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*DE SYNEMMENIS* AND ITS TRADITION:  
CONTRIBUTION TO THE STUDY OF MONOCHORD MEASURING  
TOWARDS THE END OF THE THIRTEENTH CENTURY

The division of the monochord was probably among the most fertile and richly imaginative areas in medieval music theory. In 1953 Smits van Waesberghe had identified seventeen different procedures based on 71 measuring methods compiled between c850 and c1200, transmitted in a corpus of altogether 107 witnesses.<sup>1</sup> The appearance of RISM B III, the still ongoing manuscript inventory of medieval music theory, and the expansion of its chronological range to c1500, bring the corpus of authors to a total of about 180, and prompt a review of that typology.

Unlike other areas in Medieval musical pitch theory,<sup>2</sup> monochord measurement has remained significantly underexplored, despite important work done in recent years.<sup>3</sup> This neglect may be due in part to the tentative nature of studies devoted to the origins and development of the medieval pitch system, but also to a prejudice, not wholly unjustified, against the hegemony of the Medieval Pythagorean system. Nevertheless, Michael Markovits's study of the origins of the pitch system, and of the scales in the Carolingian and Ottonian periods, has offered a wealth of perspectives that bring home the central importance of monochord measurement to that system. In particular, it has allowed us to see more clearly the relations between procedures of string division, on the one hand, and, on the other, such decisively important theoretical models as scale construction (tetrachordal or heptatonic) or the theory of modal octaves. It has also affirmed the monochord's fundamental role, not only in music pedagogy, but also more generally in the physical, geometric, and sometimes mathematical approaches of the pitch system, and their practical implications in the determination of organ pipe measures or the weight proportions of bells. The following observations regarding the « monochord of *ficta* steps » will provide one sample of the theoretical implications of monochord division.

[84]

The chronological boundary of 1200 adopted by Smits van Waesberghe was based on the view that procedures of monochord division had exhausted themselves after that date.

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<sup>1</sup> J. Smits van Waesberghe, *De musico-paedagogico et theoretico Guidone Aretino eiusque vita et moribus* (Florence, 1953), pp. 151–185.

<sup>2</sup> J. Smits van Waesberghe, *Cymbala. Bells in the Middle Ages* (Rome: American Institute of Musicology, 1951; *Musicological Studies and Documents*, 1); Klaus-Jürgen Sachs, *Mensura fistularum. Die Mensurierung der Orgelpfeifen im Mittelalter* (Stuttgart, 1970).

<sup>3</sup> Particularly the studies by Cecil Adkins, *The Theory and Practice of the Monochord* (Ph.D. diss., University of Iowa, 1963; also, by the same author, « The Technique of the Monochord », *Acta musicologica*, XXXIX [1967], 34–43) and Michael Markovits, *Das Tonsystem der abendländischen Musik im frühen Mittelalter* (Bern: P. Haupt, 1977; *Publikationen der schweizerischen musikforschenden Gesellschaft*, Series II, vol. 30).

This view calls for a reconsideration. The *Musica speculativa* (1323) by Johannes de Muris,<sup>4</sup> and the *Parvus tractatulus de modo monacordum dividendi* (1413) by Prodocimo de Beldomandi,<sup>5</sup> demonstrate that the monochord remained in use both as a practical tool and as a research instrument, and that it continued to claim the attention of theorists engaged in reflection on the pitch system. Moreover, one can observe a resurgence of interest in the monochord in the last third of the thirteenth century, as witnessed by the measuring method offered in *Sequitur de synemmenis*,<sup>6</sup> a treatise in whose tradition Prodocimo's *Tractatulus* actually situates itself.

The measuring method *de synemmenis* proposes two monochord divisions. The first yields the intermediate steps between F and G, c and d, G and a, D and E, b *mollis* and b *quadratus*, as well as their octaves within the scale  $\Gamma - e^c$ . These steps are generated by means of successive ascending fifths starting on B in the first octave; their octave equivalents are obtained through division or multiplication. The second division produces the same steps (between D and E, G and a, C and D, F and G, and their octaves), but by means of successive ascending fourths starting on b *mollis*. This particular method of establishing *ficta* steps is not known to us from any other treatise.

*De synemmenis* is transmitted in two manuscripts that were once kept at the Benedictine Abbey of Bury St Edmunds.<sup>7</sup> Its transmission history is of some interest and merits a brief review. In both of its sources, *De synemmenis* is copied as a sort of appendix directly after the well-known treatise by Anonymous IV. Its dependence on this latter treatise is made explicit by the incipit «*Sequitur*», which is attested in both sources. Anonymous IV, as well known, was directly acquainted with music teaching traditions at Paris. According to F. Reckow, he was probably a master from the Parisian environment who was familiar with the teachings of Johannes de Garlandia.<sup>8</sup> His treatise, Reckow suggests, was written for the use of English students, and must have been put together some time after the compilation of Franco's *Compendium*, which according to recent research<sup>9</sup> is datable around 1280. In the light of all this, one cannot help wondering: is there any possibility that the treatise *De synemmenis*, despite its

[85]

exclusively English transmission, was the product of Parisian teaching traditions as well?

The Bibliothèque nationale at Paris keeps, under the call number Lat. 18514 (abbreviated hereafter as P), a manuscript that originally belonged to the library of the

<sup>4</sup> For the transmission history of this treatise, see U. Michels, *Die Musiktraktate des Johannes de Muris* (Wiesbaden, 1970; *Beihefte zum Archiv für Musikwissenschaft*, 8), pp. 17–24. Ms. Elzbieta Witowska-Zaremba (Warsaw) is preparing an edition of version A of this treatise.

<sup>5</sup> Prodocimo de' Beldomandi, *Brevis summula proportionum (...) and Parvulus tractatulus de modo monacordum dividendi*, a new critical text and translation (...) by Jan Herlinger (Lincoln, London: University of Nebraska Press, 1987; *Greek and Latin Music Theory*; see the review of this edition in *Revue de musicologie*, 73 [1987], 270–271).

<sup>6</sup> Ed. Jan Herlinger, *op. cit.*, pp. 123–135.

<sup>7</sup> *GB LBl* Royal 12 C. VI, fols. 80<sup>v</sup>–81<sup>v</sup>, Cotton Tiberius B. IX., fol. 224<sup>r-v</sup>.

<sup>8</sup> Fritz Reckow, *Der Musiktraktat des Anonymus 4* (Wiesbaden, 1967; *Beihefte zum Archiv für Musikwissenschaft*, 4 and 5), II, pp. 1–22. See also Max Haas, «Die Musiklehre von Garlandia bis Franco», *Die Mittelalterliche Lehre von der Mehrstimmigkeit* (Darmstadt, 1984; *Geschichte der Musiktheorie*, ed. Frieder Zaminer, 5), p. 100.

<sup>9</sup> Cf. Wulf Arlt and Max Haas, «Pariser modale Mehrstimmigkeit in einem Fragment der Basler Universitätsbibliothek», *Forum musicologicum. Basler Studien zur Musikgeschichte*, I (1975), p. 233.

Collège de Navarre.<sup>10</sup> This volume contains two texts: Boethius's *De institutione musica* (f. 1-85<sup>r</sup>),<sup>11</sup> and a treatise that brings together elements of both « speculative » music and plainchant (f. 85<sup>r</sup>-94<sup>r</sup>).<sup>12</sup> This second treatise is copied directly after the *Musica* of Boethius, and fills out the last gathering.<sup>13</sup> The manuscript as a whole appears to be the work of a single scribe. The volume has been dated variously in the thirteenth century (Royer, RISM A III<sup>1</sup>) and the fourteenth (L. Delisle; C. M. Bower<sup>14</sup>). Both the decoration (f. 19<sup>v</sup>, 29<sup>v</sup>, 30, 51<sup>v</sup>, 81<sup>v</sup>) and the script suggest a date in the first third of the fourteenth century. According to C. Bower the manuscript was probably copied in Southwest France, possibly after an exemplar from Normandy. The *ex libris* is comparatively late (towards the end of the sixteenth century), and we cannot be certain that the volume was kept at the Collège de Navarre during the fourteenth century.<sup>15</sup>

The second treatise is headed by an inscription in red ink, in which the contents are explicitly linked to the preceding *De institutione*: « Tractatus de musica collectus ex hiis quae dicta sunt a Boetio supra atque declaratio musice practice ». This *Tractatus de musica*, then, consists of a « musica speculativa » and a « musica practica ». The first « speculative » part includes a general classification of music, a definition of the diatonic, chromatic, and enharmonic genera, a short treatise on proportions, another on specifically musical proportions, and finally a treatise setting forth three monochord divisions. It is this latter treatise that will concern us here. The second « practical » part continues with the study of the monochord and successively expounds the principles of alphabetic notation, the « proprieties of the voces » (the three positions of the hexachords), the « diastematisation » of pitch heights, the theory of *mutatio*, and finally the theory of intervals.

[86]

<sup>10</sup> Its provenance is attested by an *ex libris* from the late fifteenth or early sixteenth century: « Pro libraria Regalis collegii Campaniae alias Nauarrae parisius fundati » (f. 94<sup>r</sup>). Cf. H. Omont, *Catalogue général des manuscrits français. Ancien petit fonds français*, III (Paris, 1897), p. 411, no. 95.

<sup>11</sup> The copy of *De institutione musica* by Boethius ends with the words: « uero ut in diatonicis generibus nusquam vna. LONGOBARDORVM invidia non. Explicit MVSICA ». The same tag « Longobardorum invidia non » is found also in the Bruges manuscript directly after the « regular » explicit (Bruges, Bibliothèque publique, Ms. 531; 11th c.) where it was added at a later point (?13th c.). Cf. Roger Bragard, « Boethiana. Études sur le *De Institutione Musica* de Boèce », *Hommages à Charles Van Den Borren* (Antwerp, 1945), 84–139, cf. p. 123.

<sup>12</sup> Cf. RISM B III<sup>1</sup>, pp. 124–125. Léopold Delisle, *Inventaire des manuscrits latins (...) numéros 16719–18613* (Paris, 1871), p. 100. Louis Royer, « Catalogue des écrits des théoriciens de la musique conservés dans le fonds latin des manuscrits de la Bibliothèque nationale », *L'Année musicale*, III (1913), 239–240.

<sup>13</sup> The manuscript is made up of eight senios: f. 1-12, 13–24, 25–36, 37–48, 49–60, 61–72, 73–84, 85–94 (VI-2). The gatherings are marked: a b c d e f g j [!].

<sup>14</sup> Calvin M. Bower, « Boethius *De institutione musica*: A Handlist of Manuscripts », *Scriptorium*, XLII/2 (1988), 205–251, esp. p. 236.

<sup>15</sup> The Collège de Navarre, second in importance after the Sorbonne, and seat of the French nation, was founded in 1316. The oldest catalog of the library of the Collège de Navarre dates from the seventeenth century (and is devoted only to French manuscripts). Cf. *Bibliothèques de manuscrits médiévaux en France*, A.-M. Genevois, J.-F. Genest, A. Chalandon (Paris: C.N.R.S., 1987), pp. 165–166. On the Collège de Navarre in the fourteenth and fifteenth centuries, see Gilbert Ouy, « Le Collège de Navarre, berceau de l'humanisme français », *Actes du 95<sup>e</sup> Congrès national des Sociétés Savantes (Reims, 1970)* (Paris, 1975), vol. 1, p. 276–299, and Isabelle Chiavassa-Gouron, *Les lectures des maîtres et des étudiants du Collège de Navarre: un aspect de la vie intellectuelle à l'Université de Paris (1380–1520)*, Thèse de l'École Nationale des Chartes, Paris, 1985. Cf. *École Nationale des Chartes. Positions des thèses (...) de 1985* (Paris, 1985), pp. 31–37.

The *Tractatus* is known to us from two other manuscript versions; I speak of « versions » since there are numerous variants which indicate that we are not dealing with copies *stricto sensu*. Yet the connection between the three sources is indisputable. The two other sources are the following:

1. *Rome, Biblioteca Vaticana, Vat. lat. 5325* (abbreviated below as V<sub>1</sub>). Parchment; 30 folios; 137–139 × 91 mm; early fourteenth century (according to B. Bischoff); French origin.<sup>16</sup> In this source, which is roughly contemporary with the manuscript in the Bibliothèque Nationale (lat. 18514), the treatise is followed by a copy of Johannes de Garlandia's *De mensurabili musica* (f. 12–30<sup>v</sup>). The text that concerns us here appears on f. 1–11<sup>v</sup>:  
 1<sup>r</sup>: « Mvsica est ueraciter canendi scientia... » 9<sup>v</sup>: « ... et sic omnes consonantiae in infinitum possunt ascendere ».  
 10<sup>r</sup>: « Super sonum datum ascendere semitonium et ab eodem alium at similiter descendere... »  
 11<sup>v</sup>: Expl. « ... Ascendere dyapason descendere ditonum cum diapente etc. et similiter descendere ».
2. *Rome, Biblioteca Vaticana, Barb. lat. 307* (abbreviated below as V<sub>2</sub>). Parchment; 33 folios; c270 × c308 mm; late fourteenth century; Italian origin.<sup>17</sup> The concordant text has been associated with the *Ars nova* by Philippe de Vitry.  
 17<sup>r</sup>: « Musice tria sunt genera: mundanum, humanum et instrumentale... »  
 20<sup>v</sup>: Expl. « ... sicut maius tempus perfectum. Explicit ars nova magistri philippi de vetri. deo gratias amen amen amen ».

The scope of this enquiry does not permit us to deal in depth with this text and its transmission. Yet we may take it as accepted that Philippe de Vitry was not the author. There are two reasons for this: first, the earliest sources P and V<sub>1</sub> were probably copied before Vitry was active as a theorist; second, the other two sources for the *Ars nova* (*F Pn* 7378A, f. 16<sup>v</sup>–62 [fourteenth century] and *GB Lbl* Add. f. 1–6 [c1400]) do not contain this treatise at all. On the other hand, the section « Scientia est cognitio rei sicut est... », which is found exclusively in the P version, was cited by Hieronymus de Moravia, who attributed it to Johannes de Garlandia. On the basis of this citation, E. Reimer has brought together a range of indications which justify extending the attribution to the treatise as a whole.<sup>18</sup>

A study of the measuring methods in P adds a further element to Reimer's hypothesis. The version P does in fact contain three methods,<sup>19</sup> of which the last allows the derivation of *ficta* steps by means of a procedure comparable to those in *De synemmenis*. Given that *De synemmenis* appears to be part of the treatise by Anonymous IV, an author who probably had received direct instruction in the theory of Garlandia, this « concordance » [in measuring methods] strengthens the possibility of Garlandia's authorship of the P version. This new indication seems all the more compelling since the Parisian Dominican Hieronymus of Moravia gives a reading very close to the completely original definition

<sup>16</sup> Description of the manuscript in Erich Reimer, *Johannes de Garlandia: De mensurabili musica* (Wiesbaden, 1972; *Beihefte zum Archiv für Musikwissenschaft*, 10 and 11), vol. I, pp. 18–19. See also RISM B III<sup>2</sup>, pp. 100–101.

<sup>17</sup> See the description by Pieter Fischer in RISM B III<sup>2</sup>, pp. 102–103 and Gilbert Reaney, André Gilles and Jean Maillard, *Philippi de Vitriaco Ars Nova* (American Institute of Musicology, 1964; *Corpus scriptorum de musica*, 8), pp. 10–11, siglum V.

<sup>18</sup> Reimer, *op. cit.*, vol. I, pp. 4–10.

<sup>19</sup> The version V<sub>1</sub> lacks a folio which probably contained the measuring method or methods. The version V<sub>2</sub> transmits only the second of the three methods of P.

of the « synemmenon » in the *Tractatus de musica*,<sup>20</sup> which strengthens the hypothesis of Continental (specifically Parisian) provenance of *De synemmenis*.

[87]

The chapter devoted to the monochord is preceded by a long introduction which deals, on the one hand, with the complementarity of the intervals that constitute the octave, fourth, major third and whole tone, and, on the other, with the diatonic construction of the monochord. This second part is based on an approach that is both tetrachordal and octochordal (or heptatonic). The author distinguishes three « orders » that correspond, respectively, to the octaves  $\Gamma$ – $G$  and  $G$ – $g$  and the steps  $g$ – $d^d$ . Nevertheless, the internal articulation — which will require the procedure of monochord division — follows a tetrachordal composition built on an ascending TTS tetrachord. The first « order » consists of two conjunct tetrachords TTS ( $\Gamma$ – $C$ ,  $C$ – $F$ ) plus a whole tone ( $F$ – $G$ ), thereby realising the octave construction « bis diatessaron cum tono » (which is precisely one of the theoretical premises of the introduction in question).

Yet it seems that the author of this text was also familiar with a more sophisticated approach to the pitch system. The three manuscript versions of the introduction all agree on a curious phrase that appears again and again in the text (« usque ad .xii.d. »), and which the editors of the *Ars nova* (CSM 8) chose to emend to « .viii.G. » and « .xv.g. »

The text is as follows:

Item si uis super lineam datam constituere omnes proporcionis musice secundum diatonicum genus, primo ponendus est tonus deinde alius tonus postea semitonium etc. usque ad .xii.d.

If you wish to mark on a given line all the musical proportions according to the diatonic *genus*, then you must first write a whole tone, then another whole tone, then a semitone, and so forth until .xii.d.

If we are to assume that « .xii.d. » signifies the twelfth step of the scale, that is, « d » [counting from  $\Gamma$ ], then the expression makes little sense here, all the more so as the very same expression is used in connection with the second « order » ( $G$ – $g$ ). The unanimous agreement between the sources should surely persuade us rather to keep the text and to revise our interpretation instead.

As it happens, the expression takes on a very precise meaning if we interpret the letter « d » as an abbreviation of « diesis » Thus the author could have indicated that one proceeds by juxtaposition: tone – tone – semitone, until the number of *diesis* has reached twelve. The issue of the subdivision of the tone was in fact addressed quite frequently from the last third of the thirteenth century onwards, and the concepts of *diesis* (*semitonium minus*) and *apotome* (*semitonium maius*) are entirely relevant and testify to the attentive reading of Boethius's *De institutione musica*.<sup>21</sup> An important humanist

<sup>20</sup> Cf. *Tractatus de musica compilatus a fratre Jeronimo Moravo...*, ch. 23, ed. Cserba, pp. 172.29–173.3. Esther Lenaerts-Lachapelle, Guy Lobrichon and Marcel Pérès are currently preparing a new edition and translation of this text.

<sup>21</sup> Especially III, 5 (division of the whole tone according to Philolaus). This chapter was known to Hieronymus de Moravia (*Tractatus*, ch. xv, cf. CS I, p. 32 a–b), yet does not seem to have been read again until after the second half of the thirteenth century. It is not yet encountered among the excerpts from Boethius compiled by Vincent of Beauvais in his *Speculum doctrinale*. On the other hand, Uguccio of Pisa did know the theory, for he wrote the following under the entry « Tono » in his *Derivationes*: « ... Item ponitur semitonus et semitonium non plenus tonus sed est maius et minus semitonium minus appellatur lima uel diesis, maius aphotonie [!] et dicitur [aphotome] quasi decisio quia cum f<sup>e</sup> (?) accedat ad tonum. accedit tum ab integritate toni. lima uel diesis dicitur quasi corruptio quia fit cum quodam planctu uel plausu sed haec melius in philosophia distinguntur » (after Strasbourg, Bib. Nat. et Univ., Ms. 11, fol.

[88] florilegium of arithmetic, geometry and music of Italian origin, clearly of a later date,<sup>22</sup> transmits a vocabulary for pitch heights which includes *ficta* alterations construed in terms of *diesis* and *comma* (f. 116<sup>r-v</sup>),<sup>23</sup> and identifies the twelve *diesis* within the octave (see the table on p. 94–95). If the letter « d » is an abbreviation of the word « diesis », then it seems reasonable to conclude that the author knew and practised a « chromatic » division of the scale such as given, for example, in the treatise *De synemmenis*.

The principle of tetrachordal construction starting from the lowest step (Γ) also underlies the first measuring method of our treatise. This measuring method, « secundum Guidonem monachum sancti Johannis », actually establishes the scale Γ–G through ascending chains of successive whole tones starting on the steps Γ, C and F. The first three « steps » of this measuring method do indeed agree with the procedure introduced in the *Dialogus de musica* and adopted by Guido of Arezzo in his *Micrologus*.<sup>24</sup> The same procedure is applied also to the octave G–g. The second measuring method, « secundum optimos practicos », and the only one, incidentally, which is found also in V<sub>2</sub>, proceeds similarly from low to high, but by means of a series of fourths (fourfold divisions of the string or string segments) and fifths (threefold divisions), alternating with octaves (twofold divisions or duplications): Γ–D–a, Γ–C–F, A–E–h, F–b.<sup>25</sup>

The text *Synemmenon est additio* consists of three parts: the first supplies a definition of « synemmenon », the second describes the method of dividing the string, and the third continues with a commentary justifying the use of *ficta* steps. It is important to recall that the entire text is known to us only from the version P. On the other hand, Hieronymus of Moravia and the author of *De synemmenis* undoubtedly knew the tradition from which P sprang.

Let us begin with the measuring method proper. The method in P involves only fifths, fourths, and octaves, just like the two methods in *De synemmenis*. But unlike the latter, it defines no more than a few *ficta* steps.

1. ascending fifth starting from B: .TO. between .F. and .G. [F<sub>2</sub>#, then F<sub>3</sub>];
2. ascending fifth starting from [F<sub>2</sub>]: .TO. between .c. and .d. [C<sub>3</sub>#, then C<sub>4</sub>#, C<sub>2</sub>];
3. ascending fifth starting from [C<sub>2</sub>]: .TO. between .G. and .a. [G<sub>2</sub> then G<sub>3</sub> and G<sub>1</sub>];
4. descending octave from .b. [B<sub>1</sub>];
5. ascending fourth starting from [B<sub>1</sub>]: .TO. between .D. and .E. [E<sub>2</sub>, then E<sub>3</sub> and E<sub>4</sub>].

The mark « .TO. » corresponds to the term « crux » which in *De synemmenis* may designate either our sharp or our flat.<sup>26</sup> It is important to note that the measuring method

136<sup>f</sup>). The forthcoming edition of the glosses on Boethius's *De institutione musica* will make it possible to determine whether this is a quotation from Boethian glossography.

<sup>22</sup> Catania, Biblioteca civica, Ursino Recupero D.39 (copied around 1473). Not in RISM BIII<sup>2</sup>. There is a good description of the manuscript in J. Herlinger, *op. cit.*, pp. 17–26.

<sup>23</sup> Edition of the table in J. Herlinger, *op. cit.*, pp. 142–147.

<sup>24</sup> GS I, 252 ff. and *Micrologus*, ch. III. Cf. Smits van Waesberghe, *op. cit.*, p. 172 (Methodus III, mensura 38<sup>a</sup>).

<sup>25</sup> This measuring method does not correspond to any of the methods identified by Smits van Waesberghe.

<sup>26</sup> The author of *De synemmenis* does however distinguish between the « crux dura vel laborifera » (corresponding to the sharp; cf. Herlinger, *op. cit.*, p. 128.14–15) and the « crux dulcedinis vel mollitudinis » (corresponding to the flat, *ibid.*, p. 130.6). The author also underlines that the first corresponds to a division of the octave in fifth + fourth, and the second to a division of fourth + fifth (*ibid.*, p. 128.12–16).

in P corresponds exactly with the first three steps of the first measuring method of *De synemmenis*, and also to the first two steps of its second measuring method. Although Hieronymus de Moravia does not cite any procedure for establishing *ficta* steps, he does describe a « chromatic » scale obtained through the transposition of an ascending tetrachord STT on the steps  $\Gamma$  A C D F G c d f and g.<sup>27</sup> [89]

Let us move on to the explanations that accompany the measuring method, first of all the definition of the term « synemmenon ». Although Hieronymus de Moravia defines the « synemmenon » as an STT tetrachord, he also shares with the authors of P and *De synemmenis* a more specific understanding of the term, in which it stands for the .b. of the second octave. This meaning is already encountered among German theorists of the eleventh century,<sup>28</sup> and there are traces of it in certain monochord measurements from the same period which indicate B<sub>b</sub> with the help of the letter « S ».<sup>29</sup> For the author of *De synemmenis* the term is thus quite naturally synonymous with « crux ».<sup>30</sup> The author of P is even more explicit: « synemmenon » is « the string that was added to the monochord ». Lastly, Hieronymus of Moravia provides an etymological definition which oddly underlines the notion of a defect, and not the « conjunction » which characterises this tetrachord.<sup>31</sup> This notion of defect, which also appears in another more abstract definition by Hieronymus de Moravia,<sup>32</sup> and which is found also in P, finds its explanation in the « euphonious » character of the alteration. The definition is as follows:

Hieronymus de Moravia:	Synemennon est additio	abundantiae
P:	Synemmenon est additio superhabunda[n]tie uel	
	sive diminutio proportionum diatonici	per
	restrictio <sup>33</sup> sive diminutio proportionum diatonici generis	per
	modum harmoniae sumptum (Cserba)	
	modum armonie sumpta	

This definition specifies more precisely the alteration which a step undergoes as it is affected by augmentation<sup>34</sup> or diminution on the order of a *semitonium maius*.<sup>35</sup>

The three texts (Hieronymus de Moravia, P, and *De synemmenis*) also share a particularly curious usage found nowhere else: « Protosynemmenon, Deutero-

<sup>27</sup> *Tractatus de musica*, ch. 23; Cserba, *op. cit.*, p. 173.3–12. The scale obtained is the following:  $\Gamma$  A A<sub>b</sub> B<sub>b</sub> B C D<sub>b</sub> D E<sub>b</sub> E F G<sub>b</sub>, etc. up to c<sup>c</sup>.

<sup>28</sup> This meaning is attested from the eleventh century onwards. Thus in William of Hirsau (cf. *CSM* 23, p. 65), Aribo (cf. *CSM* 2, p. 34), and then in the 12th c. with Johannes de Afflighem (cf. *CSM* 1, p. 103).

<sup>29</sup> Cf. J. Smits van Waesberghe, *De musico-paedagogico*, *op. cit.*, measures nos. 4, 6, 16 (Frutolf), 17 (*Quaestiones in musica*), 32, 35.

<sup>30</sup> « crux sive synemmenon » (Herlinger, *op. cit.*, p. 128.12).

<sup>31</sup> « Dicitur autem synemmenon a syn, quod est con, et mene, defectus, quasi cum defectu » (Cserba, p. 173.12–14).

<sup>32</sup> *Tractatus de musica*, ch. 23; Cserba, p. 172.29–30.

<sup>33</sup> restrictionis] *ms.*

<sup>34</sup> The term « abundantia/superhabundantia » corresponds to the principle « habundans » (/« minuans ») used in P for the position of the F<sub>#</sub>: « Protosynemmenon (...) dicitur habundans .F. et minuens .G. ».

<sup>35</sup> P clarifies besides that the « synemmenal » step is obtained from (and designated after) the apotome: « Omne synemmenon ex parte maioris semitoni accipitur sive denominatur ».

[90] synemmenon, Tritesyntemmenon, Tetrasyntemmenon ». Evidently we are dealing here with a typically scholastic conceptual invention which associates the terminology of the four modes with the Boethian concept of «synemmenon ». The latter concept is understood here, not in the sense of a tetrachord, but rather in the sense — clarified a moment ago — of an altered step.

It remains for us to clarify the methods that led the author of the treatise to apply this verbal usage to altered steps. Only the text of P offers some clues here. The correspondence between the usage of the *synemmena* and the altered steps comes down to this:

Protosyntemmenon:	F $\sharp_2$
Deuterosyntemmenon:	B $\flat_2$
Tritesyntemmenon:	E $\flat_3$
Tetrasyntemmenon:	B $\flat_1$

This usage raises at least two questions: what does the order imposed by the usage correspond to? And why are there only four altered steps, when the measuring method yields at least five (that is, including the G $\sharp$ )? These two questions are related. We may try to answer them by analysing the derivation of those steps in the context of a more general theory of the pitch system. To that end the text of P provides some indications:

- The F $\sharp_2$  makes it possible to realize the upper fifth of B grave and thus to divide the octave B $_1$ –B $_2$  according to the so-called harmonic division.
- The E $\flat_3$  makes it possible to realize a fourth starting on B $\flat_2$ .
- The B $\flat_1$  yields the octave grave<sup>36</sup> of B $\flat_2$ .

The explanations of the F $\sharp$  and B $\flat$  are based on an approach conceived in terms of the octave, while the E $\flat$  can be explained in terms of a TTS tetrachord starting on B $\flat$ . The introduction of these steps does however call for some commentary. It is known that the absence of the F $\sharp$  and the B $\flat$  grave from the monochord constituted a major difficulty in plainchant theory since the eleventh century. The difficulty arose, in part, in the theory of the affinities between scale steps. It is especially apparent in Guido of Arezzo when he is dealing with the impossibility of defining a step in affinity with the fourth-mode finalis .G. (F G a h c). On the one hand, the association with the step .D. leads inevitably to change in mode due to an amphibology with the first mode. On the other hand, the solution:

		T		T		T		S
quartus modus:	F		G		a		h	c
	C		D		E		f $\sharp$ !	G

is impossible because of the absence of the F $\sharp$  on the monochord.<sup>37</sup> The same difficulty arises with the transposition of certain melodies at the fifth or at the fourth. The

<sup>36</sup> Several measuring methods from the late 11th and 12th c. already contain this step. Cf. J. Smits van Waesberghe, *De musico-paedagogico, op. cit.*, measurements nos. 15 and 16 (Frutolf), 49, 52, 56.

<sup>37</sup> Cf. *Micrologus*, ed. J. Smits van Waesberghe (Rome: American Institute of Musicology, 1955: *Corpus scriptorum de musica*, 4), ch. VII.



Communio *Beatus servus*, discussed at length by Johannes de Afflighem,<sup>38</sup> offers a typical example of the problem posed by the absence of the F# from the first octave.

These two examples, to which one could add plenty of others, offer a glimpse of the progressively widening gap between, on the one hand, the pitch system imposed by the diatonic monochord, and on the other, the formalisations of modal theory and the vagaries of musical practice. The monochord of the *ficta* steps, and in this case its « tetrasynemmenal » structure, reflect an apparent attempt to narrow that gap. The numbering of the *ficta* steps (protus, deuterus, tritus, tetrardus) shows besides that these steps are obtained within the framework of a systematic realisation of the double octave division, according to the order of the steps in the diatonic monochord:<sup>39</sup>

[91]

*Harmonic division*

Γ — D — G  
 A — E — a  
 B — F# — h [protosynemmenon]  
 C — G — c  
 D — a — d  
 E — h — e  
 F — c — f  
 G — d — g  
 a — e — a<sup>a</sup>  
 b — f — b<sup>b</sup>  
 b — B<sub>b</sub> [tetrasynemmenon]

*Arithmetic division*

Γ — C — G  
 A — D — a  
 B — E — h  
 C — F — c  
 D — G — d  
 E — a — e  
 F — b — f [deuterosynemmenon]  
 G — c — g  
 a — d — a<sup>a</sup>  
 b — e<sub>b</sub> — b [tritesynemmenon]

The « tetrasynemmenal » organisation put in place in this way can be considered as the embryonic model for the progressive determination of *ficta* steps, leading ultimately to the generalisation of the system in *De synemmenis*. As far as we can tell from the sources we have, it seems that this evolution – of which the treatise of P represents only one stage – took place in the course of barely one generation, the generation of Johannes de Garlandia, within the restricted environment of the University of Paris.

The determination of *ficta* steps on the monochord seems to answer a double need: first, that of reinforcing the coherence of a pitch system conceived on the basis of the octave and the heptatonic scale (Γ — F), and second, the more practical need to adapt the monochord, the traditional musical teaching instrument,<sup>40</sup> to changes in musical practice. The breaking-down of the diatonicism « inherited » from the *systema teleion* starts in the last third of the thirteenth century, that is, after two centuries of « modal casuistry » perpetuated by the commentators on Guido de Arezzo, and it prepares from afar the

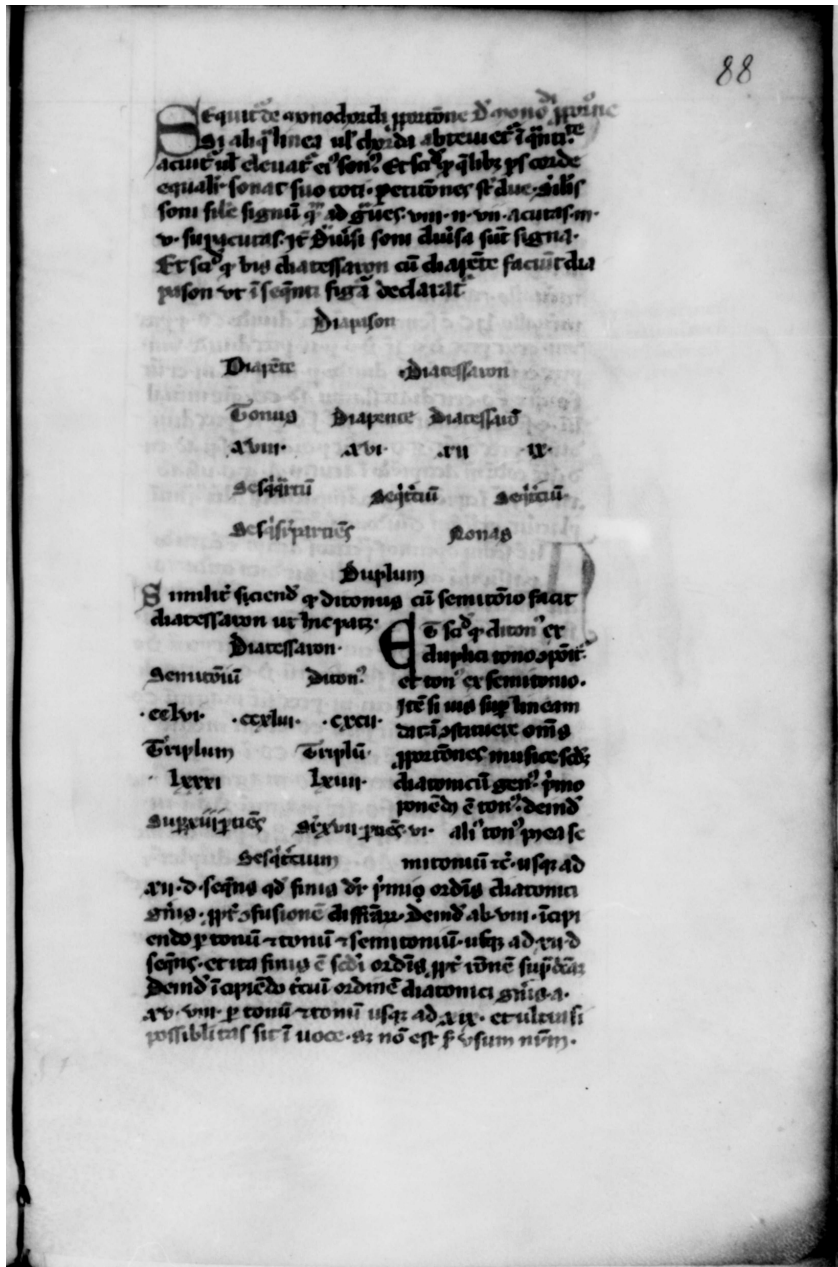
<sup>38</sup> *Musica cum tonario*, ed. J. Smits van Waesberghe (Rome: American Institute of Musicology, 1950: *Corpus scriptorum de musica*, 1), ch. XXI, p. 137. Regarding this piece, one could also refer to the synoptic transcriptions offered in G. Jacobsthal, *Die chromatische Alteration im liturgischen Gesang der abendländischen Kirche* (Berlin, 1897), pp. 99–115.

<sup>39</sup> This type of approach underlies especially the constructions of Cistercian theory (which however fiercely rejects the *ficta* steps). For this, see especially the *Regulae* of Guido d'Eu. (Claire Maître [C.N.R.S., I.R.H.T.] is currently preparing a new edition of this text). Cf. C. Meyer, « Die Lehre von den Tonarten », *Geschichte der Musiktheorie*, op. cit., vol. 4: *Die Lehre vom einstimmigen liturgischen Gesang* (forthcoming).

<sup>40</sup> Cf. for example M. Markovits, op. cit., pp. 29–30.

revision of the pitch system in general. It is probably no coincidence either that the measuring methods, which remain quite marginal in relation to the dominant currents of medieval monochord theory, arose at the very moment in the history of music theory that the theory of consonant sounds developed as well.

Christian MEYER.



## I

*De monochordi proportione*

Paris, Bibliotheque nationale, Lat. 18514, f. 88r-89v

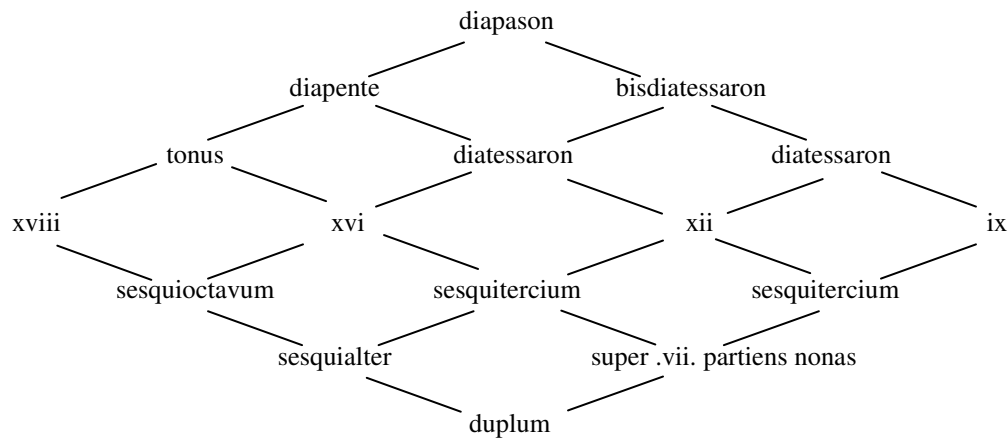
[92]

<88<sup>r</sup>>

De monochordi proportione.

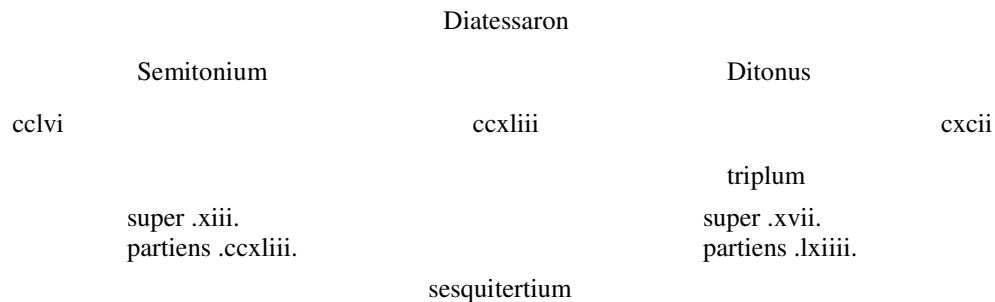
Sequitur de monochordi proportione. Si aliqua linea uel chorda abreuietur in quantitate, acuitur uel eleuatur eius sonus. Et sciendum quod quaelibet pars corde equaliter sonat suo toti. Petitiones sunt due : similis sonus simile signum quantum ad graues .viii., secundus .vii. acutas, tertius .v. superacutas. Item diuersi soni diuersa sunt signa. Et sciendum quod bis diatessaron cum [tono, vel diatessaron cum] diapente faciunt diapason ut in sequenti figura declaratur.

5



[Fig. 1]

Similiter sciendum quod ditonus cum semitonio facit diatessaron ut hic patet.



[Fig. 2]

Fig. 1, 1. 2 diapente diatessaron (*P*); 1. 3 tonus diapente diatessaron (*P*); 1. 4 sesquiquartum *pro* sesquioctavum (*P*); 1. 6 sesquisuperpartiens nonas (*P*) (emended after  $V_1$ ). The connection lines are not given in *P*. They are supplied here after  $V_1$ .

[93] Et sciendum quod ditonus ex duplici tono componitur et tonus ex semitonio.  
 10 Item si uis super lineam datam constituere omnes proporcionis musice  
 secundum diatonicum genus, primo ponendus est tonus deinde alius tonus  
 postea semitonium etc. usque ad .xii.d. sequens, quod finis dicitur primi ordinis  
 diatonici generis propter confusionem differentiarum. Deinde ab .viii. incipien-  
 15 do per tonum et tonum et semitonium usque ad .xii.d. sequens et ita finis est  
 secundi ordinis propter rationem supradictam. Deinde incipiendo tertium  
 ordinem diatonici generis a .xv. per tonum et tonum usque ad .xix. et ultra si  
 possibilitas sit in uoce. Sed non est secundum vsum nostrum.

<88v>

Certitudo passionum monochordi sic accipitur et hoc vno modo secundum  
 Guidonem monachum sancti Johannis. Sit data corda monochordi et uocetur  
 20 .Go. cujus dempta ix<sup>a</sup> parte remanent viii<sup>o</sup> partes et uocentur [.Ao. Item .Ao.  
 dividatur in nona partes, dempta ixa parte, remanent .viii. partes et uocentur]  
 .Ho. Item .Go. diuidatur in .iiii<sup>or</sup> partes. iiii<sup>a</sup> parte dempta remanent .iii. partes  
 quae uocentur .Co. Et sic per diffinitionem, diatonos genus est continens  
 25 tonum et tonum et semitonium. Sed interuallo .FA. et interuallo .AH. est tonus  
 et tonus ergo interuallo .HC. est semitonium. Item diuide .Co. que [per .ix.]  
 partes. .viii. erunt partes .Do. Item .Do. per .ix. partes diuide, .viii. partes erunt  
 .Eo. Item .Co. diuide per .iiii<sup>or</sup> partes, .iii. erunt .Fo. quare .Fo. erit diatessaron  
 ad .Co. quare interuallum .EF. erit semitonium. Item .Fo. per .ix. partes  
 diuidatur, [.viii.] partes erunt. Go. et sic per ordinem usque ad .xii.d. Item  
 30 eodem modo accipiendo in acutis a .Go. usque ad .xii.d. Item incipiendo a .go.  
 in superacutis ulterius quantum placuerit et hoc secundum Guidonem praedic-  
 tum.

Aliter secundum optimos practicos accipienda est certitudo passionum mono-  
 chordi. Sit data corda .Go. cujus medietas sit magnum .Go. et ipsius medietas  
 35 sit paruum .go. Item .Go. diuidatur per .iii. partes cuius .ii. partes sint magnum  
 .Do. cuius medietas sit paruum .do. et istius medietatis sit ultimum .do. Item .  
 Go. diuidatur per .iiii. partes cuius .iii. partes sint magnum .Co., cuius medietas  
 sic sit paruum .co. et istius medietas sit vltimum .co. Item magnum .Co. in .iiii.  
 40 partes diuidatur, cuius .iii. partes sint .Fo. magnum, cuius medietatis  
 sit paruum .Fo. Item magnum .Do. in .iii. partes diuidatur, cuius .ii. partes sint  
 .ao. paruum, cuius medietas sit ultimum .ao. Sed paruum .ao. dupletur et  
 efficietur magnum .Ao. Item magnum .Ao. in .iii. partes diuidatur, cuius .ii.  
 partes sint magnum .Eo., cuius medietas est paruum .eo. et istius medietatis  
 medietas est ultimum .eo. Item magnum .Eo. in .iii. partes diuidatur cuius due  
 45 partes sunt .ho. quadratum paruum cuius medietas est ultimum .ho. dupletur  
 <89<sup>f</sup>> quod efficietur magnum .Bo. quadratum. Item magnum .Fo. diuidatur in  
 .iiii. partes, cuius .iii. partes sint paruum .b. rotundum, cuius medietas sit  
 ultimum .b. rotundum. Et in hoc finitur certitudo omnium passionum  
 monochordi secundum optimos practicos.

50 Synemmenon est additio superhabunda[n]tie uel restrictio siue diminutio  
 proportionum diatonici generis per modum armonie sumpta. Et est nomen  
 nerui siue chorde quae fuit addita monochordo. Huius synemmenon .iiii. sunt

species, scilicet in diatonico genere, videlicet prothosynemmenon, deuterisynemmenon, tresynemmenon, tetrasynemmenon, scilicet trite synemmenon, paranete synemmenon, nete synemmenon. Tamen secundum optimos practicos plura inueniuntur in sectione chorde monochordi cuius extrahendi modus talis est processus. Magnum .Bo. quadratum in .iii. partes diuidatur cujus due partes sint .TO. quae scribitur inter .F. magnum et .G. magnum. Cuius medietas ad .TO. inter .f. et .g. parua. Item primum .TO. in .iii. partes diuidatur, cuius .ii. partes sint .TO. inter .c. et .d. parua cuius medietas est .TO. inter .c. et .d. ultima. Sed .TO. inter .c. et .d. parua dupletur et efficietur .TO. inter .C. et .D. magna. Item .TO. inter .C. et .D. magna in .iii. partes diuidatur, cuius .ij. partes sint .TO. inter .G. magnum et .a. paruuum cuius medietas est uidelicet .TO. inter .g. paruuum et .a. ultimum. Sed ipsa .TO. inter .G. et .a. paruuum dupletur in longitudine et efficietur .TO. inter .Γ. et .A. magnum. Item paruuum .b. dupletur in longitudine et efficietur magnum .B. non usitata inter .A. et .H. magnum quadratum. Sed si [.BO.] diuidatur per .iii.<sup>or</sup>. partes, .iii. partes sunt .TO. inter .D. et .E. magna; quod .TO. inter .D. et .E. mediat in longitudine efficitur .TO. inter .d. et .e. parua. Sed eius medietas facit diapason quod .TO. inter .d. et .e. ultima. Prothosynemmenon dicitur primum inter .F. et .G. magna propter differentiam diapente ad .B. quadratum magnum et propter diatessaron ad .h. paruuum quadratum et ne dissona tritoni in ordine sonorum misceatur et dicitur <89v> habundans .F. et minuens .G. Deuterisynemmenon dicitur secundum synemmenon quod est .b. paruuum rotundum propter hoc quod minuat .h. paruuum quadratum per maius semitonium. Tresynemmenon dicitur tercium synemmenon inter .d. et .e. parua propter differentiam diatessaron ad .b. paruuum rotundum. Tetrasynemmenon dicitur inter .A. et .B. quadratum magnum propter differentiam diapason ad .b. rotundum paruuum vt regula est: omne synemmenon ex parte maioris semitonij accipitur siue denominatur. Supradictorum signorum .viii. dicuntur grauia quia grauem cantum reddunt siue depressum. Alia uero dicuntur acuta quia acutum sonum reddunt. Reliqua dicuntur superacuta quia superacutum sonum reddunt vel quia superacutas ponuntur.

[94]

4 similis soni] *ms* 16 xv.vii] *ms* 50 restrictionis] *ms* 53-54 scilicet...tetrasynemmenon] *corr. in marg.* 60 est a.TO] *ms* 61 inter .C.] addantur .C. *ms* 62 magna in .ii. partes] *ms* 64-65 et a paruuum et .HO. ultimum dupletur] *ms* 65 inter .O. et .A. magnum] *ms*.

## II

Table of steps (excerpt)<sup>41</sup>  
 Catania, Biblioteche Riunite Civica e Antonio Ursino Recupero,  
 Ms. Ursino Recupero D, 39, f. 116<sup>r-v</sup>

	(...)			
	12	Diesis	[G]solreut; lichanos meson	G
		Coma	F per [b] acuta	
	11	Diesis	G per b agregata quantitate apothomes	F
	10	Diesis	Ffaut; perhipate meson	E
	9	Diesis	Elami; hipate meson	F
		Coma	D per [b] acuta quantitate apothomes	
[94]	8	Diesis	E per b agregata quantitate apothomes	D
	7	Diesis	Dsolre; lichanos hypaton	
		Coma	[C] per [b] acuta	
	6	Diesis	D per b agregata quantitate apothomes	C
	5	Diesis	Cfaut; [peripate hipaton]	B
	4	Diesis	[b]mi; hipate hipaton	
		Coma	A per b acuta quantitate apothomes	
	3	Diesis	b per b agregata quantitate apothomes	A
	2	Diesis	Are; [proslambanomenos]	
		Coma	[G] per [b] acuta quantitate apothomes	
	1	Diesis	A per b agregata quantitate apothomes	G
			Gamaut; ypanchos	

<sup>41</sup> After J. Herlinger, *op. cit.*, pp. 144, 146 (excerpt).