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Harmonica Membra Disjecta

Fabio Acerbi and Anna Gioffreda

THE AIM of the present note is to provide the details of a palaeographic finding and to work out some consequences of it.¹ The finding amounts to reassembling two *membra disjecta* of one of the most important manuscript witnesses of ancient Greek harmonic theory. The dismembered portions (which we shall call *Mo* and *Va*, and accordingly their reassembly *MoVa*) presently belong to the composite manuscripts München, Bayerische Staatsbibliothek, Cod.graec. 361a, and Città del Vaticano, Biblioteca Apostolica Vaticana, *Vat.gr.* 2338.

As we shall see, *Mo* and *Va* are both to be dated to the second half of the thirteenth century. The palaeographic analysis will also reveal the presence of a common reviser to whom we may give a name. This fact will allow us to reconstruct the early history of *MoVa* to some extent.

Again, palaeographic analysis, this time applied to *MoVa* and to another fundamental witness to Greek harmonics, Venezia, Biblioteca Nazionale Marciana, gr. VI.3 (eleventh century),² will provide a first step towards eliminating a long-standing draw-

¹ Frequently cited items are abbreviated as follows: *AEH* = R. Da Rios, *Aristoxeni Elementa Harmonica* (Rome 1954); *EOO* = J. L. Heiberg and H. Menge, *Euclidis Opera omnia* I–VIII (Leipzig 1883–1916); *MSG* = C. von Jan, *Musici Scriptores Graeci* (Leipzig 1895); *PtH* = I. Düring, *Die Harmonielehre des Klaudios Ptolemaios* (Göteborg 1930). Online reproductions of all relevant manuscripts mentioned in this article can be found through the website <https://pinakes.irht.cnrs.fr/>. Fabio Acerbi is responsible for parts 1, 2, and Appendix 2, Anna Gioffreda for Appendix 1.

² On the manuscript see *AEH* xxv–xxix; T. J. Mathiesen, *Ancient Greek Music Theory. A Catalogue Raisonné of Manuscripts* (Munich 1988) 709–713 no. 270.

back in the assessment of the several hands engaged in revising these manuscripts.

The two main sections of this article and Appendix 1 are focussed in succession on the three issues just described. Appendix 2 contains descriptive files of *Monac.gr.* 361a and of *Vat.gr.* 2338; these files contain data that are essential to our argument.

1. *Reassembling the musical portions of Monac.gr. 361a and Vat.gr. 2338*

Let us briefly introduce the two characters of our story. *Vat.gr.* 2338 is a composite manuscript made up of four codicological units: these range over ff. 1–22, 23–38 (both thirteenth century), 39, and 40–44 (both seventeenth century). The first codicological unit is our *Va*. It contains only treatises and extracts pertaining to Greek harmonic theory: ff. 1^r–3^r Cleonides *Introductio harmonica*; 3^r–4^v Euclid *Sectio canonis*; 5^r–8^r Gaudentius *Introductio harmonica*; 9^r–10^r Theon of Smyrna *excerpta musica* (*Exp.* 46.20–57.6 Hiller); 10^r–12^v [Pappus] *immo* Cleonides *Introductio harmonica*; 12^v–21^v Aristoxenus *Elementa harmonica* 1–3; 21^v–22^v *Excerpta Neapolitana*.³

Monac.gr. 361a is a composite manuscript made of an ancient portion and of a series of restorations.⁴ The former is on ff. 7–45, with the exception of ff. 42–43, and is penned by two hands, belonging to different yet related copying campaigns. The first hand is responsible of ff. 7^r–30^v, where it transcribed Euclid's minor works: *Data*, *Phaenomena*, *Optica*, and *Catoptrica*. The second hand copied Ptolemy's *Harmonica* on ff. 31^r–41^v and 44^r–45^v (this is our *Mo*). This treatise is now incomplete, two restorations

³ On the manuscript see *AEH* xx–xxv; Mathiesen, *Ancient Greek Music Theory* 608–611 no. 234, and our descriptive file in Appendix 2. On the *Excerpta Neapolitana* in this manuscript see the companion paper F. Acerbi and S. Panteri, “Eratosthenes in the *Excerpta Neapolitana*,” *GRBS* 59 (2019) 663–679.

⁴ For details see our descriptive file in Appendix 2. We there redeploy, in revised and substantially enriched form, material set out in F. Acerbi, “Byzantine Recensions of Greek Mathematical and Astronomical Texts: A Survey,” *Estudios bizantinos* 4 (2016) 133–213, at 153–154. This will make the present contribution self-contained.

being located at ff. 42^{r-v} and 50^r–59^v; the folia of the entire manuscript are in fact bound in highly perturbed order.

Vat.gr. 2338 was unknown to C. von Jan, so that he could not use it in his classic 1895 edition of the *Musici Scriptores Graeci*. The major role this manuscript plays in the transmission of a number of Greek musical writings was first recognized by R. Da Rios in her excellent 1954 edition of Aristoxenus' *Elementa harmonica*, and reaffirmed by more recent researches: *Vat.gr.* 2338 is the prototype of one of the two branches into which is split the entire manuscript tradition of some major Greek musical writings. These are the treatises it shares with *Marc.gr.* VI.3: Aristoxenus, Cleonides, and Euclid.⁵ Moreover, all texts in *Vat.gr.* 2338 can be read in versions less adulterated by Byzantine interventions than the ones we read in *Marc.gr.* VI.3.⁶

On the other hand, *Monac.gr.* 361a is a little-known manuscript, which however proved to be, as far as the ancient portion is concerned, an independent witness to the only musical writing it contains, namely, Ptolemy's *Harmonica*.⁷ As mentioned, the rest of the codex features Euclid's minor works; yet the only Euclidean musical treatise—the *Sectio canonis*—is absent.

The most prominent characteristic of *Mo* and *Va* is that they

⁵ The relevant treatises in *Marc.gr.* VI.3 are those penned by the first hand. Later hands added further writings in the margins (see Appendix 1). Menge's edition of Cleonides and of the *Sectio canonis* in *EOO* VIII just recycles von Jan's, as Menge's himself readily admits at VII.

⁶ For instance, the subscription of Euclid's *Sectio canonis* in this manuscript reads Εὐκλείδου κανόνος κατατομή Ζώσιμος διώρθου ἐν Κωνσταντινουπόλει εὐτυχῶς. The text was later heavily corrected by several hands (see Appendix 1). Zosimos' recension, supplemented with all the layers of corrections, was stemmatically very productive thanks to the abundant progeny of its direct apograph *Marc.gr.* Z. 322, penned for Bessarion by John Rhosos. See *AEH* XXII–XXV for examples of superior readings of *Vat.gr.* 2338 with respect to *Marc.gr.* VI.3 in the case of Aristoxenus.

⁷ The manuscript tradition of this treatise is complex: see Düring's discussion in *PH*, and the synthesis, with one correction to Düring, in Acerbi, *Estudios bizantinos* 4 (2016) 172–173.

are entirely penned in imitative script.⁸ This writing style was adopted, during a short time segment in the early Palaeologan period, in *scriptoria* in Constantinople: the time span goes from the reconquest of the Capital in 1261 after the Latin rule, to the death of Andronicus III in 1341.⁹ Most of the ca. 170 known manuscripts penned entirely or in part in imitative script are non-profane: only about thirty are profane, and mainly contain technical writings: rhetorical, philosophical, and scientific treatises, the latter subset amounting to eleven items.¹⁰ Thus, a group of about a dozen scientific manuscripts was produced during a very restricted period, within a very limited number of *scriptoria* in Constantinople, and by using a strongly marked script; as a matter of fact, this group constitutes a relevant—and

⁸ This fact was mistaken by Da Rios, who dated *Va* to the twelfth-thirteenth centuries.

⁹ On the imitative scripts of late thirteenth-early fourteenth century see first and foremost G. Prato, “Scritture librerie arcaizzanti della prima età dei Palaeologi e loro modelli,” *SE&C* 3 (1979) 151–193; G. De Gregorio and G. Prato, “Scrittura arcaizzante in codici profani e sacri della prima età palaeologa,” *Römische Historische Mitteilungen* 45 (2003) 59–101, for the profane manuscripts; F. Acerbi and A. Gioffreda, “Manoscritti scientifici della prima età palaeologa in scrittura arcaizzante,” *Scripta* 12 (2019, forthcoming), for the scientific and philosophical manuscripts, with bibliography.

¹⁰ The technical manuscripts are Bucuresti, Biblioteca Academiei Române, *gr.* 10 (Nikephoros Blemmydes); El Escorial, Real Biblioteca del Monasterio de S. Lorenzo, Φ .III.5 (Euclid *Elements*); Göttingen, Niedersächsische Staats- und Universitätsbibliothek, *philol.* 66 (Nicomachus *Introductio arithmetica* + Philoponus’ commentary thereon); Firenze, Biblioteca Medicea Laurenziana, *Plut.* 28.2 (Euclid *Elements, Data*); *Laur.Plut.* 28.6 (Euclid *Elements, Optica* **A**, *Phaenomena* **a**); *Laur.Plut.* 81.1 (Aristotle *Part.An.*, *IA, De an.*, *De motu an.*, *Gen.An.*, *Parv.nat.*); *Laur.Plut.* 85.1 (collection of Greek and Byzantine Aristotelian commentators); *Marc.gr.* Z. 208 (Aristotle *Hist.An.*); *Marc.gr.* Z. 211 (Aristotle *Metaph.*; Theophrastus *Metaph.*; Themistius *In Anal.Post.*); *Marc.gr.* Z.303 (Ptolemy *Almagest*); *Marc.gr.* IV.53 (Aristotle *Organon*); *Monac.gr.* 361a; *Vat.gr.* 191 (*miscellanea mathematica*); *Vat.gr.* 192 (*miscellanea mathematica*); *Vat.gr.* 203 (“little astronomy”; Apollonius; Serenus); *Vat.gr.* 225 + *Vat.gr.* 226 (Plato); *Vat.gr.* 1038 (Euclid *Opera omnia*; Ptolemy *Opera astronomica omnia*); *Vat.gr.* 1302 (*miscellanea philosophica*); *Vat.gr.* 2338; *Vat.Urb.gr.* 82 (Ptolemy *Geographia*).

stemmatically prominent—part of the entire manuscript production of scientific argument in the indicated period.¹¹

It so happens that some of these scientific manuscripts contain only portions penned in imitative writing, the other portions being written in other scripts typical of the period (*Fettaugen-Mode* or scholarly hands).¹² Thus, such manuscripts attest to a practice of copying by quire blocks that are homogeneous in their contents; some of these products constitute remarkable examples of cooperation among copyists under the supervision of a ‘*maître d’atelier*’: of this kind are for instance the huge collection of Aristotelian commentators *Laur.Plut.* 85.1, known as the “Oceanus,”¹³ and the mathematical miscellanea *Vat.gr.* 192 and *Vat.gr.* 203. Of course, there are also manuscripts penned by one single copyist and, as their palaeographic and codicological features suggest, very likely commissioned by a single customer: of this kind are for instance the Nicomachus codex *Gott.philol.* 66 and the two Euclid codices *Laur.Plut.* 28.6 and *Scorial.* Φ.III.5.¹⁴

A remarkable series of identical hands recurs in some of the profane manuscripts containing portions in imitative writing. The identification relevant to our present purposes is the one between the copyist who penned the first ancient part of *Vat.gr.* 2338 (ff. 1–22: *Va*) and the one responsible of the portion of *Monac.gr.* 361a containing Ptolemy’s *Harmonica* and not restored

¹¹ We summarize here in very broad outline Acerbi and Gioffreda, *Scripta* 12 (2019). A special focus is there accorded to the editorial projects behind the several thematic and palaeographic homogeneous blocks nowadays collected in some of the extant manuscripts. As is shown in that study, the period in which the scientific manuscripts in imitative script were produced must be restricted to the span from ca. 1270 to ca. 1310.

¹² Of course, we ignore here later restorations or additions.

¹³ On this manuscript see further M. Cacouros, “Le Laur. 85,1 témoin de l’activité conjointe d’un groupe de copistes travaillant dans la seconde moitié du XIII^e siècle,” in G. Prato (ed.), *I manoscritti greci tra riflessione e dibattito* (Florence 2000) I 295–310.

¹⁴ They feature parchment, reduced format, small number of lines per page, wide margins, a professional copyist’s tricks in the layout of the exegetical apparatus in the case of the former two.

by later hands (ff. 45^{r-v}, 31^r–36^v, 44^{r-v}, 37^r–41^v, in this order: *Mo*).¹⁵ The handwriting is an elegant, upright, canonical imitative script, characterised by a curvilinear ductus mainly displayed by the letters carrying a nucleus, small size, and a modicum of modular contrast, as in majuscule *theta* and in *ny* of greater size at the end of a line. Typical features of this hand are majuscule *beta* of a peculiar form and the ligature *epsilon-zeta*; the lowest stroke of this consonant is characteristically bent inwards.

The identity of hands is remarkably supported by the presence of two scholiasts common to *Va* and *Mo* and by the fact that these sets of folia display the same codicological features: identical dimensions, identical layout with 60 lines and with the diagrams almost exclusively located in the margins.¹⁶ Thus, *Va* and *Mo* come from one and the same codicological and palaeographic unit, which was dismembered at some point in its history. This history pertains to the second chapter of our story.

2. *The early history of MoVa*

Reconstructing the codicological and palaeographic unit of which *MoVa* was a part is not immediate. The main problem is that both *Mo* and *Va* have been so heavily restored that the original quire structure is destroyed. We thus have a set of 22 folios almost self-contained as to contents (*Va*) and 13 folios carrying Ptolemy's *Harmonica* from the middle of chapter 2.1 as far as the end (*Mo*). As for the former, we may safely surmise that ff. 1–8 were an independent quire, for f. 8^r is not entirely filled and f. 8^v was left blank. On the contrary, the ten folios allotted to Aristoxenus' *Elementa harmonica* make it certain that a two-quire set was used for this treatise and for the writings—mainly

¹⁵ As stated, the restored portions are at ff. 50^r–59^v and 42^{r-v}; f. 43^{r-v} is misplaced.

¹⁶ The latter is a very infrequent layout choice in scientific manuscripts: among the earliest manuscripts of the *Elements*, it is shared only by *Laur. Plut.* 28.3 (ca. 960) and *Paris.gr.* 2466 (twelfth century). On this and other similar features typical of scientific manuscripts see F. Acerbi, “Interazioni fra testo, tavole e diagrammi nei manoscritti matematici ed astronomici greci,” in *La conoscenza scientifica nell'Alto Medioevo* (Spoleto 2020).

fillers in the form of excerpts—preceding and following it. Whether this two-quire set comprised two quaternions or, for instance, a quaternion followed by a ternion,¹⁷ we cannot say; however, note in this connection that the transcription of the *Excerpta Neapolitana* in f. 22^v ends, without showing signs of being incomplete, some lines before the page end. As for *Mo*, by proportional calculation from the number of pages in Düring's edition, a complete *Harmonica* would have occupied 21/22 folios. The later history of *MoVa* that we outline below strongly suggests that these two sets of 22 folios (namely, *Va* and the Ur-*Mo* as just reconstructed) belonged to two independent blocks of three quires each.¹⁸

Are we entitled to guess what the original 'manuscript' looked like, possibly by advancing a hypothesis about additional contents? After all, six quires make a very slim codex, and glaring absences in *MoVa qua* potential corpus of harmonic theory are for instance Aristides Quintilianus, Alypius, or Nicomachus. As a matter of fact, we are not entitled to do this, and for a reason already hinted at by our using "codicological and palaeographic unit" instead of "manuscript" or "codex." The point, as said above, is that all we may gather about the *scriptoria* specializing in imitative script points towards a practice of copying by quire blocks homogeneous as to their contents but not necessarily aimed at giving shape to fully-fledged codices. Rather, such blocks were put on the market aiming at customers interested in assembling an encyclopaedic set of transcriptions, possibly—but not necessarily—to be made stable in the form of a codex. The remarkable textual compression carried out in a 60-line layout like that of *MoVa* is a precondition for this.¹⁹

¹⁷ In the former case, two folios have been lost; in the latter, nothing is missing.

¹⁸ That is, the *Harmonica* did not necessarily begin on the next-to-last folio of the third quaternion of *Va* (cf. the first hypothesis in the previous note).

¹⁹ A detailed discussion along these interpretive lines of all scientific transcriptions in imitative writing is in Acerbi and Gioffreda, *Scripta* 12 (2019), section 5.

Very early material problems eventually led to the dismemberment of *MoVa*, even if not because of an accident that severely damaged the upper margins of all pages of *Va*.²⁰ For a later hand in *Va* traced over most of f. 9^r and the first lines of script in ff. 5^r and 9^v, where the ink had begun to fade before the accident occurred. Now, this hand can also be found in *Mo*—which in its turn does not display ink fading—and can be identified:²¹ it is that of Philotheos of Selymbria,²² a not-so-prominent Byzantine scholar who worked ca. 1380, gravitating in his youth around Nikephoros Gregoras (whose hand can also be found in *Va*) and associated in his mature age with (the pupils of) Isaak Argyros. Since *Mo* on the one side and *Va* on the other display different material conditions in strict connection with Philotheos' interventions, we may surmise that the dismemberment of *MoVa* took place in the same period as he annotated it.

Philotheos' interventions on *MoVa* are not restricted to tracing over faded lines of script: in *Va* he apposed scholia;²³ in *Mo* he also apposed scholia, recorded variant readings, and, most importantly, added—after the end of Ptolemy's *Harmonica* in the peculiar recension we read in *Mo*—the entire f. 42. Philotheos there transcribed again the final segment of the treatise (*Harm.* 3.11–16), drawing from Gregoras' recension of it²⁴ and including the latter's restorations of chapters 3.14 and 15. As a matter

²⁰ The accident must have occurred at least two centuries later than the copying of *MoVa* because the scribe of the first codicological unit of the ms. Napoli, Biblioteca Nazionale Centrale Vittorio Emanuele III, III.C.2 (end fifteenth century), a slavish copy of *Vat.gr.* 2338, was able to read the entire text; see further below.

²¹ The identification in *Va* is by D. Bianconi *per litteras*; the one in *Mo* is by I. Pérez Martín ap. Acerbi, *Estudios bizantinos* 4 (2016) 153 n.28. A further hand is common to *Mo* and *Va*: see the descriptive files in Appendix 2.

²² On Philotheos see *Prosopographisches Lexikon der Palaiologenzeit* 29896, and A. Gioffreda, *Tra i libri di Isacco Argiro* (Berlin 2019) sections I.1 and V.2.2, for Philotheos annotating Argyros' autograph tables in *Scorial.* Y.III.21.

²³ Philotheos is *AEH*'s hand A²; its scholia to Aristoxenus are all transcribed in *AEH*'s apparatus.

²⁴ The first two lines contain the very end of Damianus' *Optical Hypotheses*

of fact, and confirming Philotheos' association with Argyros, this text is copied slavishly from the latter's autograph recension, in *Vat.gr.* 176, of Gregoras' recension of Ptolemy's *Harmonica*.²⁵ Moreover, Philotheos also drew from this manuscript the scholia and corrections he authored in the heavily reworked f. 40^v of *Mo* (*Harm.* 3.9–10). Thus, as the final two lines of Damianus' *Optical Hypotheses* opening f. 42^r confirm, Philotheos recycled a transcription of his in order to supplement Ptolemy's treatise in a manuscript we have every reason to believe was among his own personal belongings. The addition of a single folio can only take place in a book made of an unbound set of quires or of folia.

The presence of the two lines of Damianus at the beginning of f. 42^r does not come as a surprise. For a systematic apograph of *Va* (but not of *Mo*) is the first codicological unit of *Neapol.* III.C.2,²⁶ where Damianus' tract on optics figures amidst the canonical series of treatises of harmonic theory.²⁷ We may thus safely suppose that Philotheos of Selymbria included, for reasons

(22.5–9 Schöne) crossed out by Philotheos himself by means of pen strokes. A check of Damianus' manuscripts shows that the bulk of Philotheos' transcription is lost. Yet, it cannot be mere coincidence that the mimetic hand that penned the complement to *Mo* of the ancient portion of *Monac.gr.* 361a (namely, ff. 7^r–30^v) is also one of the main hands responsible of *Vat.gr.* 192, whose ff. 124^v–126^v feature the earliest known testimony of Damianus + optical excerpts from Geminus.

²⁵ This fact was already noted by Düring: *PtH* XXI.

²⁶ *AEH* LXXV and LXXIX–LXXXI. As for Cleonides, see J. Solomon, *Cleonides: Εἰσαγωγή ἁρμονική; Critical Edition, Translation, and Commentary* (diss. Univ. North Carolina 1980) 60–99, and “Vaticanus gr. 2338 and the Εἰσαγωγή ἁρμονική,” *Philologus* 127 (1983) 247–253. As for Euclid, see A. Barbera, *The Euclidean Division of the Canon. Greek and Latin Sources* (Lincoln 1991) 67–68. In its turn, the Naples manuscript is the model of the mss. Firenze, Biblioteca Riccardiana, gr. 41, and Firenze, Biblioteca Nazionale Centrale, Fondo Nazionale II.III.428 (see again the editions mentioned in this note).

²⁷ The order of the treatises is Gaudentius, Theon of Smyrna, [Pappus]/Cleonides, Aristoxenus, *Excerpta Neapolitana* (the name comes exactly from their being first edited on the basis of this manuscript), Damianus, Cleonides, Euclid. Damianus is as usual preceded by a set of excerpts from Geminus pertaining to optics. (Bad) edition of both in R. Schöne, *Damianos Schrift über Optik* (Berlin 1897): Acerbi, *Estudios bizantinos* 4 (2016) 180.

that escape us, the *Optical hypotheses* among the restorations he provided to *MoVa*. This manuscript must have already been dismembered by the end of fifteenth century, since the copyist of *Neapol.* III.C.2 did not include Ptolemy's *Harmonica* in his transcription.

If we are allowed to draw a moral from the story of *MoVa*, it is to urge the reader not to stay trapped in the rhetoric of the book-as-object and in the associated metaphor of 'dismemberment'. As for us, we could not resist the appeal of a witty title, but we hope we have given enough elements that suggest regarding *MoVa* as simply two sets of quires produced, during a coherent copying campaign, by one and the same scribe based at a highly specialized *scriptorium*.

APPENDIX 1

Assessing the hands of the correctors of *Marc.gr.* VI.3

What we have said in the previous pages only confirms the prominent role of *Mo* in the manuscript tradition of Ptolemy's *Harmonica* and clarifies a point of its early history. However, assessing the hands of scholiasts and revisers of *MoVa* has naturally led us to tackle a drawback in some editions of harmonic theory treatises. The story goes as follows. In their very detailed descriptions of the fundamental manuscript witness *Marc.gr.* VI.3, C. von Jan and R. Da Rios needed to assess the hands of the several layers of corrections that this manuscript bears.²⁸ Out of desperation because the superpositions of corrections, the frequent erasures, and the faded inks made it very difficult to distinguish these hands, they assessed them—thereby assigning them sigla M^1 , M^2 , etc., and temporal determinations—by using the following criterion: a given correction is ascribed to hand M^i and is located in the time span $[x, x + a]_i$ if it is integrated in the main text of an apograph dated with certainty to $x + a$ but not in an apograph dated with certainty to x . For instance, a correction integrated in the main text in *Marc.gr.* Z. 322 (mid fifteenth century) but not in *Vat.gr.* 191 (end thirteenth century) is ascribed to hand M^3 and thereby located in the

²⁸ *MSG* XVI–XXIV; *AEH* XXI–XXII, XXIX, LVII–LXXIV. Our expression “out of desperation” is no exaggeration: read von Jan's colourful description at *MSG* XVIII–XIX.

time span between the indicated dates.²⁹ If we may well grant that assessing a hand responsible for a few-letter correction, often *in rasura*, may be very difficult or simply impossible, von Jan and Da Rios used exactly the same criterion to date the often very long annotations or integrations added in the margins of the Venice manuscript. Thus, the hands of the correctors and scholiasts of *Marc.gr.* VI.3 are not assessed on the grounds of their script; rather, they are names for sets of variants attested in suitable apographs of this manuscript and not in others. It is clear that this approach is unmethodical, since for instance the copyists of *Vat.gr.* 191 might well have omitted to integrate some corrections.

On the other hand, the far fewer corrections and scholia in *Vat.gr.* 2338 have been assessed by Da Rios on the basis of the script in which they are penned—even if she does not date them. One of the key points of her analysis lies in recognizing that the hands she called A³ and M³ (in *Vat.gr.* 2338 and in *Marc.gr.* VI.3, respectively) are identical: thus, a scholar collated the two manuscripts—note that A³ must be associated with a reader but M³ is merely a hand-as-set-of-variants: this inconsistency further shows that the method described in the previous paragraph is unsound.

We shall try to clarify the issue and eliminate the drawback by assessing directly the script of the annotators of both *MoVa* and *Marc.gr.* VI.3. For the former, see the descriptive files in Appendix 2. The assessment of the hands of *Marc.gr.* VI.3 is much more difficult; it is presented in this section. Since some of the treatises are copied in the margins of this manuscript, let us first recall its contents: ff. 1^r–9^r Cleonides *Introductio harmonica*; ff. 9^r–17^r Euclid *Sectio canonis*; ff. 17^r–66^v Aristoxenus *Elementa harmonica* I–III (Book 1, ff. 17^r–36^v; 2, 36^v–56^r; 3, 56^r–66^v); ff. 67^r–91^v Alypius *Introductio harmonica*; ff. 92^r–95^r Aristoxenus *Elementa rhythmica*; margins of ff. 1^r–6^v Aristides Quintilianus *excerpta e libro I De musica*; ff. 7^r–10^r *Anonymi excerpta Bellermanniana*; ff. 17^r–29^r Nicomachus *Harmonices encheiridion*; ff. 29^v–34^v *excerpta e Nicomacho*; ff. 35^r–43^v Bacchius *Introductio harmonica*. The distribution of the

²⁹ In recent critical editions of texts contained in *Marc.gr.* VI.3, Solomon, *Cleonides* 58–59, correctly reports von Jan's criterion for assigning the later hands (and accordingly rejects it by conflating all corrections under one siglum); Barbera, *Euclidean* 29, does not report it correctly.

hands of annotators and correctors in *Marc.gr.* VI.3 is as follows:³⁰

- main copyist (eleventh century): ff. 19^v (integration, 9.11–12), 24^r (integration to the main text crossed out by hand B, 16.4), 26^v (two subtitles and one integration, 20.17 and 20.20), 27^v (two subtitles, 21.18 and 22.3), 28^v marg. ext. (subtitle, 23.10), 30^v (subtitle, 27.14), 42^v (integration, 48.14–15), 45^v (integration, 54.10), 46^r (gloss, 55.8);
- hand A (beginning twelfth century, rusty-red to brown ink): ff. 25^v (scholium, 18.13), 32^v (addition, 30.18), 33^v (long scholium, 32.10), 34^r marg. sup. (diagrammatic scholia, not in *AEH*), 42^r marg. sup. under F's text (integration, 47.14–15);
- hand B (beginning twelfth century, rusty-red ink): 9^v (integration, *MSG* 149.1–3), 10^r–16^v (diagrams), 30^r (diagrammatic scholium, 26.6), 47^v (diagrammatic scholium), maybe 51^v (addition, 64.13);
- hand C (twelfth century): ff. 29^v (scholium, 25.7), 50^v (addition, endowed with insertion sign by a later hand, maybe D, 63.7);
- hand D (twelfth century, decidedly rusty-red ink; maybe it corrects the entire manuscript; it possibly operates after hand B): f. 2^v (short summaries, *MSG* 186.1–8);
- hand E (twelfth century): f. 45^r (integration, 53.5–6);
- hand F (thirteenth century, *Fettaugen-Mode*, black ink with dark brown tinge, then fading to rusty-red ink; it obviously operates after

³⁰ We also point out the character of the intervention. All scholia to Aristotle are transcribed in *AEH*'s apparatus, to whose page.line we refer when no siglum precedes a page-range number; “integration” means that we read the sequence penned by the annotator in the critical text of the reference edition, “addition” means that we do not (but we read it in the apparatus to the text). A point must be clear: it is no surprise that so many different hands can be found annotating one and the same text in one and the same manuscript, even leaving just a handful of traces: Byzantine and Renaissance scholars were accustomed to read with a pen in hand, but they might use it sparingly. Two examples: Maximus Planudes left just *one* autograph scholium in the Euclid Wien, Österreichische Nationalbibliothek, *phil.gr.* 31, f. 144^v: I. Pérez Martín, “El Vindob. Phil. gr. 31, un manuscrito de Euclides anotado por Máximo Planudes,” *Estudios Bizantinos* 5 (2017) 109–130; Giorgio Valla left just *two* autograph scholia in the Euclid Bologna, Biblioteca Comunale dell'Archiginnasio, A 18–19: F. Acerbi and I. Pérez Martín, “Les études géométriques et astronomiques à Thessalonique d'après le témoignage des manuscrits: de Jean Pédiasimos à Démétrios Kydonès,” *Byzantion* 89 (2019) 129–163, at 147 n.72.

- hands B, C, and D): ff. 1^r–6^v (the excerpts from Aristides Quintilianus), 17^r–43^v (Nicomachus and the excerpts therefrom; Bacchius);
- hand G (thirteenth century): ff. 58^r (integration, 77.4–5), 59^r (addition, 79.4), 59^v (integration, 79.9–10);
 - hand H (thirteenth century): ff. 23^r marg. ext. (integration to the main text, 14.21), 66^v (long κείμενον integration: the very end of Aristoxenus' *Elementa harmonica*, 92.4–17);
 - hand I (thirteenth-fourteenth century, rusty-red to light brown ink; it obviously operates after hands D and F): ff. 1^v marg. int. (integration, *MSG* 181.5–6), 4^r and 5^v *infra lineas* (short scholia and glosses, *MSG* 190–191 and 196), 4^r marg. int. ext. inf. (scholia and supplements to the main text, *MSG* 190–191), 4^v (supplements to F's text), 5^r (integrations, *MSG* 194.16–17 and 194.19–20), 5^v (corrections, *MSG* 196.5–6), 6^v (corrections to first lines of main text), 7^r–10^r (these are the *excerpta Bellermanniana*; same hand in 8^{r-v} marg. int.), 10^v marg. int. (integration, *MSG* 151.10), maybe 16^{r-v} (scholia, *MSG* 164.6.11), 24^r marg. sup. (supplement to F's text), 56^r (integration at the beginning of *El.harm.* 3, 73.5–8; the same in *Vat.gr.* 2338, f. 19^v, hand A³), 61^v (addition, 83.7–8), 62^r (integration, 83.11), 93^v and 94^v (integrations);
 - hand L (fourteenth century): f. 62^v (integration, 84.12–14);
 - hand M (fifteenth-sixteenth century, light gray ink; it obviously operates after hand F): ff. 41^r (first line marg. sup. and corrections marg. ext. to F's text), 87^v (scholium).

Unassigned interventions are at ff. 3^r (integration, *MSG* 186.23–187.1, and corrections), 11^r and 12^r (corrections), 16^v marg. inf. (diagram, possibly two hands, the one completing the other), 28^v (integration *infra lineas*, 23.22–23), 35^r marg. int. (integration, 35.16–17), 47^v and 49^{r-v} (traced-over script, black ink, maybe operating throughout the treatise), 50^v (insertion sign, same ink as 58^v, possibly hand D), 51^r (schematic scholium), 58^r (integration, 77.9, *immo* 77.7 after φανερόν), 58^v (two different hands; 2 integrations + integration of πῶς and a λείπει pointing to a lacuna, 78.4–7), 60^r (correction, 80.9), 94^v (long annotations).

We stress that the annotations on ff. 28^v and 58^r, *pace* von Jan and Da Rios, are definitely not in the hand of John Rhosos. We also confirm that hand H coincides with Da Rios' A³. Thus, a scholar collated the two manuscripts, adding in *Marc.gr.* VI.3 the end of Aristoxenus' *Elementa harmonica* as he found it in *MoVa*.

APPENDIX 2

Descriptive files of *Monac.gr.* 361a and *Vat.gr.* 2338*Monac.gr.* 361a

Structure. Second half of thirteenth century, oriental paper, mm $345 \times 245 = 31/245/21/47 \times 21/152/56/16$ (f. 24^r), ff. III + 59 (+ 6^a) + I. Quire structure largely dependent on recent binding; no quire numbering; folios sometimes bound in wrong order. Ancient portion (ff. 7–45, with the exception of ff. 42–43) on 60 lines per page; ruling unit 5 mm; ruling type 11C1bn Sautel-Leroy. On ff. 7–30, diagrams are only placed in the margins; they are mostly placed in the margins on ff. 31–45. Folio numbering in the manuscript partly restoring the original ordering as follows: ff. 7–14 = 34–41; ff. 15–22 = 26–33; ff. 23–30 = 42–49; ff. 31–36 = 12–17; ff. 37–39 = 19–21; f. 40 = 23; f. 41 = 22 (the ancient ordering of ff. 40–41 is wrong); ff. 42–43 = 24–25; f. 44 = 18; f. 45 = 11. Folios 6^v–6^{av} blank.

Hands. Twelve hands can be distinguished,³¹ the earliest of which can be assigned to the second half of thirteenth century. They are distributed as follows:³²

- hand A (Ionas,³³ second half of thirteenth century): ff. 7^r–30^v, including a rich apparatus of scholia;
- hand B (it coincides with the imitative hand of *Vat.gr.* 2338): ff. 31^r–41^v, 44^r–45^v;
- hand C (end thirteenth century; it coincides with hand B of *Vat.gr.* 2338): ff. 19^v, 20^v, 21^v, 22^r (third scholium marg. ext.);
- hand D (fourteenth century): diagrams ff. 31^{r-v}, 32^r (marg. sup.), 34^v, short note at f. 34^r;

³¹ It is difficult to assess the hands of the annotations at ff. 15^r (marg. sup. et int.), 22^r (last scholium marg. ext.: sixteenth century), 26^r (marg. int.), 35^r (marg. ext.), 37^v (marg. ext. et int.), and 38^v (in these three cases, it might be hand D below), 45^r (marg. sup.).

³² For some of the hands see already I. Pérez Martín ap. Acerbi, *Estudios bizantinos* 4 (2016) 153 n.28, here carefully revised, and with substantial additions.

³³ See A. Turyn, *Dated Greek Manuscripts of the Thirteenth and Fourteenth Centuries in the Libraries of Great Britain* (Washington 1980) 49–52 and pll. 28–31 (Oxford, Bodleian Library, *Roe* 22). This copyist, a real ‘maître d’atelier’, is also found in *Laur.Plut.* 85.1, *Marc.gr.* Z. 303, *Vat.gr.* 192, *Vat.gr.* 203: see Acerbi and Gioffreda, *Scripta* 12 (2019), section 4.

- hand E (Nikephoros Gregoras: D. Bianconi *per litteras*): f. 34^v gloss τοῦτο βέλτιον to the table;
- hand F (Philotheos of Selymbria = hand C of *Vat.gr.* 2338): f. 42^{r-v} + marginalia ff. 32^r (he annotates the diagram marg. inf.), 32^v, 34^v, 38^r, 39^v, 40^r (marg. inf.), 40^v, 42^{r-v}, 44^v, 45^v;
- hand G: f. 43^r1–17 + marginalia ff. 40^r (marg. ext.), 40^v (marg. sup. deleted by pen strokes);
- and H (hands G and H can be assigned to ca. 1350–1375 and are therefore contemporary with hand F): f. 43^r.18–43^v;
- hand I (fifteenth century): ff. 46^r–49^v;
- hand L (end fifteenth–beginning sixteenth century): ff. 50^r–59^v;
- hand M (Manuel Glynzounios,³⁴ second half sixteenth century): f. 1^{r-v};
- hand N (second half of sixteenth century): ff. 2^r–6^r.

Contents. ff. 1^r–6^r mathematico-philosophical lucubrations; 7^r–8^r Euclid *Phaenomena* **b** from a supplement to prop. 14, edited as *scholium* 129, to end (*incipit* *EOO* VIII 156.20 καὶ ἡ ΖΗ); ff. 8^r–13^v Euclid *Optica* **B**; ff. 13^v–14^v Euclid *Data* from beginning to prop. 13 (*desinit* *EOO* VI 26.5 τὸ ΑΗ); ff. 15^r–17^r Euclid *Catoptrica*; ff. 17^r–22^v Euclid *Phaenomena* **b** from beginning to a supplement to prop. 14, edited as *sch.* 129 (*des. EOO* VIII 156.20 χρόνῳ καὶ); ff. 23^r–30^v Euclid *Data* 13–80 *aliter* (*inc. EOO* VI 26.5 καὶ λοιποῦ, *des.* 220.11 μετὰ); ff. 31^r–36^v Ptolemy *Harmonica* 2.2–15 (*inc. PtH* 48.21 τοῖς λόγοις, *des.* end of chapter); ff. 37^r–41^v Ptolemy *Harmonica* 3.1–14 (*inc. PtH* 85.19 τῆς τοῦ κανόνος, *des.* 109.11 τῶν γενομένων); ff. 42^{r-v} Ptolemy *Harmonica* 3.11–15 (complete chapters, including Gregoras' supplements); f. 43^{r-v} Aristotle *Problemata* 19.1–17; f. 44^{r-v} Ptolemy *Harmonica* 2.16–3.1 (*inc. PtH* 80.6 τὸ μὲν τοῖνον, *des.* 85.19 τοῦ ἐτέρου τρόπου *sed reclamans alia manu marg. inf.* τῆς τοῦ κανόνος); 45^{r-v} Ptolemy *Harmonica* 2.1–2 (*inc. PtH* 43.1 δύο λόγοι, *des.* 48.21 τὰς ἀκολούθους); ff. 46^r–49^v Euclid *Data* 80 *aliter* to end (*inc. EOO* VI 220.11 τοῦ ἀπὸ; this is a Renaissance restoration); ff. 50^r–59^v Ptolemy *Harmonica* from beginning to 2.1 (*des. PtH* 42.17 ἐπίτριτος *sed reclamans alia manu marg. inf.* δύο λόγοι; this is a Renaissance restoration).

Stemmatic relations. The (quite unusual, but the same as that in *Vat.gr.* 191) order of the Euclidean treatises in this manuscript was *Catoptrica*, *Phaenomena* **b**, *Optica* **B**, *Data*; the folios containing them must be read in the following order: 15^r–22^v, 7^r–14^v, 23^r–30^v, 46^r–49^v (restoration).

³⁴ See *Repertorium der griechischen Kopisten 800–1600* I 248, II 341, III 409.

The folia containing Ptolemy's *Harmonica* must be read in the following order: 50^r–59^v (restoration), 45^{r-v}, 31^r–36^v, 44^{r-v}, 37^r–41^v, 42^{r-v} (restoration). A recension (*PtHP*'s class **f**) of Ptolemy's treatise giving rise to a rich branch of the tradition stems from *Monac.gr.* 361a, in which we also read Gregoras' supplements, in principle belonging to class **g**. This manuscript changes its model (from *Vat.gr.* 191, in this case a copy of *Vat.gr.* 204 *ante correctionem*, to an unknown copy of *Vat.gr.* 204) and type of paper (from oriental to occidental paper) in the final portion of *Data*, ff. 46–49 (*EOO* VI XXI–XXIII). In these folios, in fact a Renaissance restoration as we have seen, the text integrates the corrections that Sylvester Syropoulos had apposed on *Vat.gr.* 204 (*EOO* VI XXII). The Euclidean works on optics in *Monac.gr.* 361a are also copied from *Vat.gr.* 191 (*EOO* VII XXIII); as for *Phaenomena* **b**, the Munich codex is the prototype of an independent branch of tradition.³⁵ In the portion on oriental paper, it presents extensive corrections, interlinear and *in rasura*, to the text of the *Data*.

Annotators. See above under *Hands*.

Vat.gr. 2338

Structure. A composite manuscript, ff. I + 44, made of four codicological units, ff. 1–22, 23–38 (both thirteenth century), 39, and 40–44 (both seventeenth century); ff. 40^v, 41^v–42^r, 43^v–44^r are blank. First codicological unit dating to second half of thirteenth century, oriental paper, mm 345×255. Quire structure largely dependent on recent binding; no quire numbering. Upper margin of all folios severely damaged. Diagrams are placed in the margins.

Hands. Penned by one single hand on 60 lines per page, coinciding with the copyist responsible of ff. 31^r–41^v, 44^r–45^v of *Monac.gr.* 361a. A later hand fills half of f. 8^v, originally blank.

Contents. ff. 1^r–3^r Cleonides *Introductio harmonica*; ff. 3^r–4^v Euclid *Sectio canonicis*; ff. 5^r–8^r Gaudentius *Introductio harmonica*; f. 8^v (originally blank) *secessionum a Romana Ecclesia orientali index*; ff. 9^r–10^r Theon of Smyrna *excerpta musica* (*Exp.* 46.20–57.6 Hiller); ff. 10^r–12^v [Pappus], *immo* Cleonides, *Introductio harmonica*; ff. 12^v–21^v Aristoxenus *Elementa harmonica* 1–3 (Book 1, ff. 12^v–16^r; 2, 16^r–19^v; 3, 19^v–21^v); ff. 21^v–22^v *Excerpta Neapolitana* (*MSG* 411–420 and 266–271).

³⁵ C. Czinczenheim, *Euclidis Phaenomena* (Paris, forthcoming). The filiation relations between the manuscripts established in *EOO* by Heiberg and Menge prove to be unreliable, especially as regards Euclid's minor works.

Stemmatic relations. *Vat.gr.* 2338 is the prototype of an independent branch of the tradition for all musical writings it contains.³⁶ It was added to the manuscript collection of the Vatican Library by Giovanni Mercati (the codex was formerly held by the church of Sant' Andrea della Valle in Rome) and therefore unknown to *MSG*.

Annotators. Five hands.³⁷ In almost all its interventions, hand A restores segments of text omitted by the main copyist (most of them are κείμενον integrations), among which figures the beginning of Book 2 of Aristoxenus' *Elementa harmonica*. It is thus apparent that A collates the copy with its model.

- hand A (end thirteenth century = Da Rios' A³): ff. 1^r, 2^r–3^r, 3^v–4^r (diagrams), 4^r–^v, 5^v–6^r, 10^r–12^r, 13^v, 15^r–16^v, 17^v–18^r, 19^v, 20^r–21^v, 22^v;
- hand B (end thirteenth century = Da Rios' A⁴; it coincides with hand C of *Monac.gr.* 361a): ff. 9^r, 14^v;
- hand C (Philotheos of Selymbria = hand F of *Monac.gr.* 361a = Da Rios' A²): ff. 1^v, 4^r–^v, 5^r (he traces over the first lines of the main text), 5^v, 6^r–^v, 9^r–^v (he traces over most of the main text of f. 9^r and the first lines of f. 9^v), 12^r, 14^v, 15^r–^v, 16^r, 17^v, 18^v, 22^r;
- hand D (end fourteenth century): f. 1^v;
- hand E (beginning fifteenth century):³⁸ f. 8^v.

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³⁶ See *AEH* LVI–LXXV, for Aristoxenus; Barbera, *Euclidean* 63–79, for the *Sectio canonis*; Solomon, *Cleonides and Philologus* 127 (1983) 247–253, for Cleonides (both transcriptions).

³⁷ Cf. *AEH* XXI–XXII and LVII–LXXIV, whose partition of the hands is also marked in the list below. All interventions in Aristoxenus' text are recorded in *AEH*'s apparatus.

³⁸ This is Marc, copyist of Paris, Bibliothèque nationale de France, *Coislin* 243 (*Repertorium der griechischen Kopisten 800–1600* II 362): see Gioffreda, *Tra i libri*, sect. IV.2.