means of rhythmic articulation distinguishing *arsis* from *thesis*.

**ἴσαι αὐταῖς τοῦ ῥυθμοῦ φύσεως διαφοραῖς**

Aristoxenus will list seven rhythmic *differentiae* at paragraphs 22-29, formulated in terms of rhythmic feet, which can apply to all three objects of rhythmic composition. The link with par. 22-29 makes this is a structural marker of the treatise, which binds par. 1-29 as an introduction delineating the domain of rhythmic science while paragraph 30 represents a new beginning at a more rigorous standard of argumentation. For similar examinations of the logical structure of *E.H.*, see Bélis (1986) and Brancacci (1984).

**ὁ αὐτὸς δὲ λόγος κατὰ τοῦ μέλος**

The earliest extant pieces of instrumental musical notation are much later than Aristoxenus, but they do show the use of a contrast between long and short notes to generate rhythmical patterns familiar from verse. *Anonymous Bellermann* 97 and 100 show the same melody in two different rhythms.

**καὶ εἴ τι ἄλλο πέφυκε ῥυθμίζεσθαι**

This will be completed at par. 9 with dance, which was so strongly alluded to by the word play on σῶμα and σχῆμα at the beginning of this paragraph. Aristoxenus leaves it unspecified here in order to present the list of three objects of rhythmic composition as the conclusion to a demonstration developed in paragraphs 6 and 9.

## PARAGRAPH 5

**τῶν τε γὰρ πεφυκότων σχηματίζεσθαι σωμάτων**

In *On the Heavens* Book III, Aristotle distinguishes complex substances, which can be said to have been shaped according to nature, from elementary particles, which cannot have a fixed shape. At 302a25-27, he says of theorists like Anaxagoras and Empedocles that πρόσωπον γὰρ οὐκ ἐκ προσώπων ποιοῦσιν, οὐδ’ ἄλλο τῶν κατὰ φύσιν ἐσχηματισμένων οὐθέν ‘they do not pretend that a face is composed of faces, or that any other natural conformation is composed of parts like itself’.[34] At 306b9-12, he refutes Democritus’s attribution of a fixed shape to elementary particles: ἔπειτα φαίνεται πάντα μὲν τὰ ἁπλᾶ σώματα

[34] Trans. J. L. Stocks in McKeon 1941:445.

σχηματιζόμενα τῷ περιέχοντι τόπῳ, μάλιστα δὲ τὸ ὕδωρ καὶ ὁ ἀήρ. διαμένειν μὲν οὖν τὸ τοῦ στοιχείου σχῆμα ἀδύνατον 'since all simple bodies are shaped by the place which contains them, especially water and air, it is impossible that the shape of the elementary particle persist'.[35]

**διάθεσίς τίς ἐστι τῶν τοῦ σώματος μερῶν τὸ σχῆμα**

Aristoxenus takes time to reiterate this point because he is at odds with Aristotle's description of shape. At *Categories* 10a11-24, Aristotle distinguishes shape from the qualities of denseness versus rarity or roughness versus smoothness: he says it is these qualities, not shape, that have to do with the relative positions of the parts of a body, θέσιν μορίων 'arrangement of parts'. At *Metaphysics*1035a9-12, Aristotle says that shapes are defined holistically, not by reference to their parts: ὁ μὲν τοῦ κύκλου λόγος οὐκ ἔχει τὸν τῶν τμημάτων 'the formula of the circle does not include that of its segments'. See also the note to par. 4 **ἐὰν αὐτοῦ τὰ μέρη τεθῇ διαφερόντως**. Aristoxenus is setting up a definition of shape to provide an argument by hypothetical necessity as to why there are three objects of rhythmic composition.

**ἐκ τοῦ σχεῖν πως ἕκαστον αὐτῶν ὅθεν δὴ σχῆμα ἐκλήθη**

At *Categories* 15b17-27, Aristotle lists different meanings of ἔχειν 'to have', but does not include this sense among them. He says his list is incomplete, but it

[35] Trans. Marchetti.

does have the most commonly used expressions. Given the lack of other references to this sense of σχῆμα, it is probably directed to σχῆμα as a dance term, as discussed in the notes to paragraph 4.

**διατιθέντων πως…καὶ ποιούντων…τοιόνδε ἢ τοιόνδε**

These active participles emphasize that the form exercises a determining power upon its material.

**PARAGRAPH 6**

**μὴ ὑπάρχοντος τοῦ δεξομένου αὐτό, δῆλον ὡς ἀδυνατεῖ γενέσθαι**

This statement reflects Aristotle's refutation of the Platonic thesis that forms exist apart from their material manifestations, as at *Metaphysics* 1033b19-24. The requirement of physical material led Aristotle to a further question: what are the constraints upon the matter in which a given form may exist? At *Physics* 199b34-200a15, Aristotle introduces ἐξ ὑποθέσεως...τὸ ἀναγκαῖον 'hypothetical necessity': the idea that a thing's purpose may entail certain requirements for the material of which it can be made. Aristotle gives the example of a saw, which must be made of iron if it is to perform its purpose of sawing. Aristoxenus will specify a necessary requirement for the material of rhythm at the end of *E.R.* 6.

**ἐπειδὴ ὁ μὲν χρόνος αὐτὸς**

The notion of time itself, as distinguished from time intervals, is found at Aristotle *Physics* 218b14. In distinguishing time from μεταβολή 'change', Aristotle attributes to time a quality of absolute consistency: ἔτι δὲ μεταβολὴ μέν ἐστι πᾶσα θάττων καῖ βραδυτέρα, χρόνος δ' οὐκ ἔστιν· τὸ γὰρ βραδὺ καῖ ταχὺ χρόνῳ ὥρισται… 'yet all change is faster or slower, but time is not; for slow and fast are defined in reference to time'. It is this sense of time to which Aristoxenus refers.[36]

**ἑτέρου δέ τινος δεῖ τοῦ διαιρήσοντος αὐτόν**

Aristotle discusses the mutual divisibility of time and motion at *Physics* 231-237. While their relationship is usually conceived as motion requiring a certain amount of time, the reversibility of this perspective is attested at *Physics* 220b15: οὐ μόνον δὲ τὴν κίνησιν τῷ χρόνῳ μετροῦμεν, ἀλλὰ καὶ τῇ κινήσει τὸν χρόνον διὰ τὸ ὁρίζεσθαι ὑπ' ἀλλήλων 'Not only do we measure the movement by the time, but also the time by the movement, because they are defined by each other'.[37]

**ἀναγκαῖον οὖν ἂν εἴη μεριστὸν εἶναι τὸ ῥυθμίζόμενον γνωρίμοις μέρεσιν**

Aristoxenus here applies the Aristotelian concept of hypothetical necessity (see above) to establish a property necessary for something to be an object of

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[36] Trans. Marchetti.

[37] Trans. Marchetti.

rhythmic composition: it must be divisible into recognizable parts. The repetition of the word root in μεριστόν and μέρεσιν reiterates Aristoxenus's definition of shape, the relative position of the parts, μέρη. Aristoxenus will give examples of how the different types of object of rhythmic composition are in fact divisible into recognizable parts in par. 9.

The word γνώριμος is used in a special technical sense in Psellus *Introduction to the Study of Rhythm* 6 (= 22.12-19 Pearson). Psellus defines γνώριμοι χρόνοι 'recognizable time intervals' as those that are long enough to be perceptible, such as the time taken by a syllable, dance step, or note. In contrast, Psellus says that there are imperceptibly small, ἄγνωστοι, rests between each syllable, step, or note. This sense of the word γνώριμος would apply here. The word γνώριμος will appear in paragraphs 16 and 20 in a different technical sense, to be discussed there.

**PARAGRAPH 7**

**ἡ τῶν χρόνων διαίρεσις**

The word διαίρεσις is best translated 'distribution', as at Herodotus *Histories* 7.144 and Xenophon *Institution of Cyrus* 4.5.55, because it concerns a system of many related divisions of time into time intervals. See par. 18, where usage confirms this interpretation.

**τάξιν τινὰ λάβῃ ἀφωρισμένην**

The idea that rhythm has to do with an orderly arrangement, τάξις, is found in Plato *Laws* 653e3-5. Arguing that education comes first from the Muses and Apollo, Plato says: τὰ μὲν οὖν ἄλλα ζῷα οὐκ ἔχειν αἴσθησιν τῶν ἐν ταῖς κινήσεσιν τάξεων οὐδὲ ἀταξιῶν οἷς δὴ ῥυθμὸς ὄνομα καὶ ἁρμονία 'other living things do not have perception of the orderly arrangements in motion called rhythm and harmony, nor of lack of order'. The idea of *taxis* is related to shape, especially of the arrangement of parts of a shape as described by Aristoxenus. If evaluative words are added to shape, we wind up back at rhythm; moving to *taxis* opens up a wider evaluative vocabulary, with terms such as ἀφωρισμένην.

Aristotle identifies τάξις and τὸ ὡρισμένον as two of the three greatest types of beauty at *Metaphysics* 1078a36-b2: τοῦ δὲ καλοῦ μέγιστα εἴδη τάξις καὶ συμμετρία καὶ τὸ ὡρισμένον, ἃ μάλιστα δεικνύουσιν αἱ μαθηματικαὶ ἐπιστῆμαι 'the chief forms of beauty are order and symmetry and definiteness, which the mathematical sciences demonstrate in a special degree'.[38]

The connection between mathematics and rhythm will come in Aristoxenus's definition of the rhythmic foot, which embodies a ratio. This is discussed at paragraphs 18-19 and 30-36.

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[38] Trans. W. D. Ross in McKeon 1941: 893.

**οὐ γὰρ πᾶσα χρόνων τάξις εὔρυθμος**

Two emendations have been proposed for the manuscript reading ἐν ῥυθμοῖς: Morelli (1785: reprinted in Feussner 1840: 5), while retaining the manuscript reading in his text, noted the parallel of Psellus 3 (= 20.21-22 Pearson) οὐ γὰρ πᾶσα χρόνων σύνθεσις εὔρυθμος 'for not every combination of time-lengths is rhythmical'.[39] Pearson (1990: 4) incorporates this emendation into his text. The adjective εὔρυθμος appears again in the manuscripts of *E.R.* at 8 (*bis*), 21, and 24. Bartels (1854: 6 and 6n11) emends ἐν ῥυθμοῖς to ἔρρυθμος, arguing that a scribe changed an original ἔνρυθμος to ἐν ῥυθμοῖς, perhaps because the common spelling ἔνρυθμος contrasts with the assimilated spelling ἔρρυθμός appearing in *E.R*. 32, 33, 34, and 35. However, the phrase ἐν ῥυθμοῖς is used at Plato *Laws* 660a7, Aristotle *Metaphysics* 1087b36, and Ps.-Aristotle *Problems* 919b33 to indicate that something is in the realm of musical rhythm. The fact that Aristoxenus uses the adjectives εὔρυθμος and ἔρρυθμος elsewhere in *E.R*. supports, if anything, retention of the manuscript reading ἐν ῥυθμοῖς here by the principle of *lectio difficilior*.

[39] Trans. Pearson 1990: 21.

**PARAGRAPH 8**

**πιθανὸν μὲν καὶ χωρὶς λόγου**

Aristoxenus assumes his readers' experience of rhythm and absence of rhythm makes this statement πιθανόν.

**δεῖ δὲ καὶ διὰ τῶν ὁμοιοτήτων ἐπάγειν τὴν διάνοιαν**

Aristoxenus is not introducing an account of what in rhythm is acceptable and what is not; rather, he will go on to present concepts through which rhythm can be described. Aristoxenus will use analogy with melodic theory to illustrate rhythmic concepts at par. 14.4-5 and 21.2-4, but here the point of similarity is a much more general claim about the presence of order in rhythm.

**ἕως ἂν παραγένηται ἡ ἐξ αὐτοῦ τοῦ πράγματος πίστις**

Proof from the practice itself must be a form of induction; see Aristotle *Posterior Analytics* 90b14 for induction as one type of πίστις 'proof'. The difference between this sort of proof and the common opinion that not all arrangements of time intervals are rhythmic implies a capacity for discernment that has been trained by exposure to and analysis of good models. This capacity for discernment is analogous to the grammatical or melodic competence that the rules of grammar or melody seek to formulate. The sciences of grammar and melody had developed more completely than the science of rhythm and had formulated more comprehensive generalizations for what is acceptable.

Aristoxenus thus disavows a thorough account of what will be acceptable or not in rhythm, limiting the purview of his account of rhythm to the development of an analytic framework.

**ἔστι δὲ ἡμῖν γνώριμα τὰ περὶ τὴν τῶν γραμμάτων σύνθεσιν καὶ τὰ περὶ <τὴν> τῶν διαστημάτων**

Grammar and music were associated in Greek education at least from the time of Archytas (see above in my biography of Aristoxenus); Diogenes Laertius IX, 37 and Quintilian 1.10.17 say that Archytas put grammar under the topic of music.

Plato *Philebos* 17a-e treats grammar and music, including the construction of scales and the analysis of dance rhythms, as archetypical types of knowledge in his discussion of the roles of the concepts of unity and infinity in human understanding. While infinity and unity can be predicated of vocal sound vis-à-vis music or vis-à-vis language, the sciences of music or of grammar treat as significant only a limited number of the infinite possible variations.

Plato *Cratylus* 424c1-2 encapsulates how the study of letters, referred to as στοιχεῖα rather than as γράμματα, led to the study of rhythms:

> οἱ ἐπιχειροῦντες τοῖς ῥυθμοῖς τῶν στοιχείων πρῶτον τὰς δυνάμεις διείλοντο, ἔπειτα τῶν συλλαβῶν, καὶ οὕτως ἤδη ἔρχονται ἐπὶ τοὺς ῥυθμοὺς σκεψόμενοι.

> Those setting to work on rhythms first distinguished the functions of the letters, then of the syllables, and thus next proceed inquiring into the rhythms.[40]

This progression is mentioned also by Aristotle *Poetics* 1456b20-38, and is developed at length by Dionysius of Halicarnassus *On Literary Composition* chapter 14, and Aristides Quintilianus *On Music* 1.20 (= 40.28-41.17 W-I). However, Aristoxenus is developing his theory of rhythm not in terms of syllables but of time intervals and their perception; see next note.

**οὐτ' ἐν τῷ διαλέγεσθαι πάντα τρόπον τὰ γράμματα συντίθεμεν**

At the notes to par. 1 and 4, citations were offered attesting a distinction between musical rhythm and rhythm in poetic meters. Here, Aristoxenus limits the consideration of linguistic principles to the way letters may combine to form syllables in prose, and does not proceed from prosody to poetic meters, as was done by the researchers before and after Aristoxenus mentioned in the preceding note. This reinforces Aristoxenus's separation of rhythm from the study of poetic meters.

**οὔτ' ἐν τῷ μελῳδεῖν τὰ διαστήματα**

At *E.H.* 2.37 (= 46.12-15 Da Rios), Aristoxenus used grammar as a metaphor for melody:

> Ἔστι δὲ τοιαύτη τις ἡ περὶ τὸ ἐμμελές τε καὶ ἐκμελὲς τάξις οἵα καὶ ἡ περὶ <τὴν> τῶν γραμμάτων σύνθεσιν ἐν τῷ διαλέγεσθαι˙ οὐ γὰρ

40 Trans. Marchetti.

> πάντα τρόπον ἐκ τῶν αὐτῶν γραμμάτων συντιθεμένη ξυλλαβὴ γίγνεται, ἀλλὰ πὼς μέν, πὼς δ' οὔ.
> The arrangement of the melodic and the amelodic is something of the same sort as that concerning the combining of letters in speaking; for a syllable does not arise from letters put together in any fashion, even if the same letters are used, but only put together in some ways, and in others, not.

In *E.H.* and *E.R.*, Aristoxenus constructs analytic systems that can describe and/or generate a variety of scales and rhythms, respectively. Aristoxenus's references to the limits on the ways letters can be combined into syllables demonstrate his recognition that these analytic systems must be complemented by evaluative criteria. In *E.H.* the law of succession (see introduction pp. 21-22) serves as an evaluative criterion for valid combinations of intervals, though Aristoxenus notes at *E.H.* 2.54 (= 67.12 Da Rios) that it alone is not sufficient to determine whether a scale is constructed correctly.

**οὔτε ἡ φωνὴ δύναται συντιθέναι φθεγγομένη**

At *E.H.* 1.28 (= 36.5-9 Da Rios), Aristoxenus says that the voice cannot sing a long sequence of very small intervals, but must complete the interval of a fourth in any sequence of four consecutive notes.[41] Thus, we cannot assume that Aristoxenus here means to rule out only such syllables as we would agree are

[41] *E.H.* 1.28 (= 36.5-9 Da Rios) οὐ γὰρ ὅτι [μὴ] δυνατὸν διέσεις ὀκτὼ καὶ εἴδοσιν ἑξῆς μελῳδῆσαι τῇ φωνῇ ἐστίν, ἀλλὰ τὴν τρίτην δίεσιν πάντα ποιοῦσα οὐχ οἵα τέ ἐστι προστιθέναι, ἀλλ' ἐπὶ μὲν τὸ ὀξὺ ἐλάχιστον μελῳδεῖ τὸ λοιπὸν τοῦ διὰ τεσσάρων, -- τὰ δ' ἐλάττω πάντα ἐξαδυνατεῖ…So far is the voice from being able to produce twenty-eight consecutive dieses, it can by no effort produce three dieses in succession. 'If ascending after two dieses it can produce nothing less than the complement of a fourth...it cannot produce anything smaller'. Trans. H. Macran 1902: 185.

physically impossible to utter. Rather, Aristoxenus describes as a result of nature what we would describe as the operation of a linguistic principle, in the case of syllables, or an aesthetic principle, in the case of musical scales or rhythms.

**οὔτε ἡ αἴσθησις προσδέχεται**

Aristoxenus is following a method; compare his examination of the limits of production and perception of voice at *E.H.* 1-13-15 (= 19.1-20.14 Da Rios).

**ἰδέας**

While the sentence refers to melodic structure, ἰδέας echoes the "shapes" of paragraph 4, and will be transferred to rhythm by the οὕτω δὲ καὶ περὶ τοὺς χρόνους opening the next sentence. It would be awkward to take ἰδέας as 'types' or 'genera' here because it would entail Aristoxenus cataloguing the different types of bad melodies. Rather, ἰδέας here should be taken more in the sense of form or appearance as a reference to the arrangements that make a melody well or poorly tuned.

**ὀλίγαι δέ τινες οἰκεῖαί τε καὶ δυνανταὶ ταχθῆναι εἰς τὴν τοῦ ῥυθμοῦ φύσιν**

Though Aristoxenus cannot provide a formula or list of criteria for what is proper to the perception of rhythm and can be placed in the nature of rhythm, what is rhythmic does have formal properties, ἰδέας, which carry aesthetic value. Aristoxenus posits the φύσις of rhythm as the reality that a formulation of criteria for good rhythm would capture: that which satisfies the innate rhythmic sense.

**τὸ δὲ ῥυθμιζόμενόν ἐστι κοινόν πως ἀρρυθμίας τε καὶ ῥυθμοῦ**

This statement entails that the ῥυθμιζόμενον is, in Aristotelian terms, a substance, οὐσία; see *Categories* 4a10: μάλιστα δὲ ἴδιον τῆς οὐσιας δοκεῖ εἶναι τὸ ταὐτὸν καὶ ἓν ἀριθμῷ ὂν τῶν ἐναντίων εἶναι δεκτικόν 'The most distinctive mark of substance appears to be that, while remaining numerically one and the same, it is capable of admitting contrary qualities'.[42]

Rhythm, on the other hand, is a quality, ποιότης, in Aristotelian terms. At *Categories* 10a11, shape is a quality, though as mentioned in the notes to paragraph 5, Aristotle is thinking primarily of simple shapes such as circles, triangles, and squares: τέταρτον δὲ γένος ποιότητος σχῆμά τε καὶ ἡ περὶ ἕκαστον ὑπάρχουσα μορφή 'the fourth type of quality is figure and the shape that belongs to a thing'.[43]

Looking back to *E.R.* 4 and ahead to par. 22, rhythm is a quality that has *differentiae* of its own. Examples of qualities in Aristotle's *Categories* 8b26 include virtues and knowledge; at *Categories* 1b17, Aristotle states that knowledge has *differentiae*. Thus, it is possible in Aristotelian theory for a quality to have *differentiae*. At *Categories* 10b12-25 examples are given of contrary qualities:

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[42] Trans. E. M. Edgill in McKeon 1941:13.
[43] Trans. E. M. Edgill in McKeon 1941:25.

δικαιοσύνη ἀδικία, λευκότης μελανία 'justice, injustice, whiteness, blackness'. Aristoxenus here introduces the contrary qualities ἀρρυθμίας τε καὶ ῥυθμοῦ.

At *Categories* 11a38-12a25, Aristotle distinguishes between contraries that have an intermediate and those that do not. Contraries have no intermediate if one of the contraries must be present in anything of the type to which the contraries apply; Aristotle gives the examples of disease and health in living things or even and odd in numbers. Contraries for which it is not necessary that one must appear do have intermediates. For example, black and white have all other colors as their intermediates; good , σπουδαίον, and bad, φαῦλον have as intermediates things which are neither good nor bad.

Aristides Quintilianus 1.14 (= 33.5 W-I) and *Fragmenta Neapolitana* 11 (= 28.8 Pearson) posit an intermediate term between rhythmic and arrhythmic, the *rhythmoeidēs*. Since much of the material in these contexts comes from Aristoxenus, this concept may too. However, Aristoxenus's use of the word ἀμφότερα 'either of two' in the following sentence indicates that here he conceives of the rhythmic and the arrhythmic as contraries without an intermediate in the field of music.

**τό τε εὔρυθμον καὶ τὸ ἄρρυθμον**

These opposites are contrasted at Plato *Republic* 400c-d; Plato *Laws* 655a5 also attests the adjective εὔρυθμον applied to dance, σχῆμα, in music. Aristides

Quintilianus 1.13 (= 31.4-5 W-I) formulates two of three senses of rhythm with reference to εὔρυθμον; see citation at τοῦ ῥυθμοῦ in paragraph 1.

Aristotle *Rhetoric* 1408b21-30 treats rhythm as an aspect of style, along with word-choice and metaphor. He begins with the observation (1408b21) that the scheme of diction, σχῆμα (lit. shape) τῆς λέξεως, must μήτε ἔμμετρον εἶναι μήτε ἄρρυθμον 'neither be in meter, nor arrhythmic'.

Dionysius of Halicarnassus *On Literary Composition* VI.25, 11-12 (= 212 Usher = 125 Usener-Radermacher) expresses this as a distinction between εὔρυθμον, well-rhythmed, i.e., with a loose sense of rhythm, and ἔρρυθμον, in rhythm, in poetic meter. Ephorus (Fr. 6 = 2a.70.6 Jacoby) attests this sense of ἔνρυθμον = ἔρρυθμον in the fourth century B.C. As mentioned above in the commentary to paragraph 7, the adjective ἔρρυθμος appears in *E.R.* 32, 33, 34, and 35. Morelli (1785: reprinted in Feussner 1840: 7) argues that Aristoxenus is not making this distinction here, and that perhaps ἔρρυθμος should be read for all instances of εὔρυθμος in *E.R.* However, at *E.R.* 32-35, the adjective ἔρρυθμος is applied to the noun λόγος 'ratio'. Aristoxenus may be observing a distinction between a more general application of the adjective εὔρυθμος and a more limited application of the adjective ἔρρυθμος.

**οἷον μετατίθεσθαι εἰς χρόνων μεγέθη παντοδαπὰ καὶ εἰς ξυνθέσεις παντοδαπάς.**

This is the most salient feature of the genus *rhythmizomenon*: it can be manipulated into all different time structures, being indeterminate in respect to time. For the object of rhythmic composition *lexis*, mentioned at paragraph 4, this entails a break with Aristotle *Categories*, where language is listed as a type of quantity. The integrity of the syllable, measured as long or short, makes language, for Aristotle, a discrete quantity as opposed to a continuous quantity. Aristoxenus's statement here entails a separation of duration from the other components of a syllable, which entails in turn that for Aristoxenus, the remaining components would be sufficient for the recognition of the syllable.

On the other hand, Aristoxenus's rhetorical purpose here is to draw attention from *lexis* to the genus *rhythmizomenon*. The phrase χρόνων μεγέθη refers to the durations given to individual rhythmic events. The συνθέσεις refer to the grouping of rhythmic events.

**PARAGRAPH 9**

**διαιρήσει τὸν χρόνον ἡ μὲν λέξις…γράμμασι καὶ συλλαβαῖς καὶ ῥήμασι**

Aristotle *Poetics* 1456b20-21 offers a longer list of the divisions of *lexis*: στοιχεῖον, συλλαβή, σύνδεσμος, ὄνομα, ῥῆμα, ἄρθρον, πτῶσις, λόγος 'letter, syllable, conjunction, noun, verb, article, case, utterance'.

At *Metaphysics* 1035a9-12, he uses the composition of syllables from letters as an example of a form that has parts:

διὸ ὁ μὲν τοῦ κύκλου λόγος οὐκ ἔχει τὸν τῶν τμημάτων, ὁ δὲ τῆς συλλαβῆς τὸν τῶν στοιχείων˙ τὰ μὲν γὰρ στοιχεῖα τοῦ λόγου μέρη τοῦ εἴδους καὶ οὐχ ὕλη, τὰ δὲ τμήματα οὕτως μέρη ὡς ὕλη ἐφ' οἷς ἐπιγίγνεται

And so the formula of the circle does not include that of the segments, but the formula of the syllable includes that of the letters; for the letters are parts of the formula of the form, and not matter, but the segments are parts in the sense of matter on which the form supervenes.[44]

At 1041b11-28, Aristotle uses the syllable to exemplify the principle that when anything is compounded in such a way that the result is a unity, its form must include something beyond the parts that comprise it. Aristotle concludes that this additional facet is a thing's essence.[45]

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[44] Trans. by W. D. Ross in McKeon 1941: 797.

[45] Aristotle *Metaphysics* 1041b11-14 ἐπεὶ δὲ τὶ ἔκ τινος σύνθετον οὕτως ὥστε ἓν εἶναι τὸ πᾶν, ἀλλὰ μὴ ὡς σωρὸς ἀλλ' ὡς ἡ συλλαβή, ἡ δὲ συλλαβὴ οὐκ ἔστι τὰ στοιχεῖα, οὐδὲ τὸ Βα ταὐτὸ

However, Aristoxenus does not highlight the syllable in his list of the parts of *lexis*; he intends to distinguish the study of rhythm from the study of metrics,[46] by highlighting the parallel between the parts of language and the parts of the other objects of rhythmic composition. For language and melody, he lists three types of part, listed in order of increasing complexity.

**τὸ δὲ μέλος τοῖς ἑαυτοῦ φθόγγοις τε καὶ διαστήμασι καὶ συστήμασιν**

At *E.H.* 1.15, Aristoxenus defines a note, φθόγγος, as the falling of the voice on one pitch, staying there long enough to be perceived as such. As the simplest element of melody, and that element which is closest to the ὕλη of the voice, it is parallel to the letter of the *lexis*.

At *E.H.* 1.15 (= 20.15 Da Rios)Aristoxenus defines an interval, διαστῆμα, as the difference between two pitches. As can be seen in *E.H.* 1.19 (= 24 Da Rios) and 2.53-4 (= 66-67 Da Rios), the interval is the first unit of melody at which the

τῷ β καὶ α, οὐδ᾽ ἡ σὰρξ πῦρ καὶ γῆ 'Since that which is compounded out of something so that the whole is one, not like a heap but like a syllable—now the syllable is not its elements, ba is not the same as b and a, nor is flesh fire and earth…' Trans. W. D. Ross in McKeon 1941:811.
1041b16-17 ἔστιν ἄρα τι ἡ συλλαβή, οὐ μόνον τὰ στοιχεῖα τὸ φωνῆεν καὶ ἄφωνον, ἀλλὰ καὶ ἕτερόν τι '...the syllable, then, is something—not only its elements, the vowel and the consonant, but also something else'. Trans. W. D. Ross in McKeon 1941:811.
1041b25-7 δόξειε δ᾽ ἂν εἶναί τι τοῦτο καὶ οὐ στοιχεῖον, καὶ αἴτιόν γε τοῦ εἶναι τοδὶ μὲν σάρκα τοδὶ δὲ συλλαβήν 'It would seem that this 'other' is something, and not an element, and that it is the cause which makes this thing flesh and that a syllable'. Trans. W. D. Ross in McKeon 1941:811.
1041b27-28 οὐσία δ᾽ ἑκάστου μὲν τοῦτο˙ τοῦτο γὰρ αἴτιον πρῶτον τοῦ εἶναι 'This is the substance of each thing, for this is the primary cause of its being'. Trans. W. D. Ross in McKeon 1941:811.
[46] Aristoxenus refers to the study of metrics as τῆς μετρικῆς at *E.H.* 2.39 (= 49.9 Da Rios).

principles of harmony can be grasped.[47] Thus, the interval of melody is parallel to the syllable of *lexis*.

A σύστημα is compounded out of more than one interval (*E.H.* 1.15 = 21.7 Da Rios). It is the level at which melodies could be characterized according to mode or ἁρμονία, as attested in Pindar, Plato, and elsewhere (Winnington-Ingram 1965). It is the level at which melody becomes an object of interpretation, and is parallel to the word, ῥῆμα, of *lexis.*

**ἡ δὲ κίνησις σημείοις τε καὶ σχήμασι καὶ εἴ τι τοιοῦτόν ἐστιν κινήσεως μέρος**

The term σημεῖον 'marker' used as a unit of dance reappears at Aristides Quintilianus's paraphrase of this passage in *On Music* 1.13 (= 32.4-7 W-I):

> διαιρεῖται δὲ ὁ ῥυθμὸς ἐν μὲν λέξει ταῖς συλλαβαῖς, ἐν δὲ μέλει τοῖς λόγοις τῶν ἄρσεων πρὸς τὰς θέσεις, ἐν δὲ κινήσει τοῖς τε σχήμασι καὶ τοῖς τούτων πέρασιν, ἃ δὴ καὶ σημεῖα καλεῖται.
> Rhythm is divided in *lexis* by the syllables, in melody by the ratios of *arses* towards *theses*, and in motion by the steps and their boundaries, which are called markers.

While Aristides has not preserved the parallelism of *E.R.*, his gloss of σημεῖα as boundaries, πέρατα, indicates that Aristoxenus took the σημεῖα of dance as parts of the formulae of steps, σχήματα.

[47] The fact that we can identify the same melody in different keys indicates that we perceive melodies as being made up of intervals rather than of notes.

Plato *Philebos* 17d4-6 attests that there were attempts to analyze the rhythms of dance by the same system as the meters of poetry, finding rhythms and measures in dance: ἔν τε ταῖς κινήσεσιν αὖ τοῦ σώματος ἕτερα τοιαῦτα ἐνόντα πάθη γιγνόμενα, ἃ δὴ δι' ἀριθμῶν μετρηθέντα δεῖν αὖ φασι ῥυθμοὺς καὶ μέτρα ἐπονομάζειν 'In the movements of the body there arise similar characteristics, which, they say, being measured with numbers, it is right to call rhythms and meters'. Thus, Aristoxenus pursues the parallelism between the parts of the different objects of rhythmic composition as far as he can within the limits of terminology already available to him.

**PARAGRAPH 10**

**πρῶτος μὲν τῶν χρόνων**

In *Physics* 235a32-236b24, Aristotle defines a primary time as the time interval in which a movement happens, such that there is no part of the primary time in which the movement is not happening. The temporal boundaries of the movement coincide exactly with the beginning and end of the time interval.

**ὁ ὑπὸ μηδενὸς τῶν ῥυθμιζομένων δυνατὸς ὢν διαιρεθῆναι**

Aristoxenus's formulation defines the primary time interval in terms of the essential characteristic of an object of rhythmic composition: that it be able to divide time.

Porphyry's Commentary on Ptolemy's *Harmonics* preserves a fragment of an Aristoxenian treatise *On the Primary Time*, in which Aristoxenus makes clear that the tempo, ἀγωγή, of a performance establishes a value of the primary time for that performance.[48] Aristoxenus made that point to counter critics who asserted that his rhythmical theory improperly included the idea of the unbounded, τὸ ἄπειρον. He answered that while music may be performed at any one of an infinite number of possibilities within the limits of range of human perception, so varying in performance, any actual performance would use one determined value as its primary time.

**δίσημος…τρίσημος…τετράσημος**

This study follows Pearson (1990) and West (2001) in using the transliterations diseme, triseme, etc. Barker (1984) and Gibson (2005) use 'two-unit, three-unit, etc.'

The ancient treatise published as *Anonymous Bellermann* 2.21 catalogues symbols of rhythmic notation for the diseme, triseme, tetraseme, and pentaseme time intervals. The diseme and triseme marks are also found in several fragments of ancient Greek music.[49] These marks indicate the prolongation of a

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[48] The fragment addresses a criticism of his conception of the primary time. Although, Aristoxenus says, the tempo of a piece of music can be varied infinitely (by infinitesimally small variations), any actual performance exhibits one tempo which establishes the primary time and all its multiples for that performance. Therefore, his theory is not liable to the criticism that it violates logic by incorporating the indefinable concept of the infinite.

[49] West and Pöhlmann 2001 passim, see esp. *DAGM* 23, 42, 50.

single syllable or note to these time values. The earliest document to attest a hyper-length syllable is *DAGM* 11, dated to about 200 B.C. It features a triseme sign, with one note of melody. However, we cannot determine the rhythmic context to determine its function.

Aristoxenus will enumerate the rhythmic characteristics of multiples of the primary time in paragraphs 31-36. In that passage, each time interval is taken as comprising at least two syllables, notes, or steps. The enumeration of time intervals was used as an organizational principle by Hephaestion *Handbook* 3 (10-12 Consbruch).

**PARAGRAPH 11**

**τὴν δὲ τοῦ πρώτου δύναμιν**

The term δύναμιν can be translated 'meaning' here in a non-technical sense. However, a technical meaning will be seen in paragraphs 16 and 19, where Aristoxenus develops a rhythmic counterpart to his theory of harmonic function in *E.H*. The last line of *E.R.* paragraph 12 will link this appearance of the term δύναμις to the special sense developed further on.

**τῶν σφόδρα φαινομένων ἔστι τῇ αἰσθήσει τὸ μὴ λαμβάνειν εἰς ἄπειρον ἐπίτασιν τὰς τῶν κινήσεων ταχυτῆτας**

To clarify the phrase σφόδρα φαινομένων, it is helpful to rule out possible meanings that cannot sustain close examination. At *On the Soul* 429a31-b5, Aristotle considers the limits of perception with respect to strong stimuli:

> ἡ μὲν γὰρ αἴσθησις οὐ δύναται αἰσθάνεσθαι ἐκ τοῦ σφόδρα αἰσθητοῦ, οἷον ψόφου ἐκ τῶν μεγάλων ψόφων, οὐδ’ ἐκ τῶν ἰσχυρῶν χρωμάτων καὶ ὀσμῶν οὔτε ὁρᾶν οὔτε ὀσμᾶσθαι·
> For the faculty of perception is not able to perceive after an excessively intense object of perception; as for example (one cannot perceive) a sound after loud sounds, nor see after (seeing) bright colors or smell after (smelling) strong scents.[50]

Context will show that Aristoxenus does not mean σφόδρα in the same sense that Aristotle does here in isolating a perceptible out of a series of intense manifestations; Aristoxenus is concerned with things that are clearly perceptible.

At Plato *Laws* 733a5 the adverb σφόδρα is used with the verb φαίνω in the sense of ‘clearly’ or ‘obviously’: ὡς δὲ ἔσται τοῦτο σαφές, ἂν γεύηταί τις ὀρθῶς, ἑτοίμως καὶ σφόδρα φανήσεται ‘and this will be plain, if a man has a true taste of them, as will be quickly and clearly seen’.[51] Another parallel can be found at Ps.-Plato *Lovers* 132a5 ἐτυγχανέτην οὖν δύο τῶν μειρακίων ἐρίζοντε,

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[50] Trans. Marchetti.
[51] Trans. Jowett 1892:115.

περὶ ὅτου δέ, οὐ σφόδρα κατήκουον 'two of the young men happened to be arguing, but about what, I did not hear very clearly'.[52]

An Aristotelian parallel can be found at *Investigations of Animals* 571a29 with the adjective φάνερον rather than a verb of perception: οὐδὲ τὸ κύημα σφόδρα φανερὸν διὰ τὴν πιμελήν 'nor is the embryo [within a pregnant conger-eel] clearly apparent, because of the fat'.[53] Similar combinations of σφόδρα with forms based on the stem δῆλ- 'manifest' can be found at *On the Soul* 421a31, *Investigations of Animals* 510a1, 518a9, and *Problems* 960a14.

Westphal's (1883:14) translation of the phrase τῶν σφόδρα φαινομένων... τῇ αἰσθήσει, 'Eine der vom Gefühle sehr deutlich empfundenden Wahrnehmungen', followed by Pearson (1990: 7) 'One of the appearances that presents itself very readily to our senses', fits closely with the preceding phrase of *E.R.* δεῖ καταμανθάνειν τόνδε τὸν τρόπον 'one must try to understand in this way' and agrees well with the sense of σφόδρα φανήσεται from Plato *Laws* 733a5 cited above. However, Aristoxenus cannot intend the rest of the sentence as a general rule about moving objects because examples of things that move too quickly for our perception are so common. Wave a finger before your eyes, it becomes a blur; the notes of many bird songs are too fast for us to distinguish individually. It is better to follow Barker (1989: 186) in translating τῶν σφόδρα

[52] Trans. Marchetti.
[53] Trans. Marchetti.

φαινομένων ἔστι τῇ αἰσθήσει 'It is characteristic of things that appear vividly to perception'. The force of σφόδρα...αἰσθήσει is that Aristoxenus is not making a claim about moving objects, but about perception, particularly musical perception. As seen in Aristoxenus's rejection in *E.H.* of Pythagorean ratios for the science of harmonics, as well as his statements about the importance of perception in *E.R.* paragraphs 2 and 16, it is an important part of Aristoxenus's program to attribute musical phenomena primarily to human musical perception rather than to the acoustic phenomena themselves.

For the preposition εἰς expressing measure or limit, see L.S.J. εἰς III.1; particularly close to the usage here are phrases such as ἐς τὰ μάλιστα 'to the greatest degree' (Herodotus I.20). The clash between the meaning of ἄπειρον and the sense of limit with this use of εἰς is deliberate; Aristoxenus is describing an impossibility.

At *Physics* 218b14, Aristotle defines the quick, τὸ ταχύς, as a motion of great extent during a given time, or of a given extent (or degree) in a small amount of time. At *On Perception and Perceptibles* 437b3, ταχυτής, rapidity, characterizes a motion that takes place in a very brief time, affecting perception. In this example, Aristotle is considering whether sight should be identified with fire. An argument for this position had been that people see a flash if their closed eyelids are pressed or poked. Aristotle counters that this implies vision seeing

itself. Actually, says Aristotle, one sees a flash in the dark if the eyes are pressed because 1. smooth things shine in the dark, 2. the pupil of the eye is very smooth, 3. when the eyes are pressed, the rapidity of the motion allows the eye to glimpse the shine of its own smoothness. We are interested here in what Aristotle says about how the rapidity of the motion affects perception:
τοῦτο δὲ ἡ ταχυτὴς ποίει τῆς κινήσεως, ὥστε δοκεῖν ἕτερον εἶναι τὸ ὁρῶν καὶ τὸ ὁρώμενον… ‘the speed of the motion makes it so that the thing seeing [the eye] seems to be something different than the seen [the pupil’s shininess]…’

The implication is that the eye makes perceptions according to minimal time intervals, such that if the eye is in two positions within that time, it will be able to see its own smoothness. The motion of the eye is quicker than the eye’s ability to distinguish different states. Aristoxenus’s statement is in line with this conception: there is a limit to brevity of motions that we can perceive and distinguish from one another.

**ἀλλ᾽ ἵστασθαί που συναγομένους τοὺς χρόνους**

The sense of συναγομένους is that as the speed of a motion increases, its duration decreases. Aristotelian parallels for συνάγω in the sense of ‘contract’, ‘narrow’ or ‘compress’ include *Meteorology* 354a7, *Investigations of Animals* 496a19, and *Parts of Animals* 664b25.

Aristides Quintilianus 1.6 (= 9.12 W-I) similarly uses a the verb ἵστημι to express a musical capacity or ability reaching its limit, specifically the voice reaching the highest range of the musical scales: ὅτι πέρας ἐν ταύταις ποιησαμένη ἡ φωνῆς ἀνθρωπίνης δύναμις ἵσταται 'because, having made an end among these (notes), the power of the human voice halts'.

At *E.H.* 1.8-10 (= 13-15 Da Rios), Aristoxenus used the verb ἵστημι to differentiate the singing voice, which stays on a given pitch for an appreciable time, from the constant pitch fluctuation of the speaking voice. For example, *E.H.* 1.8 (= 13.11-13 Da Rios): κατὰ μὲν οὖν τὴν συνεχῆ τόπον τινὰ διεξιέναι φαίνεται ἡ φωνὴ τῇ αἰσθήσει οὕτως ὡς ἂν μηδαμοῦ ἱσταμένη 'in continuous change of position the voice seems to the senses to traverse a certain space in such a manner that it does not become stationary at any point'.[54] This description of the perception of continuously changing pitch in *E.H.* is apparently in conflict with the description of the perception of quickly changing things here in *E.R*. Aristoxenus's motivation here can be seen by considering the case of an *aulos* played so quickly that the individual notes blur. This could not be continuous pitch change, since each note corresponds to one of the holes of the *aulos*. There is a minimum duration required for a sound to be perceived as

[54] Trans. Macran 1902:170.

an individual musical event, and Aristoxenus is trying to explain this observation in terms of an underlying cognitive mechanism.

ἐν οἷς τίθεται τὰ μέρη τῶν κινουμένων·

The phrasing here echoes λέξις εἰς χρόνους τεθεῖσα in paragraph 4 and μετατίθεσθαι εἰς χρόνων μεγέθη in paragraph 8. In those passages, the underlying image is of a performer putting rhythmic events into time intervals. However, the preceding participle συναγομένους would lose its force if we consider this to refer to normal musical performance. Instead, consider again an *aulos* played so quickly the notes seem to blur. Though perception cannot isolate individual notes, it might divide the blur into segments. Lester (1986: 74) gives an example from modern music that illustrates this perceptual possibility. In discussing the effect of tempo on different pianists' performances of Bach's *Prelude in A-flat*, he remarks that Glenn Gould played the piece so quickly that "the thirty-second notes go by too fast to be perceived individually" while Bach's underlying rhythmic hierarchy is still heard clearly.

**ὡς ἥ τε φωνὴ κινεῖται λέγουσά τε καὶ μελῳδοῦσα**

As mentioned above, at *E.H.* 1.8-10 (= 13.7-15.5 Da Rios), Aristoxenus specifies the difference between speaking and singing as being that in normal speech there is constant variation in pitch, while in singing pitches are held for certain definite times. Here, the speaking voice, ἡ φωνὴ λέγουσα, corresponds to *lexis* as an object of rhythmic composition: the limit of rapidity is that set by the rate at which the phonemes of language can be comprehended. The singing voice, ἡ φωνὴ μελῳδοῦσα, corresponds to μέλος as an object of rhythmic composition. The limit of rapidity is the same as was posited above in the case of an *aulos* played quickly.

This form of reference highlights the voice as the ὕλη 'material substratum' that can be put into different forms of *lexis* and/or melody, as was discussed at *E.R.* par. 4.

**καὶ τὸ σῶμα ἐμβαῖνόν τε καὶ ὀρχούμενον καὶ τὰς λοιπὰς τῶν τοιούτων κινήσεων κινούμενον**

The manuscript text, σῆμα σημαῖνον, was emended by Feussner (1840) to σῶμα ἐμβαῖνόν. The change from σῆμα to σῶμα is justified by its juxtaposition with φωνή. As Feussner points out, the word σῆμα is not used as a synonym for σημεῖον in Aristides Quintilianus or Hephaestion, or elsewhere in Aristoxenus, and even if it were accepted in this technical sense, it could not comprehensibly serve as a subject for σημαῖνον. Subsequent editors have adopted this emendation.

Feussner also found the manuscript reading σημαῖνόν unacceptable. While Aristoxenus uses the verb σημαίνω in *E.R.* 16 as a technical term for rhythm, he uses it as a general term referring to any object of rhythmic composition, not as a synonym for μιμούμενον or σχηματαποιούμενον referring specifically to dance. Nor do other authors use the word in such a sense. Marquard (1868) proposed σῶμα σῆμα σημαῖνόν, which would relieve the abruptness of σημαῖνόν being used without a direct object. However, even if we take σῆμα as an equivalent to Aristoxenus's term σημεῖον as found at *E.R.* 17-19, this would still be a term used of any object of rhythmic composition, not specifically dance. A further emendation to σῶμα σχῆμα σημαῖνόν would utilize Aristoxenian terminology in a consistent way, but would still fail to address Feussner's third concern, that τὰς λοιπὰς τῶν τοιούτων κινήσεων κινούμενον should be preceded by references to fairly specific types of motion.

To the Platonic parallels cited by Feussner for βαίνω or ἐμβαίνω used specifically of movement in music or to musical accompaniment, which are *Alcibiades* 108A, 108C, *Laws* 670B, can be added the following: Thucydides *Histories* 5.70.1, Aristophanes *Thesmophoriazusae* 956, Aristotle (Fr. 755 Gigon), Menander *Dyskolos* 951, Aristophanes Byzantinus *Historiae Animalium Epitome* 2.90.2, 2.110.6, 2.110.29 (Lampros).[55] These additional citations reinforce

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55 Plato *Alcib*. I.108C, τίς ἡ τέχνη ἧς τὸ κιθαρίζειν καὶ τὸ ᾄδειν καὶ τὸ ἐμβαίνειν ὀρθῶς; 108A πρὸς τῆν ᾠδὴν καὶ βαίνειν; , *Laws* 670B ὅσοι προσᾴδειν αὐτῶν καὶ βαίνειν ἐν ῥυθμῷ γεγόνασι διηωαγκασμένοι. Thucydides *Histories* 5.70.1 καὶ ὑπὸ αὐλητῶν πολλῶν ὁμοῦ ἐγκαθεστώτων, οὐ τοῦ θείου χάριν, ἀλλ' ἵνα ὁμαλῶς μετὰ ῥυθμοῦ βαίνοντες προσ-έλθοιεν καὶ μὴ διασπασθείη αὐτοῖς ἡ τάξις Aristophanes *Thesmophoriazusae* 956-957. χερὶ σύναπτε χέρ', <ἱερᾶς> ῥυθμὸν χορείας (955) ὕπαγε πᾶσα. Βαῖνε καρπαλίμοιν ποδοῖν. (956-957) Menander *Dyskolos* 951. καί τις βραχεῖσα προσπόλων εὐήλικος προσώπου (950) ἄνθος κατεσκιασμένη χορεῖον εἰσέβαινε ῥυθμὸν μετ' αἰσχύνης ὁμοῦ μέλλουσα <καὶ> τρέμουσα

Feussner's contention that ἐμβαίνω used in a musical context emphasized a connotation of marching to music, while ὀρχέομαι connotes more elaborate dance, echoing the progression seen above in φωνὴ... λέγουσά τε καὶ μελῳδοῦσα.

An original manuscript reading σῶμα ἐμβαῖνον could have been changed to σῆμα σημαῖνον in three steps. First, a scribe could have omitted the β. The next scribe, confronted with σῶμα ἐμαίνον would have emended to σῶμα σημαῖνον. The third scribe could have changed σῶμα to σῆμα as a type of dittography.

**ἐν οἷς ὁ μελῳδῶν θήσει τῶν φθόγγων ἕκαστον**

The switch from a hearer's perception to the performer as the agent that puts rhythmic events into time intervals is deliberate. Aristoxenus's point is that a performer's behavior is to be explained as a necessary consequence of the psychological characteristic he has outlined.

The smallest definable unit of melody is the φθόγγος; *E.H.* 1.15 (= 20.17 Da Rios) defines it as φωνῆς πτῶσις ἐπὶ μίαν τάσιν 'the incidence of the voice on one tension pitch'. This definition attributes to the φθόγγος not only pitch,

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(951) Aristotle Fragments 6.33.244. (Rose) Διὰ τί ἐπειδὰν κινδυνεύειν μέλλωσι, πρὸς αὐλὸν ἐμβαίνουσιν; ἵνα τοὺς δειλοὺς ἀσχημονοῦντας γινώσκωσιν. Aristophanes Byzantius *Historiae animalium epitome* 2.90. Εὐμουσίαν δὲ καὶ εὐπείθειαν οἶδε μανθάνειν, χορείαν τε καὶ ὀρχηστικήν, καὶ βαίνειν πρὸς ῥυθμὸν καὶ συνιέναι ἤχων διαφορὰς ἀκριβοῖ ἐλέφας καὶ οὐ σφάλλεται. 2.110.6 χορείαν γὰρ καὶ ὀρχηστικὴν καὶ βαίνειν πρὸς ῥυθμὸν καὶ αὐλουμένους ἀκούειν 2.110.29 φέρειν δὲ καὶ ἤχους ἐμμελεῖς καὶ ποδῶν ἐμβαινόντων ψόφον καὶ ᾠδὴν συμμιγῆ.

indicated by τάσις (literally, tension), but also some minimum perceptible duration, as implied by the phrase μίαν τάσιν.

**καὶ περὶ τῶν ξυλλαβῶν**

In the case of *lexis*, the smallest definable unit, the letter, cannot in all cases be associated with a minimum duration. A mute, ἄφωνον, letter such as γ or δ cannot be pronounced except in combination with another voiced or semi-voiced letter, according to Aristotle *Poetics* 1456b28-31. The syllable is the smallest part of *lexis* that can always be associated with a time interval.

**καὶ περὶ τῶν σημείων**

In the case of dance, Aristoxenus reverts to the smallest part of this object of rhythmic composition. Though Aristides Quintilianus 1.13 (= 32.6 W-I) glossed the σημεῖα of dance as πέρατα, boundaries, as contrasted with σχῆμα, the poses of dance, Aristoxenus's usage need not have had this narrow meaning here. Rather, no sub-distinction of dance σημεῖα analogous to the distinction between voiced and unvoiced letters prevented Aristoxenus from associating the role of perception in forming minimal time intervals with the smallest part of dance as an object of rhythmic composition. Aristoxenus seeks to emphasize the aspects of rhythm that are common to all three of its objects, minimizing the role of the syllable, which would be the proper central focus of metrical study.

**PARAGRAPH 12**

**μηδὲ δύο φθόγγοι δύνανται τεθῆναι, μήτε δυο ξυλλαβαί, μήτε δύο σημεῖα**

The verb δύνανται reiterates Aristoxenus's position that the duration of the primary time interval is based on a limit of perceptual ability. However, Aristoxenus has no clock or even the vocabulary to specify its duration. His strategy seems to ask the reader to perform an imaginary experiment. Suppose I present you a rapid rhythm and ask your assent that its quickest notes are at the limits of perception. You might object that you could still follow a somewhat faster rhythm. I would more easily win your assent that a rhythm twice as fast would exceed your limits of perception.

Neumaier (1989: 41) expresses in mathematical terms the consequences of this statement for the definition of the primary time interval developed in paragraphs 10 and 11, defining the variables g = the duration of the briefest perceptually possible primary time interval, x = any rhythmically acceptable time interval, and n = an integer expressing the number of primary time intervals (as defined for a given actual performance) contained in any rhythmically acceptable duration:

> Ist nämlich g die kleinste Primdauer, so sind Dauern zwischen g und 2g ebenfalls Primdauern...die erkennbare Dauer x muß nämlich für

> irgendeine ganze Zahl n zwischen ng und 2ng liegen, und dann ist der n-te Teil von x eine Primdauer.[56]

This flexibility in the duration of the primary time interval accords with the account from Aristoxenus's *On the Primary Time*, preserved in Porphyry's *Commentary on Ptolemy*. The heart of the matter is expressed as follows:

> καθόλου δὴ νοητέον, ὃς ἂν ληφθῇ τῶν ῥυθμῶν, ὅμοιον εἰπεῖν ὁ τροχαῖος, ἐπὶ τῆσδέ τινος ἀγωγῆς τεθεὶς ἀπείρων ἐκείνων πρώτων ἕνα τινὰ λήψεται εἰς αὑτόν.
> Thus, as a general conclusion, we must suppose that any rhythm we choose to mention, the trochaic for example, when it is to move at a certain *agōgē*, will adopt for itself a particular primary *chronos* out of the infinite number that it is offered.[57]

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[56] Neumaier 1989: 40 reports the experimentally determined minimum for a rhythmic event as 1/10 second = 100 milliseconds (ms). The Grove Encyclopedia of Music 2001 sv. rhythm §1.2 reports that the onset time (beginning) of two sounds must be at least 2ms apart for the sounds be distinctly perceived; a 15-20ms. difference in onset time is required for the listener to be able to determine which sound came first; 50ms is needed to hear one sound follow the other without overlap; and 100ms is needed for reliable judgment of time and for processing in the cerebral cortex to engage a musical or learned understanding of sound. Lester 1986: 74 refers to Glenn Gould playing Bach at the tempo of 84 beats (quarter notes) per minute; Lester characterizes the thirty-second notes, which would average 88ms each, as too fast to be perceived individually. Most modern music relies on longer durations. Handel 1989: 406 cites an "inability to perceive a meter easily outside of onset-to-onset intervals between 200 and 800 msec." That Handel's value for the briefest durations that can build a sense of musical meter or rhythmic hierarchy is about double the widely accepted value for the absolute minimum duration of musical event is intriguing in the light of what Neumaier points out about Aristoxenus's definition of the primary time here. Devine 1994: 94 reports an average of five syllables per second in English. In accordance with this, reciting Homer with short syllables set at 200ms and long syllables at 400ms, for a total of 4.8 seconds per line, seems a natural pace. Setting short syllables at 300ms and long syllables at 600ms, for a total of 7.2 seconds per line, is a deliberate but not plodding pace. Setting short syllables at 150ms. and long syllables at 300ms, for a total of 3.6 seconds per line, is about as fast as possible for recitation. It is extremely difficult to articulate short syllables at 100ms, which is very fast even for instrumental notes. Thus, a rough ratio of 2:1 between the fastest possible and the slowest acceptable value for the primary time interval holds true.

[57] Trans. Pearson 1990: 35.

Aristoxenus goes on in this excerpt to compare the infinite possible variation of the primary time interval with the infinite possible variation of harmonic intervals within the ranges described for each of the harmonic genera. The implication that there is also a range bounding the infinite variation of the primary time interval supports Neumaier's interpretation of this line of *E.R.* This line of *E.R.* also prefigures the distinction between compounded and uncompounded time intervals to be developed in paragraph 13. At the same time, there is a logical sleight-of-hand involved; while Aristoxenus has defined the primary time interval in terms of the limits of perception, he has extended it to include music at tempos that are not near the limits of perception.

**τοῦτον πρῶτον ἐροῦμεν χρόνον**

Aristotle *Physics* 219b7-8 addresses the necessity for a unit by which time can be measured: ὁ δὲ χρόνος ἐστὶ τὸ ἀριθμούμενον καὶ οὐχ ᾧ ἀριθμοῦμεν 'time obviously is what is counted, not that with which we count'. At *Metaphysics* 1020a7-32, a unit of measurement is that which mediates between μέγεθος 'continuous quantity', and ἀριθμός 'number', that is, discrete quantity. At *Metaphysics* 1087b33-36, arguing that the concept of a unit entails the concept of measurement, so that each type of thing to be measured has its own proper unit, Aristotle gives the step (βάσις) and the syllable as examples of units of rhythm:

> τὸ δ' ἓν ὅτι μέτρον σημαίνει, φανερόν. καὶ ἐν παντί ἐστί τι ἕτερον ὑποκείμενον, οἷον ἐν ἁρμονίᾳ δίεσις, ἐν δὲ μέγεθει δάκτυλος ἢ ποὺς ἤ τι τοιοὺτον, ἐν δὲ ῥυθμοῖς βάσις ἢ συλλαβή.
> 'The one' evidently means a measure. And in every case there is some underlying thing with a distinct nature of its own, e.g. in the scale a quarter-tone, in spatial magnitude a finger or a foot or something of the sort, in rhythms a beat or a syllable…[58]

The term βάσις, attested as part of Damon's rhythmic teachings at Plato *Republic* 400b3, would have been used by the theorists who analyzed numerically the qualities of dance, as cited by Plato at *Philebos* 17d4-6. Plato also mentions three genera from which the *baseis* are woven. Plato assumes that this is what everyone knows about rhythm. Along with the ratios of dactylic, iambic, and paionic genera given at Aristotle *Rhetoric* 1409a4-6, this shows that the short and long syllables were associated with the numbers one and two.

Aristoxenus has applied Aristotle's idea of the primary time to rhythmic phenomena in order to give a more logically rigorous and more generally applicable definition of what was already common practice, using the count of syllables as a way to describe rhythm.

**ὃν δὲ τρόπον λήψεται τοῦτον ἡ αἴσθησις, φανερὸν ἔσται ἐπὶ τῶν ποδικῶν σχημάτων**

In this context, σχῆμα cannot be a dance term as at par. 9. At par. 28, Aristoxenus will define σχῆμα as a differentia of rhythmic feet; this definition is

[58] Trans. W. D. Ross in McKeon 1941: 913.

too narrow to be the referent here. Par. 28 presents the differentia σχῆμα as a subdivision of the differentia διαίρεσις 'division' (par. 27); taking διαίρεσις and σχῆμα together gives a sense corresponding to the object of Aristoxenus's metaphor of rhythm as σχῆμα 'shape' in par. 4 and 5.

This is probably a reference to the discussion of the construction of feet of different sizes that begins at par. 31 and is cut off with the end of our fragment at par. 36. Evidence that Aristoxenus's discussion extended to feet larger than those discussed in our fragment is presented in the note to par. 19, where Aristoxenus refers to such large constructions. My translation of ποδικῶν σχημάτων as 'configurations of feet' is meant in reference to these constructions. LSJ sv. σχῆμα 8d gives 'configuration' as a translation, albeit in a different context.

Marius Victorinus 2515 (VI.65 Keil) cites Aristoxenus for a theory of ποδικὰ σχήματα according to which the six feet of a dactylic hexameter can be grouped as six individual feet, three sets of two feet, or two sets of three feet. This is similar to the theory of augmented feet in that it has to do with grouping feet into larger units.

**PARAGRAPH 13**

**ἀσύνθετον χρόνον**

The privative form ἀσύνθετον, uncompounded, introduces with a single word the dichotomy between compounded and uncompounded.[59] This dichotomy was part of Damon's rhythmic theory, as seen at Plato *Republic* 400b.

At *E.R.* par. 22, Aristoxenus will apply the term to rhythmic feet rather than time intervals, giving a different, though related, definition than that developed in this passage. Aristides Quintilianus 1.17 (= 33.7 W-I) gives a definition of the compound and uncompounded time intervals that contradicts that of Aristoxenus, although its own logical consistency is clear. Aristides also offers two different ways the dichotomy of compound and uncompounded can be applied to the foot, as will be discussed in the notes to paragraph 26.

The different uses of the dichotomous pair compound/uncompounded found in Aristoxenus and in subsequent musical writers, demonstrate that they did not seek to achieve a vocabulary of technical terms with fixed, unambiguous definitions. Rather, they used a stereotyped analytical vocabulary, trying to find all of the senses in which a term could be applied to the musical phenomena being investigated. Even within rhythmics, the concept of compounding will

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[59] "Privative" here is intended as the grammatical term alpha privative, as at Smyth (1984) §885, and not in Aristotle's sense of a privative, developed at *Categories* 12a26-41.

have more than one sense; the first developed here at par. 13-15, and the second developed implicitly at par. 16-19 and explicitly identified at par. 24.

**πρὸς τὴν τῆς ῥυθμοποιίας χρῆσιν**

The introduction of the concept of rhythmic composition is a major structural marker of *E.R.* In par. 1-8, Aristoxenus presented philosophical principles related to the study of rhythm; par. 9 specified the phenomena to be studied, and par. 10-12 concerned the perceptual underpinnings of rhythm. The discussion of compounded and uncompounded intervals in par. 14 and 15 will lead into the doctrine of the rhythmic foot in par. 16-19. The discussion or rhythmic feet in par. 19 will refer back to rhythmic and uncompounded time intervals, closing this major section of *E.R.*

The term χρῆσις 'usage' does not indicate that *E.R.* is intended for practical instruction. Aristotle *Nichomachean Ethics* 1098b32 contrasts χρῆσις 'usage' with κτῆσις 'possession'. We will see in Aristoxenus's discussion of rhythmic feet in par. 17-19 that he assumes his readers are familiar with an inherited catalogue of rhythmic feet, about which he makes general observations. A full theory of rhythm must treat not only the principles underlying such a catalogue of feet, but also discuss at least in general terms the manner in which these resources are used.

**οὐ τὸ αὐτὸ ῥυθμοποιία τε καὶ ῥυθμός**

*POxy* 2687 uses the terminology ῥυθμοποιία and ῥυθμός at ii.19-21: ἐπὶ πολὺ δὲ τῆι τοιαύτηι ῥυθμοποιΐαι οὐ πάνυ χρῆται ὁ ῥυθμὸς οὗτος 'this rhythm (sc. ii.3-4 ὁ δάκτυλος ὁ κατὰ ἴαμβον 'the iambic form of dactylic rhythm') will not use such a rhythmic composition as this (sc. a sequence of a triseme long syllable, a short syllable, and a regular diseme long syllable) very much'. This usage is slightly different than that of Aristoxenus in that *rhythmopoiia* here focuses on the rhythmic result rather than the process itself. Nevertheless, it illustrates a rhythmic process applied to a member of a catalogue of rhythms to produce a specific result.

**σαφὲς μὲν οὔπω ῥᾴδιόν ἐστι ποιῆσαι**

In order for the distinction between a catalogue of rhythmic resources and a process of application to hold, the members of the catalogue must be defined in such a way as to admit some possibility of manipulation. We will see that Aristoxenus develops the definition of feet in terms of time intervals, leaving a role for a process of rhythmic composition to determine the actual sequence of rhythmic events.

**ὥσπερ γὰρ ἐν τῇ τοῦ μέλους φύσει τεθεωρήκαμεν**

Aristoxenus's reference is to *E.H.* 2. 38 (= 48.5-8 Da Rios):

> ἐπεὶ γὰρ ἐν τοῖς αὐτοῖς φθόγγοις ἀδιαφόροις οὖσι τὸ καθ' αὑτοὺς πολλαί τε καὶ παντοδαπαὶ μορφαὶ μελῶν γίγνονται, δῆλον ὅτι παρὰ τὴν χρῆσιν τοῦτο γένοιτ' ἄν. καλοῦμεν δὲ τοῦτο μελοποιίαν Since in the same notes, remaining unchanged in and of themselves, many and all sorts of melodies arise, it is clear that this happens by some usage. We call this melodic composition.

The process of composition produces actual individual pieces of work from the musical resources available to the composer. Aristides Quintilianus 1.19 (= 40.10-14 W-I) defines rhythmic composition by dividing it into three parts, just as he had defined melodic composition in 1.12 (= 28.10-29.5 W-I) by dividing it into the same three parts: λῆψις 'choice', χρῆσις 'usage', and μίξις 'mixing'. Only Aristides' category of χρῆσις 'usage' seems to coincide with Aristoxenus's description of rhythmic composition in *E.R.*

**{οὔτε μελοποιΐα}**

Bartels (1854: 9) proposes the emendation μεταβολὴ; he supports this with a parallel list of the parts of Harmonic science "ab omnibus servatus", cf. Cleonides *Introduction to Harmony* 1 (= 179.5-6 Jan) περὶ φθόγγων, περὶ διαστημάτων, περὶ γενῶν, περὶ συστήματος, περὶ τόνου, περὶ μεταβολῆς, περὶ μελοποιΐας 'about notes, intervals, genera, scale, key, modulation, melodic composition'.[60] This is an appealing conjecture, but the absence of this list from *E.H.* argues for caution in taking this as evidence for Aristoxenus' thought.

**περὶ τοὺς ῥυθμούς τε καὶ ῥυθμοποιίας**

The plural form of ῥυθμοποιία is paralleled by a plural form of μελοποιία at *E.H.* 2.31 (= 40.17 Da Rios) πειρώμεθα ποιεῖν τῶν μελοποιϊῶν ἑκάστην 'we aim at the construction of every style of melody'.[61] Aristides Quintilianus chap. 1.12 (= 30.8-14 W.I.) lists the parameters by which different styles of melodic composition differ: genre, scale, tone, *tropos*, and character. Thus, μελοποιία in the plural refers to the associated characteristics of particular styles of music.

Plutarch *On Music* 1141b uses the term ῥυθμοποία of the rhythmic character associated with one type of song, when attributing to Archilochus τὴν τῶν τριμέτρων ῥυθμοποιϊαν 'the rhythmic composition of trimeters'. However, this example refers to the composition of poetic meter, not the rhythmic constructions described in *E.R.* par. 17-19 and *POxy* 2687. A closer parallel to the plural here is actually the usage in *POxy* ii.19 and iv. 9 of the phrase τοιαύτη ῥυθμοποιία 'such a rhythmic composition'; the types of rhythmic composition the author discusses are thus implicitly contrasted with other types, which implies that other sorts do exist. The author of the fragments mentions two other types of rhythmic composition as well: at v. 15, ἡ δύο ἰαμβικοῖς εἰς τὸν

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[60] Trans. Marchetti.
[61] Trans. H. Macran 1902: 188.

πόδα χρωμένη ῥυθμοποιΐα 'the rhythmopoiia using two iambs in the foot' and at v. 25, τὴν δακτυλικὴν ῥυθμοποιΐαν 'the dactylic form of rhythmic composition.'

**PARAGRAPH 14**

**οἷον τόδε τι χρόνου μέγεθος**

As noted by Pearson (1990: 57), τόδε τι is here used in a sense "something particular", as attested at Aristotle *Categories* 8a38. The statement implies that a *megethos* has qualities in and of itself: in paragraphs 31-36, Aristoxenus will develop the idea that the ratios that an interval can accept are qualities of *megethē*. In this vein, Aristotle *Metaphysics* 1020b3-8 attributes certain qualities to numbers besides their quantity, such as existing in one or more than one dimension, i.e. having one or more prime factors.

**ὑπὸ μιᾶς...καταληφθῇ**

Aristides Quintilianus 1.14 (= 32.25-27 W-I) offers a definition of a compound time interval as one containing more than one primary time. This definition is the simplest way to apply the concept of compound and uncompounded to the concept of time intervals.

Aristoxenus's definition describes time intervals not by their size, but by the way they are filled. This is a more productive application of the dichotomy compound/uncompounded to time intervals; by Aristides Quintilianus's definition, the uncompounded time interval is nothing more than the primary time interval, while all other time intervals are always compounded. For Aristoxenus, referring to the uncompounded intervals of a piece of music would become a general way of referring to its actual rhythmic events.

**ὑπὸ πλεόνων…καταληφθῇ**

In par. 12, the definition of the primary time as that in which more than one syllable, note, or step cannot possibly be placed implied the possibility that for other time intervals, either one or more notes could be placed. Aristoxenus now makes that explicit.

**παράδειγμα ἐκ τῆς περὶ τὸ ἡρμοσμένον πραγματείας**

Cleonides *Introduction to Harmony* 5 (= 188.10-189.1 Jan) explains how the same interval can be composite and non-composite in harmonic theory.

> ἔστι δέ τινα κοινὰ συνθέτου διαστήματα, τὰ ἀπὸ ἡμιτονίου μέχρι διτόνου. τὸ μὲν γὰρ ἡμιτόνιον ἐστιν ἐν ἁρμονίᾳ σύνθετον, ἐν δὲ χρώματι καὶ διατόνῳ ἀσύνθετον· ὁ τόνος ἐν μὲν χρώματι σύνθετος, ἐν δὲ διατόνῳ ἀσύνθετος. τὸ τριημιτόνιον ἐν μὲν χρώματι ἀσύνθετον, ἐν δὲ διατόνῳ σύνθετον. τὸ δίτονον ἐν μὲν ἁρμονίᾳ ἀσύνθετον, ἐν δὲ χρώματι καὶ διατόνῳ σύνθετον. τὰ δὲ ἐλάττω τοῦ ἡμιτονίου πάντα ἐστὶν ἀσύνθετα, ὁμοίως δὲ καὶ τὰ μείζω τοῦ διτόνου πάντα σύνθετα.
> There are some intervals that are common as regards compounding, between the semitone and the ditone. For the semitone is compound in the harmonic genus, but uncompounded in the chromatic and diatonic. The tone is compound in the chromatic, but in the diatonic uncompounded. The tone-and-a-half is uncompounded in the chromatic,

> but compounded in the diatonic. All intervals smaller than the semitone are uncompounded; likewise, all larger than the ditone are compounded.[62]

**ἡ μὲν ἁρμονία σύνθετον, τὸ δὲ χρῶμα ἀσύνθετον**

The semitone is compound in the enharmonic genus, where the *puknon* section of the tetrachord (the lower part of the tetrachord in Aristoxenus's presentation) contains two quarter-tone intervals. In the chromatic genus, each interval of the *puknon* section of the tetrachord is a semitone, which makes the semitone an uncompounded interval.

**τὸ διάτονον ἀσύνθετον, τὸ δὲ χρῶμα σύνθετον**

The ditone is uncompounded in the enharmonic genus because it represents the span from the second interval of the *puknon* to the concord of the fourth; it is compounded in the chromatic genus because it includes both the second interval of the *puknon* and the interval remaining to the concord of the fourth.

**οὐ μέντοι ἐν τῷ αὐτῷ τόπῳ τοῦ συστήματος**

Ancient Greek music theory recognized two ways in which tetrachords could be combined in larger scales. Often, the highest note of a lower tetrachord served also as the lowest note of the next higher tetrachord. When a tone separated the highest note of a lower tetrachord from the lowest note of the next higher tetrachord, the scale was called διεζευγμένον 'gapped'. In a gapped

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[62] Trans. Marchetti.

chromatic scale, the tone between the tetrachords would be uncompounded, while the two semitone intervals of the *puknon* would span a compounded tone.

**διαφέρει γὰρ τὸ παράδειγμα τοῦ προβλήματος**

In musical practice, a compound interval occurred when a composer took the notes of a scale out of order; skipping a note or notes in the scale would produce a compound interval. In melodic theory, an interval is classified as compound or uncompounded with reference to the formula of the scale in question. Aristoxenus has been developing the idea of the same size of interval being compounded or uncompounded, which has in turn drawn his focus to the theoretical rather than the practical use of the dichotomy.

**ὑπὸ τῆς ῥυθμοποιίας ἀσύνθετον τε καὶ σύνθετον γίνεσθαι**

In rhythm, the distinction between compound and uncompounded intervals is used in reference to the characteristics of individual compositions, rather than the definitions of items in a catalogue of rhythmic types.

**PARAGRAPH 15**

**πὴ δὲ σύνθετος καί πη ἀσύνθετος**

The concept of partially compounded and partially uncompounded times allows an analysis of divergence between the rhythm of diction and rhythm of melody. Aristophanes *Frogs* 1349 and 1390 εἰειειειειειλίσσετε provides an example of a syllable being prolonged over many sung notes. Single syllables set to more than one melodic note are seen also in musical papyri; the earliest example is *DAGM* 3, a third-century B.C. text with musical notation of Euripides *Orestes* 338-44. Divergence between the rhythms of the words and the melody or dance is criticized at Plato *Laws* 812d. Such divergence is often considered characteristic of the New Music of the late fifth century (West 1992a; Visconti 1999).

**PARAGRAPH 16**

**Ὧι δὲ σημαινόμεθα τὸν ῥυθμὸν**

This phraseology echoes and expands that given by Aristoxenus at *E.H.* 2.34 (= 43.8-44.2 Da Rios) οἱ δὲ πόδες οἷς σημαινόμεθα τοὺς ῥυθμοὺς....'the feet by which we mark the rhythm'. The fact that Aristoxenus used this phraseology in the *Harmonics* suggests that he considered it a standard definition that would be clear to his audience.

The verb σημαίνω has the same root as the noun σημασία, used in par. 31 without a definition but in a context which allows us to make some conclusions about its meaning. There, Aristoxenus rejects the diseme foot on the grounds that it would incorporate παντελῶς...πυκνὴν σημασίαν 'altogether dense marking'. The meaning of this phrase can be deduced by considering a sequence of short rhythmic events. Since Aristoxenus has rejected the diseme foot but will accept the tetraseme foot at par. 32, he would interpret a sequence of four short rhythmic events as one tetraseme foot rather than as two diseme feet. However, he does not say it is inconceivable for short rhythmic events to be grouped by pairs into diseme feet, but that it would involve πυκνὴν σημασίαν 'dense marking'. In general, then, *sēmasia* refers to a means to guide the listener's grouping of rhythmic events. *Sēmasia* is independent of changes in the duration of rhythmic events involved, since a sequence of all shorts (as in this example) does not utilize the long-short distinction of ancient Greek quantitative poetic meter.

Aristides Quintilianus 1.16 (= 37.3 W-I) also uses the noun σημασία in a context that refers to a quality of rhythm separable from the distinction between long and short syllables.

Thus, σημαινόμεθα here refers to external articulation, where "external" is used in Setti's sense of external *ictus* (1963: 145). In the terms used by Devine (1994: 100), it would be a "non-linguistic" principle or resource of rhythm. Since this articulation is external to the poetic meter of a song, Aristoxenus's investigation of it entails a distinction of the science of musical rhythm from the science of poetic meter.

Feussner argued that σημαίνω meant the same as the German **taktiren** in the music theory of his time, such as described in J. G. Sulzer's *Allgemeine Theorie der schönen Künst* (1794). However, the a priori grounds for such application to ancient Greek theory of the concept of ictus or musical stress as in 19th century musical theory, have been undermined by ethnomusicological studies (Sachs 1953).[63] Nevertheless, the text of *E.R.* does describe a rhythmic system that is similar to 19th century musical theory in its isochronous, hierarchical structure. There are various means in modern music by which rhythmic structures can be expressed; see Cooper-Meyer (1964) and Handel (1989). Furthermore, it is not necessary that ancient Greeks used the same acoustic parameters or resources in the same way that modern Western music does. The verb **σημαίνω** refers to some external articulation analogous to modern musical stress in that it indicates hierarchy in an isochronous rhythmic structure.

Dance steps can also fulfill this role for notes of a melody or syllables of a song, when groups of notes or syllables coincide with single dance steps. Movements of the extremities are most likely to correspond to short rhythmic events, while steps that involve shifting the body weight could group short rhythmic events into feet. Dance movements that involve rotating the torso or

[63] Sachs 1953: 90-95 contrasts the additive rhythms of Near Eastern and Middle Eastern rhythms with the divisive rhythms of Western European music, finding (p. 131) that at least some of Ancient Greek Music followed the principles of additive rhythm.

moving from one place to another could combine these dance steps into larger rhythmic hierarchies. By such an interpretation, the πύνκην σημασίαν 'dense marking' Aristoxenus cites at *E.R.* 31 for his rejection of the diseme foot would refer to steps so fast that, for him, they crossed an aesthetic line from dance into exercise.

**καὶ γνώριμον ποιοῦμεν τῇ αἰσθήσει,**

The word γνώριμος here cannot mean the same thing it does elsewhere in *E.R.* At par. 8, γνώριμος referrred to familiar branches of study. At par. 6, objects of rhythmic composition are required to have parts that are recognizable to perception and do not need to be made recognizable. In paragraphs 21 and 22, where γνώριμος ratios are distinguished from those between them, a ratio that is not γνώριμος could not be made so. This usage is parallel to that at *E.H.* 1.19 (= 20.1 Da Rios) γνωρίμων διαστημάτων 'recognizable intervals' and 2.50 (=62.17 Da Rios) γνώριμα...μεγέθη διαστήματων 'recognizable sizes of intervals'.

The closest parallel to the usage here of γνώριμος is at *E.H.* 2.40 (= 50.18 Da Rios), where Aristoxenus criticizes theorists who sought only to develop a harmonic notation based on the sizes of musical intervals. He says that musical phenomena such as the functions of tetrachords or intervals, the differences in harmonic genera, the differences between compound and uncompounded intervals, the difference between simple melody and melody incorporating modulation, or the differences between styles of melodic composition, cannot become recognizable, γνώριμος, through the sizes of intervals alone.[64] The point of comparison is in the application of the term γνώριμος to complex musical phenomena, rather than to the simpler components. At *E.H.* 1.19 (= 20.1 Da Rios) and 2.50 (=62.17 Da Rios), cited above, Aristoxenus described intervals or sizes of intervals as γνώριμος; however, it is by conceptualizing these intervals as δυνάμεις 'functions' that one can extend theory to explain the more complex phenomena. Analogously, a concept of musical function is latent in Aristoxenus's use of the word γνώριμος here; Aristoxenus will explicitly mention the δύναμις of the rhythmic foot at paragraph 19.

Gibson (2005: 95) argues that Aristoxenus does not make as much use of the concept of *aesthsis* in *E.R.* as he had in *E.H.* She points out that there is no extant passage in *E.R.* contrasting perception to pure reason that is analogous to the demonstration in *E.H.* that the interval of a fourth is equal to two and one-half tones. However, in developing his concept of musical δύναμις 'function', Aristoxenus *E.H.* 2.41 (= 51.6-52.5 Da Rios) refers to a psychological process of

[64] *E.H.* 2.40 (= 50.12-18 Da Rios) οὔτε γὰρ τὰς τῶν τετραχόρδων οὔτε τὰς τῶν φθόγγων δυνάμεις οὔτε τὰς τῶν γενῶν διαφορὰς οὔτε, ἁπλῶς εἰπεῖν, τὰς τῶν συνθέτων καὶ τὰς τῶν ἀσυνθέτων διαφορὰς οὔτε τὸ ἁπλοῦν καὶ μεταβολὴν ἔχον οὔτε τοὺς μελοποιϊῶν τρόπους οὔτ' ἄλλο οὐδέν, ὡσαύτως εἰπεῖν, δι' αὐτῶν τῶν μεγεθῶν γίγνεται γνώριμον. 'For neither the functions of the tetrachords nor of the notes, nor the distinctions between the genera, nor, to speak frankly, the distinctions between the compound and the uncompounded, between the plain and that which uses modulation, nor the styles of melodic composition nor anything else at all becomes recognizable through the magnitudes themselves'. Trans. Marchetti.

ξύνεσις 'musical intuition'.[65] At *E.H.* 2.33 (= 42.11-12 Da Rios) Aristoxenus attributes the understanding of music to a combination of ἀκοή 'hearing', which determines the sizes of intervals, and διάνοια 'intellect', which recognizes their δυνάμεις. At *E.H.* 2.47 (= 59.9 Da Rios), Aristoxenus associates the function of a note with its named role in a tetrachord, e.g. *nētē*, *mesē*, *paranētē*, *lichanos*. At *E.H.* 2.49 (= 62.1 Da Rios), αἴσθησις 'perception' determines the names of notes of a tetrachord, hence their functions. Therefore, αἴσθησις here incorporates the psychological function Aristoxenus had analyzed into hearing and intellect at *E.H.* 2.33.

Aristoxenus's reference to the δύναμις of a foot at *E.R.* 19 provides further support for the idea that Aristoxenus intends αἴσθησις here in *E.R.* as a psychological function including διάνοια or ξύνεσις. Also, at *E.H.* 2.34 (= 43.19-44.3 Da Rios) Aristoxenus mentions rhythmic feet and the variations possible in a given duration of time as an illustration of what he means by a musical function. Finally, Aristoxenus's rejection of the epitrite ratio at *E.R.* 35 also entails that ratio alone cannot explain rhythm, since the epitrite ratio was included in the ratio theory of harmonics. The rhythmic genera Aristoxenus accepts are named according to their ratios, but for Aristoxenus what is essential is that perception recognizes them as musical functions; conversely, the epitrite foot is not

[65] Levin 1972 and Pereira 1995 interpret Aristoxenus's notion of musical ξύνεσις as analogous to Chomsky's concept of linguistic competence.

recognized as a function, despite being described as a ratio. The explanation of rhythmic phenomena is not in ratio, but in musical function.

**πούς ἐστιν**

Paragraphs 13-15 dealt with rhythmic events as substance; acoustic qualities that are processed as "substance" would include duration and our perception of the rhythmic event as a voice, a musical instrument, or a dance move. The discourse on the foot will be concerned with how rhythmic events can take on form. Rhythmic events are perceptually grouped in ways that embody rhythmic ratios and instantiate the shape metaphor of rhythm given in *E.R.* 4-6.

However, Aristoxenus does not identify specific feet with specific sequences of rhythmic events in what we have of *E.R.*; he deliberately avoids or at least postpones the kind of catalogue as is found in Aristides Quintilianus, Hephaestion, and, prior to Aristoxenus, in Aristotle's *Rhetoric* (albeit the term rhythm is used there instead of foot.)

The word foot as a rhythmic term is found twice prior to Aristoxenus, in Aristophanes *Frogs* and Plato's *Republic* 399e-400d. The term foot is used of analyzing the text of a choral lyric in Aristophanes *Frogs* 1323: after reciting a Euripidean lyric passage, the character of Aeschylus says "ὁρᾷς τὸν πόδα τοῦτον; do you see this foot?" This could be a reference to a dance step performed by an actor (cf. the ancient scholia), but modern scholars including Wilamowitz (1921: 246) and Palmieri (1987: 50) have agreed that πούς refers to the previous verse, a glyconic, or to a part of it.[66]

At *Republic* 400c, Plato attests that the terms πούς 'foot' and ἀγωγή 'tempo' were both part of Damon's rhythmic theory, but Plato does not expand upon Damon's meaning.[67] At *Republic* 399e-400a, Plato says:

> ἑπόμενον γὰρ δὴ ταῖς ἁρμονίαις ἂν ἡμῖν εἴη τὸ περὶ ῥυθμούς, μὴ ποικίλους αὐτοὺς διώκειν μηδὲ παντοδαπὰς βάσεις, ἀλλὰ βίου ῥυθμοὺς ἰδεῖν κοσμίου τε καὶ ἀνδρείου τίνες εἰσίν· οὓς ἰδόντα τὸν πόδα τῷ τοῦ τοιούτου λόγῳ ἀναγκάζειν ἕπεσθαι καὶ τὸ μέλος, ἀλλὰ μὴ λόγον ποδί τε καὶ μέλει.
> Upon the musical modes are to follow for us the rhythms; we should not pursue their complexity and the great diversity of their basic modes but we should observe what the rhythms are of a life that is well-ordered and brave. After having observed these, we should require the musical foot and the mode to conform to the speech of such a man but not the speech to the foot and the mode.[68]

Visconti (1999: 113) interprets this statement as a complaint against the rhythms of the New Music of the late fifth century. He takes λόγος here as "le parole", the words of poem with their poetic or metrical structure, while τὸν πόδα 'the foot' refers to musical rhythm. According to this interpretation, Plato

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[66] A discussion with bibliography can be found in Palmieri 1987: 50n46. A glyconic normally begins with a two-syllable base: the customary formula is xx ¯ ˘ ˘ ¯ ˘ ¯. The last verse of the Euripidean quote has an anapest in the place of the base. This is an unusual construction, but is attested elsewhere in Euripides. The peculiarity is not with the anapestic foot per se, but with its usage in the context of a glyconic colon.
[67] Palmieri 1987: 51-52 discusses and gives bibliography for different interpretations given to this passage. While the passage suggests that ἀγωγή meant more than simply 'tempo' for Damon, it does not provide enough information to base a firm conclusion.
[68] Trans. M.G.J. Beets 2002: I.173.

wants musical rhythm to follow the traditional durations of the poetic text, while the New Music distorts these durations, making the words follow the feet of musical rhythm. However, Beets (2002: I.172-174) points out that Plato is not overly concerned with technical matters in this passage; λόγος in this passage, which he translates as 'speech', stands for the ethical qualities of a virtuous man, which the rhythm of music should follow. Such an interpretation is more consistent with Plato's reference at *Republic* 397b to πρέπουσαν ἁρμονίαν καὶ ῥυθμὸν τῇ λέξει 'harmony and rhythm appropriate to such a style (of narration)' and with his statement at 398d that τήν γε ἁρμονίαν καὶ ῥυθμὸν ἀκολουθεῖν δεῖ τῷ λόγῳ 'the harmony and the rhythm should follow the speech'. In the context leading up to 397b, Plato has used the term λέξις as 'style of narration', contrasting the imitative with the narrative style, without technical reference to poetic meter; the poetic meter given a poem would be its rhythm in Plato's sense. That λόγος at 398d9 is intended in reference to the moral character of a lyric poem rather than its precise poetic meter is established at 398d5, where the λόγος of good lyric poetry is said not to differ from the λόγος of good narrative poetry.

Nevertheless, the subsequent development of *E.R.* will confirm that Aristoxenus conceives of the rhythmic foot as something analogous to a measure of modern music.

**εἷς ἢ πλείους ἕνος**

The meaning of this phrase depends upon the definition of foot used, with the result that interpreting this phrase is an exercise in the logical consequences of different approaches to the rhythmic foot. It also provides a demonstration of how different interpretations can be supported by adducing different aspects of Greek music as examples or illustrations.

Feussner (1840: 16), translates πούς here is as 'Taktabschnitt', meaning one cycle of a beat with its associated offbeat. He translates ἢ πλείους ἕνος as 'oder zu mehreren gruppirt', a foreshadowing reference to rhythms that coordinate beats or measures into larger hierarchical structures, such as are described in *E.R.* 17-19 and identified as compound feet at *E.R.* 25.

Westphal (1883) accepted the premise that classical poetry was set to stress-accented isochronous, hierarchical rhythm. For him, a foot was a sequence of syllables that would be manipulated according to codifiable rules to fit an isochronous rhythm. He denied that the phrase εἷς ἤ πλείους ἕνος here referred to such compound feet such as Feussner had identified. Westphal interpreted this phrase as an exception to what was for him a general principle of syllable manipulation, an exception that would allow certain asymmetrical poetic cola, such as the anaclastic (Gk. ἀνακλώμενον) form of the Anacreontic verse, ˘ ˘ ¯ ˘ ¯ ˘ ¯ ¯ to be performed without the syllable duration manipulation that his theory would otherwise mandate.   This interpretation allows Westphal to avert the contradiction that his theory would otherwise generate between the anaclastic form of the Anacreontic colon and its ionic dimeter variant ˘ ˘ ¯ ¯ ˘ ˘ ¯ ¯.   Pearson (1990: 59) accepts Westphal's interpretation.

Goodell (1905: 134) interprets this phrase as a broader exception to the isochronous hierarchical rhythm to be described in *E.R.* 17-19.  For Goodell, the rhythms which are marked by more than one foot are all kinds of anisochronous rhythms as occur in classical lyric according to the principle that a long syllable is always twice a short syllable.  Thus, he takes this phrase as a loophole through which Aristoxenus intends to introduce what I would argue was treated by Aristoxenus as the province of *metrikē* rather than rhythm.

Baumgart (1869: ix), whose theme was Aristoxenus's empiricism, argued that this phrase refers to a perceptual requirement that a foot be repeated in order for a listener to firmly grasp and identify a rhythm.  However, if the phrase has this meaning, it is an observation left undeveloped by Aristoxenus.

Feussner's identification of this phrase with the compound foot developed in *E.R.* 17-19 is the position most consistent with the subsequent development of *E.R.*, and gives the most coherent interpretation of our fragment.  Bartels (1854: 39-41) recognizes this, but goes on (p. 43) to distinguish this type of rhythmic construction from the repetition of metrical feet in Greek poetry.  Weil (1855) accepted the idea that this line connects to Aristides Quintilianus's sense of compound feet, and thus accepted Feussner's line of thought. Brill (1870: 75) also affirms this interpretation. However, as mentioned in my note on **σημαίνω** in par. 16, it is not necessary to follow Feussner and others in assuming that the ancient Greeks used the same acoustical means as modern musicians to produce the psychological effect of rhythmic hierarchy. Nor need we assume with them that the fragment we have of *E.R.* covers the gamut of ancient Greek rhythms that existed or that Aristoxenus treated in *E.R.* as a whole.

**PARAGRAPH 17**

**δύο χρόνων**

Boeckh (1811) took the term χρόνος here as a primary time interval, so that two time intervals refers to a diseme foot. Other proponents of this interpretation include Hoffmann (1835), Vincent (1847), Baumgart (1869), Del Grande (1960), Palmieri (1987), and Luque-Moreno (1994).

However, Feussner (1840) demonstrated that the characterization of the foot in paragraphs 18 and 19 and Aristoxenus's rejection of the diseme foot at par. 31 (see below) entail that this phrase cannot refer to diseme feet. Instead, the time intervals mentioned here are of unspecified duration (except that one of the intervals must be at least a diseme, giving a triseme as the smallest foot, as specified at *E.R.* 31). The time intervals mentioned here may be uncompounded or compounded in the sense described in *E.R.* 13-15. This interpretation, which has been accepted by Bartels (1854), Weil (1855), Caesar (1861), Westphal (1861 and 1883), and Pearson (1990), yields the more internally consistent reading of our fragment of *E.R.*

**τοῦ τε ἄνω καὶ τοῦ κάτω**

Aristoxenus has prepared for this by the metaphor of shape; see para. 28 for the assignment of *arsis* and *thesis* as the distinction of σχῆμα.

Aristoxenus will use the terminology ἄρσις and βάσις in par. 20, where he mixes the terminology ἄνω / κάτω with ἄρσις / βάσις, without drawing any technical distinction between the two pairs. Aristoxenus intends τὸ ἄνω/ τὸ κάτω as synonyms for his ἄρσις/βάσις or the ἄρσις/θέσις distinction found in other texts, contrary to the arguments of Del Grande (1960: 221, 227-228), accepted by Luque-Moreno (1994: 14-17, 142-146).[69]

In par. 20, Aristoxenus describes the *arsis* and *thesis* of the feet he is there concerned with, irrational feet, in terms of their duration. Since duration is measured in terms of the primary time interval, he is in effect defining *arsis* and *thesis* by their relative durations. In par. 31-36, where Aristoxenus will discuss the ratios embodied in feet of different sizes. Such a ratio exists between the *arsis*

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[69] The case against Del Grande's arguments will be given in the notes to the next lemma οἱ μὲν ἐκ τριῶν....

and *thesis* of each foot, though the terms *arsis* and *thesis* don't appear in the passage. As will be seen in par. 19, Aristoxenus has in mind the possibility at least of feet composed entirely of short rhythmic events, even feet composed of eight, twelve, sixteen or more shorts.

In light of this possibility, Aristoxenus's references to σημαίνω in par. 16 and σημασία in par. 31 raise questions unanswered in *E.R.* *E.R.* does not describe how listeners tell when each *arsis* or *thesis* begins and ends, nor how listeners identify their value as *arsis* or *thesis*. While Aristoxenus's use of the terms σημαίνω and σημασία probably refer to some acoustic means by which these relationships were expressed, and possibly refer to the use of dance steps to group notes of melody or syllables of song, he is interested primarily in the structural purpose of the parts of the foot.

With the meaning of *arsis* and *thesis* having been established, as far as possible, from evidence within *E.R.*, parallel passages from other ancient sources cited by modern scholars as evidence for the meanings of *arsis* and *thesis* can be reevaluated.

Aristides gives a definition of arsis and thesis according to bodily motion at 1.13 (= 31.15-16 W-I): ἄρσις μὲν οὖν ἐστι φορὰ μέρους σώματος ἐπὶ τὸ ἄνω, θέσις δὲ ἐπὶ τὸ κάτω ταὐτοῦ μέρους. 'Arsis is the upwards movement of a part of the body, thesis the downwards movement of the same part.'[70] Luque-Moreno (1994: 104) sees this as a remnant of the oldest phase of rhythmic theory. Reinach (1926: 78) raised the possibility that in classical times, an *aulētēs* leading a chorus may have used some type of noisemaker on the foot to audibly mark time by this motion.[71] Luque-Moreno (1994: 106) accepts this possibility as the basis for a separate phase in the historical development of the meaning of the term.

Some citations in Aristides Quintilianus use *arsis* and *thesis* in the same way *E.R.* uses *arsis/ano* and *basis/kato*; that is, as the parts of a rhythmic foot that exhibit a ratio but without any further information on how *arsis* and *thesis* are distinguished. *Aristides Quintilianus* 1.19 (= 39.26-29 W-I) refers to the ratio of the *arsis* and *thesis* staying the same at different speeds, as *E.R.* 23 and 24 separate the ratio embodied in a foot from its duration or rate of performance. In a broadly philosophical passage in Book 3 listing ways the concept of *logos* applies to music, Aristides Quintilianus 3.23 (= 125.18-20 W-I) defines rhythmic *logos* as the ratio of the *arsis* to the *thesis*.

Two citations from Aristides Quintilianus have been cited as evidence for stress accent in ancient Greek poetry, with Aristoxenus's references to *arsis* and *thesis* adduced as proof that this reached back to an authentic tradition. The first makes explicit that the distinction between *arsis* and *thesis* has to do with an

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[70] Trans. A. Barker 1989a: ii.434.
[71] Accepted by Luque-Moreno 1993: 53n160.

acoustic property separate from the time intervals that make up the foot (1.13 = 31.9-10 W-I):

> ῥυθμὸς τοίνυν ἐστὶ σύστημα ἐκ χρόνων κατά τινα τάξιν συγκειμένων· καὶ τὰ τούτων [χρόνων] πάθη καλοῦμεν ἄρσιν καὶ θέσιν, ψόφον καὶ ἠρεμίαν.
> Rhythm, then, is a *systēma* of durations put together in some kind of order. The modifications of these durations we call *arsis* and *thesis*, and sound and silence.[72]

Feussner (1837: 15), Vincent (1847: 199), and Rossbach-Westphal (1854: 25) argued that this statement refers to dynamic accent. The ψόφος would be the extra volume or intensity given the marked element, ἠρεμία would be the absence of this acoustic marking. The word order of the text, which apparently links ψόφος with ἄρσις, for θέσις, would reflect either a chiasmus or an erroneous reversal.

Not all scholars have accepted this interpretation. Caesar (1861: 64-5) argued that the *arsis* is the ψόφος, the initiation of a rhythmic foot, while the *thesis* is the ἠρεμία, in the sense of the goal or completion of the foot. One weakness of this argument is that it relies on *arsis* being the first part of the foot, which, as Caesar admits, is not always the way the terminology is used. Also, another citation, Aristides Quintilianus 3.25 (= 130.17-18 W-I), militates against taking *thesis* as the settling down or completion of a foot:

[72] Trans. A. Barker 1989a: ii.434.

> καὶ μὴν καὶ τῶν ῥυθμῶν, ὧν ἐν ἄρσει καὶ θέσει τὴν ὑπόστασιν ἴσμεν, ἡ μὲν θέσις γένεσιν τὴν τῶν καθ' ἕκαστον, ἡ δὲ ἄρσις τὴν φθορὰν δηλοῖ...
> In the case of rhythms, whose constitution we identify in their *arsis* and *thesis*, the *thesis* exhibits the generation of particular things, the *arsis* their destruction.

Palmieri (1987: 84-85) argues that Aristides Quintilianus's reference to ψόφος and ἠρεμία at 1.13 (= 31.9-10 W-I) distinguishes *arsis* and *thesis* according to pitch differentiation, in regard to music and poetry. He draws a parallel between ἠρεμία here and in Aristoxenus's definition of musical pitch at *E.H.* 1.13 (= 18.2 Da Rios), where ἠρεμία referred to constancy or lack of change in pitch. Palmieri then identifies ψόφος with a change in pitch, and, given the connotation of the term *arsis*, specifically with the rising of the voice. However, Palmieri's discussion of this passage becomes confused when he goes on to cite Psellus 6 (= 22.6-19 Pearson) to confirm that the term ἠρεμία can be used of part of rhythmic foot. In this passage from Psellus, both *arsis* and *thesis* are musical events of recognizable duration, as opposed to the imperceptibly fast changes between recognizable musical events, and so both *arsis* and *thesis* would be characterized by Psellus's sense of ἠρεμία.

Palmieri adduces this passage as support for his theory that the distinction between *arsis* and *thesis* was a difference of pitch, and for the proposed supplementation of the text of *Fragmenta Parisina* (Palmieri 1987: 74-77) he offers as his primary evidence. Palmieri's goal is to identify the distinction between *arsis* and *thesis* with a phonetic quality of the ancient Greek language, pitch accentuation, as opposed to stress or dynamic accent, which did not play a phonetic role in ancient Greek. However, Palmieri does not mean that the *arsis* and *thesis* were distinguished by the pitch accents of the words in poetry. Ancient Greek poetry does not exhibit such a patterning of accents. Wahlstrom (1970: 12-22) found that the location of word accents in selected strophic poems was not random, but rather patterned in such a way as to make possible a single melodic line that would generally accord with the accentuation of words. However, these tendencies in the location of accents varied from poem to poem and even from line to line within a strophe, contradicting any association of accent with *arsis* and *thesis*.

Instead, Palmieri (1987: 78) posits that the distinction between *arsis* and *thesis* is a pitch difference analogous to the system of Greek pitch accentuation: "Analoga, se non uguale elevazione tonale...doveva comportarse l'arsi di ogni piede rispetto alla tesi." This qualification undermines Palmieri's attempt to find a distinction between *arsis* and *thesis* internal or inherent in the Greek language, because even though a parameter, pitch, of the Greek phonetic system is being utilized, it has been subjected to other principles, unnamed by Palmieri, that govern the "analogy". Thus, pitch as the distinction between *arsis* and *thesis* is still functionally external to language. Finally, Palmieri's attempts to reconcile many different ancient accounts of the terms *arsis* and *thesis* lead him to conclude (1987: 87-91) that the term *thesis* would indicate the "forte" 'marked' part of a rhythmic foot when applied to dance but the unmarked part of a foot when applied to music or poetry, and that Greek usage accepted both possibilities simultaneously. This implies that for a given song accompanied by dance, the analysis of the rhythm in terms of dance would be the inverse of the analysis of the same rhythm in terms of its melody or verbal rhythm. Such a double analysis is very improbable for Aristoxenus. While the meanings of Aristoxenus's technical terms do vary with their application to musical phenomena, they do not vary so as to embrace contrary or contradictory definitions when applied to different phenomena. Because Aristoxenus is focused on the formal, structural properties of the foot, the double signification posited by Palmieri would thwart rather than promote his purposes.

Aristides Quintilianus 2.15 (= 82.4-6 W-I) provides another often-cited reference to an acoustic distinction between *arsis* and *thesis*:

> τῶν δὲ ῥυθμῶν ἡσυχαίτεροι μὲν οἱ ἀπὸ θέσεων προκαταστέλλοντες τὴν διανοῖαν, οἱ δ' ἀπὸ ἄρσεων τῇ φωνῇ τὴν κροῦσιν ἐπιφέροντες τεταραγμένοι
> Of the rhythms, those that give an initial calm to the mind by beginning from the thesis are more peaceful: those that transmit the beat [*krousis*] to the voice by beginning from the arsis are restless.[73]

[73] Trans. A. Barker 1989a: ii.484.

This is an observation similar to that underlying our modern use of the term "falling" to describe rhythms that start with a downbeat and "rising" for rhythms that start with the upbeat. The term κροῦσιν here is apparently a reference to dynamic stress distinguishing *thesis* from *arsis*, although Setti (1965: 391n10 and 1963: 148n3) has tried to argue it that refers to perceived subjective *ictus* arising from regularities in the poetic meter. However, there is no other ancient parallel for an awareness of the phenomenon of subjective stress described in modern psychological studies of rhythm.[74] It is more methodologically conservative to interpret κροῦσις as a heard impact or sound, and limit the application of this statement to music for which there is independent evidence for the presence or possibility of such acoustic differentiation. One possibility is that this statement stems from the rhythmic school that mixed rhythm and meter, and was motivated by the contrast between lyric anapests, beginning from the *arsis*, and the dactylic hexameter, beginning from the *thesis*. The close association of anapests with marching serves as evidence for an association of this type of poetry with the added impact or sound of marching feet.

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[74] Though he does not cite this passage, Luque-Moreno 1994: 101 also makes the case that the poetic meters could give rise to a distinction between marked and unmarked segments because of their nature as patterned sequences.

In his wide-ranging account of the development of the terms *arsis* and *thesis* in the ancient Greek and Latin sources, Luque-Moreno (1994: 137, 146-52) traces how closely different sections of Aristides Quintilianus's discussion of rhythm reflect Aristoxenus's methods and conclusions. This discussion is augmented in his subsequent study (1995) of the development of the concept of the rhythmic foot. Luque-Moreno (1995: 46-7) rightly cites Aristides' iambic dactyl (1.17 = 38.5 W-I) as differing from Aristoxenus's methods, in that it describes a foot by its precise sequence of rhythmic events. Luque-Moreno attributes the passage of Aristides Quintilianus to later scholars, the school Aristides identifies as the συμπλέκοντες, who mix rhythmic and metrical theory. However, Luque-Moreno (1995: 41-42) does not distinguish these feet from others in Aristides' catalogue, the double spondee (1.15 = 35.12-13 W-I), the orthios (1.16 = 36.3-4 W-I), and the marked trochee (1.16 = 36.4-6 W-I), which are defined in terms of the durations of their respective *arses* and *theses.* These feet are constructed in a way consistent with the methods of *E.R.* We will see as Aristoxenus's discussion of the rhythmic foot continues through paragraph 19 that these feet can serve as salient illustrations of the points Aristoxenus raises.

**οἱ δὲ ἐκ τριῶν, δύο μὲν τῶν ἄνω, ἑνὸς δὲ τοῦ κάτω ἢ ἐξ ἑνὸς μὲν τοῦ ἄνω, δύο δὲ τῶν κάτω <οἱ δὲ ἐκ τεττάρων, δύο μὲν τῶν ἄνω, δύο δὲ τῶν κάτω>**

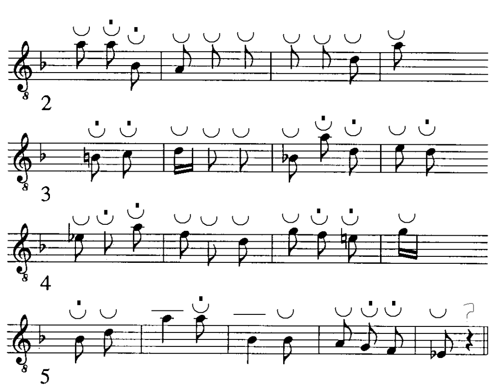
Morelli's (1785) supplement, based on the text of Psellus, is further justified by a reference in the following paragraph to there being a maximum of four markers to a foot.[75]

Del Grande (1960: 217), having identified the foot of two times as the diseme pyrrichios ˘˘, identified the three-time foot as a triseme, either an iamb or a trochee, and a four-time foot as tetraseme, either a dactyl or an anapest. Del Grande argued that this passage of *E.R.* preserves earlier Damonian theory. In particular, according to DelGrande, Damon used the terms τὸ ἄνω and τὸ κάτω strictly of the ratios of time intervals, without any reference to stress or *ictus*. Del Grande relies on the following logic: if the difference between *arsis* and *thesis* is stress accentuation, then only a long syllable can be a *thesis*, because a short syllable given a stress would be heard as a long syllable. The phrase δύο μὲν τῶν ἄνω, ἑνὸς δὲ τοῦ κάτω, which Del Grande takes as a trochee, becomes contradictory by this interpretation, as it identifies a short rhythmic event, one primary time interval long, as τὸ κάτω or *thesis*. Del Grande resolves the

[75] Psellus 14 (= 26 Pearson) τῶν δὲ ποδῶν οἱ μὲν ἐκ δύο χρόνων σύγκεινται τοῦ τε ἄνω καὶ τοῦ κάτω, οἱ δὲ ἐκ τριῶν δύο μὲν τῶν ἄνω, ἑνὸς δὲ τοῦ κάτω, ἢ ἑνὸς μὲν τοῦ ἄνω, δύο δὲ τῶν κάτω.

contradiction by concluding that κάτω cannot entail a stress or dynamic accent in this passage of *E.R.*

Del Grande's interpretation of paragraph 17 has been adopted by Palmieri (1987) and Luque-Moreno (1994). However, it is vulnerable at two points: first, the premise that a short cannot be stressed without being heard as a long does not hold up in instrumental music. West (1992) offers the "Scottish snap" as a familiar counterexample in modern music. Vincent (1847) pointed out that the effect of such accentuation in the triseme rhythmic foot ¯ ˘ would be what modern musical theory calls syncopation, a stress on a customarily unaccented beat. Among documents of ancient Greek music, *DAGM* 61.2-4 (Pöhlmann and West 2001: 196) attests diseme *arsis*, monoseme *thesis*:




These observations do not prove that Aristoxenus did intend τὸ κάτω to be the stressed part of a foot, but do refute Del Grande's opinion that τὸ κάτω cannot possibly be marked by ictus.

A second weakness in the position of Del Grande is that the term σημεῖον 'marker' in *E.R.* 18 is used as a synonym of the term χρόνος here, and yet cannot refer to a primary time interval; thus, χρόνος cannot refer to the primary time interval here either. Feussner (1840) first demonstrated that the term σημεῖον in *E.R.* 18 is used as a synonym for χρόνος here, and that χρόνος/σημεῖον cannot refer to the primary time interval, but must rather refer to longer, potentially compound time intervals; his arguments will be presented in the notes to paragraph 18 below.

Bartels (1854: 40), identifying the χρόνοι as the *arsis* or *thesis* of each foot, took the two-χρόνος foot as the dactyl, anapest, or proceleusmatic; the three-χρόνος foot as cretics or bacchics, and the four-χρόνος foot as iambic or trochaic metra. However, though Bartels accepts that χρόνος here is a synonym of σημεῖον in paragraphs 18 and 19, this interpretation is not consistent with Aristoxenus's discussion of large feet with more than two σημεῖα in paragraphs 18 and 19. Furthermore, Bartels's interpretation overlooks the fact that Aristoxenus avoids defining feet in *E.R.* by their sequence of syllables or rhythmic events.

Gibson (2005: 93-4) argues that the term χρόνος in this passage refers to non-composite time intervals, that is, to individual syllables/rhythmic events. However, *E.R.* 19, in a passage not mentioned by Gibson, says that some feet can be divided into more than four parts, which must mean that some feet can consist of more than four rhythmic events. Also, Gibson (2005: 93) posits a distinction between the term χρόνος here and the term σημεῖον in paragraphs 18 and 19; however, she (2005: 200n60) overlooks this distinction when she cites the foot with four σημεῖα 'markers' mentioned at *E.R.* 19 as support for Morelli's supplement to this lemma.

For Westphal (1883: 82-96), Aristoxenus's two-marker foot refers to a dipody, or colon comprising two smaller constituent feet: the three-marker foot refers to a tripody or colon of three smaller feet, and the four-marker foot refers the tetrapody of four smaller feet. Paradoxically, Luque-Moreno (1994: 25) cites this passage of *E.R.* in support of Westphal's interpretation, which he accepts, after having cited it previously (1994: 15) in the presentation of Del Grande's contrary interpretation, which Luque-Moreno also accepts. Westphal's application of this passage of *E.R.* to the metric cola to classical lyric poetry in general is motivated by his desire to establish patterns of stress accent for ancient song in general. It requires the unsupportable assumption that stress accent was a feature of classical lyric in general. It is better to associate Aristoxenus's comments with a more limited set of ancient rhythms, for which the testimony of Aristides Quintilianus's *On Music* and of *POxy* 2687 strongly suggests the inclusion of stress accent or a functionally analogous equivalent external to purely poetic or linguistic factors.

Among citations from Aristides Quintilianus that are consistent with the usage in *E.R.* (as mentioned above) are some that define *arsis* and *thesis* by their total duration expressed as time intervals, without reference to the sequence of rhythmic events contained. Here we get constructions analyzed as two or three χρόνοι: at 1.16 (= 36.3-4 W-I), the *orthios* consists of a tetraseme *arsis* and an octaseme *thesis*, and at 1.16 (= 36.4-6 W-I) the marked trochee consists of an octaseme *thesis* and a tetraseme *arsis*. Aristides' reference to διπλασιάζων τὰς θέσεις 'doubling the *theses*' (1.16 = 37.1 W-I) of the marked trochee shows that this foot also could be interpreted as comprising three χρόνοι. Aristides gives various counts of the χρόνοι comprising another foot, the decaseme paean *epibatos*: at 1.16 (= 37.7-9 W-I) it is counted as having five χρόνοι, but in the next line (1.16 = 37.10 W-I) as comprising four χρόνοι.[76] Weil (1855 = 1902: 127-34) was first to argue that Aristoxenus meant these larger feet here.

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[76] παίων ἐπιβατὸς ἐκ μακρᾶς θέσεως καὶ μακρᾶς ἄρσεως καὶ δύο μακρῶν θέσεων καὶ μακρᾶς ἄρσεως...ἐπιβατὸς δὲ (sc. εἴρηται) ἐπειδὴ τέτρασι χρώνενος μέρεσιν ἐκ δυεῖν ἄρσεων καὶ δυεῖν διαφόρων θέσεων γίνεται. 'The paean *epibatos* (is constructed) from a long *thesis* and a long *arsis* and two long *theses* and a long *arsis*...it is called the *epibatos* because it comes about from two *arses* and two different *theses*'.

Because the double spondee, the marked trochee and the *orthios* are defined in terms of duration rather than their sequence of rhythmic events, scholars have proposed various syllable sequences to associate with them.

Boeckh (1811: 23) and Apel (1814: ii.42) interpreted the *orthios* and the marked trochee as feet with two extended syllables each, one a tetraseme, the other octaseme. Hermann (1816: 660-1) also took the *orthios* and marked trochee as feet with two extended syllables, arguing that these occurred for the sake of rhythmic balance, in poetic verses where his own scansion left two syllables apparently dangling from a larger colon. Hermann (1815 = 1827: 122) argued that the ἐπιτεχνηταῖς σημασίαις and διπλασιάζων τὰς θέσεις of Aristides Quintilianus 1.16 (= 36.30-37.1 W-I) refer to a practice of marking time halfway through the octaseme syllable, which would be otherwise be too long to be rhythmically comprehensible. Baumgart (1869: xxiv) also held that the *orthios* and marked trochee were prolonged versions of ˘ ¯ and ¯ ˘ respectively. Differentiating himself from Hermann, Baumgart denied that Aristides Quintilianus's reference to διπλασιάζων τὰς θέσεις adverts to a special accentuation pattern for these feet, taking it instead as a reference to the extended length of the *thesis*. For Baumgart, ἐπιτεχνηταῖς σημασίαις simply means that the performers must be particularly careful not to rush the count of such a slow measure.

Meibom (1652: cited by Boeckh 1811: 23) interpreted the orthios as a sequence of six long syllables, with two in the arsis and four in the thesis: ¯ ¯ | ¯ ¯ ¯ ¯.[77] Feussner (1837) revived Meibom's interpretation, arguing that the pattern of stress accents Hermann had described would coordinate the six long syllables into a single rhythmic construction.

Rossbach (1854: 98) posited that the *orthios* and marked trochee consist of three extended *tetraseme* syllables, coordinated into a rhythmic unit by the pattern of stress accents. This interpretation, which combines compounding and prolongation, was accepted by Weil (1855), Caesar (1861: 181), and retained by Westphal (1883). The primary evidence for taking these rhythmic constructions as extended syllables is Aristides' Quintilianus description of them at 2.15 (= 83.4-5 W-I) as using μακροτάτοις ἤχοις 'longest sounds'. His characterization of the *orthios* at 1.16 (= 36.29 W-I) as σέμνος 'stately', suggests an association with religious hymns; this is reinforced by his description at 2.15 (= 82.17-25 W-I) of religious hymns as using the longest time intervals found in musical rhythm.[78]

Aristides Quintilianus describes the paean *epibatos* as containing five long syllables. Weil (1902b: 135) suggested that the paean *epibatos* in the form of the cultic cry to Apollo ἰή παιήων is the original form of the paionic genre. Many

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[77] Meibom (1652: cited by Boeckh 1811: 23) similarly interprets the double spondee as ¯ ¯ | ¯ ¯ and the marked trochee as ¯ ¯ ¯ ¯ | ¯ ¯.

[78] The key phrase of this passage is at 2.15 (= 82.21-22 W-I): (ὁρωμεν) τοὺς δὲ μηκίστους (χρόνους) ἐν τοῖς ἱεροῖς ὕμνοις 'we find the largest time intervals in religious hymns'.

other suggestions have been offered over where the paean *epibatos*, taken as a construction of five long syllables, can be found in the corpus of Greek lyric poetry.[79] In addition, analogy with the double spondee, *orthios*, and marked trochee suggests there may have been other possibilities. Baumgart (1869: xxv) argued that the epibatos contains four long syllables, with the third syllable prolonged to tetraseme duration: ‾ ‾ ⊔ ‾ . Though it had not been published in his time, *DAGM* 50 can be taken as exhibiting this rhythmic logic.

*POxy* 2687, a fragment of a rhythmic treatise, suggests that these feet are defined in a way that invites different interpretations because they were characterized by variety in practice. At *POxy* 2687.iv.2, the paean mentioned is presumably the *epibatos*: the papyrus describes it, along with the *orthios* and marked trochee, as being able to be constructed in more than one way. The author proposes a new way to construct these feet, based on a rhythmic compounding of the syllable sequence ‾ ˘ ‾ . What remains essential to these large feet, whatever rhythmic events they contain, is the pattern of accentuation that coordinated the various elements into one rhythmic unit.

[79] Westphal (1861: 153) and Caesar (1861: 198) discuss suggestions made up to that time. Westphal (1861: 155) interprets the paean epibatos as a equivalent to a modern musical measure in 5/4 time. Twenty years later, Westphal (1883: 50) takes the paean *epibatos* as an abbreviated form of an ionic *dipody*; this interpretation is motivated by his scansion of a choriambic tetrameter such as Sophocles *OT* 483-497 as a "greater epitrite" (14-*seme* construction) plus a paean *epibatos*: ‾ ˘ ˘ ‾ ‾ ˘ ˘ ‾ ‾ | ˘ ˘ ‾ ‾ ˘ ˘ ‾. Westphal seeks to find poetic examples for his rhythmic theory, whether or not it sheds light on the poetic meter. Dale (1968: 43; 1971: 2.36), for example, scans this passage as a choriambic tetrameters.

*POxy* 2687 presents its rhythmic constructs as innovations which have not yet been tried, but argues that since there had already been established more than one way to construct these named feet, his proposal was legitimate by analogy to their precedent (see our chapter on *POxy* 2687). Presumably, the original usage of these feet was in the religious hymns using the extended syllables attested by Aristides Quintilianus, creating a slow artificial rate of delivery. This is echoed by reference at *POxy* 2687 iv.8-9 to the original character of these rhythms. The other way to construct feet, which are similar to those the author of *POxy* cites as a precedent to his proposal, would presumably be to form them out of compound tetraseme intervals—that is, sequences of diseme syllables as in Meibom's interpretation. Replacing extended tetraseme syllables with tetraseme compound intervals would provide an analogy for the proposal the author of POxy 2687 makes.

I should emphasize, however, that the way Aristoxenus will develop his account of the rhythmic foot in paragraphs 18 and 19 will support the premises that Aristoxenus has these named feet in mind here and that there are at least two different ways to construct them.

**PARAGRAPH 18**

**ἑνὸς χρόνου…ἓν σημεῖον**

Aristoxenus uses σημεῖον, marker, in a sense different than in paragraph 9, where it was specifically a dance term.

Boeckh (1811: 22n14) held that σημεῖον in *E.R.* referred to the primary time interval, a position essentially reiterated by Gibson (2005: 93).[80] Other scholars, including Hermann (1824), Rossbach (1856), and Brill (1870) take σημεῖον to indicate an uncompounded time interval, or individual rhythmic event. These interpretations are contradicted by the statement at *E.R.* 19 that the σημεῖα 'markers' of a foot can be subdivided by the process of rhythmic composition.

The parallelism of this sentence indicates that σημεῖον is used as an alternative term for χρόνος, as χρόνος was used in the preceding paragraph: a time interval that is either τὸ ἄνω or τὸ κάτω. Thus, σημεῖον is a general term for either τὸ ἄνω or τὸ κάτω, or *arsis* and *thesis*. Feussner (1840: 56) proposed this equivalence, insisting that the meaning of technical terms must be determined by their proper context; his arguments will be further explored below.

[80] Gibson 2005: 93 defines σημεῖον as "a sign to indicate duration in relation to the primary *chronos*." She goes on (pp. 93-94) to use the term as an equivalent to 'primary time interval' when she says that feet of "three *semeia*" to feet of "eight *semeia*" are discussed in paragraphs 31-36.

Baumgart (1869) and Pearson (1990) argued that the σημεῖον is not a complete synonym for a χρόνος in the sense of a part of a foot. Pearson (1990: 60) interpreted semeion as the dividing line between χρόνοι, citing Aristides Quintilianus 1.13 (= 32.7 W-I), who attests the term σημεῖον being used in dance of the σχημάτων πέρασιν 'boundaries of poses'. Baumgart (1869: xxvii) took σημεῖον here as the moment of the ictus that he assumed was necessary for marking the *arsis* and *thesis* of each foot. However, Aristoxenus's phrasing here indicates that he intends σημεῖον interchangeably as a synonym for χρόνος, a difficulty Baumgart acknowledges. Furthermore, these interpretations are difficult to reconcile with Aristoxenus's comments at *E.R.* 19 regarding σημεῖα 'markers' of a foot that stay the same even as the process of rhythmic composition may subdivide the markers with several rhythmic events.

**διαίρεσιν χρόνου**

This justifies the interpretation of διαίρεσις as distribution, rather than simple division, in paragraph 7; one marker could divide time, in the sense of "before and after", or in the sense in which Aristotle discusses the divisibility of time in the *Physics*, but this would not be a rhythmic distribution of time intervals. Here, both χρόνος and σημεῖον here must be taken as uncompounded, since Aristoxenus is trying to make a point about one isolated rhythmic event; a compound time interval, comprising more than one rhythmic event, would yield a distribution or repeated division of time within itself.

**τοῦ δὲ λαμβάνειν τὸν πόδα πλείω τῶν δύο σημεῖα τὰ μεγέθη τῶν ποδῶν αἰτιατέον**

An explanation of why some feet take more than two *semeia* would lay the foundation for addressing such an ambiguity regarding the number of markers in the marked trochee, the *orthios* and the paean *epibatos* as was attested in Aristides Quintilianus, as discussed above in the notes to paragraph 17.

**οἱ γὰρ ἐλάττους τῶν ποδῶν…διὰ τῶν δύο σημείων**

As will be seen in paragraphs 31-36, feet up to at least octaseme duration are small enough to be rhythmically divided into just two markers.

**οἱ δὲ μεγάλοι…δυσπερίληπτον γὰρ τῇ αἰσθήσει**

Aristoxenus's interest in the limits of musical perception is seen in *E.H.*: he discusses the smallest and largest melodic intervals at *E.H.* 1.13-15 (=19.1-20.14 Da Rios) and at *E.H.* 1.20-1.21 (=25.11-27.13 Da Rios). At *E.R.* 11 Aristoxenus defined the primary time interval as the shortest time interval perception can grasp as part of rhythm; here, he alludes to limits of perception at the other extreme.

The notion that large feet can be δυσπερίλεπτον 'hard to embrace in one view' (LSJ δυσπερίληπτος II) indicates that the meaning of the term foot has shifted from paragraph 16, where it was introduced as a means for making the rhythm clear. Now, there is a notion that large feet embody a sort of latent order that requires special treatment to be made perceptible.

**εἰς πλείω μέρη διαιρεθὲν τὸ τοῦ ὅλου πόδος μέγεθος εὐσυνόπτερον**

The special treatment required to make a large foot easily perceptible involves dividing it into smaller, more easily perceived parts. As mentioned in the notes to paragraph 17, Hermann (1815 = 1827: 122) had suggested such an interpretation of the *orthios* and marked trochee described by Aristides Quintilianus. Westphal (1883: 106) cited Berlioz for the practice of a conductor making two arm movements for each beat to mark a very slow tempo accurately.

DeGroot (1932: 89) asserts that humans expect a rhythmic signal approximately every ¾ of a second. Handel (1989: 406) says that it is very difficult to generate a sense of musical meter from notes (or rhythmic events) that exceed 800 ms., or 4/5 of a second. This sets a maximum size for effective σημεῖα, and therefore a maximum size for feet that can be made clear by two markers.

Thus Aristoxenus gives a reason why the *orthios* and marked trochee should be counted as having three tetraseme markers rather than two markers, a tetraseme and an octaseme.

**οὐ γίνεται πλείω σημεῖα τῶν τεττάρων**

This statement attests that feet could take four *semeia*, supporting the supplement made to paragraph 17. With reference to counting of four or five markers to the paean *epibatos*, Aristoxenus would prefer or defend the count with four markers over that with five markers.

This statement has been given different interpretations by scholars with other interpretations of *semeion*. For Boeckh (1811: 22), it meant *tetraseme* was the largest basic foot, the musical measure and the basis of his method of syllable duration manipulation. This view seems to conflict with *E.R.* 31-36, as well as with Aristoxenus's statement in this paragraph that some feet need more than two markers because their large size strains the limits of rhythmic perception.

Gibson seems to have overlooked the wording of this phrase when she refers to "the restriction to feet of four *chronoi*" (2005: 94). This undermines her attempt to establish a distinction between χρόνος and σημεῖον in this passage.

**οἷς ὁ ποὺς χρῆται κατὰ τὴν αὑτοῦ δύναμιν**

The *dunamis* is the rhythmical function, analogous to the melodic *dunameis* of notes in *E.H.* Alternatively, it is the formula of a foot such as the *orthios* or marked trochee.

**PARAGRAPH 19**

**μερίζονται γὰρ ἔνιοι τῶν ποδῶν εἰς διπλάσιον τοῦ εἰρημένου πλήθους ἀριθμὸν καὶ εἰς πολυπλάσιον**

Double four could be a completely resolved octaseme, described as a two-marker foot at par. 36. For καὶ πολυπλάσιον, we can get 12 rhythmic events in a maximally resolved *orthios*, marked trochee, or *epibatos*. We can get 16 rhyhmic events if we posit a foot of four *tetraseme* markers, again, fully resolved. The augmented rhythms attested in Aristides Quintilianus and other musical writers will be discussed below; they also exemplify feet that could be divided into more than four parts in that each contains more than four rhythmic events.

**ἀλλ' οὐ καθ' αὑτόν**

See below at the notes to **τά τε τὴν τοῦ ποδὸς δύναμιν φυλάσσοντα σημεῖα.**

**ὑπὸ τῆς ῥυθμοποιίας διαιρεῖται**

See below at the notes to τὰς ὑπὸ τῆς ῥυθμοποιΐας γινομένας διαιρέσεις.

**τά τε τὴν τοῦ ποδὸς δύναμιν φυλάσσοντα σημεῖα**

The δύναμιν φυλάσσοντα σημεῖα are the sequence of markers, conceived as potentially compound time intervals, which define the formula of a foot. In Aristotelian terms, this formula is what stays the same for the different versions of the marked trochee and *epibatos* in *POxy* 2687, justifying their having the same name.

In order to be δύναμιν φυλάσσοντα σημεῖα, they have to fulfill the function of the foot given in par. 18: they must be short enough to be *euperilēpton* to perception.

**τὰς ὑπὸ τῆς ῥυθμοποιίας γινομένας διαιρέσεις**

Each of these markers δύναμιν φυλάσσοντα may be itself a compound interval; thus, the reference to rhythmic composition here corresponds to the statement in par. 13 that the distinction between compound and uncompounded intervals comes up particularly in regard to rhythmic composition. The marked trochee may be made of uncompounded intervals, but it can be made of compounded intervals, in which case the whole construction may be divided into more than four pieces. A marked trochee composed of three spondees would include six rhythmic events. The author of *POxy* 2687 proposes a marked trochee comprised of three iterations of the sequence ¯ ˘ ¯; this would include nine rhythmic events. Furthermore, there are different tetraseme sequences, each one of which could be such a compound marker in the marked trochee. If such a foot were comprised of short syllables, as mentioned above, it could contain twelve rhythmic events.

**τὰ μὲν ἑκάστου ποδὸς σημεῖα διαμένει ἴσα ὄντα καὶ τὸ ἀριθμῷ καὶ τῷ μεγέθει, αἱ δ’ ὑπὸ τῆς ῥυθμοποιίας γινόμεναι διαιρέσεις πολλὴν λαμβάνουσι ποικιλίαν.**

Aristoxenus's focus here is on the larger feet or compound feet, not the basic feet of poetic meters such as the dactyl or trochee, composed of two or three syllables or rhythmic events. The distinction between *sēmeia* and the divisions of *rhythmopoiia* can only occur when the *sēmeia* are taken as compound intervals—not when the rhythmic events themselves, such as syllables, comprise the feet.

This can be seen as modeled on a definition of feet like the *orthios* and marked trochee as three tetraseme markers each, with the tetraseme markers accepting different realizations. For example, they could be filled either with the μακροτάτοις ἤχοις mentioned at Aristides Quintilianus 2.15 (= 83.5 W-I), or with different sequences of rhythmic events, as implied by the precedents the author of *POxy* 2687 cites (cols. iii.30-iv.5) for his own proposed innovations.

This is the structure Aristoxenus has been setting forth: feet are made of markers; the markers are χρόνοι 'time intervals' that have been assigned a status as arsis or thesis; the χρόνοι can be either uncompounded χρόνοι, filled by a single rhythmic event, or compound χρόνοι, filled by sequences of rhythmic events.

Extending or extrapolating beyond the named feet such as *orthios*, marked trochee, and paean *epibatos*, are the augmented rhythms, cited by Aristides Quintilianus, Michael Psellus, and the *Fragmenta Neapolitana = Fragmenta Parisina*. These augmented rhythms are probably Aristoxenian; they follow the structure of *E.R.* 31-36, and they accord with Aristoxenus's interest in the limits of perception. On the other hand, variations between the three sources show that some or all interpolate non-Aristoxenian material as well.

Let us start with Aristides Quintilianus 1.14 (= 34.4-15 W-I):

> τὸ μὲν οὖν ἴσον ἄρχεται μὲν ἀπὸ δισήμου, πληροῦται δὲ ἕως ἑκκαιδεκασήμου διὰ τὸ ἐξασθενεῖν ἡμᾶς τοὺς μείζους τοῦ τοιούτου γένους διαγινώσκειν ῥυθμούς˙ τὸ δὲ διπλάσιον ἄρχεται μὲν ἀπὸ τρισήμου, περαιοῦται δὲ ἕως ὀκτωκαιδεκασήμου· οὐκέτι γὰρ τῆς τοῦ τοιούτου ῥυθμοῦ φύσεως ἀντιλαμβανόμεθα· τὸ δὲ ἡμιόλιον ἄρχεται μὲν ἀπὸ πεντασήμου, πληροὺται δὲ ἕως πεντεκαιεικοσασήμου· Μέχρι γὰρ τοσούτου τὸν τοιοῦτον ῥυθμὸν τὸ αἰσθητήριον καταλαμβάνει· τὸ δ' ἐπίτριτον ἄρχεται μὲν ἀπὸ ἑπτασήμου, γίνεται δὲ ἕως τεσσαρεσκαιδεκασήμου· σπάνιος δὲ ἡ χρῆσις αὐτοῦ.
> The equal genus starts from the diseme, and is filled out as far as the 16-seme, because we are too weak to recognize larger rhythms of this genus. The double genus starts from the triseme, and is filled out as far as the 18-seme, for no further do we apprehend the nature of this sort of rhythm. The hemiolic (3:2) genus starts from the pentaseme and is filled out as far as the 25-seme, for up to this point the organ of sense grasps this sort of rhythm. The epitrite (4:3) genus starts from the heptaseme and comes about as far as the 14-seme; but the use of this is rare.[81]

Psellus par. 12 (= 24 Pearson)

> τῶν δὲ τριῶν γενῶν οἱ πρῶτοι πόδες ἐν τοῖς ἑξῆς ἀριθμοῖς τεθήσονται ὁ μὲν ἰαμβικὸς ἐν τοῖς τρισὶ πρῶτος, ὁ δὲ δακτυλικὸς ἐν τοῖς τέταρσιν, ὁ

[81] Trans. Marchetti

δὲ παιωνικὸς ἐν τοῖς πέντε. αὔξεσθαι δὲ φαίνεται τὸ μὲν ἰαμβικὸν γένος μεχρὶ τοῦ ὀκτωκαιδεκασήμου μεγέθους ὥστε γίνεσθαι τὸν μέγιστον πόδα ἑξαπλάσιον τοῦ ἐλαχίστου, τὸ δὲ δακτυλικὸν μέχρι τοῦ ἑκκαιδεκασήμου, τὸ δὲ παιωνικὸν μέχρι τοῦ πεντεκαιεικοσασήμου. αὔξεται δὲ ἐπὶ πλειόνων τό τε ἰαμβικὸν γένος καὶ τὸ παιωνικὸν τοῦ δακτυλικοῦ, ὅτι πλείοσι σημείοις ἑκάτερον αὐτῶν χρῆται. οἱ μὲν γὰρ τῶν ποδῶν δύο μόνοις πεφύκασι σημείοις χρῆσθαι, ἄρσει καὶ βάσει, οἱ δὲ τρισίν, ἄρσει καὶ διπλῇ βάσει, οἱ δὲ τέτρασι, δύο ἄρσεσι καὶ δύο βάσεσιν.

The basic feet of the three genera will be reckoned in the following numbers: the primary iambic foot is in three, the dactylic in four, the paionic in five. The iambic genus seems to be extended as far as the 18-seme size, so that the largest foot is six times the smallest; the dactylic as far as the 16-seme; the paionic as far as the 25-seme. The iambic genus and the paionic genus are extended to a further degree than the dactylic, because each of them utilizes more *sēmeia*. Some of the feet utilize only two *sēmeia*, *arsis* and *basis*; others utilize three, and *arsis* and a double *basis*, others use four, two *arseis* and two *baseis*.[82]

*Fragamenta Neapolitana* para. 14 (= 28, 30 Pearson)

Ἄρχεται δὲ τὸ δακτυλικὸν ἀπὸ τετρασήμου ἀγωγῆς, αὔξεται δὲ μέχρι ἑξκαιδεκασήμου, ὥστε γίνεσθαι τὸν μέγιστον πόδα τοῦ ἐλαχίστου τετραπλάσιον. ἔστι δὲ ὅτε καὶ ἐν δισήμῳ γίνεται δακτυλικὸς πούς. τὸ δὲ ἰαμβικὸν γένος ἄρχεται μὲν ἀπὸ τρισήμου ἀγωγῦς, αὔξεται δὲ μέχρι ὀκτωκαιδεκασήμου, ὥστε γίνεσθαι τὸν μέγιστον πόδα τοῦ ἐλαχίστου ἑξαπλάσιον. τὸ δὲ παιωνικὸν ἄρχεται μὲν ἀπὸ πεντασήμου ἀγωγῆς, αὔξεται δὲ μέχρι πεντεκαιεικοσισήμου, ὥστε γίνεσθαι τὸν μέγιστον πόδα τοῦ ἐλαχίστου πενταπλάσιον.

The dactylic genus starts from the tetraseme *agōgē*, and is extended as far as the 16-seme, so that the largest foot is four times the smallest. It is possible that sometimes a dactylic foot is in a diseme interval. The iambic genus starts from the triseme *agōgē*, and is extended as far as the 18-seme, so that the largest foot is six times the smallest. The paionic genus starts from the pentaseme *agōgē*, and is extended as far as the 25-seme, so that the largest foot is five times the smallest.[83]

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[82] Trans. Marchetti

[83] Trans. Marchetti

That Aristoxenus would have started the dactylic genus with the tetraseme rather than a diseme foot is attested at *E.R.* 32. *E.R.* 35 rejects the heptaseme foot, which Aristides Quintilianus appends to the other three genera of rhythmic feet. Aristides Quintilianus attributes the limits of augmentation to the limits of perception without further explanation. Psellus notes that, in the iambic genus, the largest foot is six times the smallest, a ratio exceeding that found in the paionic and dactylic genera. He offers an explanation of the iambic and paionic genera being extended to a greater degree than the dactylic in terms of the number of markers the genera of feet use. *Fragmenta Neapolitana* par. 14 mentions these ratios for all three genera, increasing the probability that Psellus's explanation comes from an older tradition, rather than being his own addition. The mention of ἀγωγή unique to the *Fragmenta Parisina* argues against it or Psellus being either sources one for the other or stemming from the same immediate source.

One approach to the augmented rhythms is taken by Neumaier (1989: 48), who posited that the maximum extensions of the rhythmic genera refer not to compound feet, but to prolonged feet. This is in agreement with Boeckh and Hermann's interpretation of the marked trochee as composed of octaseme and tetraseme extended syllables. Neumaier finds support in the description of augmentation found in *Fragmenta Neapolitana* par. 14, which links augmentation to ἀγωγή. However, this interpretation had already been considered and rejected by Caesar (1861: 117-8). Caesar's strongest evidence that these intervals cannot refer to prolonged syllables is that the triseme *arsis* of Aristides Quintilianus's paean *diaguios* contains a long and a short syllable, not a prolonged syllable. Further support for Caesar's rejection of extended syllables can be found in the distinction made in *E.R.* 19 between the *sēmeia* of the larger feet and the rhythmic events that comprise each *sēmeion*.

The other approach to the augmented rhythms is exemplified by Boeckh (1811), who made many of claims about ancient rhythm that subsequent scholars on Aristoxenus have tried to support or refute by their readings of *E.R*. Boeckh (1811: 59) held that augmented feet are not composed of extended syllables or rhythmic events but repeated simple feet, combined into an *ordo*. An *ordo* is a group of smaller feet, unified as a group by one strong stress, or *ictus*. Boeckh affirmed that the difference between *dipodia* and *monopodia* is as significant as modern 6/8 vs. 12/8; thus confirming that his interpretation was similar in approach to the later interpretations of Feussner and Westphal. The augmented feet are not to be taken as limits on the composition of poetic cola. Poetic verses can exceed these limits on a rhythmic *ordo*, as poets and Aristides Quintilianus 1.28-29 (= 51.1-52.23 W-I) show.

However, Boeckh does not connect *E.R.*'s discussion of the *sēmeia* that a foot takes by its own nature and the divisions brought about by *rhythmopoiia* with these augmented rhythms. For Boeckh, Aristoxenus's statement that the foot by its own nature takes at most four *sēmeia* means that the tetraseme dactyl (or anapest, spondee, or *proceleusmatic*) is the largest basic rhythmic foot; larger feet are to be decomposed into these smaller feet. Boeckh held that each of these small basic feet corresponded to one musical measure in performance; for poems that mixed triseme with tetraseme poetic feet, manipulation of syllable lengths would equalize the durations of poetic feet to musical measures. Even before Boeckh, J. A. Apel and J. H. Voss had propounded this type of approach.[84]

Feussner (1840) was the first explicitly to link the testimony of Aristides Quintilianus and Michael Psellus concerning the augmentation of the genera with *E.R.* 18-19, though Hoffmann (1835) presented these rhythmic constructions without a detailed discussion of the sources *per se*. Feussner argues that the augmentation of the rhythmic genera refers to the construction of larger rhythmic figures by means of primary and secondary musical accent. He attributes this to Aristoxenus, and takes it as a starting point for the interpretation of *E.R.*

[84] Boeckh 1811: 105 mentions both writers as having influenced his work, without giving a more detailed citation.

Arguing from the statement in Psellus that the paionic and iambic genera are able to be augmented to a greater degree because they utilize more *sēmeia*, Feussner associates the dactylic genre with two *sēmeia*, the paionic genre with three *sēmeia*, and the iambic genre with four *sēmeia*.

Weil (1855) revised Feussner's assignment of the number of *sēmeia* to the rhythmic genera, adducing Aristides Quintilianus's descriptions of the *orthios*, the marked trochee, and the paean *epibatos*.

As mentioned in the note to par. 17, Weil understood the *orthios* and marked trochee to consist of three long syllables, each prolonged to a tetraseme duration; he further understood the reference to διπλασιάζων τὰς θέσεις 'doubling the theses' to mean that the octaseme *thesis* was accented twice, and could therefore be considered two *theses*. This special pattern of stress accent coordinated the three long syllables into one rhythmic foot. By analogy, Weil argued, augmented feet in the iambic genre were trimeters, using three *sēmeia*. Weil affirmed that the 18-seme iambic foot is the iambic trimeter, with a pattern of stress accent analogous to that ascribed to the 12-seme *orthios*. Augmented feet in the dactylic genre were dimeters and tetrameters, either of which used two *sēmeia*. Augmented feet in the paionic genre were pentameters counted as four *sēmeia*. Weil affirmed that these counts hold true only for augmented feet, not for the smaller feet: Aristides Quintilianus attests that the pentaseme paean is divided into two *sēmeia*, as are the iambic or trochaic *dipodia*. Weil's approach won the assent of Caesar (1861) and Westphal (1883), as well as of Pearson (1990).

Weil made the link from *orthios* and *epibatos* to the augmented rhythms through the statements cited above from Psellus and Aristides Quintilianus; *POxy* 2687 had not as yet been published. However, the link through *POxy* 2687 gives an interpretation more detailed and more narrowly focused in its application.

The author of *POxy* 2687 posits that the *cretic*, by which he means the syllable sequence ¯ ˘ ¯ with its final long syllable prolonged to equal the preceding two syllables, can itself serve as a marker in the *orthios*, marked trochee, or *epibatos* (cols. iii.30-iv.5). The author of *POxy* 2687 proposes these rhythms, rather than composing music in them; therefore, these constructions are the result of self-conscious, theory-driven innovation. Limiting this theory's application, the author of *POxy* 2687 describes these extensions on the pattern of the *orthios* and paean *epibatos* as his own innovation, something that would be against the usual character of these rhythms (col. iv.8-11). In justifying his innovation, the author states that there already existed more than one way of constructing these rhythms (cols. iii.30-iv.5). As will be argued in the notes to

*POxy* 2687, one way was with extended syllables, the other with groups of syllables.

This suggests the following model for the historical development of augmented rhythm. As discussed in the notes to paragraph 17, Aristides Quintilianus links the *othios* and marked trochee, with extended syllables, to religious hymns. As suggested by Weil (1902b: 135), the paean *epibatos* may also have originated as a hymnal rhythm. The names of these rhythms were later appropriated to other rhythmic constructions that used compound time intervals, sequences of syllables, as markers. This first step of innovation from the hymnal rhythms would have involved identifying their extended syllables with potentially compound tetraseme markers in the later constructions.

Of all the forms of ancient Greek poetry, the anapestic dimeter is most likely to have served as the original basis for this sort of hierarchical rhythm. The meter is based on isochronous tetraseme units. As found in Classical drama, word division in this meter tends to reinforce the symmetrical division into octaseme units. By contrast, the usual caesura of the dactylic hexameter divides the line into unequal, asymmetrical portions. The anapest is associated in drama with the marching of the chorus. As each tetraseme foot would be associated with a step of the marching chorus, each extended syllable of the hymnic rhythms could have been associated with a step of the religious procession. This connection could have motivated the extension of the names of the religious rhythms to new constructions of tetraseme markers, constructions that would use stress accent or other articulation external to poetic language in order to combine tetraseme sequences in novel ways.

The innovations proposed by the author of *POxy* 2687 involve a further extension, in that he identifies his *cretic*, which he would use as a rhythmic marker, as being itself a *syzygy* (col. iii.19). As Weil (1855) had pointed out, admitting the possibility that a *syzygy* or 'yoking' of smaller feet could itself serve as a marker in a larger construction is a necessary step in linking the augmented rhythms to the theory of the foot found in *E.R.*

There are differences between *POxy* 2687 and the Aristoxenian theory of augmentation. Aristoxenian theory can be seen as an alternative analysis of constructions such as those proposed in *POxy* 2687. What the author of *POxy* 2687 presents as the *orthios* or marked trochee built on *cretics*, would be an 18-seme augmented iamb with hexaseme markers to Aristoxenus. The construction the author of *POxy* 2687 proposes for the paean *epibatos* is subjected in Aristoxenus's theory of augmentation to the limitation that the *cretics* be taken as pentasemes, taking the sequence ¯ ˘ ¯ without manipulation of syllable duration. In Aristoxenian augmented rhythms, the same rhythmic proportion exists at the level of individual rhythmic events as at the upper level of the rhythmic hierarchy.

In accordance with the special status seen for the tetraseme marker, the preferred analysis for the anapestic dimeter would have been as a four-marker foot. Modeling the other augmented forms on this paradigm would account for the stipulation that the augmented paean be based on paionic markers.

While these adjustments render these rhythmic constructions closer to the theory Aristoxenus presents in *E.R.* 18 and 19, they do not constitute a generative theory for them. The expansion of the decaseme paean *epibatos* to the 25-seme augmented rhythm is much greater than the expansion of the dodecaseme *orthios* or marked trochee to the 18-seme augmented iambic rhythm. No explanation for this difference is offered, nor a principle excluding, for example, a 27-seme augmented iamb. For this reason, it is more reasonable to assume that Aristoxenus formulated the augmented rhythms on the basis of constructions already proposed by others.

**ἔσται δὲ τοῦτο καὶ ἐν τοῖς ἔπειτα φανερόν**

This could refer to the same promised expansion as the ὕστερον δειχθήσεται at par. 18. However, Aristoxenus uses no stronger adversative conjunction than δέ to introduce the next topic of discussion. A close connection with the following paragraph would turn on the noun ποικιλία; having discussed one way in which rhythmic composition can generate/accommodate different constructions sharing a common name, Aristoxenus will now present another way rhythmic composition can generate/accommodate variant expressions to a foot's standard formula, where the formula is the sequence of markers for which the foot is named.

**PARAGRAPH 20**

**ὥρισται δὲ τῶν ποδῶν ἕκαστος**

The phrase τῶν ποδῶν ἕκαστος here clashes with ἑκαστοῦ ποδός two sentences ago, since there the reference was to compound feet, but this paragraph will refer to feet no larger than tetraseme; par. 21 will make clear that it cannot refer to larger compound feet. In paragraphs 20-21, Aristoxenus is focused on the feet of the surface rhythm, the feet seen as sequences of rhythmic events, which may be coordinated into larger compound feet.

**λόγῳ τινὶ ἢ ἀλογίᾳ τοιαύτῃ**

Aristoxenus introduces the topic of the ratio between *arsis* and *thesis* in tandem with the distinction between rational and irrational proportions. This compression of thought contrasts with the systematic introduction of vocabulary seen in paragraphs 1-15, and is similar to the brevity with which the term πούς 'foot' was introduced in paragraph 16. Just as Aristoxenus merely mentioned the basic but familiar concept of the foot before treating the additional complexity of large feet that take more than two markers, so here Aristoxenus merely mentions the basic but familiar concept of rhythmic ratio before introducing the additional complexity of irrational feet.

**δύο λόγων γνωρίμων τῇ αἰσθήσει**

At paragraph 16, we saw Aristoxenus develop a meaning of the word γνώριμος in rhythm that entailed the actualization or activation of a musical faculty inherent in perception. This is the common ground between the usage there and here. Earlier, however, the focus was on the means of activation; here, it is on what exists potentially, the relationship between sound and perception that Aristoxenus conceives of as a musical function.

**ἀνὰ μέσον ἔσται**

This ratio is between 1:1 and 2:1, but not necessarily exactly between. Aristides Quintilianus 1.14 (= 33.21-22 W-I) expresses the relationship between the parts of the irrational foot thus: οὐκ ἔχομεν διόλου τὸν λόγον τὸν αὐτὸν τῶν χρονικῶν μερῶν εἰπεῖν πρὸς ἄλληλα 'We are not able completely to specify the ratio of the temporal parts to each other'. Neumaier (1989: 44) points out that Aristoxenus does not specify which of the three mathematical means listed in Archytas (Fr. 2 D-K), the arithmetic, the geometric, or the harmonic, he has in mind here. Aristoxenus's further development of the idea will show that he does not intend this statement as indicating one precise value.

**εἰ ληφθείησαν**

This hypothetical construction indicates that the following description is not an exhaustive account of the irrational foot, but one illustrative example.

**ὁ δὲ τὸ μὲν κάτω δίσημον, τὸ δὲ ἄνω ἥμισυ**

The apparent redundancy of calling the one double and the other half is paralleled in Aristotle *Categories* 6b30-31 καὶ τὸ διπλάσιον ἡμίσεος διπλάσιον καὶ τὸ ἥμισυ διπλασίου ἥμισυ…'the double double of a half, and the half half of a double'.[85] Aristides Quintilianus 1.16 (= 36.2 W-I) uses the term "half" as a synonym for "short": ἴαμβος ἐξ ἡμισείας ἄρσεως διπλασίου θέσεως, τροχεῖος ἐκ διπλασίου θέσεως καὶ βραχείας ἄρσεως 'the iamb [is made] from a half *arsis* and a double *thesis*, the trochee from a double *thesis* and a short *arsis*'.

**τὴν μὲν βάσιν…τὴν δὲ ἄρσιν**

The parallelism of this passage requires that βάσις is used here as a synonym for τὸ κατώ, the downbeat and the ἄρσις a synonym for τὸ ἀνώ.

The term βάσις is found used in other senses in other sources; for example, Del Grande (1960: 221) points out that Aristotle's use of βάσις at *Politics* 1263b35 and *Metaphysics* 1087b36 is ambiguous in that it could refer to a foot or

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[85] Trans. J.L. Akrill in Barnes 1984: 1.11.

syllable. Del Grande (1960: 218) gives an overview of senses βάσις found in other ancient sources.

Del Grande (1960: 220) hypothesizes that before Aristoxenus, Damon had used the term βάσις as unit of the "flusso ritmico". Del Grande is trying to establish ancient testimony for a general sense of rhythm, which he associates with modern terms "rising" and "falling" rhythms, and which he terms (1960: 221) the "moto agogico": a loose sense of meter which can accommodate the anisochronous rhythms of classical poetry. However, Del Grande's attempts to reconstruct Damon's teaching from the text *E.R.* rely on his interpretations of τὸ ἀνώ and τὸ κατώ, discussed above in our comments on par. 17.

Del Grande (1960: 219) also rejects the reading (attributed to Westphal) δὲ ἄρσιν for codd. διαίρησιν. Morelli had observed (in a note) the lack of δέ, and gave τὴν διαίρεσιν. Boeckh (1811: 40) gave τὴν δὲ ἄρσιν, which Feussner and Bartels adopted.

However, because of the parallelism of the passage, even if the wording varies, and we take διαίρεσιν for δὲ ἄρσιν, it amounts to no more than stylistic variation. Del Grande does not suggest any interpretative difference stemming from his adoption of the manuscript reading. It does not necessarily change the comparison Aristoxenus is setting up, but using the word διαίρεσιν here instead of referring to the *arsis* again would be a stylistic variation tying this sentence back to the last sentence of paragraph 19. It would emphasize that this section has to do with the power of rhythmic composition generating a variation on the formula of this part of the foot.

**γνωρίμων τῇ αἰσθήσει, τοῦ τε ἴσου καὶ τοῦ διπλασίου**

Handel (1989: 402-403) gives an overview of modern research that reveals a general tendency for people to respond to the equal and the double ratios, and to assimilate stimuli that are not exactly in these ratios to them.

> When listeners are asked to reproduce temporal patterns, they tend to simplify the original intervals by making the similar intervals more identical and making the longer intervals equal to twice the shorter intervals...Fraisse (1956) counted the frequency of different durations in compositions ranging from Beethoven to Stravinsky to Bartók and found that these composers tended to use only two durations extensively in any piece. Two durations account for over 85% of the notes in one composition. The ratio of the two durations is 2 to 1 (e.g., quarter note to eighth note, or eight note to sixteenth note)…The experimental results and music conventions converge. … All shorter and all longer intervals tend to become more similar, and the ratio between the shorter and longer intervals tends toward 2 to 1. These adjustments act to reinforce the sense of meter…

Tellingly, Aristoxenus does not include the paionic ratio here, though it is included at *E.R.* 30 as well as at Aristotle's *Rhetoric* 1408b33-1409a23, and is itself ἄνα μέσον to the equal and double ratios. This gives the equal and double ratios a status like that of the concords, musical functions which are of the first order recognizable to perception—see Aristoxenus's appropriation of them at *E.H.* 2.54 as the building blocks of his refutation of the ratio theory of harmonics.

**καλεῖται δ᾽ οὗτος χορεῖος ἄλογος**

The use of the term *choreios* for a trochee is attested in the scholia to Hephaestion (426 Consbruch), though it is more widely used for the *tribrach*. The fact that this irrational foot has a name, as well as the time Aristoxenus spends discussing it, indicates that he considered the irrational to be a part of musical practice, not simply a mistake as held by Pearson (1990: 61) and Gibson (2005: 95).

The term irrational foot is used in different senses in different ancient sources. Dionysius of Halicarnassus uses it of the cyclic hexameters and anapests he describes, apparently consistently with the irrational feet Aristides Quintilianus describes. Hephaestion uses the irrational foot of the metric flexibility allowed in comedy, allowing two short syllables in an even-numbered *arsis* in iambic or an odd-numbered *arsis* in trochaic. These differences warn us against describing one canonical irrational foot when ancient theory found various ways to find the common analytic tool of applying the dichotomy *alogos/rhetos* to the study of rhythm.

Rossi (1963: 13n26 and 49-61) argued that Dionysius's use of the term irrational is to be distinguished from that of Aristoxenus. Rossi (1963: 73-5) concluded that Dionysius's remarks refer to specific phonetic qualities of the lines he gives as examples, which makes the syllables flow together more easily and thus reduces the time associated with each. Dionysius's remarks should not be taken as testimony that all dactyls in hexameters were pronounced with slightly contracted first long syllables, although this view has in fact been retained by West (1982: 20).[86]

The wide range of applications of the term ἄλογος indicates that ancient theorists were not seeking to establish a system of nomenclature with clear, unambiguous technical terms, but were interested rather in how many ways a stereotyped analytical vocabulary could be applied to rhythmic phenomena. Aristoxenus's purpose is to qualify what he will have to say about rhythmic ratios and genera.

One of Boeckh's most important theses in interpreting *E.R.* regards the irrational foot, described in *E.R.* paragraphs 20-21. Boeckh used the irrational foot to explain how Greek musical practice accommodated *anceps* positions in iambo-trochaic and other rhythms. For example, according to Boeckh, when the *anceps* position in a trochaic *metron* was long, that foot would be a triseme like other trochees, but instead of being divided 2:1, it would be divided 12/7 : 9/7.

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[86] Georgiades 1949 proposed that the dactylic hexameter was sung to the same rhythm as the modern Syrtos Kalamikos, which has the sequence long, pause, short, pause, short, pause—yielding a measure in 7/8 time. Georgiades takes Dionysius of Halicarnassus's description of the irrational dactyl as ancient testimony of this rhythmic composition. Again, Dionysius did not intend his comments to apply to all hexameters.

Westphal agrees that the irrational syllable is the *anceps* position of Greek metrics, but treats the irrational foot somewhat differently than Boeckh. While agreeing that the irrational foot is a spondee appearing in iambo-trochaic and other meters, he argues that it requires a slight retardation of the rhythm, an elongation of the musical measure in which it appears. For example, a trochee with a long syllable in an anceps position would be performed 2:1 ½.

As evidence that the irrational foot corresponds to the *anceps* position of metrics, Boeckh cites Bacchius Geron *Introduction to the Art of Music* (315. 18 Jan). Bacchius gives as an example of an irrational foot the word ὀργή, the first syllable of which is considered prosodically κοινόν 'common', able to be taken as a long or a short syllable. This is a false association. If the prosodic category of *koinon* syllables were to be associated with the metrical phenomenon of the *anceps* position, we would expect to find a preponderance of prosodically common syllables in *anceps* positions. This is not the case.

Nevertheless, even though Boeckh's premise of setting classical poetry to isochronous rhythms has been abandoned by most scholars (with Pearson as an emphatic exception), the irrational syllable is still often taken as an *anceps* position in metrics; for a recent example, see Gentili-Lomiento (2003: 28).

Other interpretations have been suggested. Cole (1988: 246-247) sees the irrational foot as accommodating irregularities in versification, thus extending from Hephaestion.

In the commentary to *E.R.* 35, it will be argued that the use of what Hermann called the *anceps* position, places in poetic meter which accepted either a short or long syllable, separates for Aristoxenus the realm of rhythmic theory from the realm of metric theory.

Aristoxenus's point in discussing the irrational foot is appropriate to his narrowly defined domain of rhythm. There may be rhythmic arrangements (τάξεις) to which simple numerical ratios are not actually applicable; these are nevertheless apprehended as variations of the simple standard rather than in terms of a more truly accurate ratio. One motivation for the presence of irrational feet in Aristoxenus's system could have been the compression of long syllables relative to short syllables in performances at tempos close to the limits of physical possibility. At such fast tempos, especially in the performance of song as opposed to purely instrumental music, the performer's ability to enunciate quickly becomes the limiting factor. The only way to increase the overall speed of the rhythmic foot would be to compress long syllables with respect to short syllables.

**PARAGRAPH 21**

**τοῦ τε ῥητοῦ καὶ τοῦ ἀλόγου**

Aristotle *On Indivisible Lines* 968b15 shows that ῥητός is a synonym for σύμμετρος; 968b20-21 says that lines πρὸς ἀλλήλας δὲ ἔσονται ῥηταὶ καὶ ἄλογοι 'will be legitimate or irrational in relation to each other'.

Aristoxenus will similarly assert that the ῥητός and the ἄλογος are defined in terms of each other, but will add an aesthetic component to the mathematical definition of this distinction.

**ὥσπερ ἐν τοῖς διαστηματικοῖς στοιχείοις**

The distinction between ῥητός and ἄλογος is applied to intervals at *E.H.* 1.16 (= 22.1 Da Rios), but without explanation. At 1.17 (= 22.15-16 Da Rios) the application of this distinction to systems is referred to whether such systems included rational or irrational intervals.

**τὸ μὲν κατὰ μέλος ῥητὸν**

The reference here is to an interval.

**ὃ πρῶτον μέν ἐστι μελῳδούμενον**

This qualification is similar to the reference in paragraph 5 to "bodies that are of a nature to be shaped." The participle μελῳδούμενον is used in *E.H.* of the musical phenomena which theory must explain. At 2.47 (= 58.4-5 Da Rios) Aristoxenus says that the quarter tone is the smallest of the sung intervals in musical practice: ἐπειδὴ πάντων τῶν μελῳδουμένων ἐλάχιστόν ἐστι δίεσις ἐναρμόνιος 'since of all sung intervals the smallest is the enharmonic *diesis*'. Aristoxenus 1.20-21 (= 25.11-27.16 Da Rios) discusses maximum intervals that can be perceived or sung. The μελῳδούμενον interval is one within these limits.

**ἔπειτα γνώριμον κατὰ μέγεθος**

This second criterion defines a subset of the μελῳδούμενον intervals. The phrase γνωρίμων λόγων in paragraph 20 prefigured the use of γνώριμος here as referring to something which has a special status, as the following examples illustrate.

**ἤτοι ὡς τά τε σύμφωνα καὶ ὁ τόνος**

The concords are the most easily recognized intervals. The fixed notes of the Greek scales embodied concords: the fixed notes of yoked scales comprised intervals of fourths, and the fixed notes of a gapped scale comprised the fourth, the fifth, and the octave, as well as the tone, which is defined as the difference between a fourth and a fifth. Their role as fixed notes of the musical scales makes these intervals exemplars of what it means for an interval to be ῥητός.

**ἢ ὡς τὰ τούτοις σύμμετρα**

Ps.-Aristotle *Indivisible Lines* 968b15 identified σύμμετρος and ῥῆτος as synonyms. At 968b6 the author defines things as commensurate that are measured by the same unit of measurement: σύμμετροι αἵ τῷ αὐτῷ μέτρῳ μετρούμεναι.

Aristoxenus could here be referring to larger combinations of concords, such as he considers at *E.H.* 1.20 and 2.45; however, intervals which are fractions of a tone play a much more important role in Aristoxenus's theory than do the large concords.

At *E.H* 1.25, three fractional intervals serve as boundaries for distinguishing the different genera of scales. The quarter-tone, also called the enharmonic *diesis*, is the smallest interval sung in music; the third tone is associated with the hemiolic shade of the chromatic genus; the half tone occurs in the enharmonic, the tonic chromatic, and the diatonic genera. At *E.H.* 1.25 and 2.48, Aristoxenus emphasizes that scales are constructed by locating the moveable notes within a range of these values. The half tone, the third tone, and the quarter tone are boundary marks where, Aristoxenus asserts in *E.H.* 1.25, the ear detects changes in the musical function of notes.

Westphal (1861: 210-215) argued that the half tone was for Aristoxenus the smallest interval to be included among the rationals. *E.H.* 1.23 (= p. 29.14-30.9 Da Rios) does say that the quarter tone is difficult to sing, and that the use of the enharmonic fell out of favor. Westphal wants to establish that irrational notes were as common in harmonics as he will find irrational feet to be in rhythm.

However, this requires a strained interpretation of the harmonics. Aristoxenus assigns the quartertone as essential a role as he does to the half tone; furthermore, the quarter tone was recognized by Aristotle and others as the unit of measurement in harmonics.

**τὸ δὲ κατὰ τοὺς τῶν ἀριθμῶν μόνον λόγους ῥητόν**

This phrase implies something more to the concept of ῥητόν in harmony than the criterion of mathematical commensurability. Though an interval may be able to be mathematically described, it lacks the quality that makes certain musical intervals directly recognizable to the senses. Thus, it would be ῥητόν in the mathematical sense only, and not in the special sense which Aristoxenus is describing for harmonics and rhythmics.

Aristotle *Rhetoric* 1408b26-31 presents a case for a need of some rhythm in oratory.

> τὸ δὲ ἄρρυθμον ἀπέραντον, δεῖ δὲ πεπαράνθαι μέν, μὴ μέτρῳ δέ· ἀηδὲς γὰρ καὶ ἄγνωστον τὸ ἄπειρον. περαίνεται δὲ ἀριθμῷ πάντα
> The arrhythmic is unbounded, but it ought to be bounded, though not by meter. For the unbounded is unpleasant and unknowable. But all things are bounded by number.[87]

Here, number represents a notion of underlying order. The meters are familiar units of rhythmical measurement; diction that does not exhibit regular meter may nonetheless exhibit some underlying order.

[87] Trans. Marchetti.

**ᾧ συνέβαινεν ἀμελῳδήτῳ εἶναι**

At *E.H.* 1.21 (= 27.18-19), Aristoxenus says that intervals smaller than the half, third, or quarter tone are amusical: τὰ δὲ τούτῶν ἐλάττονα διαστήματα πάντα ἔστω ἀμελῴδητα. However, this would be redundant with the way the ῥητός interval was said to be first of all μελῳδούμενον in the previous sentence. At *E.H.* 1.25 (p. 33.4-5 Da Rios), Aristoxenus, noting that the corresponding notes of different shades of a scale may differ by sixths or twelfths of a tone, says ἀμελῴδητον γὰρ λέγομεν ὃ μὴ τάττεται καθ' ἑαυτὸ ἐν συστήματι 'we call that amelodic which is not placed in a scale in and of itself'.

Westphal (1861: 214) took μὴ τάττεται καθ' ἑαυτὸ to mean that amelodic intervals could appear in a scale, but only through the flexibility Aristoxenus ascribes to the movable notes of a scale, not because they have any special quality, such as that which Aristoxenus attributed to the fixed notes and those of the πυκνά which are turning points between genera.[88] The moveable notes of melody are identified by their function, not their size. Only the special ones are immediately associated with their sizes: the others are named as σύντονος 'tight' or μαλακός 'loose' versions of the special, γνώριμος intervals. They are seen as modifications of the γνώριμος, not as musical entities in their own right.

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[88] We leave unquestioned for the moment Aristoxenus's assertion that these fractions of a tone can be evaluated by the ear. This level of accuracy has been questioned by Barker 1978b and Litchfeld 1994.

**τὸ μὲν γὰρ κατὰ τὴν τοῦ ῥυθμοῦ φύσιν λαμβάνεται ῥητόν**

This would refer to feet such as those Aristoxenus used as his starting point for describing the irrational foot: one exhibiting the equal ratio, or one exhibiting the double ratio. These rhythms are analogous to the fixed notes of harmonic theory: they have a special musical property that is immediately perceived by the ear; they are γνώριμος in a special sense.

**τὸ δὲ κατὰ τοὺς τῶν ἀριθμῶν μόνον λόγους**

In melody, the reason why the irrational intervals were acceptable was that they could fulfill the same function as their ῥητός counterparts—the colors of the genera relied on this approximating function. Acceptance of variations in size was not paradoxical because the functions were not based on size alone, but on the structure of the Greater Perfect System.[89] At *E.R.* 30-36, in contrast, Aristoxenus will specify the three genera of rhythm in terms of the ratios between the parts of each foot. It seems paradoxical that Aristoxenus here associates the rhythmically irrational, rather than the rhythmically legitimate, with the ratios of numbers. However, the motivation for Aristoxenus's discussion of irrational feet is that they appeared in practice; they do not follow the theory of ratios, and yet Aristoxenus must accommodate them because they are a part of practice. The phrase κατὰ τοὺς τῶν ἀριθμῶν μόνον λόγους echoes

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[89] See our introductory chapter on *E.H.*, under "The Principle of Musical Function".

the thought behind Aristotle's statement at *Rhetoric* 1408b31, cited above, that περαίνεται δὲ ἀριθμῷ πάντα 'all things are bounded by number'. It reflects an attitude that 'number' expresses a general sense of order, even though we may be unable to measure or specify the number. This statement reinforces the position, presented in the notes to *E.R.* 16, that Aristoxenus viewed rhythmic feet as functions, analogous to the theory of melodic function developed in *E.H.* Though the rhythmic genera are named for the ratios they embody, the ratios are not the explanation for their use in rhythm. Rather, the explanation is the special quality Aristoxenus expressed above in the phrase κατὰ τὴν τοῦ ῥυθμοῦ φύσιν λαμβάνεται ῥητόν.

The irrationals are an example of a different division within feet of which the σημεῖα φυλάσσοντα τὴν δύναμιν remain the same.

**πρῶτον μὲν δεῖ τῶν πιπτόντων εἰς τὴν ῥυθμοποιίαν εἶναι**

The rhythmically legitimate must be within the minimum and maximum boundaries of rhythmic time; it must be at least the value of a primary time interval. While our text of *E.R.* does not specify the maximum rhythmic time interval, the discussion of large feet in paragraphs 18 and 19 did imply the existence of such a maximum.

**ἔπειτα τοῦ ποδὸς ἐν ᾧ τέτακται μέρος εἶναι ῥητόν˙**

Westphal (1861: 216) remarked that both the interval and the foot into which it is placed are rational when they are multiples of the primary intervals. This overlooks the relative nature expressed here of the distinction between rational and irrational. The primary time interval is established for any given performance by the *sēmeia* and feet themselves.

**τὸ δωδεκατημόριον**

The twelfth tone interval is not used in music, but enters musical theory in the comparison of fractional intervals which are used in music: *E.H.* 1.25 (= 32.9-10 Da Rios) "ἡ χρωματικὴ δίεσις τῆς ἐναρμονίου διέσεως δωδεκατημορίῳ τόνου μείζων ἐστί: 'the chromatic diesis is one twelfth-tone greater than the enharmonic diesis'.

The irrational marker of the irrational foot can be expressed as one primary time plus the irrational interval. The irrational interval is amusical, like the twelfth tone, because it is not itself performed in music. However, it may be added to the smallest interval of rhythm, as the twelfth tone is added to the smallest *diesis* of harmony, to produce a sound that may be part of a musical performance.

**ἡ μέση ληφθεῖσα τῶν ἄρσεων**

This is the *arsis* that includes the irrational interval, whether conceived as being itself the irrational interval or as a primary time plus the irrational interval.

**οὐκ ἔσται σύμμετρος τῇ βάσει· οὐδὲν γὰρ αὐτῶν μέτρον ἐστὶ κοινὸν ἔνρυθμον**

The *enrhythmon* represents the way Aristoxenus has incorporated an aesthetic criterion along with the mathematical. This statement holds true for the irrational interval that involves exactly one-half of a primary time, because no fraction of the primary time is ἔνρυθμον, used in rhythm. ἔνρυθμον is thus an analogue to μελῴδητον in harmonic theory. This statement also holds true for irrational intervals that do not involve exactly one-half primary time.

West (1992: 20) also takes Dionysios's reference to irrational dactyls as indicating that for all hexameter recitations, the long syllable in the *thesis* is slightly shorter than two short syllables (or one long) of the *arsis*. However, as Rossi (1963) points out, Dionysios is contrasting a special sounding hexameter with the customary setting. This customary setting of the hexameter was identified with the equal rhythmic ratio by Aristotle *Rhetoric* , in the passage which attested the customary valuation of long = 2, short = 1.

**PARAGRAPH 22**

**τῶν ποδικῶν διαφορῶν**

The first book of Aristotle *Parts of Animals* explicates the methodological approach motivating these lists of differentiae. At *Parts of Animals* 642b5-643b10, Aristotle argues that differentiae in natural sciences cannot be ordered in the same way as in the dialectic process of division.[90] Aristotle concludes:

643b10-13: ἀλλὰ δεῖ πειρᾶσθαι λαμβάνειν κατὰ γένη τὰ ζῷα, ὡς ὑφήγηνθ' οἱ πολλοὶ διορίσαντες ὄρνιθος γένος καὶ ἰχθύος. Τούτων δ' ἕκαστον πολλαῖς ὥρισται διαφοραῖς, οὐ κατὰ τὴν διχοτομίαν.

The method then that we must adopt is to attempt to recognize the natural groups, following the indications afforded by the instincts of mankind, which led them for instance to form the class of Birds and the class of Fishes, each of which groups combines a multitude of differentiae, and is not defined by a single one as in dichotomy.[91]

> 643b24-26 διὸ πολλαῖς τὸ ἓν εὐθέως διαιρετέον, ὥσπερ λέγομεν. καὶ γὰρ οὕτως μὲν αἱ στερήσεις ποιήσουσι διαφοράν, ἐν δὲ τῇ διχοτομίᾳ οὐ ποιήσουσιν.
> We must define by a multiplicity of differentiae; if we do so, privative terms will be available to us which are unavailable to the dichotomist.[92]

[90] For discussion, see Balme 1972: 101-6, 117-8; Lennox 2001: 152-160, 161-167, 176.
[91] Trans. William Ogle in McKeon 1941: 653.
[92] Ibid. p. 654.

644b1-4 ἴσως μὲν οὖν ὀρθῶς ἔχει τὰ μὲν κατὰ γένη κοινῇ λέγειν, ὅσα…ἔχει τε μίαν φύσιν κοινὴν καὶ εἴδη ἐν αυτοῖς μὴ πολὺ διεστῶτα… Perhaps, then, it will be best to treat generically the universal attributes of the groups that have a common nature and contain closely allied subordinate forms…[93]

645b20-8 λεκτέον ἄρα πρῶτον τὰς πράξεις τάς τε κοινὰς πάντων καὶ τὰς κατὰ γένος καὶ τὰς κατ' εἶδος. λέγω δὲ κοινὰς μὲν αἳ πᾶσιν ὑπάρχουσι τοῖς ζῴοις, κατὰ γένος δέ, ὅσων παρ' ἄλληλα τὰς διαφορὰς ὁρῶμεν καθ' ὑπεροχὴν οὔσας, οἷον ὄρνιθα λέγω κατὰ γένος, ἄνθρωπον δὲ κατ' εἶδος, καὶ ἂν ὃ κατὰ τὸν καθόλου λόγον μηδεμίαν ἔχει διαφοράν. τὰ μὲν γὰρ ἔχουσι τὸ κοινὸν κατ' ἀναλογίαν, τὰ δὲ κατὰ γένος, τὰ δὲ κατ' εἶδος.
We have, then, first to describe the common functions, common, that is, to the whole animal kingdom, or to certain large groups, or to the members of a species. In other words, we have to describe the attributes common to all animals, or to assemblages, like the class of Birds, of closely allied groups differentiated by gradation, or to groups like Man not differentiated into subordinate groups. In the first case the common attributes may be called analogous, in the second generic, in the third specific.[94]

The list of differentiae of rhythmic feet that Aristoxenus offers here is similar to the lists of differentiae of intervals and of scales offered at *E.H.* 1.16-17. Four of the seven differentiae of rhythmic feet appear also as differentiae of intervals: distinction by genre, γένος; distinction by size, μέγεθος; the distinction between compound and uncompounded, σύνθετος and ἀσύνθετος; and that between legitimate and irrational, ῥητός and ἄλογος. Aristoxenus says all the distinctions applicable to intervals apply also to scales, except the

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[93] Ibid. p. 655.
[94] Ibid. p. 658.

distinction between compound and uncompounded; at *E.H.*1.15 (= 21.6-7 Da Rios), he had defined scales as being compounded out of intervals. However, a parallel distinction between simple versus double or multiple scales is introduced at *E.H.* 1.17-18 (= 23.4-7 Da Rios). The similarity between the lists of differentiae of rhythm and of harmony suggests that Aristoxenus utilized a catalogue of analytical terms, experimenting with different terms for their applicability to the phenomena at hand. This conclusion is reinforced from comments Aristoxenus makes at *E.H.* 1.16 about applying those distinctions that are applicable to rhythm (21.18-19 and 22.31-32 Da Rios):

> πειρατέον διελεῖν εἰς ὅσας πέφυκε διαιρέσεις διαιρεῖσθαι χρήσιμους…τὰς δὲ λοιπὰς τῶν διαιρέσεων ὡς οὐ χρησίμους οὔσας εἰς ταύτην τὴν πραγματείαν ἀφετέον τὰ νῦν
> We should seek to divide into as many distinctions as are useful...the remaining distinctions, as not being useful for this matter, are to be left aside for now.[95]

The impression given is that Aristoxenus is drawing from a catalogue of stereotypical differentiae, choosing those that can be made applicable to the matter at hand.

Neumaier (1989: 46) observed that Aristoxenus's differentiae of rhythm are presented in an order of continuous refinement. Size is the first *differentia*; when size has been established, then genus or ratio can be determined, as exemplified in *E.R.* 31-36. The distinction between rational and irrational is a

[95] Trans. Marchetti.

refinement of the distinction of genre. Neumaier does not explain how the distinction between compound and uncompounded feet falls into the order of continuous refinement. It seems a refinement to the distinction of genus, in that it can distinguish feet of the same genus. The distinction according to division refers to the sequence of rhythmic events comprising a foot; for example, the realization of a diseme as either two shorts or one long would be an example of division.[96] As Aristoxenus indicates, the distinction of *skhēma* is a refinement of the distinction of division, while the definition of antithesis is presented as an outgrowth of the distinction of *skhēma*.

With regard to the structure of *E.R.*, it should be noted that this list of differentiae complements par. 4, that spoke of the same λέξις being set into differing time intervals and thus taking on the characteristic *differentiae* of the rhythm.

**PARAGRAPH 23**

**ὅταν τὰ μεγέθη τῶν ποδῶν, ἅ κατέχουσιν οἱ πόδες, ἄνισα ᾖ.**

At *E.R.* 8, it is said that an object of rhythmic composition can be put into χρόνων μεγέθη παντοδαπὰ, where the point being made is that such

[96] My account diverges here from Neumaier's, who interprets the difference of division in a way that would apply only to compound feet, since he distinguishes the *Dauernfolgern*, in my terms the 'sequence of rhythmic events', from the *Glieder*, 'markers' of a foot.

arrangements can be rhythmic or not; such μεγέθη need not share any definite measurement. At 10.2, the μεγέθη are the named multiples of the primary time interval.

Supplying χρόνου from paragraph 14, and furthermore taking χρόνου as a synonym for σημεῖον 'marker' (as it is used in paragraphs 17-18), we can paraphrase this *differentia*: the feet differ in size when their markers differ in size. This statement transfers a characteristic of the parts to their combination; Aristoxenus uses the same logic at *E.H.* 1.17 (= 22.15-16 Da Rios) when he defines irrational scales as those that have irrational intervals.

**PARAGRAPH 24**

**οἱ λόγοι**

Aristoxenus first mentioned the ratio between the parts of the feet in paragraph 20, when introducing the distinction between legitimate and irrational feet.

**ὁ μὲν τὸν τοῦ ἴσου…ὁ δὲ τὸν τοῦ διπλασίου**

The choice of examples echoes the presentation of the irrational foot in paragraph 20. Aristoxenus will discuss three ratios, the equal (1:1), the double (2:1), and the hemiolic (3:2), at par. 30.

**ἄλλον τινὰ τῶν εὐρύθμων χρόνων**

This has often been taken as an attestation that the 3:1 ratio and 4:3 ratio could occur, though they are not on the list of rhythmic ratios given in par. 30: see *E.R.* 33 and 35. However, Aristoxenus used a similar locution at par. 4, giving two members of three possible objects of rhythmic composition, and then adding "and anything else to be rhythmized by the sort of rhythm that is organized in time intervals." In Aristoxenus's theory, there only would be one other object of rhythmic composition. At *E.R.* 6-9, Aristoxenus develops an argument explaining why *lexis*, melody, and dance are the three objects of rhythmic composition. Aristoxenus's reference here to "some other of the rhythmic ratios" could mean nothing more here than that Aristoxenus has yet to develop a comprehensive account of why the dactylic, iambic, and paionic are the accepted three rhythmic genera.

The possibility of a distinction in application between the adjectives εὔρυθμος and ἔρρυθμος was raised in our commentary on par. 8. Though the adjective ἔρρυθμος will be used to describe rhythmic λόγος in par. 32-35, the more general adjective εὔρυθμος is better in keeping with the open-ended nature of the phrase ἄλλον τινὰ here.

**PARAGRAPH 25**

**μὴ εἶναι ῥητόν**

See paragraphs 20-21. This distinction is an elaboration on the distinction of genre. It would be strange to include them as *euruthmon* in *E.R.* 24, even though they may have occurred, since they are contrasted with the *erruthmon*.

**PARAGRAPH 26**

**οἱ δ' ἀσύνθετοι τῶν συνθέτων**

Aristoxenus applied the distinction of compound and uncompounded to time intervals in paragraphs 13-15. Now the distinction is being applied to feet. At a certain level, to call a foot compound is redundant; a foot is by its definition a compound of *arsis* and *thesis*. At *E.H.* 1.17 (= 22.9-11 Da Rios) Aristoxenus is sensitive to such a redundancy in applying the concept of compounded-uncompounded to the system, which is itself a compound of intervals; he coins the term double system to avoid compound system. However, the term σύνθετος had been used of rhythms by Aristoxenus's predecessor Damon, as cited by Plato *Republic* 400a. Though Damon's use of the word may not be the same as that of Aristoxenus, since Damon does not seem to have pursued a strict distinction between rhythm and meter, Aristoxenus appropriates existing terminology to his own system wherever possible. (Other meanings of the term σύνθετος attested in Aristides Quintilianus and possibly traceable to Damon will be discussed below.)

**τῷ μὴ διαιρεῖσθαι εἰς πόδας**

Aristides Quintilianus *On Music* 1.14 (= 33.16-19 W-I) preserves a similar account:

[ποδες διενηνόχασι] σύνθεσει, ᾗ τοὺς μὲν ἁπλοῦς εἶναι συμβέβηκεν, ὡς τοὺς δισήμους, τοὺς δὲ συνθέτους, ὡς τοὺς δωδεκασήμους (ἁπλοῖ μὲν γάρ εἰσιν οἱ εἰς χρόνους διαρούμενοι, σύνθετοι δὲ οἱ καὶ εἰς πόδας ἀναλυόμενοι)·

(Feet differ) by synthesis, by which it befalls some to be simple, like the disemes, others to be compound, like the twelve-semes, since they are simple which are divided into time intervals, compound which can also be divided into feet.[97]

However, at 1.14 (= 34.19.24 W-I) he says:

> τῶν ῥυθμῶν τοίνυν οἱ μὲν εἰσι σύνθετοι, οἱ δὲ ἀσύνθετοι, <οἱ δὲ μικτοί>, σύνθετοι μὲν οἱ ἐκ δύο γενῶν ἢ καὶ πλειόνων συνεστῶτες, ὡς οἱ δωδεκάσημοι, ἀσύνθετοι δὲ οἱ ἑνὶ γένει ποδικῷ χρώμενοι, ὅς οἱ τετράσημοι, μικτοί δὲ οἱ ποτὲ μὲν εἰς χρόνους, ποτὲ δὲ εἰς ῥυθμοὺς ἀναλυόμενοι, ὡς οἱ ἑξάσημοι.
> Of rhythms, some are compound, some uncompounded, others mixed. Compound are those comprising two or more genera, as the dodecasemes; uncompounded those using one *podiκος* [relative to the foot] genus, like the tetrasemes, mixed those that are sometimes analyzed as feet, other times as rhythms, like the hexasemes.[98]

[97] Trans. Marchetti.
[98] Trans. Marchetti.

Though different senses of the terms σύνθετος and ἀσύνθετος are found in these passages, both passages contain a reference to feet being divided into time intervals or into feet. Such a distinction would be comprehensible in conjunction with Aristoxenus's rejection of the diseme foot, which leaves the diseme as a time interval that can be a compound interval, that is, filled by two rhythmic events, but still not be a foot. Under such a system, the triseme, tetraseme, and pentaseme would be always ἀσύνθετος. Though the triseme marker of the paean can be analyzed as a foot, the diseme marker can only have the status of a χρόνος. As Aristoxenus will specify in par. 34, the hexaseme foot could be divided either as 3+3, two feet, or as 2+4. Since the diseme cannot be taken as a foot, such a hexaseme would be said, like the pentaseme, to be divided εἰς χρόνους rather than εἰς πόδας. Aristides' Quintilianus's acceptance of the diseme foot yields the uncompounded foot as a trivial category, including only the diseme foot.

Aristides' importing another definition of compound from the field of metrics, perhaps with the precedent of Damon's theory, further confuses the issue. Aristides does not follow this definition, namely that compound feet contain more than one rhythmic genus, in the examples that follow. Rather, he takes compound feet as composed of markers that are different in some way, though not necessarily of different rhythmic genera or ratios.

In chapter 1.16 (= 34.6-7 W-I), Aristides identifies two iambo-trochaic rhythms composite by conjunction, the first consisting of an iamb followed by a trochee ( ˘ ¯ | ¯ ˘ ) and the second of a trochee followed by an iamb ( ¯ ˘ | ˘ ¯ ). In these examples, the markers differ by the order of the rhythmic events. Aristides Quintilianus describes iambo-trochaic rhythms composite by period; that is, rhythmic phrases made up of both iambs and trochees such that there are a total of four feet in each phrase. While these rhythms use different forms of the double genus, the trochee and the iamb, they do not strictly speaking use more than one rhythmic genus.

In chapter 1.15 (= 35.14-17 W-I), as composite κατὰ συζυγίαν rhythms in the dactylic genus, Aristides lists the ionic major ( ¯ ¯ | ˘ ˘ ) and ionic minor ( ˘ ˘ | ¯ ¯ ); each is analyzed as consisting of a spondee and a pyrrhic. The ionics are labeled composite because their constituents differ; both are feet of the dactylic genus, but they differ in magnitude. The rhythm is labeled dactylic because its constituent parts contain the equal ratios 2:2 and 1:1. The ratio of the overall *thesis* to *arsis* would be 4:2, in the double (iambo-trochaic) genus, but Aristides does not comment on this. Analyzing them as compound meters, Aristides classifies them by the ratio exhibited within the constituent parts.

By contrast, the double spondee is listed as an uncompounded rhythm in the dactylic genus and the marked trochee and *orthios* are listed as uncompounded feet in the 2:1 genus. Although these are compound in Aristoxenus’s sense of the term, Aristides calls them uncompounded because their markers are similar.

**PARAGRAPH 27**

**διαιρέσει …ὅταν τὸ αὐτὸ μέγεθος εἰς ἄνισα μέρη διαιρεθῇ**

Aristoxenus has prepared for this at par. 19, where he observed that rhythmic composition could produce many divisions. In this light, the *differentia* of division refers to the different sequences of rhythmic events possible within a given foot, that foot being defined in terms of the durations of its component time intervals.

**ἢ κατὰ θἄτερα**

A *megethos* can be divided into the same number of parts, but parts of different size, as long as in any one such division the parts are different sizes from each other: thus, the hexaseme could be divided into three disemes ¯ ¯ ¯ or three rhythmic events of differing length ┘˘ ¯.

For a *megethos* to be divided into a different number of parts of the same size is paradoxical, but it is not necessary to excise this line, as Westphal (1883: 33) does. Aristoxenus referred in paragraph 19 to ambiguity in counting the number of markers in a foot. This line could play upon such ambiguity. Though

Aristoxenus would have counted the marked trochee discussed above as consisting of three tetraseme markers, its name implies the two-marker count, octaseme and tetraseme, which is attested in Aristides Quintilianus. The size of the parts has not changed, in the sense that both counts refer to the same rhythmic entity, based on the same tetraseme pulse; the difference is in the conventions of counting. Compare this to a hypothetical dodecaseme foot divided into two hexaseme markers.

**PARAGRAPH 28**

**σχήματι**

Shape was Aristoxenus's first metaphor for rhythm, in paragraph 4. Especially relevant for the differentia of *skhēma* is that Aristoxenus defined shape in terms of the relative positions of an object's parts. At par. 17 he labeled the parts of a foot *anō* and *katō*, which implies a spatial metaphor. Putting these together, the *skhēma* refers to the assignment of time intervals as *arsis* or *thesis* of a foot.

This differs from Aristotle's reference to the *skhēma* of a *lexis* at *Rhetoric* 1408b21, which referred to the sequence of time intervals embodied by a word's syllables. For Aristotle, ¯ ˘ and ˘ ¯ would differ in σχῆμα. For many scholars, including Bartels, Westphal, Laloy, and Rowell, the differentia of *skhēma* includes the order of long and short rhythmic events, which corresponds with Aristotle's usage. These scholars associate the differentia of division with the assignment of *arsis* and *thesis*. Only Westphal grapples with the difficulties this raises with Aristoxenus's wording; as mentioned, he excises the phrase καὶ θἄτερα from paragraph 27.

Pearson (1990: 63-64) offers a different interpretation of the *differentiae* of division and *skhēma*. Pearson takes division to mean that ˘ ¯ and ¯ ¯ can be different divisions of the same *megethos*; the division can yield a different value of the primary time interval. Pearson also categorizes such differences as arise from the equivalence of two shorts to one long under division. *Skhēma* includes differences in the order of rhythmic events in a foot, such as ˘ ¯ versus ¯ ˘ . In other words, Pearson splits aspects of Aristotle's sense of σχῆμα between Aristoxenian division and *skhēma*.

Pearson's theory contradicts *E.R.* in that it posits the same *megethos* being potentially divided into a different number of primary time intervals. However, to Aristoxenus, the τὸ αὐτὸ μέγεθος of par. 27 is definite, measured as a multiple of the primary time. As stated in the comments to par. 19, the divisions of intervals of the same *megethos* πολλὴν λαμβάνουσι ποικιλίαν 'admit of great variety'. This formulation cannot refer to the different ratios generated by different values of the primary time interval; at paragraphs 31-36 Aristoxenus explicitly associates different *megethē* with the ratios each can contain. The association of *megethos* with ratio is meaningful only in terms of markers that share the same primary time interval.

**τὰ αὐτὰ μέρη τοῦ αὐτοῦ μεγέθους μὴ ὡσαύτως ᾖ <τεταγμένα>**

For Aristoxenus, *skhēma* is depicted as something that happens after the division of an interval has been determined; it relates to external articulation in the types of rhythm to which *E.R.* applies.

Morelli's supplement τεταγμένα is based on Michael Psellus *Introduction* paragraph 16 (p. 26 Pearson): σχήματι δὲ ὅταν τὸ αὐτὰ μέρη τοῦ αὐτοῦ μεγέθους μὴ ὡσαύτως ᾖ τεταγμένα '*skhēma* when the same parts of the same duration are not arranged in the same way'... Psellus includes six of Aristoxenus's seven differentiae, and the other five are quoted nearly verbatim from *E.R.* The *taxis* of the parts is predicated on their assignment as *arsis* or *thesis*.

This also echoes *E.R.* 21 τοῦ ποδὸς ἐν ᾧ τέτακται μέρος 'the part of the foot in which it is placed'.

**PARAGRAPH 29**

**οἱ τὸν ἄνω χρόνον πρὸς τὸν κάτω ἀντικείμενον ἔχοντες**

Since *skhēma* is the assignment of *arsis* and *thesis*, this is one special case of difference of shape.

**ἔσται δὲ ἡ διαφορὰ αὕτη ἐν τοῖς ἴσοις μέν, ἄνισον δὲ ἔχουσι τῷ ἄνω χρόνῳ τὸν κάτω**

*E.R.* 17 gives an example of two feet that would be considered in antithesis: one up and two down as compared to two up and one down.

Aristoxenus's *differentia* of antithesis does not apply to feet with equal markers because it does not deal with the sequence of *arsis* and *thesis*, but with the effect of having a *thesis* shorter than an *arsis*. In a rhythmic framework consisting of unequal markers, one being longer than the other, either the longer or shorter marker can be *arsis* and either can be *thesis*. The parameter distinguishing upbeat from downbeat is separate from the parameter of duration. The differentia of antithesis refers to the difference arising by having the longer or the shorter marker serving as *thesis* in such a rhythm.

Aristides Quintilianus *On Music* 1.14 (= 33.26-28 W-I) diverges greatly from Aristoxenus's definition.

> ἡ κατὰ ἀντίθεσιν, ὅταν δύο ποδῶν λαμβανομένων ὁ μὲν ἔχῃ τὸν μείζονα χρόνον καθηγούμενον, ἑπόμενον δὲ τὸν ἐλάττονα, ὁ δὲ ἐναντίως.

> The difference by antithesis occurs when, of two given feet, the one has the larger time interval first, while the smaller interval follows, and the other foot is arranged in the opposite way.[99]

Aristides' definition would apply to the distinction between the iambic foot and the trochaic foot. It could be Aristides Quintilianus is working from *E.R.* 17 but interpreting it as triseme, as Del Grande and Luque-Moreno do. Aristides uses the term antithesis in rhythm again at 1.19 (= 40.6 W-I), 45.27-29 W-I, and p. 51.20 W-I; he does not use the definition given here, but uses this stereotypical vocabulary in a variety of senses.

**PARAGRAPH 30**

**τῶν δὲ ποδῶν <τῶν> καὶ συνεχῆ ῥυθμοποιίαν δεχομένων**

The list of *differentiae* at 22-29 corresponds to the mention of ταῖς τοῦ ῥυθμοῦ διαφοραῖς at *E.R.* 4; now a major new section of the treatise begins. The term συνεχῆ, continuous, is introduced here without a definition. The term plays a very important role in *E.H.* 2.53-54 (= 66.1-65.10 Da Rios); the contiguous notes in a scale are σύνεχεῖς 'continuous'.

In rhythm, συνεχής means featuring consistent repetition. This usage is found at *POxy* 2687 where continuous *rhythmopoiia* implies the same figure of adjusting syllable lengths to fit isochronous hierarchical intervals repeated

[99] Trans. Marchetti.

within compound feet. Hephaestion also used derivations of the root *sunekhē* for repeated poetic meters: ἐν συνεχείᾳ of three non-contracted anapests in a row within a larger colon (28.8 Consbruch); συνεχέστερα of usage of the choriamb (30.3 Consbruch); ἐν συνεχεια of the *iambelegos* colon not used continuously (51.4 Consbruch). These passages in Hephaestion all refer to the repetition of specific sequences of rhythmic events. In contrast, Aristoxenus's emphasis from par. 18 has been the variation produced by rhythmic composition, so that the idea that a fixed rhythmic composition is important or desirable has not been well prepared. Nor will such an idea be developed in the paragraphs to follow. Rather, paragraphs 31-36 discuss feet in terms of potentially compound time intervals, without reference to their sequences of rhythmic events. Therefore, it seems most consistent with the treatise as a whole to limit the sense of συνεχής to the continuous progression of functional *sēmeia* rather than exact the repetition of specific sequences of rhythmic events.

**τρία γένη ἐστί, δακτυλικὸν μὲν οὖν ἐστι τὸ ἐν <τῷ> ἴσῳ λόγῳ, ἰαμβικὸν δὲ τὸ ἐν τῷ διπλασίῳ, παιωνικὸν δὲ τὸ ἐν τῷ ἡμιολίῳ.**

Plato *Republic* 400a4-c3 attests a list of three basic rhythmic types prior to Aristoxenus, though Plato does not list them: ὅτι μὲν γὰρ τρί' ἄττα ἐστὶν εἴδη ἐξ ὧν αἱ βάσεις πλέκονται: 'there are three species from which the rhythms are woven'.

Aristotle *Rhetoric* 1408b32-1409a17 gives the same three proportions for the eponymous syllable sequences. He goes on to offer a numerical analysis of these meters in order to explain the usefulness of the paean in oratory (1409a3-6):

> ἔστι δὲ τρίτος ὁ παιάν, καὶ ἐχόμενος τῶν εἰρημένων˙ τρία γὰρ πρὸς δύ' ἐστίν, ἐκείνων δὲ ὁ μὲν ἓν πρὸς ἕν, ὁ δὲ δύο πρὸς ἕν, ἔχεται δὲ τῶν λόγων τούτων ὁ ἡμιόλιος˙ οὗτος δ' ἐστὶν ὁ παιάν.
> The paean is third, comprised of the aforementioned meters. For it is three to two; of the aforementioned meters, the first was one to one, the other two to one. The *hemiolic* ratio holds of these proportions, and this is the paean.

The one to one ratio corresponds to the heroic rhythm, the two-to-one ratio to iambo-trochaic. The paean is useful in oratory because it is not a meter of either of these rhythms, and therefore would not be conspicuous to the audience.

Aristoxenus does not explain why these three genera are special. The equal and double were called *gnōrimos* to perception at 20, but there's been no statement as to why the paionic ratio is acceptable. In 31-36, Aristoxenus will rule out other ratios without explanation but simply by the assertion that they are not rhythmical. Thus the three acceptable ratios take on the status of axioms; they are not explained, but taken as accepted, and, through the association of ratios to sizes, perhaps theorems about legitimate sequences of *megethē* were drawn from them (as *E.H.* III presents theorems about interval sequences based on the rule of succession).

Theophrastus wrote several works on music; his interest in the psychological aspects of music parallels Aristoxenus's.[100] Theophrastus's refutation of the theory that the concords of harmony are caused by ratios complements Aristoxenus's development of an alternative in *E.H.*[101] Theophrastus denies that the theory of ratios constitutes an explanation of the phenomenon of harmonic concords. His argument is a *reductio ad absurdum*: if the qualities of sounds are explained by numerical analysis, so ought the qualities of colors—but if both harmonies and colors are explained by numerical analysis, what explains the difference between them? Theophrastus goes on to point out aspects of sound that could not be explained by numerical analysis.[102]

For Aristoxenus, the rhythmic genera are musical functions that are conventionally named for their ratios. The ratio is one aspect of the form of the rhythm, but a theory of rhythm must start from the way the human faculty of musical perception comprehends and responds to them.

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[100] Fortenbaugh, W. W. et al. 1992 = *FHSG* 714 collects the titles of Theophrastus's works on music: Diogenes Laertius v.42-51 attests the following titles: *On Music* 1-3, *On Musicians* 1, *Harmonics* 1, and *On Arithmetic*, for which Meurs conjectured *On Rhythm*. *FHSG* 719-724 attest Theophrastus's attention to the psychology of music.
[101] Porphyry, *On Claudius Ptolemy's* Harmonics 1.3, = FHSG 716, contains these arguments of Theophrastus regarding harmonic concords.
[102] These are qualities relating to the physical-acoustic generation of sound; Theophrastus points out the inconsistencies and unsolved problems of acoustic theory at his time.

## PARAGRAPH 31

**ἐλάχιστοι ...ἐν τῷ τρισήμῳ μεγέθει**

This is the smallest construction to which the distinction presented at *E.R.* 19 between δύναμιν φυλάσσοντα σημεῖα 'function-preserving markers' and the divisions brought about by *rhythmopoiia*, can be maintained. Thus the triseme is the smallest foot consistent with the theory presented in *E.R.*

**τὸ γὰρ δίσημον μέγεθος**

Aristides Quintilianus 1.14 (= 34.5 W-I) and *Fragmenta Neapolitana* 14 (= 28.23 Pearson) do accept the diseme foot. The *pyrrichios* foot of two short syllables is associated with the *pyrrichē* dance.[103] If this dance was performed with a step for each short syllable, Aristoxenus may have considered it an aspect of gymnastic exercise rather than music. As mentioned in the notes to par. 4, Plato *Laws* 795e distinguishes dance which "serves the Muses" from dance practiced for bodily exercise. Aristoxenus describes the *pyrrichē* dance as being warlike (Fr. 103 Wehrli) and recounts that οἱ παλαιοὶ γυμναζόμενοι πρῶτον ἐν τῇ γυμνοπαιδικῇ εἰς τὴν πυρρίχην ἐχώρουν πρὸ τοῦ εἰσιέναι εἰς τὸ θέατρον 'the ancients while first training in naked dance used to go forward in the *pyrrichē* before going into the theater'.[104]

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[103] See Ceccarelli 1998 and 2004 for a full discussion of the dance and its social significance.

[104] Trans. Marchetti. Aristoxenus (Fr. 103 Wehrli) says that γυμνοπαιδική is a type of dance παρεμφερής 'somewhat like' tragic dance.

Aristoxenus's distinction between the markers of a foot and the divisions of rhythmic composition could not be upheld if he accepted the diseme as a foot. If a diseme were taken as a foot, then both its δύναμιν φυλάσσοντα σημεῖα 'function-preserving markers' would be monosemes: neither marker could be subdivided, so there would be no distinction between δύναμιν φυλάσσοντα σημεῖα and divisions brought about by rhythmic composition.

**παντελῶς ἂν ἔχοι πυκνὴν τὴν ποδικὴν σημασίαν**

When accentuation falls on every small πρῶτος χρόνος, the accentuation pattern cannot articulate a larger grouping. The coordinating or articulating function of the distinction between *arsis* and *thesis* was based on grouping of rhythmic events and the distinction of these groups. By whatever means this was carried out, application to every rhythmic event eliminates contrast and therefore does not create a rhythmic hierarchy. A modern parallel is the backbeat of popular music; a dynamic stress on every beat does away with the sense of rhythmic depth or hierarchy.

## PARAGRAPH 32

**οἱ <ἐν> τετρασήμῳ μεγέθει˙**

The tetraseme is small enough to be clearly recognizable to perception as a marker in a larger foot, as attested by the division of the octaseme foot into two tetraseme markers at 36. The term *poluplasion* at paragraph 19 implied that in some large rhythmic constructions the markers were at least tetrasemes. Thus, the tetraseme is the largest interval explicitly identified within *E.R.* as being part of the articulation of larger rhythmical units by functional markers.

**ἐισὶ δ' οὗτοι δακτυλικοὶ τῷ γένει … ὁ μὲν τοῦ τριπλασίου οὐκ ἐνρυθμός ἐστιν**

The analysis first lists all ratios by which the interval can be divided, and then evaluates these ratios by whether they are rhythmical. The apprehension of ratios in sequences of rhythmic events is a characteristic of perception, which quantizes continuous percepts (see par. 11). The double ratio was called *gnōrimos* to perception at 20, as compared to the irrational ratio. Like the double ratio, the triple ratio is a small multiple of the primary time interval; in harmonics, the triple ratio corresponds to a large concordant interval, an octave plus a fifth, which Aristoxenus recognizes would be a concord within the range of musical practice at *E.H.* 1.20 (= p. 25.18-26.7 Da Rios).

This rejection of the 3:1 ratio from rhythm entails that Aristoxenus required another criterion for his rhythmic genera than just that they be expressible in low integers. The rhythmic genera are musical functions, analogous to the melodic functions described in *E.H.*, rather than merely ratios.

**PARAGRAPH 33**

**ὁ μὲν τοῦ τετραπλασίου οὐκ ἔρρυθμος ἐστιν**

The 4:1 ratio appears in harmonics in the double octave. Coming after the rejection of the triple ratio, the rejection of the quadruple ratio here raises the possibility, borne out in paragraphs 34 and 35, that Aristoxenus considers ratios above 2:1 too unequal to serve as rhythmic functions.

**ὁ δὲ τοῦ ἡμιολίου τὸ παιωνικὸν ποιήσει γένος**

The hemiolic (3:2) ratio is not explicitly mentioned with the equal and the double as *gnōrimos* at paragraph 21. Numerically, the irrational foot would be closer to 3:2 than it is to 2:1 or 1:1, but 2:1 and 1:1 are singled out as the most readily recognizable to perception. Aristotle *Rhetoric* 1409a8-9 recommends the paean for oratory because, not being associated with a poetic meter as recognizable as the hexameter in the equal ratio or the trimeter in the double ratio, its use in oratory would not be as obvious to an audience.[105]

However, for the 3:2 ratio to be accepted as eurhythmic and yet not be *gnōrimos* would seriously undermine the distinction between *gnōrimos* ratios and irrational ratios at paragraphs 20 and 21. It seems that a ratio being *gnōrimos*

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[105] Poetry using feet paionic feet did exist; for a recent survey, see Gentile and Lomiento 2003: 220-234. Hagel 133-164 gives a detailed rhythmic analysis of the Delphic hymns, composed entirely in paionic feet. Aristotle's point seems to be that paionic feet mixed in with prose did not stand out the way that even a few consecutive dactylic or iambic feet could sound like snippets of poetry in an oration.

admits of degrees; though the hemiolic is not as readily *gnōrimos* as the equal or double, it is still sufficiently *gnōrimos* to be eurhythmic.

**PARAGRAPH 34**

**ὁ μὲν τοῦ ἴσου…ὁ δὲ τοῦ διπλασίου**

The equal ratio holds for the hexaseme divided 3:3; the double ratio holds for the hexaseme divided 4:2. When divided 3:3, the hexaseme fits the definition of a compound foot given at *E.R.* 24. The 4:2 division of the hexaseme must be taken as an uncompounded foot.

**PARAGRAPH 35**

**οὐθείς ἐστιν ἔρρυθμος˙ ὧν εἷς μέν ἐστιν ὁ τοῦ ἐπιτρίτου**

The epitrite ratio lies between the 1:1 and 2:1 ratios, is expressed in small integers, and has a counterpart in harmonics, the concord of the fourth. Despite these characteristics, it is excluded from rhythm. This is the strongest indication that Aristoxenus conceived of the dactylic, iambic, and paionic rhythmic genera as musical functions rather than taking their ratios as the explanation for their being rhythmical.

The references in Plato's *Republic* and Aristotle's *Rhetoric* to three rhythmic genera indicate that Aristoxenus did not originate the rejection of the epitrite.

Nonetheless, some sources accept it. In his passage on the augmented rhythms (cf. par. 19), Aristides Quintilianus gives a heptaseme and a 14-seme epitrite construction, but notes their use as rare. Such constructions may have been the creation of rhythmic theorists seeking to expand Aristoxenian rhythmic theory.

In a different context, in his section on metrics, Aristides Quintilianus lists syllable sequences of three longs and a short as epitrites. Hephaestion explicitly calls these metric feet, which commonly appear as common forms of iambic or trochaic *metra*, as heptasemes. Aristoxenus's rejection of the heptaseme in rhythm is not evidence that the syllable durations of such sequences were manipulated to an isochronous structure. Rather, this observation could serve as a boundary line between Aristoxenus's theory of rhythm and his theory of poetic meters.

## CHAPTER 6: TRANSLATION AND COMMENTARY FOR *POXY* 2687

*POxy* 2687, portions of which were first published as *POxy* 9, shares some technical terminology with *E.R.*, but its approach to rhythm is very different. Whereas *E.R.* is theoretical, *POxy* is practical in orientation and provides examples of many points it makes. While previous editors (Grenfell-Hunt 1898; Rea 1968; Rossi 1988; Pearson 1990) ascribe the work to Aristoxenus or a member of his school, the absence of key terms found in *E.R.* such as σύνθετος 'compound', ἀσύνθετος 'uncompounded', διαίρεσις 'division', and σημεῖον 'marker' from passages in which they could have added precision suggests that the author may have been from a different school of rhythmic theory. Plato mentions rhythmic theorists at *Cratylus* 424c1-2 and describes Damon's rhythmic theory at *Republic* 400a-c, while Aristides Quintilianus 1.18 (= 38.15-17 W-I) refers to competing schools of rhythm after Aristoxenus.

In our notes to *E.R.* 17-19, the testimony of *POxy* 2687 on the *orthios*, the marked trochee, and the *epibatos* was frequently cited as a source that could shed light on Aristoxenus's remarks about large rhythmic feet. Our claim that *POxy* 2687 provides evidence of various acceptable ways to construct these feet can best be substantiated by a close reading the fragment.

The following text of *POxy* 2687 i.33-v.29 is provided for ease of reference with the subsequent translation and commentary. This text does not indicate text restorations, the lengths of *lacunae* (indicated simply by ...), or the line breaks within each column. Col. i.1-32 and v.30-35 are too fragmentary for interpretation and have been omitted. Some word fragments have also been omitted within sections marked here simply as *lacunae*. The beginning of each new column is noted, as well as which sections were included in *POxy* 9, and which were first published in *POxy* 2687.

i.

[33] …οἰκειότατοι

ii.

μὲν οὖν εἰσιν οἱ ῥυθμοὶ οὗτοι τῆς τοιαύτης λέξεως· χρήσαιτο δ’ἂν αὐτῆι καὶ ὁ δάκτυλος ὁ κατὰ ἴαμβον ἀνάπαλι τῶν περιεχουσῶν ξυλλαβῶν τεθεισῶν εἰς τοὺς χρόνους ἢ ὡς ἐν τῶι κρητικῶι ἐτίθεντο· ἔσται δὲ τὸ σχῆμα τοῦ ποδὸς δι’ οὗ ἡ ῥυθμοποιΐα πορεύσεται τὸ εἰς ἴαμβον οἷον "ἔνθα δὴ ποικίλων ἀνθέων ἄμβροτοι λείμακες βαθύσκιον παρ’ἄλσος ἁβροπαρθένους εὐιώτας χοροὺς ἀγκάλαις δέχονται"· ἐν τούτωι γὰρ οἵ τε πέντε πρῶτοι πόδες οὕτω κέχρηνται τῆι λέξει καὶ πάλιν ὕστεροι τρεῖς καὶ "ὅστις εὐθυμίηι καὶ χοροῖς ἥδεται"· ἐπὶ πολὺ δὲ τῆι τοιαύτηι ῥυθμοποιΐαι οὐ πάνυ χρῆται ὁ ῥυθμὸς οὗτος· χρήσαιτο δ’ ἂν τῆι τοιαύτηι λέξει καὶ ὁ ἀπὸ τροχαίου βακχεῖος ἐν καταμείξει τιθεὶς τὴν ἐκ μονοχρόνου καὶ ἰάμβου ξυνζυγίαν ὥστε ξυνεχῆ μὲν οὐδὲ ταύτην δεῖ ζητεῖν τὴν ῥυθμοποιΐαν· οὐ γὰρ παραγίγνεται· διεσπαρμένηι δ’ ἔστι περιπεσεῖν οἷον ἐν τῶι “ῥιπτείσθω ποδὸς ἱερὰ βάσις” κατὰ τὸ “Διόνυσον τὸν ἐκ πυρός” μία ξυνζυγία· προελθόντι δὲ κατὰ μὲν τὴν λέξιν ἔστι λαβεῖν τὸ προκείμε-

iii.

νον εἶδος, κατὰ δὲ τὰ τῆς ῥυθμοποιΐας σχήματα παραλλάττει ἐν τῶι “φίλιον ὥραισιν ἀγάπημα θνατοῖσιν ἀνάπαυμα μόχθων”· ἔστι δέ που καὶ ξυνεχεῖς ἐπὶ τρεῖς “φέρταταον δαίμον᾽ ἁγνᾶς τέκος ματέρος ἃν Κάδμος ἐγέννασέ ποτ᾽ ἐν ταῖς πολυολβίοισιν Θήβαις”· χρήσαιτο δ᾽ ἂν καὶ ὁ ἴαμβος τῆι αὐτῆι ταύτηι λέξει, ἀφυέστερον δὲ τοῦ βακχείου· τὸ γὰρ μονόχρονον οἰκειότερον τοῦ τροχαϊκοῦ ἢ τοῦ ἰάμβου, οἷον ἐν τῶι “βᾶτε, βᾶτε κεῖθεν, αἱ δ᾽ εἰς τὸ πρόσθεν ὀρόμεναι· τίς ποθ᾽ ἁ νεᾶνις; ὡς εὐπρεπής νιν ἀμφέπει”· τρεῖς πόδας διαλείπουσιν αἱ ξυνζυγίαι ὥστε περιοδῶδές τι γίγνεσθαι· αὗται μὲν οὖν αἱ χρήσεις τῶν γιγνομένων εἰσὶν οὕτως ὡς δήποθ᾽ ἑκάστην αὐτῶν· αἱ δὲ μέλλουσαι ῥηθήσεσθαι δύνανται μὲν γενέσθαι εἴ τις εὐκαίρως αὐταῖς χρῶιτο καταμιγνὺς εἰς τὰς γνωριμωτέρας τε καὶ οἰκειοτέρας χρήσεις· οὐ μέντοι γεγενημέναι γέ πως· λέγω δὲ τὰς τοιάσδε· ὁ ὄρθιος καὶ ὁ σημαντὸς τροχαῖος ἐκ τριῶν κρητικῶν δύνανται ξυντίθεσθαι· δῆλον δ᾽ ὅτι καὶ ἐκ τριῶν περιεχόντων· δύνανται δὲ καὶ ἐκ τριcol. iv

ῶν ἡμισέων· ὁ αὐτὸς δὲ λόγος καὶ περὶ τοῦ παιῶνος· καὶ γὰρ οὗτος ἐκ πέντε περιεχόντων δύναται ξυντίσεσθαι· δῆλον δ᾽ ὅτι καὶ ἐκ πέντε ἡμισέων. ξυνεχὴς μὲν οὖν ἡ τοιαύτη χρῆσις οὐκ ἂν γίγνοιτο· παντελῶς γὰρ ἀλλότριον τὸ ἦθος τῆς τοιαύτης ῥυθμοποιΐας τοῦ τε παιῶνος καὶ τῶν πρὸ τούτου ῥηθέντων· εἰ δέ που τιθεμένη ἐν καταμείξει τοῦ ἰδίου ἕνεκα δοκιμάζοιτο, τάχ᾽ ἂν χρήσαιτό τις αὐτῆι· εἰ δὲ μὴ καθόλου· διὰ τὴν προεκκειμένην ἀπορίαν· ἀθέτους ἐατέον τὰς τοιαύτας χρήσεις ὅσαι μεικτοὺς τινὰς ἐμφαίνουσι ῥυθμοὺς μὴ δοκιμαζομένους ὑπὸ τῆς αἰσθήσεως· επει…

..διῃρημένοι ῥυθμοὶ καὶ ξυνεστραμμένοι εἰς ἐλάττους χρόνους ἐπειδήπερ ἐνδέχεται...δύο τῶν τριῶν ξυλλαβῶν τας…

…λέγω δ᾽ εἰς ἀνίσους, τὴν μὲν προτέραν εἰς τὸν μείζω ἐπειδήπερ καὶ μακρά, τὴν δὲ ὑστέραν εἰς τὸν ἐλάττω ἐπειδήπερ βραχεῖα· ὅτι δὲ γενομένου τούτου τὸ χρώμενον οὕτως ταῖς τρισὶ ξυλλαβαῖς

col. v

ἐγγὺς ἔσται ἀναπαιστικοῦ σχήματος σχεδὸν δῆλον· διὰ τί δ᾽ οὐκ ἂν γίγνοιτο καὶ τὸ ἀντεστραμμένον ὥστε τὴν μὲν πρώτην ξυλλαβὴν ἐν τῶι μεγίστωι χρόνωι κεῖσθαι, τὴν δὲ δευτέραν ἐν τῶι ἐλαχίστωι, τὴν δὲ τρίτην ἐν τῶι μέσωι· δῆλον δ᾽ ὅτι ἡ αὐτὴ αὕτη ἀπορία διατείνει καὶ ἐπὶ τὴν ἀντικειμένην λέξιν τῆι τετραχρόνωι κρητικῆι λέξει· διὰ τί γὰρ οὐκ ἂν ἡ δύο ἰαμβικοῖς εἰς τὸν πόδα χρωμένη ῥυθμοποιΐα…τὴν αὐτὴν ἀγωγὴν…ικοις χρωμένη…..δι’ ἣν αἰτίαν…φανερόν· περὶ μὲν οὖν τούτου τοῦ σχήματος τοσαῦτ’ εἰρήσθω· ἡ γὰρ παρὰ φύσιν τῶν ξυλλαβῶν θέσις ἡ εἰς τὴν δακτυλικὴν ῥυθμοποιΐαν ξυντείνουσα φανερὰ ἐκ τῶν ἔμπροσθεν· ἡ δ’ ἀπὸ βραχείας ἀρχομένη τῶν ξυλλαβῶν τάξις οἰκεία μὲν οὐδενός ἐστιν τῶν ῥυθμῶν τοιούτων…

**TRANSLATION**

**col. ii (9)**

…these rhythms are more suited to such a diction. The iambic dactyl might also use it, when the syllables composing the cadence are placed into time intervals in the opposite order as they are placed in the cretic. The shape of the foot, through which the *rhythmopoiia* will proceed, will be that which ends in an iamb, such as:

– ˘ – – ˘ – – ˘ – – ˘ – – ˘ –
ἔνθα δὴ ποικίλων ἀνθέων ἄμβροτοι λείμακες
˘ – ˘ – ˘ – ˘ – ˘ – ˘ –
βαθύσκιον παρ’ ἄλσος ἁβροπαρθένους
– ˘ – – ˘ – – ˘ – ˘ – –
εὐιώτας χοροὺς ἀγκάλαις δέχονται

[Where immortal meadows full of many-colored flowers take in their arms the singing choruses of Bacchantes, beside a shady grove]

for in this, the first five feet treat this diction in this way. Again later, three feet also use it:

– ˘ – – ˘– – ˘ – – ˘ –
ὅστις εὐθυμίηι καὶ χοροῖς ἥδεται

[whosoever rejoices in good cheer and dances]

But this rhythm will indeed not use this sort of *rhythmopoiia* for long.

**col ii. (2687)**

The bacchic foot from the trochee [ ¯ ˘ ˘ ¯ ] might also use such a diction, mixing in the syzygy made from a monochrone and an iamb in such a way that one ought not seek this as a continuous *rhythmopoiia*, since it does not occur. One stumbles across it here and there, as there is one syzygy in

– – – ˘ ˘ ˘ ˘ – ˘ x
ῥιπτείσθω ποδὸς ἱερὰ βάσις

[let the holy step of the foot be flung forward]

after the

˘ ˘ – – ˘ – ˘ –
Διόνυσον τὸν ἐκ πυρός

[Dionysus, from the fire]

As one proceeds, it is possible to find the type under consideration in diction,

**col. iii (9)**

but it alternates in the forms of the rhythmic composition, in

˘ ˘ ˘ – – ˘ ˘ ˘ – ˘ – – ˘ ˘ ˘ – ˘ – –
φίλιον ὥραισιν ἀγάπημα θνατοῖσιν ἀνάπαυμα μόχθων

[gift dear to the Graces, rest for mortals from toil]

And it even occurs continuously for three feet in

– ˘ – – ˘ – – ˘ –

φέρτατον δαίμον’ ἁγνᾶς τέκος

– ˘ ˘ – – ˘ ˘ – – ˘ ˘ –

ματέρος ἂν Κάδμος ἐγέννασέ ποτ’ ἐν

– ˘ ˘ – ˘ – – –

ταῖς πολυολβίοις Θήβαις

[Mightiest god, offspring of a chaste mother, whom Cadmus fathered long ago in wealthy Thebes]

The <bacchic foot from the> iamb might even use this type of diction, though it is less natural than the bacchic. For the monochrone is more natural to the trochee than to the iamb, as in

– ˘ – ˘ – ˘ – – ˘ – ˘ ˘ ˘ ˘ –

βᾶτε, βᾶτε κεῖθεν αἱ δ’ εἰς τὸ πρόσθεν ὀρόμεναι·

– ˘ – ˘ – ˘ – – ˘ – ˘ – ˘ –

τίς ποθ’ [[ε]] ‘ά’ νεᾶνις; ὡς εὐπρεπής νιν ἀμφέπει

[Come, come from there, girls who who have been urged out to the front. Who is that youth? How fittingly she cares for... {antecedent of νιν lacking}.]

The syzygies come every second foot, so that a cyclic effect results.

These practices-

**col iii. (2687)**

are among those which have been in use, each of them at some time. Those which remain to be described would be able to be used, if one were to use them mixed among more familiar and more natural practices, but have not yet ever been used. I speak of such as these: the *orthios* and the marked trochee could be constructed from three cretics. It could be made out of three "encompassers" and it could also be made of three-

**col. iv (9)**

halves. The same account holds for the paean, for this too could be made of five "encompassers", and it clearly could be made from five halves. This practice could not be used continuously, for the character of such a rhythmic composition is altogether foreign to the paean and the previously mentioned meters. But if it were tested, placed in combination for some special effect, one could indeed use it; not without restriction, though, on account of the problem already discussed. One must leave rejected those uses such as which present mixed rhythms not approved by perception, since…

**col. iv (2687)**

… rhythms divided and compressed into smaller time intervals, since it is possible that... two of the three syllables…

…I say into unequals, the first into the greater, since it is indeed long, the next into the shorter, since it is short. With this done, it is clear that the result, thus using the three syllables,

**col. v (9)**

will be close to the shape of an anapaest. Why does the opposite arrangement not come about, so that the first syllable lies in the largest time interval, the second in the shortest, and the third in the mid-length interval? Clearly the same problem (as was discussed above) extends also to the diction that is the reversal of the tetraseme cretic. For why the rhythmic composition using two iambs in the foot…

the same *agōgē*…is clear.

Concerning, therefore, this shape, let this be sufficient. For the unnatural placement of syllables that applies to dactylic rhythmic composition is clear from the preceding. That which begins from the short is suited to none of this sort of rhythms…

**COMMENTARY**

Despite the gaps within our fragment, we can be confident that it represents one continuous passage because the reference to the iambic dactyl in col. ii.3 ties the beginning of our fragment to the summary statement at col. v.23, which says that the topic of discussion has been the unnatural placement of syllables in dactylic *rhythmopoiia*. The passage breaks into two sections: the first, from col. ii. 1- iii. 20) discusses rhythmic practices which are in use, the second (col. iii. 20-v. 2) discusses hypothetical possibilities. The examples given in the first section all deal with the placement of diction showing the metric pattern ¯ ˘ ¯ into different rhythmic structures.

**Column ii (9)**

**οἰκειότατοι μὲν εἰσιν οἱ ῥυθμοὶ οὗτοι τῆς τοιαύτης λέξεως**

The treatise presupposes a distinction between poetic meter and rhythmic expression. However, while there is flexibility in the rhythmic setting of a poem, there are preferences for some settings over others.

**χρήσαιτο δ' ἂν αὐτῇ ὁ [[ιαμβ]] ʻδάκτυλʼος ὅ κατὰ [[δ]] ʻἴʼα[[κτυλ]]ʻμʼβον**

The original text was corrected by an ancient hand; this is a reference to the dactylic iamb, listed at Aristides Quintilianus 1.17 (= 38.5-6 W-I) as one of six mixed rhythms[105]: δάκτυλος κατ' ἴαμβον, ὃς σύγκειται ἐξ ἰάμβου θέσεως καὶ ἰάμβου ἄρσεως 'the dactylic iamb, which is composed of an iamb *thesis* and an iamb *arsis*'. The examples that follow, which are based on hexaseme feet, confirm this parallel with Aristides Quintilanus.

The underlying rhythm which uses a *lexis* is presented as having more parameters than simply duration; it is described in terms of a sequence of rhythmic events ˘ ¯ . There is no mention an alternative with a long first rhythmic event equivalent to the *anceps* position of the iambic dipody.

105 Aristides lists six mixed rhythms that are mixed in that they have a dactylic ratio at one level and iambic ratio at another level. He also offers lists of rhythms that are mixed in other senses.

**τῶν περιεχουσῶν ξυλλαβῶν**

Grenfell and Hunt (1898: 18) translate τῶν περιεχουσῶν ξυλλαβῶν as 'the syllables composing the cadence'.

Pearson interprets these as the outer syllables, taking περιέχω in its customary signification of 'embrace' or 'surround'. The syllable sequence being referred to is ¯ ˘ ¯ performed as a diseme long, a short, and a triseme long. This will be made clear by the upcoming examples. The outer syllables are the two longs.

According to (Rossi 1988: 24), however, the περιεχουσῶν are the extended triseme syllables, which embrace or comprise an entire rhythmic marker.

While these interpretations all yield good sense for the passage, the use of the term in col. iii will show that Grenfell and Hunt's interpretation gives the best internal consistency to the treatise. Using the term περιέχω in a similar sense, Choeroboscus (211.14 Consbruch) gives the following definition of a foot: ποὺς τοίνυν ἐστὶν σύνταξις συλλαβῶν ἄρσιν καὶ θέσιν περιέχουσα 'the foot accordingly is an arrangement of syllables encompassing *arsis* and *thesis*; this gives a good parallel for taking περιέχω as 'comprise' here.

**τεθεισῶν εἰς τοὺς χρόνους**

The syllables are placed into time intervals established by the rhythmic framework; the dactylic iamb refers to the rhythmic framework, rather than to the syllable sequence. The phrasing is similar to *E.R.* 20.

**ἢ ὡς ἐν τῶι κρητικῶι**

In metrics, the term cretic is used for the pentaseme syllable sequence ¯ ˘ ¯ . This usage is found in Hephaestion as well as Aristides Quintilianus's account of meter at 1.23 (= 50.20-21 W-I): τὸ δὲ παιωνικὸν καλεῖται μὲν καὶ κρητικὸν διὰ τὸ ποτὲ μὲν τοῖς παίωσι καθαροῖς, ποτὲ δὲ τοῖς κρητικοῖς μετρεῖσθαι. 'The paionic is also called the cretic on account of its being measured sometimes by pure paeans [poetic feet with one long and three short syllables], sometimes with cretics'.[106]

A different definition of the term cretic is found in rhythmic theory. Choerobuscus (219.10 Cons.) attests that Aristoxenus used the term cretic for the ditrochee ¯ ˘ ¯ ˘ . At Aristides Quintilianus chap. 1.17 (=8.3-5 W-I), the cretic is defined immediately before the dactylic iamb: κρητικός, ὃς συνέστηκεν ἐκ τροχαίου θέσεως καὶ τροχαίου ἄρσεως 'the cretic, which consists of a trochee thesis and a trochee arsis'. Aristides goes on to say that of the hexaseme 3+3 rhythms the cretic has its name from its basis in traditional Cretan music; the

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[106] Trans. Marchetti.

others have names created according to a theoretical system of nomenclature. This testimony suggests that the roots of the term are in a traditional cretic rhythm that was based on the trochaic foot, but which also used triseme syllables for some feet. This may have been a way to accommodate words with two long syllables in a rhythmic tradition that did not use the *anceps* position.

**τὸ σχῆμα τοῦ ποδὸς**

The foot refers to the temporal framework; its shape is the set of time values assigned in its realization, the sequence of syllables. This usage of the word σχῆμα is more consistent with Aristotle's than with that of Aristoxenus (see the note to par. 27.)

**τὸ εἰς ἴαμβον**

When the syllable sequence ¯ ˘ ¯ is set to the dactylic iamb, the first long syllable will be lengthened to a triseme, making it equal to the thesis of the rhythmic framework. The second and third syllables, ˘ ¯ , will correspond with the iamb *arsis* of the rhythmic framework.

**ἔνθα δὴ ποικίλων…δέχονται** The first example clearly shows the syllable sequence ¯ ˘ ¯ in the first five feet and the last three. These sequences are separated by an iambic trimeter.

˪ ˘ – | ˪ ˘ – | ˪ ˘ – | ˪ ˘ – | ˪ ˘ – |
ἔνθα δὴ ποικίλων ἀνθέων ἄμβροτοι λείμακες

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ – |
βαθύσκιον παρ᾽ ἄλσος ἁβροπαρθένους

˪ ˘ – | ˪ ˘ – | ˪ ˘ – | ˘ – –
εὐιώτας χορούς ἀγκάλαις δέχονται

Using a triseme syllable for the first foot of an iambic dipody violates the practice of the classical tragedians, whose use of triseme syllables in syncopated iambic and trochaic metra can be surmised from the possibility of responsion between syncopated and non-syncopated forms. The observation that classical poetry does not allow resolution of a long syllable before syncopation underlies the principle that in classical practice, the syllable before the syncopation was always the one lengthened to triseme. This means that a syncopated quantity in an iambic *metron* would be supplied by the long syllable of the previous foot, not by the long syllable in the same foot.

Reinach (1898: 399) offers the following scansion, intended to reconcile the papyrus with classical practice:

∧ – ˘ ˩ – ˘ ˩ – ˘ ˩ – ˘ ˩ – ˘ ˩
ἔνθα δὴ ποικίλων ἀνθέων ἄμβροτοι λείμακες

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ ˩
βαθύσκιον παρ᾽ ἄλσος ἁβροπαρθένους

– ˘ ˩ – ˘ ˩ – ˘ ˩ ˘ – –
εὐιώτας χορούς ἀγκάλαις δέχονται

Reinach does not indicate bar-lines, because the prolonged syllables cross bar-lines presumably corresponding to iambic *metra*; as a parallel, he cites the ionic anaclastic period, ˘ ˘ ¯ ˘ ¯ ˘ ¯ ¯, in which the fifth syllable would cross a bar-line breaking the period into temporal halves. However, Reinach's interpretation strains against the testimony of our fragment.

Wilamowitz (1898), on the other hand, uses the discrepancy as evidence that this and the other examples cited in our fragment do not represent classical poetry, but rather dithyrambic or Dionysian poetry dating to the late fourth century BC, roughly the time of Aristoxenus. Cole (1988) and Rossi (1988) accept this position.

A third possibility is that isochronous rhythms such as seen in the examples were introduced into dithyrambic or Dionysian poetry at the time of the New Music of the late fifth century, though the tragedians themselves did not adopt these practices.

As was argued in the notes to paragraphs 18-19, Aristoxenus's discussion of large rhythmic feet can best be understood as referring to a catalogue of feet for which different constructions were possible, a situation which the second half of *POxy* 2687 describes. Other indications that this treatise predates Aristoxenus will be discussed as they appear; however, the points made concerning *E.R.* paragraphs 18-19 do not rely on such an early dating for *POxy* 2687. The structure of Aristoxenus's argument in and of itself implies that there was a catalogue of large feet that could be constructed in different ways.

**καὶ “ὅστις…ἥδεται”**

Grenfell and Hunt (1898: 19) scan:

┘ ˘ ¯ | ┘ ˘ ¯ | ┘ ˘ ¯ | ┘ ˘ ¯
ὅστις εὐθυμίηι καὶ χοροῖς ἥδεται

Reinach (1898: 400) gives:

∧ ¯ ˘ ┘ ¯ ˘ ┘ ¯ ˘ ┘ ¯ ˘ ┘
ὅστις εὐθυμίηι καὶ χοροῖς ἥδεται.

Reinach (1898: 401) points out that this example must have been well-known to the readers of this text, or else they would not have recognized it as an example of iambic rhythm.

**ἐπὶ πολὺ δὲ τῆι τοιαύτηι ῥυθμοποιίαι οὐ πάνυ χρῆται**

The author’s point in presenting these examples is that while the └ ˘ ¯ arrangement of the syllable sequence ¯ ˘ ¯ is possible, it is not the most common or preferred rhythmic arrangement of ¯ ˘ ¯.

**col. ii (2687)**

**ὁ ἀπὸ τροχαῖου βακχεῖος**

Aristides Quintilianus *On Music* 1.16 (= 36.11 W-I) lists the βακχεῖος ἀπὸ τροχαίου as one of twelve possible dodecaseme compounds of trochees and iambs. However, since *POxy* 2687 has been considering two hexaseme rhythms, it is best to take the bacchic from the trochee here as being also a hexaseme,

– ˘ ˘ – . Aristides Quintilianus classifies this rhythmic framework in two ways. At 1.16 (= 36.5 W-I), he classifies it under the iambic genus, following the ratio of the feet which have been compounded into a larger structure: ἐν δὲ τῷ ἰαμβικῷ γένει…σύνθετοι δὲ οἱ κατὰ συζυγίαν βακχεῖοι δύο, ὧν ὁ μὲν πρότρον ἔχει τὸν ἴαμβον, δεύτερον δὲ τὸν τροχαῖον, ὁ δὲ ἐναντίως ‘in the iambic genus…there are two bacchic feet compounded by syzygy, of which one has the iamb first, the trochee second; the other, in the oppposite order’. At 1.17 (= 38.6 W-I), considering the ratio which the compounded feet have towards each other, he classifies it as a form of the dactyl (as *POxy* 2687 treats it): δάκτυλος κατὰ βακχεῖον τὸν ἀπὸ τροχαίου, ὃς γίνεται ἐκ τροχαίου θέσεως καὶ ἰάμβου ἄρσεως ‘the dactylic bacchius from the trochee, which consists of a trochee thesis and an iamb arsis’.

**ἐκ μονοχρόνου καὶ ἰάμβου ξυνζυγίαν**

col. ii.

The term μονόχρονον refers to the triseme syllable that fills one triseme marker of the hexaseme rhythmic foot.

**ῥιπτείσθω πο‘δὸς’ ἱερὰ βάσις** The syllable sequence – – – ˘ ˘ ˘ ˘ – ˘ – resists conventional scansion. The initial three longs suggest an aeolic colon, but the sequence of four shorts disallows this scansion. An iambic scansion would work if the colon started with two longs, but not with the three we have. The ending of the colon rules out an anapaestic scansion, though West (1992: 121) provides examples of four consecutive shorts in lyric anapaests. In accordance with the author's statement that this example contains one example of the syzygy ¯ ˘ ¯ set to a hexaseme rhythmic framework, it must be scanned ¯ ¯ | ¯ ˘ ˘ ˘ ˘ | ¯ ˘ ¯ . A. M. Dale (cf. Rea 1968: 23) suggested that ἱερά be scanned as two syllables, and perhaps written ἱρά, giving the syllable sequence ¯ ¯ | ¯ ˘ ˘ ¯ | ¯ ˘ ¯ . While this reading clarifies the association of the colon with the rhythmic framework ¯ ˘ ˘ ¯, the colon remains atypical. The first two syllables may represent an incomplete foot, or both syllables may have been extended to triseme duration.

¯ ¯ | ¯ ˘ ˘ ˘ ˘|┘ ˘ ¯ |
ῥιπτείσθω ποδὸς ἱερὰ βάσις

┘ ┘ | ¯ ˘ ˘ ˘ ˘|┘ ˘ ¯ |
ῥιπτείσθω ποδὸς ἱερὰ βάσις

**κατὰ τὸ 'Διόνυσο{σ}'ν τὸν ἐκ πυρός'** Rea and Pearson take this to be a second example of setting ¯ ˘ ¯ to the bacchic trochee: Pearson (1990: 80) suggests the scansion ˘ ˘ ¯ | ¯ ˘ ¯ | ˘ ˘ . Both comment on the strangeness of the preposition κατὰ introducing a new example. The fact that this and the next two examples to be given all come from a song to Dionysius suggests that they could all be from the same song. This line is cited perhaps as an especially familiar line, to bring the song to readers' attention. It can be readily scanned as two hexaseme feet: ˘ ˘ ¯ ¯ | ˘ ¯ ˘ ¯ . Neither of these corresponds to the rhythmic framework under discussion, ¯ ˘ ˘ ¯ , though they are different forms of the hexaseme.

**προελθόντι** As pointed out by Pearson (1990: 80), this likely refers to a reader continuing on in the same poem or collection.

**Column iii (9)**

**κατὰ δὲ ‘τα’ τῆς ῥυθμοποιίας σχήματα παραλλάττει**

The term *παραλλάττει*, according to Grenfell-Hunt (1898: 19) refers to the use of ¯ ˘ ˘ ˘ as well as ¯ ˘ ¯. As seen above, the shape, *σχῆμα*, refers to the result of rhythmic composition, the set of time values assigned to syllables. Hunt & Grenfill (1898: 19) give

– ˘ ˘ ¯ | ⊔ ˘ ˘ ˘ | ⊔ ˘ ¯ | ⊔ ˘ ˘ ˘ | ⊔ ˘ – | –
- φίλον ὥραισιν ἀγάπημα θνατοῖσιν ἀνάπαυμα μόχθων

However, Page *PMG* 926 (1962: 495) emends φίλον to φίλιον, a reading adopted by Pearson (1990: 39). This suggests another possibility for the assignment of rhythmic values here:

˘ ˘ ˘ ⊔ | ⊔ ˘ ˘ ˘ | – ˘ ⊔ | ⊔ ˘ ˘ ˘ | – ˘ ⊔ | –
φίλ<ι>ον ὥραισιν ἀγάπημα θνατοῖσιν ἀνάπαυμα μόχθων

Thus, *παράλλαττει*, alternates, refers to the placement of the prolonged syllable within each foot of the rhythmic framework. The author is arguing that the usual way to set the syllable sequence ¯ ˘ ¯ to a hexaseme rhythm is as diseme, short, triseme, and that the arrangement triseme, short, diseme is exceptional.

Thus, this example shows the rhythmic intermixing of the usual and the exceptional.

**καὶ ξυνεχεῖς ἐπὶ τρεῖς**

The sequence triseme, short, diseme, repeated for three consecutive feet is, the author maintains, an extreme rarity. The *καὶ* here is adverbial, "even"; it is not necessary to connect this with the previous example, as Pearson (1990: 81) does. I would scan it:

┘ ˘ ¯ | ┘ ˘ ¯ | ┘ ˘ ¯ |<br>
φέρτατον δαίμον' ἁγνᾶς τέκος<br>
¯ ˘ ˘ ¯ | ¯ ˘ ˘ ¯ | ¯ ˘ ˘ ¯ |<br>
ματέρος ἃν Κάδμος ἐγέννασέ ποτ' ἐν<br>
¯ ˘ ˘ ¯ | ˘ ¯ ¯ ¯<br>
ταῖς πολυολβίοις [[ιν]] Θήβαις

This is the basic scansion given by Grenfell and Hunt (1898: 20), except that they indicate the trisemes with └, and render the final line as:

¯ ˘ ˘ ¯ | └ ˘ ¯ | ¯<br>
ταῖς πολυόλβοισιν Θήβαις.

After the three consecutive repetitions of the sequence triseme, short, diseme, the poet gives a series of feet which fit the rhythmic framework ¯ ˘ ˘ ¯ .

**χρήσαιτο δ' ἂν καὶ ὁ ἴαμβος**

According to Grenfell and Hunt (1898: 20), this refers to the iambic *monopode*, rather than the *dipody*. Reinach (1898: 404) observes that an iamb could be counted in *monopodia*, provided the schema did not include irrational longs.

Rea (1968: 22, 24) also seeks to distinguish the iamb mentioned here from the dactylic iamb found in column ii, so that this introduces a new type. The problem with such an interpretation is that it does not fit with the subsequent comparison to the bacchic rhythm.

Pearson (1990: 81) takes this as a reference to the bacchius from the iamb, the counterpart to the bacchius that begins with a trochee at Aristides Quintilianus 1.16 (= 36.7-8 W-I). The problem with this reading is that the bacchius from beginning with an iamb has two longs together in the junction of the syzygy, contradicting the short in the middle of the forms our author is discussing. The author is more likely referring to the dactylic iamb introduced in column ii. He is summing up his argument in this section, in order to justify the conclusion he wants to carry over into the next section.

**ἀφυέστερον δὲ τοῦ βακχείου**

The author has provided examples of the syllable sequence ¯ ˘ ¯ set to two different hexaseme rhythmic frameworks, the dactylic iamb and the bacchic from the trochee. The dactylic iamb was presented first, as the counterpart to the cretic rhythm. The bacchius from the trochee was presented next, as another rhythmic framework that extends the first long syllable of ¯ ˘ ¯ . The comparative adjective ἀφυέστερον indicates that Greek musical practice did tolerate a range of divergence between the rhythmic surface and the rhythmic framework, without losing sight of a standard correlation between them.

**τὸ γὰρ μονόχρονον οἰκειότερον τοῦ τροχαικοῦ ἢ τοῦ ἰάμβου**

When ¯ ˘ ¯ is set to the dactylic iamb, the prolonged first syllable covers an iamb of the rhythmic framework; when it is set to the bacchic from the trochee, the prolonged first syllable covers a trochee of the rhythmic framework. Why is it more fitting to the trochee? The author argues on the basis of his illustrative examples without offering a theoretical reason in our fragment, but seems to have offered a basis or at least a context for it in the passage preceding our fragment; see the note to col. v below.

**βᾶτε, βᾶτε...ἀμφέπει**

Pearson (1990: 81-82) correctly takes this as an illustration of how the sequence ¯ ˘ ¯ is more naturally set to the trochaic rhythmic framework.

 –  ˘    –  ˘  | –  ˘   ┘  |  –    ˘     –    ˘ | ˘  ˘  ˘  ┘
βᾶτε, βᾶτε κεῖθεν αἱ δ’ εἰς τὸ πρόσθεν ὀρόμεναι·
–    ˘          –   ˘|– ˘   ┘  |–    ˘  –   ˘ | –   ˘  ┘
τίς ποθ’ [[ε]] ‘ἁ’ νεᾶνις; ὡς εὐπρεπὴς νιν ἀμφέπει

Grenfell and Hunt (1898: 18) scan the lines as iambic *monopodia* of ¯ ˘ ¯ as └˘ ¯:

 └  ˘   – |˘  –  ˘   –   |   └   ˘     –   |  ˘  ˘  ˘  ˘  –
βᾶτε, βᾶτε κεῖθεν αἱ δ’ εἰς τὸ πρόσθεν ὀρόμεναι·
└    ˘          –  |˘ –  ˘    – | └    ˘   –  | ˘  –    ˘  –
τίς ποθ’ [[ε]] ‘ἁ’ νεᾶνις; ὡς εὐπρεπὴς νιν ἀμφέπει

Reinach (1898: 404) scans this as iambic *monopodia*; either

˪| ˘ ‒ | ˘ ‒| ˘ ‒ | ˩ | ˘ ‒ | ˘ ˘ ˘| ˘ ‒
βᾶτε, βᾶτε κεῖθεν αἱ δʼ εἰς τὸ πρόσθεν ὀρόμεναι·

or
∧ ¯| ˘ ‒ | ˘ ‒| ˘ ˩ ‒ | ˘ ‒ | ˘ ˘ ˘| ˘ ‒
βᾶτε, βᾶτε κεῖθεν αἱ δʼ εἰς τὸ πρόσθεν ὀρόμεναι·

**τρεῖς πόδας διαλείπυσιν αἱ ξυνζυγίαι**

Grenfell and Hunt (1898: 18) interpret this as "the syncope occurs at intervals of three feet". For Reinach (1898: 406), this comment confirms the scansion by iambic *monopodia*. Pearson (1990: 82), however, correctly takes this as inclusive counting: the syzygies, ¯ ˘ ¯ , occur every other foot. This is what produces the περιοδῶδες 'periodic' effect of the construction.

**col. iii (2687)**

**αὗται μὲν οὖν αἱ χρήσεις τῶν γιγνομένων**

Until now, the author has been building his argument on the basis of rhythmic practices for which he can cite prior examples.

**οὐ μέντοι γεγενημέναι γέ πως**

This willingness to consider hypothetical rhythmic innovations seems uncharacteristic of Aristoxenus, who was a musical conservative. On the other hand, as Pearson (1990: 82) points out, it is the statement of an author who considers himself to have exhaustive knowledge of ancient music.

**ὁ ὄρθιος καὶ ὁ σημαντὸς τροχαῖος ἐκ τριῶν κρητικῶν δύνανται ξυντίσθεσθαι· δῆλον δʼ ὅτι καὶ ἐκ τριῶν περιεχόντων· δύνανται δὲ καὶ ἐκ τριῶν [ἡ]μι[σ]έων**

This passage presents several interrelated difficulties: the meanings of the terms περιεχόντων and ἡμισέων, and the relation of the named feet to their descriptions in Aristides Quintilianus.

As discussed in the notes to *E.R.* 17-19, Aristides Quintilianus describes these as dodecaseme feet. Because they are associated with "the longest syllables" and the solemn rhythms of hymns, they probably originated as combinations of extended syllables. Taking περιεχόντων as extended syllables, as discussed in the note to col. ii. 4-5 gives a construction consistent with Aristides Quintilianus's description. Grenfell and Hunt (1898: 18) take the ἡμίσεις as short syllables, employing the parallel of Aristides Quintilianus's definition of the regular iamb. However, taking ἡμισέων as short syllables yields the *tribrach*, which is an alternative for the regular iamb and trochee and shows no connection with Aristides Quintilanus's description of the *orthios* and marked trochee. Also, the author's point is a *non-sequitur* taking the ἡμισέων as just short syllables. Stating that these feet can be constructed of three extended syllables or three short syllables implies a definition of these feet in terms of having three syllables, whereas the author is ostensibly justifying a nine-syllable construction for these feet. Additionally, taking the *orthios* and marked trochee here as potentially trisemes would have implications for the interpretation of the first half of the papyrus, particularly the meaning of "iamb" at col. iii.10.

A coherent argument for the author's proposal would be interpreting as "the *orthios* and marked trochee can be made of three extended syllables or of three spondees, and by extension could be made of three cretics." This would be reinforced by the author's description at col. iv.23-v.8 of using temporally compressed cretics in these constructions. The term περιεχόντων can reasonably be interpreted either as the extended syllables or as any group of syllables that comprises an internal ratio (again, see the note to περιεχουσῶν συλλαβῶν at col. ii.4-5.) However, if the περιεχόντων are the extended syllables, the ἡμισέων would have to be spondees. Each long syllable of a spondee could be taken as half of the extended syllables posited for the original construction of the *orthios* and marked trochee, but this would require six halves, not three, for the construction. Taking περιεχόντων as syllable groups would leave the ἡμισέων as the extended syllables. It could perhaps be argued that the author intends ἡμισέων as a general term for the parts of a foot, *arsis* and *thesis*, but since there are three parts it is hard to see why the author would not use the term μέρη or a similar term for the parts of a foot that does not yield the oxymoron "three halves." However, neither interpretation has any parallel.

Grammatically, an emendation to the text changing ἡμισέων to a passive participle meaning "having been halved" would fit very well with the interpretation of περιεχόντων as extended syllables. The concept of halved large rhythmic events being acceptable is a logical middle step between the traditional extended syllables and the author’s proposed construction. However there is no parallel for counting parts of a thing collectively in that way, that is, cutting three loaves of bread in half and calling the result three halves.

Another interpretation is possible if we impute to the author sophistical reasoning that exploits a double meaning of the term ὄρθιος attested in Ps.-Plutarch *On Music*. Here, the invention of the ὄρθιος is attributed to the most ancient musician Olympus. At this citation, the ὄρθιος is described as being quick and light. It could be that the same term was used both for a light, quick music and for a slow rhythm conceived as a counterpart to the marked trochee. It could be that the author justifies construction of these from περιέχοντες on the one hand as extended syllables by the example of the marked trochee and the dodecaseme *orthios*, and from ἡμισέων on the other hand as the triseme rhythm of Olympus’s lively and quick ὄρθιος. One reason for the extension of the term ὄρθιος to a dodecaseme could be the precedent in Olympus’s ὄρθιος of a rhythmic practice that utilized external articulation over rhythmic events of uniform duration.

**ὁ αὐτὸς δὲ λόγος καὶ π[ερ]ὶ τοῦ παιῶνος· καὶ γὰρ οὗτος ἐκ πέντε περιεχόντων δύναται ξυντίθεσθαι· δῆλον δ’ ὅτι καὶ ἐκ πέντε ἡμισέων.**

Pearson (1990: 84) points out that this is best interpreted as referring to Aristides Quintilianus’s paean *epibatos*, since this is a large rhythmic structure comparable to the *orthios* and marked trochee. Like the *orthios* and marked trochee, Aristides Quintilianus 1.16 (= 37.8-9 W-I) defines the paean *epibatos* as an uncompounded foot. He describes it first as having five markers, each of which would be a diseme, then as having four markers, three of which would be diseme and one of which would be a tetraseme equivalent to the constituents of the *orthios* and marked trochee. The paean *epibatos* is not entirely parallel to the *orthios* and marked trochee, and the author of *POxy* 2687 is extending his argument considerably by applying it to the paean *epibatos*. For the *orthios* and marked trochee, the author posits ¯ ˘ ¯ for what had been ¯ ¯ in the rhythm's normal formulation. For the paean *epibatos*, he posits ¯ ˘ ¯ for what had been ¯ in the rhythm's normal formulation. He exploits the ambiguity in the count of the constituents of a paean *epibatos* to make this leap.

**συνεχὴς…χρῆσις**

The statement can read two ways: this construction cannot be used on an extended basis, or, this construction will not yield this continuous effect; it is too complex to be considered one of the basic rhythmic functions.

**ἀλλότριον τὸ ἦθος τῆς τοιαύτης ῥυθμοποιίας**

The cretic related to the trochee is a dance rhythm. The *orthios* and marked trochee are slow, dignified, stately, as attested by Aristides Quintilianus 2.15 (= 82.15-83.6 W-I).

**ἐν καταμε[ί]ξει τ[ο]ῦ ἰ[δ]ίου ἕνεκα**

It gets its aesthetic effect through contrast with its simpler context.

**ἀθέτους ἐατέον τὰς το[ιαύτ]ας χρήσεις**

By offering hypothetical rhythmic innovations, the author expanded the range of rhythmical possibility. Now he is reasserting the limits of rhythmical acceptability.

**ῥυθμ[οὺς μὴ] δ[ο]κιμαζομένους ὑ[πὸ τῆς αἰσθ]ήσεως**

The author does not mean that all hypothetically possible rhythmic variations are to be tested, and accepted or rejected as the result of this testing. Rather, he cites perception as a principle that will allow him to transfer the conclusion reached in the discussion of rhythmic examples to his hypothetical rhythms.

**col. iv (2687)**

**ξυνεστραμμέν[οι] εἰς ἐλάττους χρόνους**

The author's argument that the compound foot can be constructed out of cretics as well as in its various traditional forms relies primarily on an overlap in the range of durations possible for the extended syllables of traditional hymn rhythms and the rhythmic feet of his proposed rhythms.

**τὴν [μὲν] προτέραν εἰς τὸν μείζῳ [ἐπε]ιδήπερ καὶ μακρά**

The first syllable of ¯ ˘ ¯ would be compressed, but into relatively more time than the second syllable. The compressed time intervals would maintain the relative distinction of long and short in the syllables.

**col. v (9)**

**ἐγγὺ[ς ἔ]σται ἀναπαιστικοῦ σχήματος**

As Grenfell and Hunt (1898: 20) point out, the subject to be supplied is the *λέξις* of the form ¯ ˘ ┘. The three syllables would be set in such a way that the third syllable ¯ ˘ ¯ is equal to the first two together. This is the point of similarity with the anapest; that the first two syllables are balanced by the third.

**οὐκ ἂν γ[ί]γν[ο]ιτο καὶ τὸ ἀντεστρ[αμ]μένον**

The author introduces a rhythm that would be unacceptable, even by his own standards. Though he espouses innovation, he establishes a boundary for what is acceptable and unacceptable in innovation.

**ἡ αὐτὴ α[ὕτ]η ἀπορ[ία**

Gaps in column iv preclude a precise account of the antecedent for this expression; however, it is most likely a reference to the principle established in the first section of our fragment: that when ¯ ˘ ¯ is extended to a hexaseme rhythm, extending the first syllable to a triseme is a less natural setting than setting the last syllable to a triseme.

**καὶ ἐπὶ τὴν ἀντικειμένην λέξιν τηι τετραχρόνωι κρητικῆι λέξει**

On the basis of the term μονόχρονον used throughout the papyrus, the τετράχρονος cretic *lexis* should be that with four rhythmic events. However, this requires a complete break with the preceding discussion of sequences built of three rhythmic events. It also provides no connection with the reference in column iv above to compressing time intervals. Taking τετράχρονος as an equivalent to Aristoxenus's τετράσημος yields greater cohesion to this passage. It also reinforces the model of the *orthios* and marked trochee being commonly conceived of as built on tetraseme markers. The author of *POxy* 2687 would bring his proposal of building these feet out of the sequence ¯ ˘ ¯ closer to their familiar form by positing that the syllables should be compressed into tetraseme markers. Such compression is acceptable, the author says, when it follows the more natural pattern of putting the longest syllable at the end. Trying to build a compound rhythm by compressing sequences that put the longest syllable first would involve too many factors of difference from the usual norm.

The clash between the formation of the terms μονόχρονον and that suggested here for τετράχρονος is softened by the consideration that the term μονόχρονον in *POxy* 2687 is always used as a neuter substantive, with a definite article. The term τετράχρονος, on the other hand, is here used as an adjective.

**ἀγωγὴν**

According to Grenfell-Hunt (1898: 21), if ¯ ˘ ¯ ˘ or ˘ ¯ ˘ ¯ were used instead of a dactyl, the resulting increase in *morae* would have to be compensated by a diminution in time value.

**ἡ γὰρ π[α]ρὰ φύσιν τῶν ξυλλαβῶν θέσις**

As with the term ἀφυέστερον col. iii.11, παρὰ φύσιν does not refer to unacceptable rhythms, but to rhythms which feature divergence between the rhythmic surface and the rhythmic framework.

**ἡ εἰς [τ]ὴ[ν] δακτυλικὴν ῥυθμοποί[αν**

In the first section, the author discussed hexaseme rhythms that exhibit the dactylic ratio at their larger level. Aristides Quintilianus 1.17 (= 38.3-8 W-I) described them as mixed rhythms because they exhibit the dactylic ratio at the larger level and the iambic ratio at the lower level. The *orthios* and marked trochee, discussed in the second section of our papyrus, are constructed of lower-level constituents in the dactylic genus. The paean *epibatos* is included along with the *orthios* and marked trochee insofar as it includes a tetraseme marker in its customary formulation. It is also associated with the *orthios* and marked trochee in that their customary formulations do not allow for the inclusion of a single short syllable between longs. These rhythmic frameworks were customarily used to set poems in dactylic or anapestic meters, or hymns written in all long syllables.

**ἡ δ' ἀπὸ β[ραχ]είας ἀρχομένη τ[ῶν] ξυλλαβ[ῶν τά]ξις**

Having discussed the setting of the syllable sequence ¯ ˘ ¯ into different rhythmic frameworks, the author proceeds to a syllable sequence beginning with a short, probably ˘ ¯ ¯ .

**οἰκεία μὲν [οὐ]δενός [ἐσ]τιν τῶν ῥυθμῶν**

While the sequence ˘ ¯ ¯ is found in several metrical contexts, there is no customary setting of ˘ ¯ ¯ comparable to the "cretic" setting of ¯ ˘ ¯ to the ¯ ˘ ┘ hexaseme. Any setting of ˘ ¯ ¯ to a hexaseme rhythmic framework would involve the sort of less natural rhythmic effect exemplified by the └ ˘ ¯ setting of ¯ ˘ ¯ to iambic or the ┘ ˘ ¯ setting of ¯ ˘ ¯ to bacchic rhythmic frameworks. On the other hand, the Seikilos inscription (line 6) attests just this sort of rhythmical setting, and lines 7-9 give this rhythmic setting to the syllables, though the triseme syllables are set to more than one melodic note each.[107]

[107] Pöhlmann and West 2001: 88-91.

## CHAPTER 7: ARISTOXENUS'S THEORY OF RHYTHM IN PRACTICE

An appraisal of Aristoxenus's theory of rhythm, as presented in *E.R.*, must address the question of its applicability to ancient Greek music. One school of interpretation, from Boeckh (1811) to Pearson (1990), holds that all of ancient Greek poetry was adapted to the isochronous rhythms described in *E.R.* However, this position is based primarily on an *a priori* assumption that Greek rhythms must have been like modern Western rhythms. Wilamowitz (1921: 66-67), rejecting the application of *E.R.* to Classical lyric, asserted not only that the isochronous rhythms described by Aristoxenus were characteristic of late Classical and Hellenistic music, but also that this style of music had completely replaced the earlier style of music. This view is also oversimplified; an examination of several representations of ancient Greek music preserved with rhythmic notation shows that while some pieces followed the principles expressed in *E.R.*, others did not: both styles coexisted.

The *Song of Seikilos*, presented in our commentary on *E.R.* 4, clearly demonstrates the manipulation of syllable lengths to achieve the isochronous rhythm described in *E.R.*

Mesomedes' *Ode to the Sun* and *Ode to Nemesis* (*DAGM* 27 and 28) deviate from the strict isochronicity described in *E.R.* The lines of these pieces share the same rhythmic structure; the metric formula is either ⏖—⏖—⏖—⏑— or

⏖—⏖—⏖——, and when the catalectic form is used, the penultimate syllable is extended to a triseme ⏖—⏖—⏖⏗—. Either version produces a 15-seme line, and in each, the principle of isochronous rhythm is broken. The acatalectic form features three tetraseme measures followed by one triseme measure. In the catalectic form, the triseme syllable breaks the pattern of tetraseme measures after two-and-a-half measures. However, this is a relatively weak exception to the strict isochronicity described in *E.R.* If the entire 15-seme line is taken as one Aristoxenian "large" foot (see *E.R.* paragraphs 18 and 19), the form can be reconciled with Aristoxenian theory.

Another example of Hellenistic music that deviates from Aristoxenian theory is found in *DAGM* 17. The poetic text would scan as follows:

– ⏑ ⏑ – ⏑ ⏑ – – ⏑ ⏑

Αὐτοφόνῳ χερὶ καὶ φάσγανον ι[

⏑ ⏑ – ⏑ ⏑ – ⏑ ⏑ – –

Τελαμωνιάδα, τὸ σόν, Αἶαν, ε[

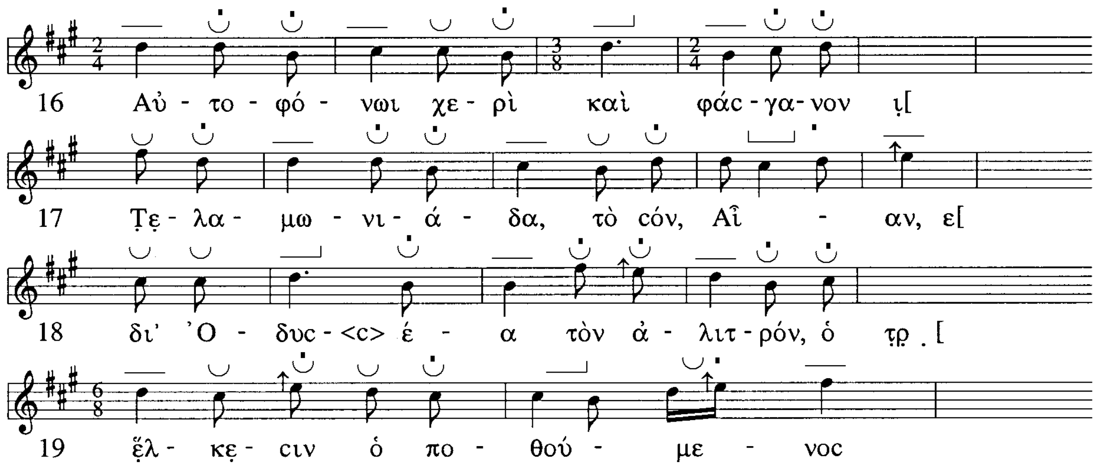
⏑ ⏑ – ⏑ – ⏑ ⏑ – ⏑ ⏑

δι᾽ Ὀδυσσέα τὸν ἀλιτρόν, ὁ τρ . [

– ⏑ ⏑ ⏑ ⏑ – ⏑ –

ἕλκεσιν ὁ ποθούμενος

*DAGM* 17 lines 17-19 shows rhythmic modulation between tetraseme and hexaseme measures: lines 17 and 18 show tetraseme measures, while 19 shows hexaseme measures. Pöhlmann and West (2001: 57) notate 2/4 modulating to 6/8:




Like Mesomedes' odes discussed above, this is a rather weak exception to the isochronicity of *E.R.* because it can be accommodated by positing modulation between sections or regions of isochronous rhythm in a piece of music. In such a case, the statement at *E.R.* 19 that the markers of a rhythm are always equal holds true at least within appreciable temporal regions, the series of tetraseme or hexaseme measures.

A sharper contrast with the isochronicity described in *E.R.* occurs at *DAGM* 17 line 16, where a triseme syllable is notated between tetraseme measures. This contradicts Aristoxenian theory more pointedly than modulation from a series of tetraseme feet to a series of hexaseme feet; the triseme syllable bluntly interrupts a series of tetrasemes. Pöhlmann and West (2001: 59) comment that this triseme "equalizes the rhythm", meaning that the triseme represents the lengthening of a syllable to fill the place of what could have been a short *anceps* syllables between two cola; that is, that the dactylo-epitrite sequence

– ◡ ◡ – ◡ ◡ – x – ◡ ◡ – ◡ ◡ –

is here realized as

– ◡ ◡ – ◡ ◡ ⌟ – ◡ ◡ – ◡ ◡ – .

In other words, according to Pöhlmann and West, the purpose of the elongation is to maintain a rhythmic pattern that is not isochronous. The fact that the same symbol of rhythmic notation, the *leimma*, is used to notate triseme syllables within regions of isochronous measures in lines 18 and 19 indicates that the triseme in line 16 is unambiguous. This adherence to a non-isochronous rhythm is one reason why the editors judge this piece to be earlier than the other pieces preserved on the same papyrus. Whether or not it represents the survival of an earlier style, *DAGM* 17 attests that non-isochronous music did exist in the Hellenistic period, at the very least to the extent that it warranted copying and transmission.

Other rhythmic characteristics of *DAGM* 17 are associated with Hellenistic music. On example is the tetraseme *melisma* on Ἀιαν in line 17; such an arbitrary extension of one syllable is considered part of Hellenistic music. The triseme δυσσ of Ὀδυσσέα in line 18 completes a tetraseme measure in a sequence of tetrasemes. The triseme syllable θού of θούμενος is used at line 19 to complete a hexaseme measure; the short syllable με of θούμενος in line 19 shows two melody notes, notated by Pöhlmann and West as 16th notes. Both of these rhythmic characteristics fit what we will find in *E.R.*: they illustrate different divisions of consistent measures; the split syllable in line 19 illustrates the importance of the dissociation of short syllable from shortest performed unit; both show the relevance of mixed compound intervals as described at *E.R.* 15.

*DAGM* 3, which contains lines 338-344 of Euripides' *Orestes*, also attests the survival of music that does not utilize isochronous measures. The poetic text, retaining the papyrus's inversion of lines 338 and 339 as compared to the manuscript tradition, is as follows:

˘ ˘ ˘ – ˘ – | ˘ ˘ ˘ – ˘ –

339 καταλοφύρομαι καταλοφύρομαι

– ˘ ˘ – ˘ – | ˘ ˘ ˘ – – –

338 ματέρος αἷμα σᾶς, ὅ σ' ἀναβακχεύει;

˘ ˘ ˘ – ˘ – | ˘ ˘ ˘ – ˘ –

340 ὁ μέγας ὄλβος οὐ μόνιμος ἐν βροτοῖς·

˘ ˘ ˘ – ˘ – | ˘ ˘ ˘ – ˘ –

341 ἀνὰ δὲ λαῖφος ὥς τις ἀκάτου θοᾶς

˘ – – – –

342 τινάξας δαίμων

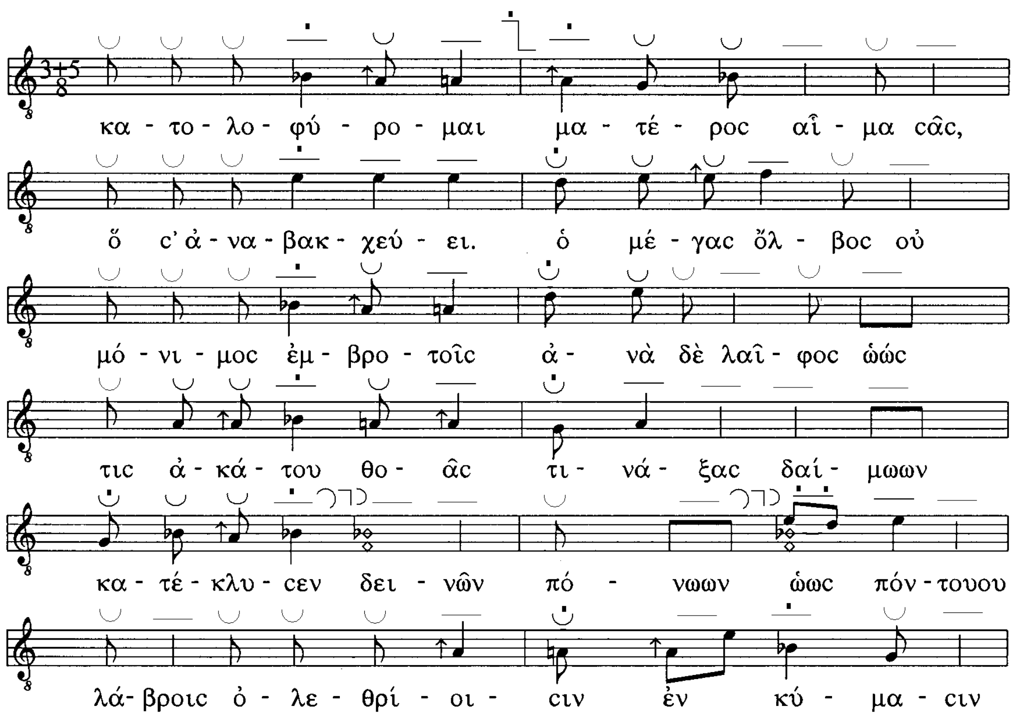
˘ ˘ ˘ – – – | ˘ – – – –

343 κατέκλυσεν δεινῶν πόνων ὡς πόντου

˘ – ˘ ˘ ˘ – | ˘ – – ˘ –

344 λάβροις ὀλεθρίοισιν ἐν κύμασιν.

This ode is based on the dochmiac foot, ˘ ¯ ¯ ˘ ¯, in which any of the longs can be resolved to two shorts. This octaseme sequence can be seen as 3:5 or 5:3, violating Aristoxenus's statement at *E.R.* 36 that the only rhythmical division of the octaseme is 4:4. This piece also violates the isochronous rhythms of *E.R.* when one of the short positions of the basic form ˘ ¯ ¯ ˘ ¯ is replaced by a long, as this poetic meter allows. Below is the score given by Pöhlmann and West (2001: 13) with syllable lengths indicated above the musical bars.




One interesting feature of the papyrus is the inclusion of long marks over φυρ (line 1), εμ (line 3), του (line 4), σεν (line 5), and κυμ (line 7). Devine (1994: 114) offers an interpretation by which these syllables are actually trisemes, so that the dochmiac rhythm is built on nonaseme pattern. This is unsupported by evidence in other documents of ancient music; in particular, the similar disemes notated over short syllables in *DAGM* 5 and 8 should make one particularly reluctant to make broad claims on the basis of this evidence.

*DAGM* 42 is a Hellenistic musical setting of what are probably iambic trimeters. Pöhlmann and West (2001: 145) offer the following supplemented text of the text, here with the conventional poetic scansion indicated.

– – ˘ – |˘ – ˘ – | – – ˘ –
A. ὦ φίλτατ' [ο]ἰκετῶ[ν σὺ πατρώιων ἐμοί.

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ –
B. ἀ]τ[ὰ]ρ τίς εἶ ποτ' ἢ τίνος νέον [θάλ]ος;

˘ ˘ – ˘ – | – – ˘ – | – ˘ ˘ ˘ –
A. [Ἀγαμέμνονος. B. παίζω]ν τ[ι] ἢ πῆ[ι] τάδε λέγεις;

B. πότ...[...]ον[ τ]ὸν πέλας

– – ˘ – | – ˘ ˘
πάντη<ι>ς' Ὀρέστα μοσικ[..]..ο[...]...

– – ˘ ˘
B. ὦ φίλτατε (interjection *extra metrum*)

x – ˘] – | ˘ – ˘ – | ˘ – ˘ –
]τωι σ' ἀνεῖπα. [πῶ]ς, φράσον φρά[σον,

– – ˘ – | – ˘ ˘ ˘ – | – – ˘ –
τοίων ὑπ' ἐχθρ]ῶν ἐγένεθ' ἡ σωτηρία;

– – ˘ – – ˘ –
τίς νόστος [ ] γῆς δεῦρό μοι

– – ˘ – |– – ˘ – | ˘ – ˘ –
ἐκ [τῆς]φανείσης [Λοξίου ποτ’ ἐντο]λῆς;

˘ – ˘
δίδαξον,

˘ – ˘ – | – – ˘ – | – – ˘ –
δίδαξον, ὡς τῶν εὐ[γενῶν σωτηρί]ας

– – ˘ – | – – ˘ –|˘ – ˘ –
οὐκ ἔστ’ἀέλπτου τέρψις [ἡδίων βροτοῖς.

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ –
A. ξέ]νου[ς] πρὸς εὐνο[οῦν]τας [ἐκκλέψασά με

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ –
τροφὸς Κίλισσ’ ἔσωσεν·] ἄλλο δ’ αὖ μ’ ἔτι

– – ˘ – | ˘ – ˘ – ˘ – ˘ –
ἔσπευδε, [πα]τρὸς ἡ μεγ[ασθενὴς ἀρά

– – ˘ – | ˘ – ˘ –|– – ˘ –
σὺν θεοῖς ἅπα]σι<ν>. B. οὐκ ἂν εἰδείην τάδ[ε·

˘ – ˘ – | ˘ – ˘ – | ˘ – ˘ –
π]αρόντα [δ’ οὖν ὁρῶν σε, θά]μβος ἐμποεῖ.

– – ˘ – | ˘ – ˘ – | ˘ – ˘ –
A. [θάρσει νυν, ὡς φίλων γ]ε σῶν πεφασμένων.

– – ˘ – | ˘ – ˘ – |– – ˘ –
B. [κίνδυνός ἐστι. A. μὴ] τὸν Αἰγίσθου λέγεις;

– – ˘ – | – – ˘ – | – – ˘ –
B. τῶ[ι πάν]τα [ἐ]ν α[ἰχμῆι, καὶ στέφει φρουραῖ]ς κράτη.

– – ˘ – | – – ˘ ˘ ˘ | ˘ – ˘ –
A. ποῖον φοβηθεὶς δεῖμα; [B. θάνατον ἐκ σέθεν.]

Below is the score Pöhlmann and West (2001: 139,141) give for *DAGM* 42, with syllable lengths indicated by short, long, and triseme marks.[108]


108 The papyrus uses both triseme marks and a rhythmic mark called a *leimma* to indicate hyper-length syllables. The scansion marks I have given overwrite triplet signs given by Pöhlmann and West in line 1 over the syllable ὦ and line 7 over the syllable πα as well as the fermata or elongation marks over τε in line 7; ληϛ and ξον in line 10; the third pitch, ἐλ and πτου in line 11; εἶ in line 15 and γειϛ in line 17. The durations indicated agree with Pöhlmann and West 's notation.


The musical setting uses triseme syllables that do not give rise to isochronous measures. Some seem to come at the end of trimeters. These prolonged syllables, combined with the variation of *anceps* positions in the verse, strongly contradict the isochronicity described in *E.R.* This brief survey shows that the system of isochronous rhythm outlined in the *E.R.* does not apply to all of Hellenistic music. Laloy (1904: 302) argues that Aristoxenus probably expanded his theory to non-isochronous rhythms in a lost part of the work.

Another area in which the extant documents of Greek music diverge from the principles put forward in *E.R.* is in the relationship of *arsis* to *thesis* as indicated by in some of the musical documents by *arsis* pointing, the use of a στιγμή 'point' to mark a syllable or note as *arsis*. Though there are difficulties in the interpretation of many extant musical passages, leading West (2001) to posit errors in the pointing of several of the pieces in *DAGM*, one conclusion is certain: we do not see the large or augmented feet discussed in *E.R.* and elsewhere. The nearest approximation to possible large feet are at *DAGM* 17, where we may have octaseme feet, if the alternation of single with double *stigmai* over tetraseme measures has such a meaning. In *DAGM* 45 we see a hexaseme *arsis* with a tetraseme *thesis*. Most examples of notated *arsis* seem to rule out large compound feet.

The prominence of large and augmented feet in *E.R.* and other rhythmic writings may have been motivated by the fact that they provided a clear example of a distinction between musical rhythm and poetic meter, since they depended on criteria external to poetic rhythm.

**SUMMATION**

In its incomplete state, *E.R.* is valuable more as an example of the application of Aristotelian methodology in the Peripatetic school than as a source of information about ancient Greek music. The coherence and integrity of the work come to light when it is examined on its own terms, rather than shanghaied into the service of a theory of poetic meter.

Aristoxenus uses Aristotelian methods productively in developing his theory of rhythm. In *E.R.* paragraphs 3-6, he applies the Aristotelian distinction of form and material to rhythmic phenomena. The syllables, musical notes, or dance steps that comprise a performance provide the material basis for rhythm. Taken together, paragraphs 6 and 9 give a theoretical explanation of why the traditional analysis of rhythm as music, dance, and words attested in Plato and Aristotle is in fact correct.

The form of rhythm does not exist separately from its material basis, but can be apprehended in terms of the time intervals in which the syllables, notes, or steps occur. In *E.R.* paragraphs 7-8, Aristoxenus says that rhythm arises when the arrangement of time intervals takes on a determinate order. The nature of this order is elaborated in the remainder of our text. Paragraphs 10-12 establish the primary time interval as the measure by which the durations of time intervals can be determined by the faculty of perception. Paragraphs 13-15 serve as an important preliminary to Aristoxenus's definition of the rhythmic foot by establishing that more than one rhythmic event may be grouped into a single time interval with regard to rhythmic form. Aristoxenus here introduces the concept of rhythmic composition, which will be further developed in paragraphs 18 and 19.

In paragraphs 16-19, Aristoxenus defines the rhythmic foot as a sequence of time intervals that have been assigned the status of arsis or thesis. The common term for an arsis or a thesis is σημεῖον 'marker'. A foot may consist of two, three, or four such markers, and each marker may consist of one or more rhythmic events. Aristoxenus does not specify the acoustic means by which arsis was distinguished from thesis, but the use of the terms σημαίνω 'mark' in paragraph 16 and σημασία 'marking' in paragraph 31 indicates that there was some acoustic parameter besides duration; this parameter can be provisionally identified as dynamic accent with the caveat that it was not necessarily applied in the same way as it is in modern Western music. Aristoxenus's focus is on describing the rhythmic foot as a system of rhythmic functions, analogous to way he had described the tetrachord in *E.H.* as a system comprised of individual pitches that embody melodic functions.

Aristoxenus's account of the rhythmic foot in paragraphs 16-19, supplemented by the descriptions of augmented rhythms found in Aristides Quintilianus, the *Fragmenta Neapolitana*, and Michael Psellus, provides a framework for a systematic exposition of rhythmic constructions such as those described more impressionistically in *POxy* 2687.

In paragraphs 20-21 Aristoxenus presents the irrational foot, in which the thesis and arsis have a ratio between 2:1 and 1:1 that cannot be exactly specified. Aristoxenus reports that the example he presents was called the irrational *choreios*; the implication is that such a foot was considered a variation on its rational counterpart. This in turn reinforces the idea that Aristoxenus conceived of the rhythmic foot as a musical function analogous to the melodic functions described in *E.H.* In some contexts, unspecified in *E.R.*, rhythmic feet can accept variations in duration the way the melodic functions can accept the some variations of pitch.

Paragraphs 22-29 of *E.R.* recap the material presented in paragraphs 10-21 in a list of rhythmic differentiae, a format derived from Aristotle's *Parts of Animals*. The seven differentiae listed here specify aspects of the τάξις 'order' of rhythmic form mentioned in paragraphs 7-8. The correct interpretation of these differentiae depends on careful consideration of the use of technical terms within *E.R.* because parallel passages in other authors use the same terms in different senses.

Paragraph 30 of *E.R.* present the three rhythmic ratios acceptable for continuous rhythmic composition: the dactylic, the iambic, and the paionic, while paragraphs 31-36 associate these rhythmic ratios with time intervals from the diseme to the octaseme, at which point our fragmentary text ends. Aristoxenus's rejection in paragraph 35 of the 4:3 ratio, associated with the concord of the fourth in Pythagorean harmonic theory, reinforces our claim that Aristoxenus conceived of rhythmic feet as musical functions.

**GLOSSARY**

**αἴσθησις** perception: The existence of musical rhythm is primarily a quality of perception, rather than a quality of acoustic sound. Always used in the singular in *E.R.* 2.1, 5.1, 8.13, 8.10, 11.2, 16.2, 18.6, 18.7, 20.2, 20.8.

**ἄλογος/ἀλογία** irrational/irrationality: Refers to rhythmic articulation that is noticeably different from a straight count of time, yet is behaviorally counted by simple integers. An example in modern music is the rhythm of the Viennese waltz, for which the performers or dancers mentally or behaviorally count one-two-three, though the first beat is customarily augmented by a third to a half of its nominal value. Modern swing rhythms are also behaviorally counted with simple integers, though the actual duration can vary from the nominal time as much as the example Aristoxenus gives of the irrational foot. This is not to say that Ancient Greek music sounded like either a waltz or swing, but that Aristoxenus introduces the irrational foot with regard to some kind of music that exploited this possibility of a difference between behavioral counting and actual duration. ἀλογία: 20.1, 11. ἄλογος: 20.10, 13; 21.1, 10; 22.4; 25.1. cf. ῥητός.

**ἀμελῳδῆτα**: See μελῳδῆτα.

**τὸ ἄνω/ἄρσις** *arsis*: Analogous to the upbeat(s) in modern rhythm. Aristoxenus's usage of this term in *E.R.* cannot be generalized to Greek poetic meters, since *E.R.* treats only isochronous feet. τὸ ἄνω: 17.1, 2, 3 (*bis*); 20.4, 5, 7; 25.1; 29.1; 3. ἄρσις: 20.9 (*bis*), 21.21. cf. τὸ κάτω/βάσις.

**ἀριθμός** number: In *E.R.* 19, one parameter or facet of the formula of any given rhythmic foot is the number of rhythmic markers it contains. This number may differ from the number of rhythmic events (notes, syllables, or dance steps) the rhythmic structure contains. Par. 27 uses ἀριθμός in a way that makes sense only if we assume a conflation of both possible ways of counting. In the phrase κατὰ τοὺς τῶν ἀριθμῶν λόγους μόνον (par. 21), number refers to Aristoxenus's rejection of numerical ratios as a sufficient cause of rhythm. 19.2, 3, 9; 21.6, 9, 13; 27.2.

***arsis***: see τὸ ἄνω/ἄρσις.

**ἀσύνθετος** uncompounded: In rhythmics, a time interval comprising only one rhythmic event: note, syllable, step of dance. 13.1, 14.1, 3; 22.4; 26.1. In harmonics, an interval representing one step in a given position of a given scale. 14.9, 10, 11.; 15.1, 4, 5.

**βάσις:** see τὸ κάτω/θέσις/βάσις.

**γένος**: The genus or type of rhythm. Aristoxenus mentions three genera explicitly: iambic, dactylic, and paeanic. These genera are associated with the ratios of the contrasting parts of the rhythmic feet. This concept of rhythmic structures differs from the conception embodied in the time signatures of modern musical notation. Modern musical measures are defined by the total number of beats they contain; certain positions within each measure are customarily marked as downbeats. Modern nomenclature and notation does not highlight a ratio between upbeat and downbeat regions of a measure, though such ratios can be found if one seeks them.

The difference between Aristoxenus's iambic hexaseme foot and his dactylic hexaseme foot is analogous to the distinction between 3/4 time and 6/8 time in modern notation. Conventionally, the 3/4 measure is counted as having one downbeat and two upbeats, while the 6/8 measure is counted as two groups of three beats each. It bears repeating that this does not entail that Ancient Greek music used the same acoustic means in the same way as modern music does to express this distinction, nor that our fragmentary text of *E.R.* treats all Greek music comprehensively. 22.2; 24.1; 30.2; 31.3; 32.2, 4; 33.4; 34.2, 5; 36.2.

**δακτυλικός**: The dactylic genus of rhythm, characterized by the ratio of equality between the two parts of the foot. 30.2, 3; 32.2, 4; 34.2, 5; 36.2 cf. ἴσος.

**διπλασίος**: The double ratio, characteristic of the iambic genus of rhythm. 24.2; 30.4; 31.4; 34.3, 6. cf. ἰαμβικός.

**ἡμιολίος**: The ratio of 3:2, characteristic of the paionic genus of rhythm. 33.3, 4.

**ἰαμβικός**: The iambic genus of rhythm, characterized by the double ratio between the parts of the foot. 30.2, 3; 31.3; 34.2, 6. cf. διπλασίος.

**isochronous hierarchical rhythm** A generalized formulation for what is commonly called meter in modern theory, highlighting what are seen as the two characteristics of regular meter as opposed to freer rhythms. Such rhythms feature prominent repetition of isochronous or equal-timed events. The rhythms are hierarchical in that they are built on a steady pulse, grouped into isochronous measures, which can be articulated into larger figures.

**ἴσος**: Equal ratio, characteristic of the dactylic genus of rhythm. 24.2; 32.3, 4; 34.3, 5.

**τὸ κάτω/θέσις/βάσις** *thesis*: Analogous to the downbeat in modern rhythm, but with two differences in conception: first, it is conceived of as a region or duration in time rather than a point or instant in time; second, rhythm can be counted with two consecutive downbeat regions without an intervening upbeat. We cannot specify with certainty what acoustic means were used to express the relationship between downbeat and upbeat. βάσις: 20.8, 21.1.

**λόγος** ratio: The ratio between the *arsis* and *thesis* of a rhythmic foot. Compare γένος, but λόγος is a more general term in that it can accommodate irrational durations and/or relationships acoustically possible but excluded from music. 20.1, 2, 8; 21.6, 9, 13; 24.2, 3; 30.3; 31.4; 32.2; 33.2; 34.7; 35.2.

**μέγεθος** size: In paragraphs 8, 10, 14, and 18, this is duration. In the treatment of the irrational foot in paragraphs 20-21, Aristoxenus makes explicit a distinction between accurate chronometric counting and the behavioral counting underlying the name of the irrational choree; the possibility is latent in his previous uses of the word. In developing a metaphor from the harmonics, Aristoxenus uses μέγεθος for the physical acoustic value of a harmonic interval as distinct from the ways an interval that size could be spanned in the various harmonic scales. In paragraphs 31-26 Aristoxenus uses μέγεθος as an organizing principle for his catalogue of rhythmic feet. Paragraphs 22, 23, 27 and 28 are expressed in a way that justifies an inference that a catalogue of feet labeled or known by their size, μέγεθος, was already familiar to Aristoxenus's audience. 8.21; 10.6; 14.2, 4, 8, 11; 18.4, 6, 8; 19.9; 21.5; 21.11; 22.2; 23.1; 27.1, 3; 28.2; 31.2 (bis), 4; 32.1; 33.1; 34.1; 35.1; 36.1. cf. χρόνος.

**μελῳδῆτα** melodious: Said of harmonic intervals that are used in music; that is, in at least one of the possible musical scales; opposed to ἀμελῳδῆτα intervals that are not used in music, such as the twelfth-tone.

**meter**: Though the term *metron* in regard to poetic meter is attested in Aristophanes, Plato, and Aristotle, it does not appear in *E.R*. In this study, the term meter is always qualified as either poetic meter or musical meter. Musical meter refers to the concept of meter in modern musical theory; see "isochronous hierarchical rhythm." Poetic meter refers to the syllable sequences of Greek poetry, much of which conflicts with the regularity of musical meter.

**παιωνικός**: The paeanic genus of rhythm, characterized by the ratio of 3:2. 30.2, 4; 33.4. cf. ἡμιολίος.

**πούς** foot: The unit of rhythm to which perception responds primarily or most readily. While the primary time interval is primary with respect to theory, the foot is primary with respect to perception. The parts of the foot are the markers, σημεῖα: *arsis*, τὸ ἄνω/ἄρσις; and *thesis*, τὸ κάτω/βάσις. The rhythmic feet Aristoxenus describes are functionally analogous to the measures in modern music notation, though their internal structure is conceived of differently. The large or compound feet Aristoxenus discusses in paragraphs 18 and 19 are more analogous to rhythmic figures that would be notated as more than one measure in modern notation. 16.2; 17.1; 18.1, 3, 5 (*bis*), 10; 19.3, 4, 6, 9; 20.1, 3, 5, 7; 21.12; 22.3; 23.1, 2; 24.1; 26.2; 30.1; 31.1.

**πρῶτος χρόνος** primary time interval: The unit of measurement for time intervals, defined as the duration of the shortest syllable, musical note, or dance step in the performance. It is presented in *E.R.* para. 11 as being close to a perceptual minimum, but was in practice was set by the performer(s). 10.1; 12.2.

**ῥητός** legitimate; the straight count in modern discourse. The performers hew to a chronometrically accurate count, rather than distorting the relative time values. 21.1, 3, 6, 8, 9, 10, 12; 22.3; 25.2.

**rhythmic event:** A single instance of a syllable, musical note, or dance step.

**ῥυθμοποιία** rhythmic composition: In paragraphs 17-19 of *E.R.*, rhythmic composition can ultimately be reduced to variation in the subdivision of time intervals within a rhythmic structure. Aristides Quintilianus uses the term in a broader sense, subdividing its meaning three ways; Aristoxenus may well have used the term in a wider sense as well, parallel to melodic composition in his *E.H.* 13.2 (*bis*), 7, 9; 14.1; 19.5, 8, 10; 21.11; 30.1.

**ῥυθμός** rhythm: Used in the plural, the term must refer to a catalogue of types of rhythm known to Aristoxenus's audience. In the singular, the term refers to any rhythm or to the essential commonality of all types of rhythm.
Specific types or styles of rhythm in a known catalogue: 2.4; 13.9; 21.2, 7,
Any rhythm, or the essential commonality of rhythm: 1.1, 4; 3.1; 4.6, 8; 5.3, 7; 6.3; 7.2; 8.16, 18; 13.3; 16.1; 21.8, 10.

**ῥυθμιζόμενον**: Object of rhythmic composition, or rhythmic event; either a syllable, a note of music, or an identifiable dance step, movement, or (possibly) pose. 3.2; 4.3; 5.3, 7, 8; 6.4, 7; 8.17, 18; 9.1, 2; 10.2; 15.2, 3.

**σημεῖον** marker: In paragraphs 9, 11, 12, 14, and 15, this is a term for a move or step of dance. 9.6; 11.11; 12.2; 14.3, 5; 15.7.

In paragraphs 18 and 19, it is a general term for the parts of the foot; i.e., an *arsis* or a *thesis*. 18. 3, 6, 8, 10; 19.7, 9.

At 18.2, the term σημεῖον must refer to a time interval filled by one rhythmic event; while this compromises the logical rigor with which the term is used, the qualification needed to maintain rigor (one σημεῖον alone cannot make a division of time *unless it comprises more than one rhythmic event*) is trivial. As is argued in the commentary, σημεῖον must be understood throughout the rest of paragraphs 18 and 19 as a time interval at least potentially filled by more than one rhythmic event.

**σημασία** marking: This refers to the acoustic means of distinguishing *arsis* from *thesis* in the type of rhythm *E.R.* describes; however, we cannot specify or reconstruct precisely what these means were in practice. 31.3.

--**σημος** -seme: Suffix expressing the duration of one primary time interval. 10.2, 3 (bis); 20.4 (bis); 31.1, 2, 3; 32.1; 33.1; 34.1; 35.1; 36.1.

**σύμφωνα [διαστήματα]:** The concordant intervals of harmonic theory: the fourth διὰ τεσσάρων, the fifth διὰ πέντε, and the octave διὰ πασῶν. 21.5

**σύνθετος** compounded**:** A time interval comprising more than one rhythmic event: note, syllable, dance step. 14.5, 14, 16; 15.3, 4, 7; 22.3. In harmonics, an interval representing more than one step in a given position of a given scale. 14.9, 10, 11.

**σχῆμα** shape: Used in the development of a metaphor comparing rhythm to shapes of solid bodies. 3.3, 4.1, 5.4, 5, 6; 6.2. At 9.6 it means a dance step or other movement. At 12.5, the phrase ποδικῶν σχημάτων may refer to the paragraphs 31-26; if so, it refers to the relationship of *arsis* to *thesis* found discussed there. At 22.7 and 28.1, σχῆμα is best interpreted as the assignment of the values *arsis* and *thesis* to the parts of a rhythmic sequence. This interpretation clashes with Aristotle's use of the term σχῆμα in his definition of rhythm in the *Rhetoric*, but nevertheless completes Aristoxenus's development of his shape metaphor for rhythm; see commentary *ad loc.*

**τάξις** order, arrangement of time intervals: Having distinguished rhythmic form from material in *E.R.* paragraphs 3-6, Aristoxenus posits τάξις in paragraphs 7-8 as the parameter of rhythmic form that distinguishes what is rhythmically acceptable from what is not. 7.2, 3; 8.2; 8.14.

***thesis*****:** see τὸ κάτω/θέσις/βάσις.

**χρόνος** time/time interval: Some citations use χρόνος as Aristotle defined it; that by which all motion or change is measured. 6.4, 5, 8; 9.1, 3.

Other citations show a development of the term within *E.R.* In the first 8 paragraphs, χρόνος in the plural is used of time intervals as objects of perception, without specification of how time intervals become objects of perception. 2.1; 4.5; 7.3; 8.1.

There follow citations that explicitly distinguish the durations of time intervals from the rhythmic events by which the intervals become objects of perception. In these citations, time intervals are conceived as empty space that can potentially be filled by a rhythmic event/events of that specified duration. This meaning is found in the plural at 8.21, 10.1, 11.4, 11.9. This sense of χρόνος is found in the singular at 12.1 and 14.2.

In paragraphs 13-15, a time segment can be classified as compound or uncompounded by reference to whether it contains one or more rhythmic events. 13.1, 14.1, 4, 6, 14, 16.

At 17.1, the term χρόνος refers to a time interval that can be filled either with one or with more than one rhythmic event. It must be taken this way in order to keep paragraph 17 consistent with paragraphs 18 and 19. This entails that χρόνος becomes synonymous with the term σημεῖον, with which it is used interchangeably, as a general term for the parts of a foot, arsis and thesis.

The use of χρόνος at 18.1 compromises the logical consistency of the use of the term, because it makes sense only if we consider it a time interval filled by one rhythmic event, not a potentially compound time interval. The same is true of the term σημεῖον in this sentence. In the next sentence, χρόνος is used as it was in paragraphs 2-7, in the general sense of time as that by which motion or change is measured. The remainder of paragraphs 18-19 uses the term σημεῖον for the parts of the foot.

The phrase χρόνου μέγεθος is used as a general term for a part of a foot at 21.10. The phrase τὸν ἄνω χρόνον at 25.1 and 29.1, 3 makes explicit that χρόνος can be used as a term for a part of a foot.

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