

# *ARSIS* AND *THESIS* IN ANCIENT RHYTHMICS AND METRICS: A NEW APPROACH<sup>\*</sup>

## 1. THEORETICAL DEFINITIONS OF *ARSIS/THESIS* AND THE PERCEPTION OF RHYTHM

Since the beginning of modern investigations on ancient rhythemics, scholars have faced significant problems in interpreting the technical terminology employed by ancient rhythmicians, especially in relation to two of the most basic terms attested in the sources: ἄρσις and θέσις, which indicate the two fundamental components of a rhythmical foot.

Part of the difficulty derives from the fact that the extant Greek definitions of these concepts are very concise. Despite their brevity, however, they depict a very consistent scenario: the term ἄρσις denoted the ‘lifting’ of the foot, which was also described as the up-beat (τὸ ἄνω), while θέσις indicated the ‘placement’ or ‘step’ of the foot on the ground, or the down-beat (τὸ κάτω).<sup>1</sup> Their combination produced a rhythmical πούς (‘foot’), which

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<sup>1</sup> The earliest terms ἄνω/κάτω, borrowed from ordinary language, are attested for example at Pl. *Resp.* 400b, Aristox. *El. Rhythm.* §17, 20, 25, 29, 10–16 Pearson. The technical

Aristoxenus defined as the element that marks the rhythm of a musical piece and makes it intelligible to perception.<sup>2</sup> A slightly more complex case concerns the term βάσις ('step'): except for Aristoxenus, who employed it to refer to the down-beat (τὸ κάτω),<sup>3</sup> the term βάσις generally denoted a dance step or rhythmical unit as a whole,<sup>4</sup> corresponding to the Aristoxenian πούς.

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terms ἄρσις/θέσις appear mostly in later texts: e.g. Arist. Quint. *De Mus.* 31.15–16 Winnington-Ingram (hereafter W.-I.), Bacchius *Ench.* §98, 314.10–12 Jan, Lucian *Imag.* 14.7, *Harm.* 1.9, Sext. Emp. *Adv. Math.* 6.60; but see already Herophilus *apud* Galen *Syn. Puls.* 9.464.1–4, quoted in full below.

<sup>2</sup> Aristox. *El. Rhythm.* §16, 10.21–2 Pearson: ὃ σημαίνόμεθα τὸν ῥυθμὸν καὶ γνῶριμον ποιοῦμεν τῇ αἰσθήσει, πούς ἐστιν εἷς ἢ πλείους ἑνός. See also *Frag. Neap.* §12, 28.14–16 Pearson. Rhythmical feet differ from metrical feet, as the former are defined by the ratio between the number of *protoi chronoi* contained in their *arseis* and *theseis* (Arist. Quint. *De Mus.* 31.8–10, 33.12–13 W.-I.), while the latter consist of fixed sequences of long and short syllables (Arist. Quint. *De Mus.* 44.11–12 W.-I., *App. Dionys.* 332.7 Consbruch).

<sup>3</sup> Cf. Aristox. *El. Rhythm.* §§20–21, 12–14 Pearson, with the Aristoxenian Psell. *Rhythm.* §12, 24.16–19 Pearson and *Fragm. Neap.* §22, 30.25 Pearson.

<sup>4</sup> Cf. Pl. *Resp.* 3.399e–400a, *Leg.* 2.670d, Arist. *Pol.* 2.1265b35–6, *Met.* 14.1087b36, Ps.-Long. *De Subl.* 39.2 and 41.2, Bacchius *Ench.* §91, 312.19–20 Jan, Hermog. *Id.* 1.1.149–51, 1.6.261–9, 2.3.178–82, 2.12.123, Pollux *Onom.* 2.200, Syrian. *Ad Hermog.* 18.4–9 and Planudes *Rhet. Gr.* 5.454 Walz (μεταφωρική δὲ ἡ λέξις ἀπὸ τῶν χορευτῶν· τὴν γὰρ ἐν χοροῖς βάσιν ὀρίζονται οὕτως οἱ μουσικοί· βάσις ἐστὶν ἄρσεως καὶ θέσεως ποδῶν σημείωσις· τὸ γὰρ αἶρειν τὸν πόδα, εἶτα τιθέναι, ἄρσιν καὶ θέσιν ὠνόμασαν· ἄρσις οὖν καὶ θέσις ἢ ἐν τῷ ἄρχεσθαι καὶ λήγειν τῶν χορευτῶν ὁρμὴ λέγεται). A different usage of the

Even though the Greek sources clearly indicate that the distinction into *arsis/thesis* was essential in defining the rhythmical structure of a musical piece, as we will see in §1 below only a few sparse passages give us some hints about how they were expressed in musical terms. This is all the more remarkable given the emphasis put by Aristoxenus on the importance of perception (αἴσθησις) at the beginning of his *Elementa Rhythmica*, where he defined nothing less than ‘the origin and fundamental principle of the science of rhythmics’ as the study of ‘time divisions and their perception’.<sup>5</sup> Apparently, the perception of rhythmic divisions into *arseis* and *theseis* was so natural for the Greeks that they did not feel the need to discuss it extensively.

The reticence of the sources led many modern scholars to apply an oversimplified interpretation of Western rhythmic conventions to ancient Greek music, assuming that θέσις/βάσις (the ‘down-beat’) was not just occasionally accompanied by clapping, as the

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term βάσις is attested in late Greek and Latin metrical sources such as Choer. 211.17–212.2 Consbruch, Johannes Rhet. *Ad Hermog.* 6.239.6–9, and Marius Victorinus/Aphthonius 6.47.3–7 Keil; here βάσις indicates a structure which comprises two or more basic feet (πόδες), i.e. what ancient rhythmicians called a ‘compound foot’ (cf. Aristox. *El. Rhythm.* §26, 16.6–7 Pearson). As we will see in greater detail below, such terminological and theoretical differences between rhythmicians and metricians were very common; cf. T.D. Goodell, *Chapters on Greek Metric* (New York, 1901), 6–57.

<sup>5</sup> *El. Rhythm.* §2, 2.5–8 Pearson: περὶ τοὺς χρόνους ἐστὶ καὶ τὴν τούτων αἴσθησιν [...] ἀρχὴ γὰρ τρόπον τινὰ τῆς περὶ τοὺς ῥυθμοὺς ἐπιστήμης ἐστὶν αὕτη. See also *El. Rhythm.* §§8, 11, 12 and 16, 8–10 Pearson, and Arist. Quint. *De Mus.* 33.12–13 W.-I.

sources indicate,<sup>6</sup> but was consistently emphasised by means of dynamic accents that affected both instrumental and vocal music.<sup>7</sup> However, a few Classical testimonies suggest that this practice was far from universally followed or even appreciated: for instance, Theophrastus mentions clapping along during an *aulos* performance as an example of tasteless behaviour and Cratinus disparagingly labels the ‘Pig-Boeotians’ as a ‘race of clapper-wearers’ (κρουπεζοφόρον γένος ἀνδρῶν, fr.77 KA).<sup>8</sup>

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<sup>6</sup> E.g. Hom. *Od.* 8.379, Hes. *Theog.* 70, *Pap. Hib.* 13.ii.29–31, Lucian *Salt.* 10, Ath. *Deipn.* 636d–e, Philostr. *Imag.* 1.10.4, Philostr. Jun. *Imag.* 6.3, Greg. Nys. *Contra Eunomium* 1.1.17.

<sup>7</sup> Although particularly strong in English and German scholarship, this approach is by no means limited to these traditions: see for instance P. Maas, *Greek Metre* (Oxford, 1962), 6; C.B. Heberden, ‘*Rhythmica*’, in W. Smith, G.E. Marindin, and W. Wayte (edd.), *A Dictionary of Greek and Roman Antiquities* (London, 1890), 558–65; C.F. Williams, *The Aristoxenian Theory of Musical Rhythm* (Cambridge, 1911), 27; F.A. Gevaert, *Histoire et Théorie de la Musique de l'antiquité* (Gand, 1881), 2.18; A. Rossbach, ‘Griechische Rhythmik’, in A. Rossbach and R. Westphal (edd.), *Metrik der griechischen Dramatiker und Lyriker nebst den begleitenden musischen Künsten, Theil I* (Leipzig, 1854), 24; R. Westphal, *Die Fragmente und die Lehrsätze der griechischen Rhythmiker* (Leipzig, 1861), 99. For further bibliography, see V. Palmieri, ‘*Res metrica*: il “piede” e il significato di ἄνω εἰκάτω’, in *Talarischos – Studia Graeca Antonio Garzya sexagenario a discipulis oblata*, (Naples, 1987), 33–127.

<sup>8</sup> This passage seems to refer to a special kind of sandal, called κρούπεζα, which had a wooden clapper attached to the sole and was worn by *aulos*-players: cf. M.L. West, *Ancient Greek Music* (Oxford, 1992), 123. Except for this fragment, the use of *kroupezai* is mentioned only in late Greek sources (e.g. Pollux 7.87, 10.154; cf. *Schol. in Aesch. In Timarchum* 126.20–

Furthermore, such a rigid understanding of rhythm perception does not apply to Western music either. In fact, even though in our musical tradition down-beats are indeed regarded as ‘strong’ rhythmical positions, as opposed to ‘weak’ up-beats, it is not true that all ‘strong’ beats are marked by audible dynamic accents in musical performances. This kind of consistent dynamic accentuation is mostly employed as a temporary teaching device, in order to foster an internalisation of the rhythmic pulse that ultimately substitutes the exaggerated accentuation.<sup>9</sup> And we are certainly capable of identifying the rhythmical structure of music played on the organ or the harpsichord, even though these instruments are literally unable to produce dynamic accents – an extreme case which shows that Western rhythm too is based on rules that are far more complex than a mere alternation of loud and soft tones.

More generally, modern ethnomusicological studies have shown that many non-Western rhythmical idioms are organised on the basis of completely different principles and do not necessarily grant a special role to dynamic accentuation.<sup>10</sup> These results are consistent with

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5); by contrast, the Latin *scabellum* is widely attested both in iconographic and literary sources: e.g. Cic. *Pro Caelio* 65.13, Suet. *Cal.* 54.2, Aug. *De Musica* 3.1.1; cf. A. Bélis, ‘*Kroupezai, Scabellum*’, *Bulletin de correspondance hellénique* 112.1 (1988), 323–39.

<sup>9</sup> For a discussion of this teaching device, cf. M.W. Camp, *Teaching Piano: The Synthesis of Mind, Ear and Body* (Los Angeles, 1992), 5 and 77–82.

<sup>10</sup> In general on this issue see M. Kolinski, ‘A Cross-Cultural Approach to Metro-Rhythmic Patterns’, *Ethnomusicology* 17.3 (1973), 494–506 and T. Kvifte, ‘Categories and Timing: On the Perception of Meter’, *Ethnomusicology* 51.1 (2007), 64–84; on Indian and African rhythms, see M. Clayton, *Time in Indian Music: Rhythm, Metre, and Form in North Indian Rāg Performance* (Oxford, 2000) and V. Kofi Agawu, *African Rhythm: A Northern Ewe Perspective* (New York, 1995).

recent findings in the field of music psychology which have demonstrated how, contrary to what is often claimed about ancient rhythm,<sup>11</sup> the presence of dynamic accents is not absolutely necessary in order to perceive sequences of sounds as rhythmically organised.<sup>12</sup>

Therefore, there is no ‘natural’ reason to assume that dynamic accents regularly marked rhythmical *θέσεις* and we should be wary of applying this idea to ancient Greek music in the absence of explicit testimonies.<sup>13</sup> If anything, the evidence provided by traditional Indian and Japanese music points in the opposite direction: in these musical traditions dynamic accentuation plays a very minor role in marking rhythmical phrases,<sup>14</sup> a feature that might be

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<sup>11</sup> E.g. Heberden (n. 7), 558: ‘The groups into which a succession of sounds fall are clearly recognised only when a sound more intense than its neighbours occurs at equal intervals of time. This accentuated part of each group is called by Aristoxenus *βάσις*, by the earliest writers after Aristoxenus *θέσις*. The unaccentuated part is called *ᾠσις* [...] All these terms originated in the fact that the accentuated portion of the group was marked by setting down the foot, the unaccentuated by lifting it up’.

<sup>12</sup> For experiments showing that listeners perceive a rhythmical beat even if no difference in intensity or pitch is introduced into metrically regular sequences of durations see J.A. Grahn and M. Brett, ‘Rhythm and beat perception in motor areas of the brain’, *Journal of Cognitive Neuroscience* 5 (2007), 893–906 and R. Brochard, D. Abecasis, D. Potter, R. Ragot and C. Drake, ‘The “Ticktock” of our internal clock: direct brain evidence of subjective accents in isochronous sequences’, *Psychological Science* 4 (2003), 362–6.

<sup>13</sup> Cf. the similar conclusions reached by West (n. 8), 133–4 and J. Silva Barris, *Metre and Rhythm in Greek Verse* (Wien, 2011), 18–23.

<sup>14</sup> On the role of accents in Indian music, cf. Clayton (n. 10), 37–42, 69–70, and 160–1, where the author shows how the use of dynamic accents in defining grouping structure is

significant for our purposes given that both Sanskrit and Japanese are mora-timed, pitch-accented languages like ancient Greek.<sup>15</sup>

A second hypothesis often advanced in writings on ancient rhythemics maintains that long syllables enjoyed a predominant status purely by virtue of their length, as opposed to pitch or stress.<sup>16</sup> Once again contemporary research in music psychology can help us assess the merits of this theory, since recent experiments have shown that rhythmical events emphasised by virtue of duration alone, which bear a so-called ‘temporal’ accent, are not intrinsically more capable of conveying rhythmical information than events marked by ‘melodic’ accents. By

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negligible when the surface rhythm of a musical piece corresponds to its basic rhythmical structure (*tal*). By contrast, dynamic ‘accenting plays a far more important role in defining grouping’ when the surface rhythm runs contrary to the basic one: in this case, the first element of each ‘anomalous’ group is emphasised. See also A.S. Deo, ‘The metrical organization of Classical Sanskrit verse’, *Journal of linguistics* 43.1 (2007), 63–114, who demonstrates how Sanskrit metre may be understood better in the light of its chanted nature and argues for the presence of musical syncopes marked by dynamic accents on otherwise weak positions. On Japanese music, cf. W. Adriaansz, *The Kumiuta and Danmono Traditions of Japanese Koto Music* (Berkley/Los Angeles, 1973), 47 and 229.

<sup>15</sup> Cf. W.D. Whitney, *Sanskrit Grammar* (Cambridge Mass., 1889), 27–34; T.J. Vance, *The Sounds of Japanese* (Cambridge/New York, 2008), 7 and 115–53. For a discussion of the relationship between the features of a language and the relative musical rhythms, see A.D. Patel, *Music, Language, and the Brain* (New York, 2008), 97–180.

<sup>16</sup> E.g. C.E. Bennett, ‘What was *ictus* in Latin prosody?’, *The American Journal of Philology* 19.4 (1898), 361–83, at 371–2: ‘I define *ictus*, therefore, not as stress, nor as accent, but simply as the quantitative prominence inherent in a long syllable’.

contrast ‘melodic’ accents, which emphasise specific sound events exclusively by means of pitch changes, have proven to be significantly more capable to elicit rhythmical perceptions than temporal accents of equal salience.<sup>17</sup>

These results clearly show that the preference traditionally granted to dynamic or temporal accents in interpreting the evidence on ancient rhythm is unwarranted; yet the alternative possibility that melodic features signalled the subdivision of rhythmical phrases into *arsis* and *thesis* has hardly ever been considered.<sup>18</sup> As we have noted above, rhythmical salience is often associated with dynamic accents in Western music, while Western languages are mostly based on stress patterns and Western folk songs tend to place stressed syllables on rhythmically ‘strong’ beats.<sup>19</sup> So is it possible that a similar correspondence worked also in ancient Greek music? In other words, just as linguistic salience depended on the position of

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<sup>17</sup> See M.R. Jones, ‘Musical Time’, in S. Hallam, I. Cross, and M. Thaut (edd.), *Oxford Handbook of Music Psychology* (Oxford/New York, 2009), 81–92, at 88–90; R.J. Ellis and M.R. Jones, ‘The role of accent salience and joint accent structure in meter perception’, *Journal of Experimental Psychology: Human Perception and Performance* 35.1 (2009), 264–80, especially 268 on the key concept of accent salience: in brief, while all kinds of accents attract our attention by means of a ‘local’ change in one specific dimension (duration, pitch or volume), their relative salience indicates the degree to which they actually do so and depends on different factors (e.g. the magnitude of the change and the number of simultaneous accents occurring at the same point in time).

<sup>18</sup> For a partial and largely unsatisfactory attempt, see Palmieri (n. 7).

<sup>19</sup> Cf. *New Grove Dictionary of Music and Musicians*, s.v. ‘Folk Music’ II.4 (Rhythm).



acute accents,<sup>20</sup> is it possible that rhythmical salience was also conveyed by melodic accents that emphasised higher-pitched *arseis*?

This option seems all the more promising since we know that the pitch-accents of Greek lyrics played a vital role in determining a song's melodic shape: as many extant musical fragments show, acute accents tend to be associated with melodic peaks and circumflex accents with falling melodic contours.<sup>21</sup> Furthermore, another important feature of ancient Greek

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<sup>20</sup> Just as many English heterophones are distinguished by a difference in the position of the stress (e.g. *prèsent/presènt*, *rècord/recòrd*), Greek homographs were differentiated by the shape and position of melodic accents: e.g. *λῦσαι/λύσαι*, *βίος/βίος*.

<sup>21</sup> Cf. West (n. 8), 197–204, for a detailed discussion of the intimate correlation between melody and word-accents in non-strophic songs. See also G. Comotti, 'Melodia e accento di parola nelle testimonianze degli antichi e nei testi con notazione musicale', *Quaderni Urbinati di Cultura Classica* 32.2 (1989), 91–108; C.H. Cosgrove and M.C. Meyer, 'Melody and word accent relationships in ancient Greek musical documents: the Pitch Height Rule', *Journal of Hellenic Studies* 126 (2006), 66–81. With regard to strophic songs, the general consensus is that the same melody was employed both in strophe and antistrophe: cf. E. Pöhlmann and M.L. West, *Documents of Ancient Greek Music* (Oxford, 2001), 16. However A. D'Angour ('The New Music – So what's new?', in S. Goldhill and R. Osborne (edd.), *Rethinking Revolutions Through Ancient Greece* (Cambridge, 2006), 264–83) presents a compelling case for the idea that using the same melody in corresponding strophes and antistrophes was a Euripidean innovation introduced with the staging of *Medea* in 431 B.C. It is worth noting that, in principle, this hypothesis is not incompatible with Pöhlmann and West's interpretation of *Papyrus Vienna G 2315* (=DAGM 3), since this musical fragment belongs to a tragedy first produced in 408 B.C. (Euripides' *Orestes*).

musical practice strongly suggests that *arseis* had greater rhythmical importance than *theseis*: in fact, Greek musicians marked *arseis* and not *theseis* by means of a dot (*stigma*) in their scores, a fact that would be at least surprising if *theseis* were the most relevant rhythmical element.<sup>22</sup> Finally, this hypothesis is supported by the Greek and Latin sources on rhythm, to which we will now turn.

## 2. *ARSIS* IN THE GREEK RHYTHMICAL SOURCES: FOLLOWING HIDDEN HINTS

As we said at the beginning, the Greek sources provide only a few comments on the musical features associated with rhythmical *arseis* and *theseis*. Aristoxenus, in the extant part of his *Elementa Rhythmica*, does not even offer a formal definition of these terms: he simply employs them as synonyms of ‘up-beat’ (τὸ ἄνω) and ‘down-beat’ (τὸ κάτω),<sup>23</sup> suggesting that their perception and identification was all but natural. Fortunately, Aristides Quintilianus offers a richer account of these rhythmical notions in the following passage from Book 1 of his *De Musica*:

Ῥυθμὸς τοίνυν καλεῖται τριχῶς· λέγεται γὰρ ἐπὶ τε τῶν ἀκινήτων σωμάτων (ὥς φαμεν εὐρυθμον ἀνδριάντα) κατὰ πάντων τῶν κινουμένων (οὕτως γὰρ φαμεν εὐρύθμως τινὰ βαδίζειν) καὶ ἰδίως ἐπὶ φωνῆς· περὶ οὗ νῦν πρόκειται λέγειν.

Ῥυθμὸς τοίνυν ἐστὶ σύστημα ἐκ χρόνων κατὰ τινὰ τάξιν συγκειμένων· καὶ τὰ τούτων πάθη καλοῦμεν ἄρσιν καὶ θέσιν, ψόφον καὶ ἡρεμίαν. καθόλου γὰρ τῶν φθόγγων διὰ τὴν

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<sup>22</sup> On the use of *stigmai* in Greek rhythmical notation, see *Anon. Bell.* 3, with West (n. 8), 268; R.P. Winnington-Ingram, ‘Fragments of unknown Greek tragic texts with musical notation: the music’, *Symbolae Osloenses* 31 (1955), 29–87; S. Hagel, ‘Ancient Greek Rhythm: The Bellermand Exercises’, *Quaderni Urbinati di Cultura Classica* 88.1 (2008), 125–38.

<sup>23</sup> Cf. *El. Rhythm.* §17, 20, 21.

ὁμοιότητα τῆς κινήσεως ἀνέμφατον τὴν μέλους ποιουμένων πλοκὴν καὶ ἐς πλάνην ἀγόντων τὴν διάνοιαν τὰ τοῦ ῥυθμοῦ μέρη τὴν δύναμιν τῆς μελωδίας ἐναργῆ καθίστησι, παρὰ μέρος μὲν, τεταγμένως δὲ κινουῦντα τὴν διάνοιαν. ἄρσις μὲν οὖν ἐστὶ φορὰ μέρους σώματος ἐπὶ τὸ ἄνω, θέσις δὲ ἐπὶ τὸ κάτω ταύτου μέρους. ῥυθμικὴ δὲ ἐστὶν ἐπιστήμη τῆς τῶν προειρημένων χρήσεως.

(Arist. Quint. *De Mus.* 31.8–17 W.-I.)

The term ‘rhythm’ is used in three ways. For it is applied to bodies that do not move, as when we speak of a statue having ‘good rhythm’, as well as to anything that moves, as when we speak of someone walking with ‘good rhythm’; and it is properly applied to the voice: this is what we are now to discuss.

Rhythm is a combination of durations put together in some definite order: and we call their modifications *arsis* and *thesis*, sound and calm. Since in general the notes, through the lack of differentiation in their movement, make the interweaving of the melody meaningless and lead the mind to wander in confusion, it is the parts of rhythm that make the function of the melody clear, moving the mind part by part but in an orderly fashion. In fact *arsis* is the upwards motion of a part of the body, while *thesis* is the downwards motion of the same part. Rhythmics is the science of the employment of the things we have mentioned.

While the bulk of Aristides’ discussion of rhythmics clearly derives from Aristoxenus,<sup>24</sup> his account of the rhythmical notions of *arsis* and *thesis* goes well beyond the meagre sketch

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<sup>24</sup> Cf. A. Barker, *Greek Musical Writings 2: Harmonic and Acoustic Theory* (Cambridge, 1989), 433 note 153. Aristides’ debt to Aristoxenus’ treatise is clear from the very beginning of this passage, which presents a drastically condensed version of Aristoxenus’ analysis of the many meanings of the term ῥυθμός, originally offered in Book 1 of the *Rhythmics*. Cf. *El. Rhythm.* §1, 2.1–4 Pearson.

outlined in the extant parts of the *Elementa rhythmica*. In particular, even though Aristides confirms Aristoxenus' association of ἄρσις with upward motion and θέσις with the opposite, he presents it as the logical conclusion of a complex train of thought, which begins by defining the 'modifications'<sup>25</sup> of rhythmically ordered durations as *arsis* and *thesis*, 'sound' and 'calm'.

On a straightforward reading, Aristides seems to be telling us that *arsis* corresponds to ψόφος and *thesis* to ἡρεμία – an association that evidently undermines the rhythmical prominence traditionally attributed to *theseis*. For this reason, Aristides' testimony looked suspicious to many scholars who either emended the text by inverting the last two terms or argued in favour of a dubious chiasmic reading of this passage, which would re-establish the supposedly 'correct' correspondence of *thesis* with the rhythmically marked element.<sup>26</sup> But this approach is problematic under many respects. First of all, it alters the text without any apparent need, just to conform it to a preconceived and unattested notion of Greek rhythm as a sequence of dynamically marked *theseis* and weaker *arseis*. Secondly it introduces a significant interpretative prejudice, namely that the word ψόφος – a *hapax legomenon* in Aristides – necessarily entails the presence of dynamic accents.

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<sup>25</sup> Cf. Barker (n. 24), 434 n.155, who draws attention to Aristides' unusual characterisation of *arsis/thesis* as πάθη of rhythmical durations; but this word was already employed by Plato precisely to indicate inherent features of rhythmical sequences that are akin to different intervals in a scale: cf. Pl. *Phlb.* 17d.

<sup>26</sup> E.g. Rossbach (n. 8), 25 n.12, H. Feussner, *De Rhythmorum Metrorumque Discrimine Poetarum Antiquarum* (Leipzig, 1837), 15, J. Luque Moreno, *Arsis, Thesis, Ictus: las marcas del ritmo en la música y en la métrica antiguas* (Granada, 1994), 135–6.

However scores of passages show that in acoustic and musical contexts the term ψόφος indicated generally a sound, without any specific implications in dynamic terms.<sup>27</sup> This is particularly clear in a passage of Aristotle's *De Anima*, a text that provides us with vital information about the basic aesthetic categories related to sound perception in the Classical age. After defining ψόφος in general as the object proper to the sense of hearing and as a kind of movement (κίνησις),<sup>28</sup> Aristotle contrasts 'loud sounds' (μεγάλοι ψόφοι) with 'soft sounds' (μικροὶ ψόφοι),<sup>29</sup> showing unequivocally that the term ψόφος by itself did not carry any dynamic connotations. Furthermore Aristotle identifies the differences proper to ψόφοι with 'high and low pitch' (τὸ ὀξύ καὶ τὸ βαρύν),<sup>30</sup> not loudness or softness,<sup>31</sup> and defines φωνή, that

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<sup>27</sup> E.g. Eur. *Bacch.* 687, *Cycl.* 443–4, Archytas fr. 1 DK, Ps.-Arist. *De Aud.* 802b40 (ψόφοι become 'hard' only if they are 'violent') and 803b10–16, Ps-Arist. *Problemata* 11.19, Arist. *De An.* 422a23–5, Ptol. *Harm.* 7.16–19 Düring Porph. *In Ptol.* 42.27, 77.29 Düring. For additional references, cf. E. Rocconi, *Le parole delle Muse* (Rome, 2003), 147 s.v. ψόφος.

<sup>28</sup> Arist. *De An.* 418a11–13: λέγω δ' ἴδιον μὲν ὃ μὴ ἐνδέχεται ἑτέρᾳ αἰσθήσει αἰσθάνεσθαι, καὶ περὶ ὃ μὴ ἐνδέχεται ἀπατηθῆναι, οἷον ὄψις χρώματος καὶ ἀκοή ψόφου καὶ γεῦσις χυμοῦ. Cf. *De An.* 420a20–2 (ἔστι γὰρ ὁ ψόφος κίνησις τοῦ δυναμένου κινεῖσθαι [...]), *Cat.* 15b1 (Ἔστι δὲ ἀπλῶς μὲν κίνησις ἡρεμίας ἐναντίον), *Phys.* 226b9 (ἐναντίον γὰρ ἡρεμίας κινήσει [...]).

<sup>29</sup> *De An.* 422a23–5.

<sup>30</sup> *De An.* 420a26–9: αἱ δὲ διαφοραὶ τῶν ψοφούντων ἐν τῷ κατ' ἐνέργειαν ψόφῳ δηλοῦνται· ὥσπερ γὰρ ἄνευ φωτὸς οὐχ ὁρᾶται τὰ χρώματα, οὕτως οὐδ' ἄνευ ψόφου τὸ ὀξύ καὶ τὸ βαρύν.

is to say the medium of the kind of rhythm discussed by Aristides, precisely as a type of ψόφος.<sup>32</sup>

A similar problem concerns the term ἡρεμία, which most interpreters take as referring to rhythmical rests.<sup>33</sup> Although this explanation makes perfect sense from a musical point of view, it is not warranted by Aristides' usage of the term ἡρεμία, which is consistently employed to describe gentle movements or quietude;<sup>34</sup> by contrast, Aristides defines rhythmical

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<sup>31</sup> According to Aristotle differences in volume, identified as μέγεθος/μικρότης (*De An.* 422b29–30), belong to one of the categories shared by all perceptive faculties and not specifically to the domain of hearing (*De An.* 418a16–20: τὰ μὲν οὖν τοιαῦτα λέγεται ἴδια ἐκάστης, κοινὰ δὲ κίνησις, ἡρεμία, ἀριθμός, σχῆμα, μέγεθος). Cf. also *Gen. anim.* 787a2–10, where Aristotle explicitly distinguishes pitch height (τὸ βαρὺ καὶ τὸ ὀξύ) from loudness and softness (μεγαλοφωνία καὶ μικροφωνία), emphatically denying any unqualified identifications between low-pitched and loud sounds, or the opposite (συμβήσεται τὰ αὐτὰ εἶναι βαρύφωνα καὶ μεγάλόφωνα καὶ ὀξύφωνα καὶ μικρόφωνα· τοῦτο δὲ ψεῦδος).

<sup>32</sup> *De An.* 420b5–33: ἡ δὲ φωνὴ ψόφος τίς ἐστὶν ἐμψύχου [...] φωνὴ δ' ἐστὶ ζώου ψόφος [...] σημαντικὸς γὰρ δὴ τις ψόφος ἐστὶν ἡ φωνή. Cf. Arist. Quint. *De Mus.* 31.6–7 W.-I.: λέγεται [sc. ῥυθμός] καὶ ἰδίως ἐπὶ φωνῆς· περὶ οὗ νῦν πρόκειται λέγειν.

<sup>33</sup> E.g. Barker (n. 24), 434 n.155, G. Moretti, 'Il ritmo in Aristide Quintiliano', *Musica e Storia* 24.1 (2006), 33–92, at page 39.

<sup>34</sup> *De Mus.* 30.14 W.-I. (δι' ἧς εἰς ἡρεμίαν τὴν ψυχὴν περιάγομεν), 67.31–68.1 W.-I. (ὅσα μὲν τῶν αἰσθητῶν ἔξ τε ἡδονὴν δελεάζει καὶ ἡρέμα διαχεῖν τὴν γνώμην πέφυκε, ταῦτα εἰς τὸ θῆλυ κριτέον), 69.17–18 W.-I. (ὅπου μὲν τὸ ἡρεμαῖον δηλῶν τῆς ἐπιρροῆς), 76.13–14 W.-I. (τούτων δὲ τὰ μὲν ἡρεμαίως προάγοντα τὸν ἀέρα κάκ τῶν περὶ τοὺς

rests as ‘empty durations’ (κενοὶ χρόνοι, 38.27–39.2 W.-I.), which are employed to ‘fill up’ (πρὸς ἀναπλήρωσιν) otherwise incomplete rhythmical sequences. This usage is paralleled in the treatises known as *Anonyma Bellermanniana*, where rests are again described as κενοὶ χρόνοι (§1, 3, 83, 85 and 102) while the expression ἡρεμία φωνῆς is employed, in a very Aristoxenian fashion, in order to describe the ‘static’ quality proper to the voice when it ‘stands still on one note’, as opposed to the voice’s movement (κίνησις) between high and low pitches.<sup>35</sup>

This evidence opens up the possibility that Aristides did not identify *arsis* and *thesis* with ‘sound’ and ‘silence’ but rather related these terms to two different *kinds* of sounds, a connotation that is confirmed by his subsequent comments on the distinct aesthetic influence that *arseis* and *theseis* have on the mind:

Τῶν δὲ ῥυθμῶν ἡσυχαιότεροι μὲν οἱ ἀπὸ θέσεων προκαταστέλλοντες τὴν διάνοιαν, οἱ δ’ ἀπὸ ἄρσεων τῇ φωνῇ τὴν κροῦσιν ἐπιφέροντες τεταραγμένοι.

(Arist. Quint. *De Mus.* 82.4–6 W.-I.)

Of the rhythms, those that initially calm down the mind starting from *thesis* are quieter; by contrast those that begin from *arsis* and bring the ‘sound’ upon the voice are agitated.

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ὁδόντας τόπων κέκληται τε ψιλὰ), 119.30 W.-I. (πᾶν φασὶ σῶμα τάχει πολλῶ φερόμενον καθ’ ὁμοίου καὶ ὑπέικοντος ἡρέμα), 120.32–121.1 W.-I. (τὸ δὲ θῆλυ ὑγρὸν διειμένον ἡρεμαῖόν τε καὶ φυγόπονον).

<sup>35</sup> *Anon. Bell.* §§39–41: ἐν μὲν γὰρ τῷ διαστήματι λέγοιτ’ ἂν κινεῖσθαι ἢ φωνή, ἴσταται δὲ ἐν τῷ φθόγγῳ. ἄλλως οὖν λέγεται ἡρεμία φωνῆς παρὰ μουσικοῖς καὶ κίνησις, καὶ ἄλλως παρ’ ἄλλοις. ἐπίτασις μὲν γὰρ καὶ ἄνεσις κίνησις φωνῆς, τάσις δὲ ἡρεμία [...]. Cf. Aristox. *El. Harm.* 17–18 Da Rios and Arist. Quint. 5.19–6.7, with Barker (n. 24), 405 n. 31–2.

In this passage, Aristides describes the nature of *arsis* and *thesis* in terms that are remarkably similar to the ones he employed in Book 1. First he depicts the soothing nature of rhythms that begin from *theseis* as ‘quieter’ (ἡσυχάτεροι), a characterisation that is evidently akin to the ‘calm’ (ἡρεμία) that designated *thesis* in the earlier passage and certainly does not refer to the presence of rhythmical rests, since the different aesthetic effects of rhythms employing ‘complete feet’ and rhythms comprising rests are explicitly examined in the following lines (82.6–9 W.-I.).

Secondly, while Aristides does not qualify the character of *thesis* in aesthetic terms but simply describes its relaxing effect on the mind, he presents *arseis* as being marked by a special kind of aesthetic prominence: rhythms beginning from *arsis* are agitated because of the distinctive way in which the voice is affected by κροῦσις, just like *arseis* corresponded to a special kind of ‘sound’ (ψόφος) in Book 1.

Once again, the interpretation of this testimony crucially depends on the meaning attributed to the term κροῦσις. In general this word means ‘striking’ or ‘collision’, a connotation that led many interpreters to take this passage as referring to some sort of percussion that emphasised *arseis*.<sup>36</sup> However, in musical contexts, the word κροῦσις indicates specifically the striking or plucking of the string of an instrument<sup>37</sup> and, consequently, denotes primarily differences in pitch, not volume.<sup>38</sup> And this is exactly how Aristides employs this

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<sup>36</sup> Cf. G. Moretti, ‘Il ritmo in Aristide Quintiliano’, *Musica e Storia* 24.1 (2006), 33–92, at page 79 (‘percussione’); L. Colomer and B. Gil, *Arístides Quintilianus – Sobre la Música* (Madrid, 1996), 152 (‘golpe ritmico’).

<sup>37</sup> Barker (n. 24), 485 n. 156.

<sup>38</sup> Particularly telling is the evidence provided by *Anonyma Bellermanniana*, where different melodic tropes are defined as types of *krouseis* (πρόκρουσις, ἔκκρουσις,



term throughout his *De Musica*, as all the occurrences of the words κρούσις/κρούειν in this work refer precisely to melodic features.<sup>39</sup> Therefore, in the absence of any signs to the contrary, we should take the word κρούσις as indicating a particular type of pitch also in this passage, a kind of pitch that marked *arseis* and was perceived as being particularly moving and stimulating.

While this testimony is interesting in itself, it becomes much more significant in the light of a passage from Aristotle's *De Anima* that offers a remarkable characterisation of high pitch (τὸ ὀξύ) as what 'moves perception to a great extent in a short time' (κινεῖ τὴν αἴσθησιν ἐν ὀλίγῳ χρόνῳ ἐπὶ πολὺ), as opposed to the feeble influence of low pitch.<sup>40</sup> This idea is elaborated further in one of the Pseudo-Aristotelian *Problems*:

Διὰ τί τῶν τὴν συμφωνίαν ποιοούντων φθόγγων ἐν τῷ βαρυτέρῳ τὸ μαλακώτερον; ἢ ὅτι τὸ μέλος τῇ μὲν αὐτοῦ φύσει μαλακὸν ἐστὶ καὶ ἡρεμαῖον, τῇ δὲ τοῦ ῥυθμοῦ μίξει τραχὺ καὶ κινητικόν; ἐπεὶ δὲ ὁ μὲν βαρὺς φθόγγος μαλακὸς καὶ ἡρεμαῖός ἐστιν, ὁ δὲ ὀξύς

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ἐκκρουσμός); cf. also §§18 and 68. For the standard use of the word *krousis* in musical contexts, see e.g. Ps.-Plut. *De Musica* 1137b–d, 1138b, 1141a–b, Porph. *In Ptol Harm.* 35.17–35 and 59.18 Düring; but this usage was already established in the Classical age, as shown by the Hippocratic *De Victu* 18.13–15 Littré: κρούεται δὲ [scil. τὰ διάφωνα καὶ ξύμφωνα] τοὺς φθόγγους ἄνω καὶ κάτω, καὶ οὔτε τὰ ἄνω κάτω κρουόμενα ὀρθῶς ἔχει οὔτε τὰ κάτω ἄνω. Cf. Rocconi (n. 27), 135 s.v. κρούω.

<sup>39</sup> *De Mus.* 10.2–4, 23.21, 27.28, 31.26, 74.19 W.-I. Cf. also 43.10–16, where the term σύγκρουσιν refers to the blending of two syllables.

<sup>40</sup> *De An.* 420a30–1: τὸ μὲν γὰρ ὀξύ κινεῖ τὴν αἴσθησιν ἐν ὀλίγῳ χρόνῳ ἐπὶ πολὺ, τὸ δὲ βαρὺ ἐν πολλῷ ἐπ' ὀλίγον.

κινητικός, καὶ τῶν ταῦτὸ μέλος ἔχόντων εἴη ἂν μαλακώτερος ὁ βαρύτερος ἐν ταύτῳ μέλει  
μᾶλλον· ἦν γὰρ τὸ μέλος αὐτῷ μαλακόν.

(Ps.-Arist. *Probl.* 19.49, 922b28–34)

Why is it that, among the notes that produce a concord, the softer character is in the lower register? Is it because melody is by nature soft and calm, while it becomes rough and moving thanks to the mixture of rhythm? In fact, since the low note is soft and calm while the high one is moving, then when two notes appear in the same melody the lower note should be softer; for we have seen that melody was soft in itself.

This testimony is crucial for our purposes. Not only it confirms Aristotle's account by depicting high pitch as 'moving' (κινητικός) but explicitly relates the stimulating aesthetic effect of high pitch to the naturally 'moving' function of rhythm, presenting this association as part and parcel of a well-established belief: while melody in itself is 'calm', it becomes 'moving' thanks to the mixture created by rhythm. Aristides Quintilianus expresses the very same notion in even clearer Aristotelian terms: melody is naturally 'female', 'inactive and without form' and plays the part of the matter since it is capable of embodying opposite qualities (high and low pitch), while rhythm is 'male' and acts as the 'maker', in that it 'gives shape to melody and moves it in an orderly fashion'.<sup>41</sup> It is very significant to notice that the

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<sup>41</sup> *De Mus.* 40.20–5 W.-I.: τινὲς δὲ τῶν παλαιῶν τὸν μὲν ῥυθμὸν ἄρρεν ἀπεκάλουν, τὸ δὲ μέλος θῆλυ· τὸ μὲν γὰρ μέλος ἀνενέργητόν τ' ἐστὶ καὶ ἀσχημάτιστον, ὕλης ἐπέχον λόγον διὰ τὴν πρὸς τούναντίον ἐπιτηδειότητα, ὁ δὲ ῥυθμὸς πλάττει τε αὐτὸ καὶ κινεῖ τεταγμένως, ποιοῦντος λόγον ἐπέχων πρὸς τὸ ποιοῦμενον. Cf. *Anon. Bell.* 38, where the different natures of vocal movement and rest are likened to the role of 'the producer' (τὸ ποιοῦν) and 'what is produced' (τὸ ποιοῦμενον) – i.e. the exact same roles attributed respectively to rhythm and melody by Aristides.

author of the *Problem* accounts for this phenomenon on the basis of the opposite natural characters and aesthetic effect of high and low notes while he completely ignores dynamic accents: according to him, low pitch is naturally ‘soft and calm’, similarly to the nature of melody in general, while high pitch is inherently moving (κινητικός), just like rhythm. In other words, rhythm affects melody by ‘mixing’ its pitches in a definite order and duration, creating a meaningful alternation of ‘moving’ and ‘relaxing’ elements.

This conception matches perfectly both Aristides’ general definition of rhythm as ‘the movement of the voice’<sup>42</sup> and his specific characterisation of *arsis* and *thesis*. In fact, the quality that Aristides attributes to unmarked *theseis* (ἡρεμία) is exactly the same that is associated with the relaxed nature of low pitch the Pseudo-Aristotelian *Problem* (ἡρεμαῖος) and Aristides explains this relationship by giving rhythm precisely the same role it played in the Pseudo-Aristotelian *Problem*: while unorganised sequences of notes are inexpressive and confusing, rhythm clarifies the function (*dynamis*) of a given melody by establishing a well-defined order, guiding the mind by means of meaningful sequences of high and low pitches;<sup>43</sup> once again, not a word about dynamic accentuation.

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<sup>42</sup> *De Mus.* 5.6–7 W.-I.: περὶ μὲν γὰρ μελωδίαν ἀπλῶς ἢ ποιά φωνή, περὶ δὲ ῥυθμὸν ἢ ταύτης κίνησις, περὶ δὲ τὴν λέξιν τὸ μέτρον.

<sup>43</sup> Arist. Quint. *De Mus.* 31.10 W.-I.: καθόλου γὰρ τῶν φθόγγων διὰ τὴν ὁμοιότητα τῆς κινήσεως ἀνέμφατον τὴν μέλους ποιουμένων πλοκὴν καὶ ἐς πλάνην ἀγόντων τὴν διάνοιαν τὰ τοῦ ῥυθμοῦ μέρη τὴν δύναμιν τῆς μελωδίας ἐναργῆ καθίστησι, παρὰ μέρος μὲν, τεταγμένως δὲ κινουῦντα τὴν διάνοιαν. Cf. *De Mus.* 40.20–5 W.-I., where the same outcome is attributed to the effect of rhythm on melody: τὸ μὲν γὰρ μέλος ἀνενέργητόν τ’ ἐστὶ καὶ ἀσχημάτιστον [...] ὁ δὲ ῥυθμὸς πλάττει τε αὐτὸ καὶ κινεῖ τεταγμένως.

One last piece of evidence shows beyond doubt that *arseis* were perceived as the ‘marked’ elements of rhythmical sequences already in the third century B.C. In an extended passage of his *Synopsis on Pulses*, Galen recounts how the famous Alexandrian physician Herophilus developed a theory of pulse rhythm on the basis of concepts normally employed by musicians to analyse musical rhythms. More specifically, Herophilus identified rhythmical *arsis* with the ‘dilation of the artery’, a time-duration ‘marked by a perceptible movement, when the dilated artery beats against our touch’ (τόν τε τῆς αἰσθητῆς κινήσεως, ἥνικα πλήττει τὴν ἀφὴν ἡμῶν ἢ ἀρτηρία διαστελλομένη), while he associated *thesis* with the contraction of the artery,<sup>44</sup> a time-duration characterised by absence of movement and ‘calm’ (ἡρεμία).<sup>45</sup>

The terminological and conceptual similarities between Herophilus’ and Aristides’ testimonies are evident. Both associate *arsis* with aesthetically marked durations, which are

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<sup>44</sup> Gal. *Syn. Puls* 9.464.1–4: ὥσπερ γὰρ ἐκείνους [scil. τοὺς ῥυθμούς] οἱ μουσικοὶ κατὰ τινὰς ὠρισμένας χρόνων τάξεις συνιστῶσι παραβάλλοντες ἀλλήλαις ἄρσιν καὶ θέσιν, οὕτως καὶ Ἡρόφιλος ἀνάλογον μὲν ἄρσει τὴν διαστολὴν ὑποθέμενος, ἀνάλογον δὲ θέσει τὴν συστολὴν τῆς ἀρτηρίας [...]. Cf. H. von Staden, *Herophilus – The Art of Medicine in Early Alexandria* (Cambridge, 1989), esp. 276–84, 354–6.

<sup>45</sup> Gal. *Syn. Puls* 9.464.10–465.9: τούτοις εἰς δύο χρόνους τοὺς πάντας ὁ ῥυθμὸς τοῦ σφυγμοῦ μερίζεται, τόν τε τῆς αἰσθητῆς κινήσεως, ἥνικα τὴν ἀφὴν ἡμῶν ἢ ἀρτηρία διαστελλομένη, καὶ τὸ λοιπὸν ἅπαντα συγκείμενον ἔκ τε τῆς ἐκτὸς ἡρεμίας καὶ τῆς μετ’ αὐτὴν συστολῆς, καὶ τῆς ἐπ’ ἐκείνη πάλιν ἡρεμίας καὶ τῶν πρώτων τῆς διαστολῆς, ἅπερ ἐστὶν ἀναίσθητα καὶ αὐτά. [...] ἀλλὰ τὴν διαστολὴν ταῖς αἰσθηταῖς κινήσεσι γνωρίζειν, ὅς ἐκ τοῦ πλήττεσθαι τοὺς δακτύλους ἡμῶν διαγινώσκωμεν, τὴν συστολὴν δὲ πᾶν τὸ λοιπὸν τίθεσθαι καθ’ ὃ κινήσεως οὐκ ἡσθάνετο.

identified through a physical beat (πληξίς) in the body and by specific melodic means (ψόφος/κροῦσις) in the voice; similarly, they both identify *thesis* with a kind of ‘calm’ (ἡρεμία) that corresponds to physical stillness in the body and to the relaxing effect exerted by lower pitches on the mind. The closeness of Herophilus’ and Aristides’ approach is further revealed by the fact that Aristides mentions precisely the ‘pulsation of the arteries’ along with dance and melody as examples of the three basic types of rhythm:

Πᾶς μὲν οὖν ῥυθμὸς τρισὶ τούτοις αἰσθητηρίοις νοεῖται· ὄψει, ὡς ἐν ὀρχήσει· ἀκοῇ, ὡς ἐν μέλει· ἀφῇ, ὡς οἱ τῶν ἀρτηριῶν σφυγμοί· ὁ δὲ κατὰ μουσικὴν ὑπὸ δυεῖν, ὅψεώς τε καὶ ἀκοῆς. ῥυθμίζεται δὲ ἐν μουσικῇ κίνησις σώματος, μελωδία, λέξις. [...] 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.

(Arist. Quint. *De Mus.* 31.18–32.7 W.-I.)

Rhythm as a whole is perceived by these three senses: sight, as in dancing; hearing, as in melody; and touch, as in the pulsations of the arteries. But musical rhythm is perceived by two senses, sight and hearing. In music, bodily movement, melody and diction can be organised rhythmically. [...] In diction, rhythm is divided into syllables, in melody into the ratios of *arseis* to *theseis*, and in movement into figures and their boundaries, which are also called signals.

Remarkably, in this passage Aristides does not relate *arsis* and *thesis* to dance, as one would expect if their fundamental nature truly derived from the dynamic accentuation caused by striking feet on the ground.<sup>46</sup> By contrast, he associates a rhythmical subdivision into *arsis* and *thesis* with melodies, a choice that is perfectly consistent with the melodic connotation of

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<sup>46</sup> Cf. Heberden (n. 7), 558, quoted in note 11 above.

these two concepts that is offered throughout the *De Musica* and is attested also in the Aristotelian sources.

So it is against this background that we should interpret Aristides' well-known characterisation of *arsis* as the upward motion (φορὰ) of a part of the body, as opposed to the downward motion associated with *thesis*. Since this depiction is presented as a logical follow-up of his previous remarks on the vital influence that rhythm exerts on melody, it is hard to see how Aristides could refer exclusively to dance movements without saying so openly. On the contrary, we should take Aristides' definition of *arsis* as referring to an upward motion that affects all the aesthetic media he mentions: the arteries, the dancers' limbs, as well as the melodic movement of the voice. This upward motion corresponded to the 'marked', 'moving' element of a rhythmical sequence, as opposed to the static and 'calm' character of *theseis*.

### 3. *ARSIS* AS *ELATIO VOCIS* IN LATIN RHYTHMICAL SOURCES

Even though the evidence provided by the Greek sources combines to form a remarkably consistent picture, in order to reconstruct it we had to follow hints scattered in many different texts, often in the form of passing remarks. Of course, we would have liked to find more systematic and thorough discussions but it seems that the perception of musical *arseis* and *theseis* was such a natural process for the Greeks that they did not feel the need to comment on it extensively. This surprising feature may be understood in the light of the agreement between rhythm and prosody: just as prosodic accents highlighted the most salient syllables of a sentence by raising the voice's pitch, melodic accents emphasised *arseis*, the most salient elements of each rhythmical phrase.

The situation is markedly different in the case of Latin musical sources, as they are much more explicit in associating rhythmical *arseis* with higher pitches and *theseis* with lower ones. The earliest Latin description of this correspondence appears in Book 9 of Martianus Capella's *De Nuptiis* – a text that is particularly important for our purposes as it offers a Latin

translation of extensive sections of Aristides Quintilianus' *De Musica*, accompanied by a few explanatory integrations.<sup>47</sup> This holds true also for §974, where Martianus translates Aristides' definition of rhythmical foot and openly relates its two basic components to different kinds of vocal movement:

Ποὺς μὲν οὖν ἐστὶ μέρος τοῦ παντὸς ῥυθμοῦ δι' οὗ τὸν ὅλον καταλαμβάνομεν· τούτου δὲ μέρη δύο, ἄρσις καὶ θέσις.

(Arist. Quint. *De Mus.* 33.12–13 W.-I.)

A foot is the part of the entire rhythm through which we understand the whole. It has two parts, *arsis* and *thesis*.

Pes vero est numeri prima progressio per legitimos et necessarios sonos iuncta, cuius partes duae sunt, arsis et thesis. Arsis est elatio, thesis depositio vocis ac remissio.

(Mart. Cap. *De Nupt.* §974)

A foot is the primary progression of rhythm, which consists of sounds that are legitimately and necessarily related to each other. It has two parts, *arsis* and *thesis*. *Arsis* is an elevation, *thesis* a lowering and relaxation of the voice.

A few pages before, Martianus had already produced a similar interpretation of Aristides' general definition of *arsis* and *thesis* which, as we have seen above, belonged to a discussion that was programmatically devoted to vocal rhythm and dealt primarily with

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<sup>47</sup> Cf. D. Shanzer, *A Philosophical and Literary Commentary on Martianus Capella's De Nuptiis Philologiae Et Mercurii* (Berkeley, 1986), 4; see also H. Deiters, *Über das Verhältnis des Martianus Capella zu Aristides Quintilianus* (Posen, 1881), L. Cristante, *Martiani Capellae De nuptiis Philologiae et Mercurii liber IX*, (Padua, 1987).

melodic features.<sup>48</sup> Once again, Martianus' paraphrase reflects accurately both aspects by establishing a direct connection between the melodic movement of the voice and rhythmical flows based on *arsis* and *thesis*:

Numerus est diversorum modorum ordinata conexio, tempori pro ratione modulationis inserviens, per id quod aut efferenda vox fuerit aut premenda, et qui nos a licentia modulationis ad artem disciplinamque constringat.

(Mart. Cap. *De Nupt.* §967)

Rhythm is the orderly arrangement of different measures; it is subject to time in relation to the flow of melody, by means of which the voice is either raised or lowered, and restrains us from melodic licence, binding us to art and discipline.

If the tenor of this passage was not clear enough, many other sections of Martianus' treatise indicate that his comments on the raising and lowering of the voice refer specifically to changes in pitch, not volume. Particularly interesting for our purposes is Martianus' general definition of *modulatio*:

Constat autem omnis modulatio ex gravitate soni vel acumine. Gravitas dicitur quae soni quadam remissione mollescit, acumen vero, quod in aciem tenuatam gracilis et erectae modulationis extenditur.

(*De Nupt.* §932)

Moreover, melodic movement (*modulatio*) as a whole consists of lower- or higher-pitched sounds. That which is called low pitch soothes by a certain relaxation of the sound, while high pitch is what is stretched up to the sharp tip of a high, thin melody.

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<sup>48</sup> Arist. Quint. *De Mus.* 31.6–7 W.-I.: καὶ ἰδίως ἐπὶ φωνῆς· περὶ οὗ νῦν πρόκειται λέγειν.



This excerpt shows not only that Martianus conceived *modulatio* specifically as a combination of different pitches<sup>49</sup> but also that the concept of *remissio soni/vocis*, which he employed in §974 to gloss Aristides' definition of *thesis*, unequivocally indicates low pitch.<sup>50</sup> In addition, Martianus provides here exactly the same characterisation of the different aesthetic effects of high and low pitches that we found in Aristides and the Aristotelian *Problems*: low pitches are said to be relaxing and soothing, while high pitches are tense and stimulating.

In spite of this noteworthy agreement, these testimonies have generally been dismissed as irrelevant or misleading because of their alleged inconsistency with the Greek evidence. But,

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<sup>49</sup> Cf. also *De Nupt.* §§939–40, 947–8 and 968–9, where Martianus associates the rhythmical subdivision into *arsis* and *thesis* with melodic *modulatio* and not with dance, precisely as Aristides did. On the musical nature of vocal accents, cf. §268: *et est accentus [...] anima vocis et seminarium musices, quod omnis modulatio ex fastigiis vocum gravitateque componitur, ideoque accentus quasi adcantus dictus est.*

<sup>50</sup> This is further confirmed by Remigius d'Auxerre, who glossed the word *efferenda* as *sublevanda in acumen* and the word *premenda* as *scilicet in gravitatem* – cf. W. Seidel, 'Rhythmus/numerus', in H. Eggebrecht (ed.), *Handwörterbuch der musikalischen Terminologie* (Wiesbaden, 1980), 1–36, at 16. Cf. Mar. Vict./Aphth. 6.40.14–17 Keil (quoted and discussed below) and the consistent use of *elatio* as pitch raise in later musical treatises, such as Fulgentius *Myth.* 3.9, Iac. Leod. *Spec.* 6.69.4, *Commentum Einsidlense* 8.228.23 Keil, Bonifat. *Ars Metrica* 209.23 Gebauer-Löfstedt, Anon. *Ecce modorum* in H. Schmid, *Musica et scolica enchiridis* (München, 1981) 3.183–4 and the late testimony of Ger. Plethon, *Keph. Log. Mous.* in C. Alexandre, *Pléthon – Traité des Lois* (Paris, 1858), 461.15–16: ἄρσις μὲν οὖν εἶναι ὀξύτερου φθόγγου ἐκ βαρυτέρου μετάληψιν, θέσιν δὲ τούναντίον βαρυτέρου ἐξ ὀξύτερου.

as we have seen at the beginning, this assessment was grounded on the misguided assumption that the opposition between *arseis* and *theseis* depended exclusively on dynamic contrasts, a notion which is never attested in ancient texts. Nonetheless, instead of questioning this basic premise, scholars have developed complex interpretative approaches to explain the alleged contradiction between the Greek and Latin sources on the basis of a mysterious shift in meaning of the terms *arsis* and *thesis*: according to them, the Latin term *arsis* came to denote the accented and dynamically stressed part of the foot, while *thesis* indicated the unaccented part.<sup>51</sup> However, to my knowledge, this bold change is nowhere mentioned in the sources – a fact that would be at the very least surprising if such a radical overturn of a well-established convention actually took place.

This hypothesis appears even more problematic if we take a closer look at a passage by Marius Victorinus/Aphthonius that is generally cited as evidence of this alleged inversion. According to traditional interpreters, Victorinus did not realise that he employed in the same sentence two opposite and contradictory notions: a fictional ‘Greek’ concept of *thesis* as dynamically accented down-beat and a new ‘Latin’ meaning of *arsis* as the stress-accented part

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<sup>51</sup> E.g. R. Westphal, *Griechische Rhythmik*, in A. Rossbach and R. Westphal (edd.) *Theorie der musischen Künste der Hellenen* (Leipzig, 1885), 1.106–8; Bennett (n. 16), 367–8; M.G. Nicolau, *L'origine du ‘cursus’ rythmique et les débuts de l'accent d'intensité en Latin*, (Paris, 1930), 43–56; C. Del Grande, *La metrica greca* (Torino, 1960), 252; F. Crusius and H. Rubenbauer, *Römische Metrik* (München, 1967), 29–31; see also the bibliography quoted by Luque Moreno (n. 26), 130–40, and J. Luque Moreno, *De Pedibus, De Metris: las unidades de medida en la rítmica y en la métrica antiguas* (Granada, 1995), 143–5.

of a rhythmical foot.<sup>52</sup> But this interpretation seems rather implausible not only because Victorinus was a well-respected scholar who had excellent knowledge of ancient Greek<sup>53</sup> but especially because neither of these fictitious concepts is discussed in the extant sources: the Greek evidence clearly indicates that *arseis* were associated with raises in pitch, not volume, and as we will see in greater detail below the Latin sources widely support this characterisation. For the moment, let us read the text in question:

Arsis igitur ac thesis quas Graeci dicunt, id est sublatio et positio, significant pedis motum. Est enim arsis sublatio pedis sine sono, thesis positio pedis cum sono: item arsis elatio temporis, soni, vocis, thesis depositio et quaedam contractio syllabarum.

(Mar. Vict. *Ars Gramm.* 6.40.14-17 Keil)

The notions that the Greeks call *arsis* and *thesis*, which means lifting and placement, indicate the movement of the foot. In fact *arsis* is the lifting of the foot without sound, *thesis* the placement of the foot with sound: likewise *arsis* is the elevation of a time-duration, sound or voice, *thesis* the placing down and some sort of contraction of syllables.

The first sentences are pretty straightforward: they outline the familiar Greek rhythmical definition of *arsis* and *thesis* as the raising and lowering movement of a foot,

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<sup>52</sup> Cf. Heberden (n. 7), 558: ‘in Marius Victorinus, p. 2482, the two meanings are given, apparently without any sense of their incongruity’; cf. Westphal (n. 51), 107–8, 210–11, R. Westphal and H. Gleditsch, *Allgemeine Theorie der griechischen Metrik*, in A. Rossbach and R. Westphal (edd.), *Theorie der musischen Künste der Hellenen* (Leipzig, 1887), 3.1.155–6; Bennett (n. 16), 368–9; Nicolau (n. 51), 53–4.

<sup>53</sup> Victorinus enjoyed so large a reputation that a statue was erected in his honour in the Forum: cf. Aug. *Conf.* 8.2.3 (who also mentions in commendatory terms Victorinus’ Latin translations of some Platonic dialogues), Jerome *Chron. ad ann. Abr.* 2370.

adding the intuitive remark that they are respectively accompanied by silence and sound. This last observation probably refers to the practice of accompanying musical performances by clapping, stomping or finger-snapping, which is often discussed in Latin sources<sup>54</sup> and is occasionally mentioned also by Greek authors.<sup>55</sup> However, in the absence of ancient evidence, we should be wary of assuming that such an accompaniment necessarily replicated the dynamic accentuation of the melody or its instrumental accompaniment: for instance, both the ancient Indian tradition detailed in the *Natyasastra* and its modern counterpart show that this need not necessarily be the case.<sup>56</sup>

The second part of this passage is more challenging. According to many interpreters, Victorinus/Aphthonius shifts here to the ‘new’ Latin usage, so that the word *arsis* now indicates the rhythmic section marked by a raise in volume that is opposed to a softer *thesis*. However, in my view it is difficult to reconcile this interpretation with the wording of the Latin

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<sup>54</sup> These accompaniments are described with terms such as *ictus* and *crepitus*, not *arsis/thesis*: e.g. Hor. *Carm.* 4.6.35–6, Hor. *Ars.* 251–3, 274, Hor. *Sat.* 1.10.42–3, Pliny the Elder *Nat. Hist.* 2.209, Quint. *Inst. Or.* 1.12.3–4.1 (*ne pes quidem otiosus certam legem temporum servat*), 9.4.51–5 (*tempora etiam animo metiuntur et pedum et digitorum ictu*), 9.4.55 (*oratio non descendet ad crepitum digitorum*).

<sup>55</sup> Cf. West (n. 8), 123.

<sup>56</sup> See e.g. chapter 31 of the *Natyasastra*: this text describes complex patterns of hand gestures, including claps and hand waves, which were employed to mark different rhythms. On the independence of claps and dynamic accents in Indian music, see L.E. Rowell, *Music and Musical Thought in Early India* (Chicago, 1992), 193–6, and Clayton (n. 10), 61–2. On the comparable case of Roman music, cf. T. Moore, *Music in Roman Comedy* (Cambridge, 2012), 158–62, with Cic. *De Or.* 3.182–6.

text, especially with regard to the conjunctive adverb *item* ('likewise'), which emphasises the continuity of thought between the last two clauses and would be a very odd choice if the author really employed two different acceptations of the terms *arsis/thesis*. In actual fact, though, the second clause elaborates upon the content of the previous one, exactly as the word *item* implied. First Victorinus transfers the distinction between up- and down-movements from the physical domain to a purely musical one; secondly, he clarifies how the words *arsis* and *thesis* could be employed in connection with different musical media:<sup>57</sup> pure sounds, syllables sung by the voice as well as abstract time-spans may appear in *arsis* or *thesis*, which correspond respectively to their 'elevation' and their 'lowering'.

One last issue makes the traditional interpretation of this passage even more problematic. As we have seen above, many interpreters take the definition of *arsis* as *elatio temporis, soni, vocis* as referring to an increase in volume of vocal sounds, which they associate with the presence of dynamic stress in Latin accentuation.<sup>58</sup> However, there is no

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<sup>57</sup> This approach closely resembles Aristoxenus' discussion of the relationship between different *rhythmizomena* and their subdivision into *chronoi*: cf. Aristox. *El. Rhythm.* §§3–10, 2–4 Pearson.

<sup>58</sup> This is not the place to enter into the complex debate on the nature of Latin accent, but it is important to note that interpreting the expression *arsis/elatio vocis* purely as a matter of stress or dynamic accentuation is inconsistent with the latest research in the field, which suggests that accented syllables were marked by a raise in pitch and in volume at the same time. Cf. A.L. Sihler, *New Comparative Grammar of Greek and Latin* (Oxford, 1995), 241; J. Herman, *Vulgar Latin* (University Park, 2000), 36; E.H. Sturtevant, *The Pronunciation of Latin and Greek* (Chicago, 1940<sup>2</sup>), §214. According to G. Sampson, *Writing Systems: A Linguistic*

evidence that the expression *elatio vocis* had any dynamic connotations: in itself, the word *elatio* means simply ‘raise’ and could well indicate a change in pitch and not in volume. And this is exactly the meaning attested by late Latin grammarians, who consistently use the word *elatio* to refer to the variation in pitch that characterised accented syllables.<sup>59</sup> On a few

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*Introduction* (Stanford, 1985), 107, a similar combination of stress and pitch may have characterised also the shift from pitch- to stress-accentuation in late Greek.

<sup>59</sup> Cf. Diom. 1.430.29–30 Keil: *Accentus est acutus vel gravis vel inflexa elatio orationis vocisve intentio vel inclinatio acuto aut inflexo sono regens verba* (‘An accent is the acute, grave or circumflex elevation of the speech, or the tension and depression of the voice that governs words with a high-pitched or circumflex sound’). Many other passages describe accented syllables as higher in pitch: e.g. Varro apud Sergius 4.525.21–526.1 Keil (*natura vero prosodiae in eo est, quod aut sursum est aut deorsum: nam in vocis altitudine omnino spectatur [...] Ab altitudine discernit accentus, cum pars verbi aut in grave deprimitur aut sublimatur in acutum*) and 4.523.16–19 Keil (*quae notae demonstrant omnem acutam vocem sursum esse et gravem deorsum. Ipsum etiam musicorum docetur diagrammate*). See also Cic. *Or.* 57–8 (*mira est enim quaedam natura vocis cuius quidem e tribus omnino sonis, inflexo acuto gravi, tanta sit et tam suavis varietas perfecta in cantibus. est autem etiam in dicendo quidam cantus obscurior [...] cum alter alteri obicit vocis inflexiones*) and Ps.–Priscian 3.519.25 Keil (*accentus namque est certa lex et regula ad elevandam et deprimendam syllabam unius cuiusque particulae orationis*). The dynamic component of word accentuation was described with expressions like *plus sonat*: e.g. Pompeius 5.126.30–33 Keil, with W.S. Allen, *Vox Latina – a Guide to the Pronunciation of Classical Latin* (Cambridge, 1965), 84. However, this expression occasionally indicates a combination of stress and pitch: cf. Servius, 4.426.16–20 Keil.

occasions, they literally define these pitch variations as *arsis* and *thesis*, as for example in the following passage by the Pseudo Priscian:<sup>60</sup>

Ad hanc autem rem arsis et thesis sunt necessariae. Nam in unaquaque parte orationis arsis et thesis sunt, non in ordine syllabarum sed in pronuntiatione: velut in hac parte, natura, ut quando dico ‘natu’, elevatur vox, et est arsis intus; quando vero sequitur ‘ra’, vox deponitur, et est thesis deforis. Quantum autem suspenditur vox per arsin, tantum deprimitur per thesin. sed ipsa vox, quae per dictiones formatur, donec accentus perficiatur, in arsin deputatur; quae autem post accentum sequitur, in thesin.

(Ps-Priscian 3.521.25–31 Keil)

*Arsis* and *thesis* are necessary in relation to this matter. For *arsis* and *thesis* are present in each and every part of speech, with regard to the pronunciation and not the order of syllables: for instance, in this part of speech, *natura*, when I say ‘natu’ the voice is raised and *arsis* is here. And indeed when ‘ra’ follows, the voice is lowered and *thesis* appears. As much as the voice is elevated in *arsis*, that much it is lowered in *thesis*. But the voice itself, which is created by uttering words, is attributed to *arsis* up until the point where the accent is completed; instead, the voice that follows after the accent is assigned to *thesis*.

Interestingly a passage from Quintilian’s *Institutio oratoria* shows that this ‘vertical’ conception of pitch, which we take for granted but was not universal in the ancient world, was attested already in the first century A.D. Commenting on the different vocal qualities proper to orators and singers, Quintilian describes the orator’s voice as powerful and enduring (*fortis ac durabilis*) but limited in pitch range, since orators did not train their voice to ‘reach the lowest and highest sounds’ (*nec praeparare ab imis sonis vocem ad summos*, 11.3.22.5–6); by contrast, singers are said to ‘sweeten even the *highest* notes with the melody of their voice’ (*illi*

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<sup>60</sup> See also Sergius 4.482.5–18 Keil.

*omnes etiam altissimos sonos leniant cantu oris*, 11.3.23.3–4). The same approach is shown also in the work of Ptolemy’s contemporary Aulus Gellius. In describing the science of ‘canonics’, a term that normally describes the type of harmonic investigation based on the use of the monochord (κανών),<sup>61</sup> Gellius tells us that the difference between rhythm and melody consists in the fact that the former is concerned with a sound’s ‘length’ and the latter with its ‘height’:

Κανονική autem longitudines et altitudines vocis emetitur. Longior mensura vocis ῥυθμός dicitur, altior μέλος. Est et alia species, quae appellatur μετρική, per quam syllabarum longarum et brevium et mediocrium iunctura et modus congruens cum principiis geometriae aurium mensura examinatur.

(Gell. *Noct. Att.* 16.18.4–6)

Canonics, on the other hand, measures the durations and pitch heights of the voice. The ‘longer’ measure of the voice is called rhythm, the ‘higher’ melody. There is also another science called metrics that examines with the aid of the ears the combination of long and short and intermediate syllables as well as the verse, in keeping with the principles of geometry.

Two points are particularly important for our current purposes. First, these testimonies show that the concept of *altitudo* was associated with higher pitches as early as the first century A.D. and that this usage was firmly established by the second century.<sup>62</sup> Secondly, Gellius

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<sup>61</sup> Cf. D. Creese, *The Monochord in Ancient Greek Harmonic Science* (Cambridge, 2010), 224–5.

<sup>62</sup> Later sources regularly associate higher pitches with physical height (*altitudo*), e.g. Priscian 2.6.17–22 Keil: *nam si aer corpus est, et vox, quae ex aere icto constat, corpus esse ostenditur, quippe cum et tangit aurem et tripartito dividitur, quod est suum corporis, hoc est in altitudinem, latitudinem, longitudinem, unde ex omni quoque parte potest audiri. Praeterea*



outlines a stark contrast between rhythemics and harmonics on the one hand, metrics on the other: while the former are conceived as different parts of the same discipline, which we would call ‘music’, the discipline of metrics is presented as a separate science that is concerned with syllables and not strictly ‘musical’ sounds. This theoretical opposition between rhythemics and metrics is reflected also by significant differences in the terminology employed in these two disciplines, differences which affect also the Latin usage of the term *arsis*: in fact, while musical treatises consistently relate *arseis* to raises in pitch, metrical texts show a very different understanding of this term, which we will examine in the next section.

#### 4. *ARSIS* AS *SUBLATIO* IN LATIN METRICAL TERMINOLOGY

Differently from rhythmicians, metricians employed the term *arsis* to indicate the syllables placed at the beginning of a foot or metrical sequence; in such contexts, the word *thesis* designated the syllables appearing at the end of the same foot or metrical sequence. The fact that the metrical usage of the words *arsis* and *thesis* coexisted side by side with their pitch-related one is revealed in the aforementioned passage by the Pseudo-Priscian, where the author specifies that the words *arsis* and *thesis* refer to ‘the pronunciation’ and not ‘the order of the syllables’ (*non in ordine syllabarum sed in pronuntiatione*, 3.521.25–6 Keil): this remark

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*tamen singulae syllabae altitudinem quidem habent in tenore, crassitudinem vero vel latitudinem in spiritu, longitudinem in tempore.* On this passage, cf. E. Rocconi, ‘The development of vertical direction in the spatial representation of sound’ in E. Hickmann, R. Eichmann, and A.D. Kilmer, *The Archaeology of Sound: Origin and Organisation* (Rahden. 2002), 389–92. For similar statements, see also Ps.-Priscian 3.519.8–11 Keil, Sergius 4.525.22–8 Keil, Audax 7.357.14–26 Keil and Julian of Toledo in M. Maestre Yenes, *Ars Iuliani Toletani episcopi* (Toledo, 1973), 135.182–91.

shows plainly that, in principle, the term could indicate two different concepts. Diomedes spells this out even more clearly:

Pes est sublatio ac positio duarum aut trium ampliusve syllabarum spatio comprehensa. Pes est poeticae dictionis duarum ampliusve syllabarum cum certa temporum observatione modus recipiens arsin et thesin, id est qui incipit a sublatione, finitur positione.

(Diomedes 1.474.30–475.1 Keil)

A [metrical] foot consists in the raise (*sublatio*) and placement (*positio*) that takes place in the space of two, three or more syllables. In poetic diction, a foot is a measure comprising two or more syllables; observing a specific relation between time-units, it receives *arsis* and *thesis*, which means that it starts from the raise (*sublatio*) and ends with the placing down (*positio*).

This passage is crucial not only because it tells us that the words *arsis* and *thesis* in metrical contexts referred specifically to the order of syllables, but also because it provides the key to understanding better the usage of other Latin authors: in fact, Diomedes translates this metrical acceptance of *arsis* as *sublatio* while, a few pages earlier, he used the term *elatio* in order to define the raise in pitch associated with the natural accentuation of words.<sup>63</sup>

This use of the Latin word *sublatio* as a translation of the metrical acceptance of the term ἄρσις is confirmed both in theoretical reflections and in practical analyses of metrical sequences: for instance, Latin grammarians describe dactyls (— : ∪ ∪) as comprising a long syllable in *sublatio* and two short syllables in *positio*.<sup>64</sup> Modern scholars took these testimonies

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<sup>63</sup> Diom. 1.430.28 Keil: *Accentus est acutus vel gravis vel inflexa elatio orationis*.

<sup>64</sup> E.g. Att. Fortunatianus 6.281.3.4–7 Keil (*hic est motus et ingressio, quam Graeci basin appellant: de sublatione constat et positione, quae et thesis dicitur*. ‘Arma ui’; ‘ar’ *sublatio est temporum duum*, ‘ma vi’ *positio temporum duum*), Mar. Vict. 6.40.17–18 (*In*

as evidence of a supposed contradiction between Latin and Greek sources: in fact, if *sublatio* is taken to mean *arsis* in a rhythmical sense, then the Latin metrical description indeed seems to revert the Greek rhythmical definition according to which the sequence – : ∪ ∪ comprises a long syllable in *thesis* and two short ones in *arsis* (Arist. Quint. *De Mus.* 35.8–9 W.-I.). However, in my view this interpretation is mistaken because it mixes terminology and concepts that belong to two different disciplines: metrics and rhythemics.<sup>65</sup>

In order to clarify these terminological differences, it may be useful to compare and contrast the different ways in which ‘dactyls’ were defined by the two disciplines. On the one hand, as far as we can tell Greek rhythmicians did not use the term δάκτυλος at all to describe the sequence – : ∪ ∪, which is called ἀνάπαιστος ἀπὸ μείζονος by Aristides Quintilianus; they employed the terms δάκτυλος/δακτυλικός exclusively to designate the rhythmical genus of a foot, which is defined by an equal duration of *arsis* and *thesis* and not by a fixed sequence of long and short syllables.<sup>66</sup> By contrast, Greek metricians employed the term δάκτυλος in order

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*dactylo vero tollitur una longa, ponuntur duae breves; in anapaesto contra [scil. tolluntur duae breves, ponitur una longa]),* 6.45.18–22 Keil; cf. also Diom. 1.480.6–12, Mar. Vict. 45.3–5 Keil.

<sup>65</sup> In general on this distinction, cf. Goodell (n. 4) and West (n. 8), 137 n.22, 141 and 245.

<sup>66</sup> For the consistent use of δακτυλικός in relation to the rhythmical genus 1:1, cf. Aristox. *El. Rhythm* §30, 16.17–19 Pearson, §32, 18.1–4 Pearson; Psell. *Rhythm.* §12, 24.8–16 Pearson, §17, 26.15–16 Pearson; *Fragm. Neap.* §13–14, 28.17–29.1 Pearson, Arist. Quint. *De Mus.* 35.3–26 W.-I.; for the notion of δάκτυλος κατ’ ἴσιν (∪ ∪ : ∪ ∪), cf. *P. Oxy.* 2678 ii.3–6, 37 Pearson, and Arist. Quint. *De Mus.* 38.5–12 W.-I., who describes also other types of

to indicate specifically the syllable sequence – ∪ ∪, while they seem to ignore its rhythmical subdivision into *arsis* and *thesis*.<sup>67</sup>

Given that the Latin grammarians clearly state that the term *sublatio* refers to the *ordo syllabarum* and, therefore, place their contribution squarely within the field of metrics and not rhythemics,<sup>68</sup> it is not really surprising to find out that their metrical definition of dactylic

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rhythmical ‘dactyls’ (δάκτυλος κατὰ βακχεῖον τὸν ἀπὸ τροχαίου, δάκτυλος κατὰ βακχεῖον τὸν ἀπὸ ἰάμβου, δάκτυλος κατὰ χορεῖον τὸν ἰαμβοειδῆ and δάκτυλος κατὰ χορεῖον τὸν τροχαιοειδῆ). All these rhythmical sequences are called ‘dactyls’ because the duration of their *arseis* and *theseis* is equal, independently of the specific sequence of syllables they comprise: cf. West (n. 8), 136.

<sup>67</sup> Cf. Dion. Halicarn. *Comp. Verb.* 17.55–6, Hephaestion 11.6 Consbruch, *Scholia B* 307.17 Consbruch, Trichas 367.1 Consbruch.

<sup>68</sup> E.g. Marius Victorinus/Aphthonius 6.40.6–13 Keil (*de arsi ac thesi, id est de alterna syllabarum sublatione ac positione, quibus pedes in metris nituntur atque formantur*), Diom. 1.474–5 Keil (*metrum est pedum iunctura numero modoque finita. Vel sic, metrum est conpositio pedum ordine statuto decurrens modum positionis sublationisque conservans*), Diom. 1.473.21–3 Keil (*Rythmus est pedum temporumque iunctura cum levitate sine modo. alii sic, rythmus est versus imago modulata servans numerum syllabarum positionem saepe sublationemque continens*). Cf. Quint. *Inst.* 9.4.46–50 and 9.4.55, where the author outlines a similar contrast between the precise syllabic sequences defined by metrical structures and the greater freedom of rhythms; however, Quintilianus introduces these superficial observations on rhythmical feet only to establish the superiority of prose and metrics over poetry and music (cf. 9.4.60) and his lack of interest in the specifics of rhythmical matters is reflected by the fact that he imprecisely applies the term *sublatio* to rhythmical sequences.

sequences differed from the Greek rhythmical one. That this discrepancy does not depend on the language (Latin vs. Greek) but derives from the different terminology employed by metricians and rhythmicians is further shown by the fact that the metrical concept of *arsis/sublatio* as the beginning of a syllabic sequence appears also in late Greek metrical treatises: for instance, a passage from *Anonymus Ambrosianus* defines *arsis* as ‘the beginning of a verse, while *thesis* is the end’, and Choeroboschus relates these terms to beginning and the end of a metrical foot.<sup>69</sup>

One final piece of evidence shows that we are on the right track in distinguishing the concept of *sublatio* as the first part of metrical sequence from that of *elatio* as rhythmical *arsis* marked by a raise in pitch. In his Latin translation of Aristides Quintilianus, Martianus Capella never employs the term *sublatio* but, in keeping with Aristides’ usage,<sup>70</sup> consistently translates the rhythmical concept of *arsis* with the word *elatio*, as is shown by the following examples:

Ἐν δὲ τῷ ἰαμβικῷ γένει ἀπλοῖ μὲν πίπτουσιν οἶδε ῥυθμοί· ἰαμβος ἐξ ἡμισείας ἄρσεως διπλασίου θέσεως, τροχαῖος ἐκ διπλασίου θέσεως καὶ βραχείας ἄρσεως, ὄρθιος ὁ ἐκ τετρασήμου ἄρσεως καὶ ὀκτασήμου θέσεως, τροχαῖος σημαντὸς ὁ ἐξ ὀκτασήμου θέσεως καὶ τετρασήμου ἄρσεως.

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<sup>69</sup> *Anon. Ambros.* 215.21 Studemund: ἄρσις μὲν γὰρ καλεῖται ἡ ἀρχὴ τοῦ στίχου, θέσις δὲ τὸ τέλος; Choerob. 211.14 Consbruch = *Scholia B* 294.13 Consbruch: πούς τοίνυν ἐστὶν σύνταξις συλλαβῶν ἄρσιν καὶ θέσιν περιέχουσα. See also *Anon. Ambros.* 225.15–20 and 227.9–18 Studemund.

<sup>70</sup> Not appreciating this distinction, Deiters wrongly accused Capella of contradicting himself by employing two different meanings of the word *arsis*: ‘Martianus folgt hier dem Sprachgebrauche der lateinischen Metriker, in den späteren Abschnitten aber im Widerspruch mit sich selbst wieder dem des Aristides’ (Deiters n. 47, 14).

(Arist. Quint. *De Mus.* 36.1–5 W.-I.)

The following simple rhythms fall within the iambic *genus*: the iamb, made of an *arsis* half the length of the *thesis* and a thesis double the *arsis*; the trochee, made of a double *thesis* and a short *arsis*; the orthian, consisting of a four-time *arsis* and an eight-time *thesis*; the ‘marked’ trochee, consisting of an eight-time *thesis* and a four-time *arsis*.

Qui igitur incompositi errant, isti sunt: iambus ex dimidia elatione et positione quae gemina est; trochaeus ex duplici positione et elatione quae brevis est. Orthius vero, qui ex tetrasemi elatione [id est arsi] et octasemi positione constabit, ita ut duodecim tempora hic pes recepisse videatur, atque habet propinquitatem aliquam cum iambico pede; quattuor enim primis temporibus ad iambum consonat, reliquis octo temporibus adiunctis. Dehinc trochaeus, qui semanticus dicitur, id est qui e contrario octo primis positionibus constet, reliquis in elationibus quattuor brevibus artetur.

(Mart. Cap. *De Nupt.* §985)

So these are the incomposite [iambic] measures: the iamb, consisting of an *elatio* half of the length of the *positio* and a *positio* which is double; the trochee, consisting of a double *positio* and a short *elatio*; and then the orthian, which will contain a four-time *elatio*, which is the *arsis*, and an eight-time *positio*, so that this foot seems to comprise twelve times in total and has some kinship with the iambic foot; for it agrees with the iamb by having four times first, while the remaining eight times are added afterwards. Next is the so-called ‘marked’ trochee, which is the reverse of the orthian and comprises the first eight times as *positiones*, while it is rounded off by the remaining four shorts in *elationes*.

This clear terminological distinction explains also why Marius Victorinus shifts between the terms *sublatio* and *elatio* in his discussion of the concept of *arsis*. Given that his whole section on *arsis* and *thesis* (6.40.5–41.21 Keil) focuses mainly on metrical questions, he

mostly employs the metrical term *sublatio*.<sup>71</sup> However, when he introduces a comparison with the strictly musical domain and explains how *arsis* is expressed in song, music and dance, he shifts to the proper rhythmical term, *elatio*.<sup>72</sup>

## 5. ANCIENT VERSE SCANSION AND THE ORIGIN OF THE METRICAL CONCEPT OF *ARSIS/SUBLATIO*

The previous sections have shown how the Latin sources present us with two different and well-defined concepts of *arsis*, which are respectively translated as *elatio* and *sublatio*. The word *elatio* corresponds to the rhythmical concept of *arsis*, which entailed a raise in pitch as well as a physical upward movement, while the term *sublatio* appears in metrical contexts and indicates the first syllables of a given metrical sequence. The obvious question now is, why was this double usage of the word *arsis* developed in the first place?

Of course, given the scantiness of the evidence, we are not in a position to provide a definite answer to this question; however some aspects of the ancient practice of verse scansion allow us to formulate a reasonable hypothesis. First of all, it is important to keep in mind that the verb *scandere* acquired the specialised meaning of ‘scanning verses’ only in late antique

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<sup>71</sup> This is consistent with the definition of metrical foot he provides at 6.43.9–10 Keil: *pes est certus modus syllabarum, quo cognoscimus totius metri speciem, compositus ex sublatione et positione*. Cf. 6.41–2 Keil: *differt autem rhythmus a metro, quod metrum in verbis, rhythmus in modulatione ac motu corporis sit*.

<sup>72</sup> This terminological shift most likely depended on Victorinus’ source and his subsequent distinction between different *rhythmizomena* suggests that it was an excerpt from an Aristoxenian treatise on rhythemics: cf. Aristox. *El. Harm.* §§2–9, 2–6 Pearson.

sources;<sup>73</sup> in Classical Latin, it simply indicated the activity of ‘climbing’, in keeping with the basic meaning of the Indo-European root *skand-*. This difference in usage suggests, on the one hand, that verse scansion was perceived as being related to some kind of ‘elevation’, on the other that it was introduced at a relatively late stage. In addition, our sources indicate that this practice belonged specifically to the educational sphere;<sup>74</sup> for instance, Priscian reports the following fictional dialogue between a teacher and a student, who is asked to scan the first line of the *Aeneid* and analyse its metrical structure:<sup>75</sup>

Scande versum.                    ‘Arma vi rumque ca no Troi ae qui primus ab oris’

Quot caesuras habet?    Duas.    Quas? Semiquinariam et semiseptenariam.

(Priscian 3.461.15–17 Keil)

But how did they mark these metrical subdivisions while reading verses aloud in class? To my knowledge, the earliest evidence on this matter is provided by Terentianus Maurus. In accordance with his interest in metre, Terentianus employs the terms *arsis/thesis* in their metrical acceptance, indicating respectively the beginning and the end of a metrical sequence,

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<sup>73</sup> E.g. Sergius 4.522.26 Keil (*scandere versus*), with OLD s.v. *scando*, §6, and Lewis-Short s.v.

<sup>74</sup> Cf. W. Stroh, ‘*Arsis und Thesis*, oder: Wie hat man lateinische Verse gesprochen?’, in W. Stroh, *Apocrypha: Entlegene Schriften* (Stuttgart, 2000), 193–216, esp. 206–8; S. Bonner, *Education in Ancient Rome: from the Elder Cato to the Younger Pliny* (London/New York, 2012), 190.

<sup>75</sup> See also Quint. *Inst. Or.* 1.8.13, Sext. Emp. *Adv. math.* 1.159–60 and Pompeius 5.118.6 Keil.



and significantly characterises *arsis* as the part of a foot that *sublevetur*,<sup>76</sup> which is exactly the word that was to become the standard metrical term used by later Latin grammarians. Within this framework, he mentions two different devices employed to distinguish *arsis* and *thesis*: on the one hand, he describes as *ponere* the action that identified metrical *theseis* and tells us that teachers of metre marked these positions by finger-snapping or stomping;<sup>77</sup> on the other, he associates the concept of *arsis* with a raise in the voice's sound (*attollit sonorem*) and, interestingly, relates this meaning to the Greek usage – a choice that is perfectly consistent

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<sup>76</sup> See esp. Ter. Maur. 6.368 Keil, vv. 1420–3 on the division of amphibrachs: *arsis hinc sumat necesse est tria priora tempora / et thesi relinquat unum: vel licet vertas retro, / arsis uno sublevetur, deprimant thesin tria*. On the role of *sublatio* as marking the division of metrical feet, cf. also 6.350 Keil, v. 835: *et pedum vel hinc vel inde sublevant discrimina*.

<sup>77</sup> Cf. Ter. Maur. 6.393 Keil, esp. vv. 2253–5: *scandendo [sc. necesse est] et illic ponere adsueta moram / quam pollicis sonore vel plausu pedis / discriminare, qui docent artem, solent*. The context of this quotation clarifies that Terentianus refers to metrical *theseis*. In explaining why dactylic hexameters are measured by counting single feet while iambic trimeters are measured by groups of two feet, Terentianus specifies that this distinction depends on the position of the *mora* (i.e. ‘space of time’ or ‘foot section’, not ‘pause’ – cf. Aug. *De Mus.* 2.13.24) that is marked by clapping: if the marked *mora* appears already in the first foot, then the verse will be dactylic and each foot will comprise a long syllable in *sublatio* and two short syllables in *positio*; by contrast, if the marked *mora* is not present in the first foot but appears only in the second, fourth and sixth, i.e. where it is compulsory to have purely iambic feet in iambic trimeters, then the resulting verse will be iambic. Cf. Caes. Bass. *apud* Rufin. 6.555.24 Keil, Mar. Vict. 6.80–1 Keil, Aug. *De Mus.* 5.11.24.

with the Greek evidence we have examined above.<sup>78</sup> The following passage by Sacerdos describes in greater detail what this kind of vocal accentuation entailed exactly:

hoc tamen scire debemus, quod versus percutientes, id est scandentes, interdum accentus alios pronuntiamus, quam per singula verba ponentes. *toro* et *pater*, acutum accentum in ‘to’ ponimus et in ‘pa’; scandendo vero *inde toro pater Aeneas* in ‘ro’ et in ‘ter’. haec igitur in metro ideo suam non continent rationem, quia in ipsis nulla intellectus ratio continetur: nam *ropater* nihil significat.

(Sacerd. 6.448.20–5 Keil)

But we also need to know the following: when striking verses, i.e. scanning them, sometimes we pronounce accents differently than when we put them on individual words. For instance, in the case of the words *toro* and *pater*, we put the accent on ‘to’ and ‘pa’. By contrast, when we scan the line *inde toro pater Aeneas*, we put the accent on ‘ro’ and ‘ter’. Therefore these metrical subdivisions do not reflect the sense of the words, as no discernible meaning is contained in them: for *rópater* does not mean anything.

Here Sacerdos describes very clearly how, in scanning a dactylic hexameter, the beginning of each metrical foot was marked by an artificial acute accent, which was shifted from its natural prosodic position to the first long syllable of each foot. However, one aspect of this passage poses a serious riddle: why does he state that ‘ter’ is accented, a short syllable which closes a dactyl? Several options and emendations have been proposed in order to solve this problem. According to some interpreters, Sacerdos mis-scanned the word *pătěr* as if it

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<sup>78</sup> Ter. Maur. 6.365–6 Keil, vv. 1345–6: *parte nam attollit sonorem, parte reliqua deprimit* / ἄρσιν *hanc Graeci vocarunt, alteram contra θέσιν*.

comprised two long syllables,<sup>79</sup> thus re-establishing a correspondence between accent and the beginning of the foot (*índětő rópā téraē neás*). However, even though similar prosodic errors caused by the interference of stress accents on vowel quantities appear elsewhere in *Sacerdos*,<sup>80</sup> the final remark of this passage makes this interpretation very unlikely: in fact, the group *rópater* is presented as one ‘word’, which means that it should bear only one accent,<sup>81</sup> while an erroneous scansion of *pătěr* would produce two (*rópātěr*). A promising alternative has been recently advanced by Karin Zeleny, according to whom the reading *-ter* is a corruption of the original *Aen-* caused by the similar appearance of these two syllables in cursive handwriting.<sup>82</sup> If this attractive explanation is correct, *Sacerdos*’ original text read as follows:

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<sup>79</sup> Cf. W. Beare, *Latin Verse and European Song. A Study in Accent and Rhythm* (London, 1957), 61.

<sup>80</sup> See e.g. 6.493.24 Keil where *Sacerdos* treats *perspícere possit* as a possible hexameter ending, regarding the short accented syllable as long, and 6.494.7–12 on the complementary tendency for long unstressed vowel to be shortened. Cf. J.N. Adams, *Social Variation and the Latin Language* (Cambridge, 2013), 43–51 and Keil 6.423.

<sup>81</sup> Cf. Quint. *Inst. Or.* 1.5.31: *Est autem in omni voce utique acuta, sed numquam plus una nec umquam ultima*. This passage refutes the explanation proposed by Stroh (n. 74), 208, according to whom *Sacerdos* referred to the existence of a secondary accent (cf. the German word *Müttertag*). Cf. K. Zeleny, *Itali Modi: Akzentrhythmen in der lateinischen Dichtung der augusteischen Zeit* (Wien, 2008), 64–5.

<sup>82</sup> Zeleny (n.81), 64–5; on the similarity between the letter a (œ) and t (α), cf. E.A. Lowe, *The Beneventan script: a history of the south Italian minuscule* (Oxford, 1914), 93–4, 133–48.

*toro* et *pater*, acutum accentum in ‘to’ ponimus et in ‘pa’; scandendo vero *inde toro pater Aeneas* in ‘ro’ et in ‘Aen-’.

This emendation not only leads to a consistent accentuation of the beginning of each metrical foot – *īndētō rōpătēr aēnē āssīc ōrtūsāb āltō*, Virg. *Aen.* 2.2 – but also explains why Sacerdos singled out specifically the words *toro* and *pater*. In fact, they exemplify the two kinds of artificial accentuation that affected words in verse scansion: the accent could either be shifted from its natural position to the beginning of the foot, as in the case of *toró* as opposed to the natural *tóro*; or it disappeared entirely, as in the case of the word *pater*. By contrast, Sacerdos did not have any reasons to comment on the first word *inde*, since its natural accent corresponded to the artificial one employed in metrical scansion.

But why was it necessary to devise such a complex method in order to teach metre in late antiquity? The answer readily suggests itself: the new practice of verse scansion was introduced in didactic contexts to compensate for the weakened perception of syllable quantities caused by the increased presence of stress accents,<sup>83</sup> which undermined a ‘natural’ identification of metrical feet on the basis of pure quantities. The grammarian Sergius comments explicitly on this point: after admitting that ‘it is difficult to know which syllables are long by nature’, he states that this ambiguity can be resolved ‘only by means of examples drawn from authority, when you have proceeded to scan (*scandere*) the verses of the poet’.<sup>84</sup>

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<sup>83</sup> Cf. Adams (n. 80).

<sup>84</sup> Serg. 4.522.26 Keil: *syllabas natura longas difficile est scire. sed hanc ambiguitatem sola probant auctoritatis exempla, cum versus poetae scandere coeperis*. See also 4.480.12–14, 4.482.4–18 Keil, where Sergius highlights again the artificial nature of metrical *arsis/thesis* and their original dependence on melodic accents. On the difficulty to identify syllable quantities in late antiquity, cf. Aug. *De Mus.* 2.1.1 and 3.3.5.

Not being able anymore to perceive syllabic quantities correctly, students learned to distinguish metrical feet by marking the beginning of each unit with an artificial vocal accent – something that is ironically very similar to what is still taught in most courses in Greek and Latin metre nowadays. By contrast, as Terentianus Maurus and Augustine testify, the second part of each metrical foot was identified by means of a clap or stomp.<sup>85</sup>

From this perspective, we can understand better a famous, if obscure, remark by Terentianus, namely that ‘a long syllable by itself is not sufficient to produce a foot, because a foot is created by two ‘beats’ and not by a double time’.<sup>86</sup> If the present reconstruction is correct, Terentianus is referring to the two different types of *ictus* that distinguished *arseis* and *theseis*: a vocal accentuation as opposed to a physical one. Finally, this hypothesis would also explain why late metrical treatises described both ‘descending’ and ‘ascending’ rhythms, that is to say rhythms that started respectively from *thesis* or *arsis*, as beginning with *arsis/sublatio* and ending with *thesis/positio*:<sup>87</sup> according to the new practice of verse scansion, the beginning of any given metrical sequence was marked with the same ‘elevation’ of the voice, independently of the original rhythmic character of each foot.

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<sup>85</sup> Cf. Ter. Maur. 6.393 Keil, quoted above, Aug. *De Mus.* 2.10.18 and *passim*.

<sup>86</sup> 6.365–6 Keil, vv.1342–7: *una longa non valebit edere ex sese pedem, / ictibus quia fit duobus, non gemello tempore. / brevis utrimque sit licebit, bis feriri convenit, / parte nam attollit sonorem, parte reliqua deprimit / ἄρσιν hanc Graeci vocarunt, alteram contra θέσιν / una porro bis feriri quando poterit syllaba?* Cf. Diom. 1.475.3 Keil: *ergo una longa pedem non valebit efficere, quia ictibus duobus arsis et thesis, non gemello tempore perquirenda est.*

<sup>87</sup> E.g. Mar. Vict. 40.17–18, Aug. *De Mus.* 2.14.26, where spondees, dactyls, proceleusmatics as well as anapaests are said to correspond to each other not only with regard to their duration but also their scansion.

## 6. CONCLUSIONS

At the beginning of this study, we have seen how traditional approaches to ancient rhythmic have tacitly interpreted the evidence on the basis of a very simplified and misleading understanding of the rhythmic conventions of Western music, an approach that led many scholars to assume that *theseis* enjoyed a predominant status and were consistently marked by dynamic accents. However, as I showed in sections 1–4, these notions are nowhere attested in the ancient sources, nor are they supported by contemporary studies in ethnomusicology and music perception. If we let go of these preconceived ideas and interpret the evidence following the indications explicitly provided in the sources, it becomes clear that both Greek and Latin authors consistently depict a very different picture: *theseis* were regarded as relaxing and calming while *arseis* were perceived as exciting and ‘moving’, and the rhythmical prominence of *arseis* was associated with the stimulating effect of high pitches, as opposed to the soothing influence of low notes.

Secondly, we have seen that the rhythmical notion of *arsis* as pitch raise differs radically from the metrical concept of *arsis*, which indicates the beginning of a syllabic sequence; and these two concepts are designated by different Latin words: *elatio* and *sublatio*. This terminological and conceptual distinction allowed us to dismiss another long-lived tenet of scholarship on ancient rhythm, namely that the meaning of the rhythmical terms *arsis/thesis* underwent a radical overturn in the Latin sources, coming to denote exactly the opposite of what they indicated in the Greek world. However, as I have shown in sections 2–4, this alleged ‘inversion’ is not substantiated by the sources but derives from a modern misinterpretation of the usage of these terms in two independent disciplines: rhythmic and metrics.

This approach has several advantages. First, it produces a coherent explanation of the different usage of the terms *arsis/thesis* without resorting to questionable textual emendations or mysterious and unattested ‘inversions’ in the meaning of these words. Secondly, it accounts

for the sudden appearance of the metrical concept of *arsis/sublatio* in late antique sources as a consequence of the new teaching practice of verse scansion. In addition, it clarifies why late metricians described both ‘ascending’ and ‘descending’ rhythms as beginning from *arsis/sublatio* and ending with *thesis/positio*: in scanning verses, the first part of any metrical foot was marked with the same ‘elevation’ of the voice independently of its original rhythmical character, since the aim of this practice was not reflecting what happened in musical performances but simply helping students identify the structure of a given metrical sequence.

By contrast both Greek and Latin sources consistently indicate that rhythmical *arseis* and *theseis* were expressed by meaningful alternations of high and low pitches in musical performances:<sup>88</sup> it is by establishing a ‘recognisable and orderly’ sequence of pitches and durations that rhythm transforms a shapeless scale into a moving melody which, in turn, ‘moves us in an orderly fashion’.<sup>89</sup>

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<sup>88</sup> The use of melodic means to provide rhythmical cues is attested in many folk traditions, such as Sardinian music played on *launeddas* and Scottish *pibroch* piping; as I hope to show elsewhere in due course, several ancient sources suggest that this was the case also in *aulos* music. For a discussion of the role played by instrumental accompaniment in the perception of ancient Greek rhythm, cf. A. Barker, ‘*Heterophonia* and *Poikilia*: accompaniments to Greek melody’, in B. Gentili and F. Perusino, *Mousiké: Metrica, Ritmica e Musica Greca in Memoria di Giovanni Comotti* (Pisa/Rome, 1995), 41–60.

<sup>89</sup> Ps.-Arist. *Probl.* 19.38, 920b33–6: ῥυθμῶ δὲ χαίρομεν διὰ τὸ γνῶριμον καὶ τεταγμένον ἀριθμὸν ἔχειν, καὶ κινεῖν ἡμᾶς τεταγμένως. Cf. Arist. Quint. *De Mus.* 31.10 W.-I. and 40.20–5 W.-I.

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