

Behind the Mirror
Revealing the Contexts of Jacobus's *Speculum musicae*

by

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DEDICATION

For my family

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ABSTRACT

This study addresses the general question of how medieval music theory participated in the discourse of the related disciplines of philosophy, natural science and theology. I focus on a specific instance of scientific inquiry: the fourteenth-century music treatise *Speculum musicae*, written by an author known to us as Jacobus. A detailed analysis of *Speculum musicae* reveals an aesthetic system whose elements are assigned meaning and value through the anagogical relationships that the author posits (either explicitly or implicitly) with systems articulated in philosophical and theological treatises at the turn of the fourteenth century. My central concerns are uncovering the impetus behind the production of this treatise, determining where Jacobus's philosophies fit within particular schools of medieval thought, as revealed through his vocabulary choices, supporting sources, and methods of reasoning, and then extrapolating from these philosophies which rationale (*ratio*) most informs his positions on particular issues, such as his classification of music, or his defense of the ancient art of singing against the modern art. I hope to present a fresh perspective on one of the most important yet one of the most mysterious ages in the history of music. The turn of the fourteenth century was a fascinating time for music: we find musical systems in a pronounced state of flux with various

theoretical solutions proposed in response to the problems of notating this increasingly complex music. Analyzing the background of these theoretical formulations, and assessing the various judgments of “good” practice, and the kinds of arguments used to bolster these judgments, will uncover reasons for the overturning of musical systems and go some way toward explaining the nature of musical change.

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ABBREVIATIONS

General

- CoussemakerH* Coussemaker, Edmond de. *Histoire de l'harmonie au moyen-age*. Paris: V. Didron, 1852.
- CS* Coussemaker, Edmond de. *Scriptorum de musica medii aevi. Novam seriem a Gerbertina alteram collegit nuncque primum edidit E. de Coussemaker*. 4 vols. 1876, facsimile edition; G. Olms: Hildesheim, 1963.
- GroveMO* *Grove Music Online. Oxford Music Online*, ed. Laura H. Macy, <http://www.grovemusiconline.com>
- NCE* *New Catholic Encyclopedia. Prepared by an editorial staff at the Catholic University of America*. 18 vols. New York: McGraw-Hill 1967-<c1989>.
- Notitia* *Johannes de Muris Notitia artis musicae et Compendium musicae. Petrus de Sancto Dionysio Tractatus de musica*. Edited by Ulrich Michels. Vol. 17, *Corpus scriptorum de musica*. [Dallas, Texas]: American Institute of Musicology, 1972.
- SM* *Jacobi Leodiensis Speculum musicae*. Edited by Roger Bragard. Vol. 3, *Corpus scriptorum musicae*. Rome: American Institute of Musicology, 1955-73.
- ST* Thomas Aquinas. *Summa theologiae*. Vol. 4-12. Rome: Leonine Commission, Vatican Press, 1888-1906.

Library Sigla

Austria

<i>A-KR</i>	Kremsmünster, Benediktiner-Stift Kremsmünster,
<i>A-M</i>	Regenterei oder Musikarchiv Melk, Benediktiner-Stift Melk, Bibliothek
<i>A-SPL</i>	Lavantthal, Sankt Paul im Lavanttal, St. Paul, Stiftsbibliothek
<i>A-Wn</i>	Vienna, Österreichische Nationalbibliothek Musiksammlung

Belgium

<i>B-Br</i>	Brussels, Bibliothèque Royale Albert 1.er
<i>B-Gu</i>	Ghent, Rijksuniversiteit, Centrale Bibliotheek
<i>B-Ls</i>	Liège, Bibliothèque de la Grande Seminaire
<i>B-Lsc</i>	Liège, L'église Sainte-Croix
<i>B-LVu</i>	Katholieke Universiteit van Leuven

Germany

<i>D-Baa</i>	Bamberg, Staatsarchiv
<i>D-B</i>	Berlin, Staatsbibliothek zu Berlin Preußischer Kulturbesitz, Musikabteilung

<i>D-Ds</i>	Darmstadt, Universitäts- und Landesbibliothek Darmstadt
<i>D-EF</i>	Erfurt, Stadt- und Regionalbibliothek, Bereich Sondersammlungen
<i>D-KA</i>	Karlsruhe, Badische Landesbibliothek, Musikabteilung
<i>D-Mbs</i>	Munich, Bayerische Staatsbibliothek, Musikabteilung
<i>D-TR</i>	Trier, Seminarbibliothek
<i>Denmark</i>	
<i>D-Kk</i>	Copenhagen, Det Kongelige Bibliotek Slotsholmen
<i>Spain</i>	
<i>E-Bbc</i>	Barcelona, Biblioteca de Catalunya
<i>E</i>	El Escorial, Real Monasterio de San Lorenzo
<i>E-Sc</i>	Sevilla, Catedral Metropolitana (Santa María de la Sede)
<i>France</i>	
<i>F-Pn</i>	Paris, Bibliothèque nationale de France
<i>F-Psg</i>	Paris, Bibliothèque Sainte-Geneviève
<i>F-SDI</i>	St. Dié, Bibliothèque municipale
<i>Great Britain</i>	
<i>GB-Ctc</i>	Cambridge, Trinity College Library
<i>GB-Lbl</i>	London, The British Library

<i>GB-Ob</i>	Oxford, Bodleian Library
<i>Italy</i>	
<i>I-Bc</i>	Bologna, Civico Museo Bibliografico Musicale
<i>I-CATc</i>	Catania, Biblioteche Riunite Civica e Antonio Ursino
<i>I-Fl</i>	Florence, Biblioteca Medicea-Laurenziana
<i>I-Fr</i>	Italy, Florence, Biblioteca Riccardiana e Moreniana
<i>I-FZac</i>	Faenza, Biblioteca Capitolare
<i>I-Ma</i>	Milan, Biblioteca Ambrosiana
<i>I-Na</i>	Napoli, Archivio di Stato
<i>I-PAVu</i>	Pavia, Biblioteca Universitaria Aldini
<i>I-Rvat</i>	Rome, Città del Vaticano, Biblioteca Apostolica Vaticana
<i>I-Su</i>	Siena, Università degli Studi di Siena, Facoltà di Lettere e Filosofia, Storia della Musica, Biblioteca
<i>I-Tr</i>	Turin, Biblioteca Reale
<i>I-Vnm</i>	Venice, Biblioteca Nazionale Marciana
<i>Poland</i>	
<i>PL-WRu</i>	Wrocław, Biblioteka Uniwersytecka
<i>Sweden</i>	
<i>S-Uu</i>	Uppsala, Universitetsbiblioteket

United States

US-BEm California, University of California at Berkeley, Music
Library

US-Cn Chicago, Newberry Library

US-Wc Washington, Library of Congress Music Library

CHAPTER 1

INTRODUCTION

Utinam tales monstruosas nominasset! . . . O quanta abuso, quanta illegalitas, quanta vanitas, quanta insolentia, quanta inutilitas, quanta ruditas! O in notarum figuris quanta praesumptio, quanta confusio! (*SM* 7.27, 56)

Oh, if only he had not named such monstrosities! . . . Oh, so much abuse, so much illegality, so much vanity, so much insolence, so much uselessness, so much rudeness! Oh, so much presumption in his figuring of the notes, so much confusion!¹

This is how we know the *Speculum musicae*: as a somewhat impenetrable tome containing the vehement outbursts of a certain elderly writer, known to us as Jacobus of Liège, furiously scribbling away in the hinterlands, passionately deriding and mocking the new music of his day. But if we look past the derision in these words of Jacobus, we may find a key to understanding this monumental work of music theory: he specifically objects to the particular act of *naming* of these new note forms (or monstrosities, as he calls them) of the *ars nova* style. He is incensed not because this musical style was “invented,” or “practiced” or “discovered,” but that its elements were given legitimacy through their naming within a particular ontological system. We will return to this concept presently.

¹ Unless otherwise noted, all translations are my own.

Perhaps one of the reasons *Speculum musicae* has remained little studied and little understood is the fact that we possess precious few facts concerning the author of *Speculum musicae*. In comparison with the two other major figures of fourteenth-century music theory who are most often mentioned with Jacobus - Johannes de Muris and Philippe de Vitry - we know next to nothing of Jacobus's biography. We have a relatively full account of the residences, occupations and travel of Johannes de Muris.² The outline of his career appears atypical in many

² We are lucky to have several important biographical clues as explicit or notations on the manuscript sources for his treatises. The manuscript *E-E O.II.10* contains copious notes on the various treatises in the manuscript, added over a period of 25 years by Johannes de Muris himself. See: Lawrence Gushee, "Jehan des Murs and his Milieu," in *Musik - und die Geschichte der Philosophie und Naturwissenschaften im Mittelalter*, ed. Frank Hentschel, *Studien und Texte zur Geistesgeschichte des Mittelalters* (Leiden: Brill, 1998), 339-72; Idem, "New Sources for the Biography of Johannes de Muris," *Journal of the American Musicological Society* 22 (1969): 3-26. Johannes's biography is well summarized here: Idem, "Muris, Johannes," *GroveMO* (accessed August 7, 2008). Born in the 1290s in Evreux, Normandy, in the Lisieux diocese, Johannes de Muris was convicted of a murder that he was involved in with his father in 1310 and banished to Cyprus for seven years. The center of his activities from the period 1318 to 1325 was Paris, where in 1318 he was a baccalaureate student at the Faculty of Arts. During this time he was working and possibly resident at the Collège de Sorbonne in the rue Coupe-gueule. He attained the degree of Magister in 1321. In 1326 and 1327 he was at the monastery of Fontevrault (Maine-et-Loire). He was resident in Evreux in 1332 and 1333 (in 1332 he styled himself as "solaris Ebroicensis, tunc rector"). In 1336 and 1337 there are notes to suggest he was back living at the College of Sorbonne. He may have been the "maître Jehan des Murs" listed among the clerks of the household of Philippe d'Evreux, King of Navarre in 1338 to 1342. In 1342 and 1344, Johannes was a canon at the collegiate church in Mézières-en-Brenne (Indre), and he is known to have worked on calendar reform at Avignon in 1344 to 1345. The last date in his biography is 1351, where it is thought that he

respects, and it presents Johannes as somewhat of a free agent, with the motivation behind the many moves throughout his career unknown.³ We know that his writings on music were most prolific during his early years in Paris (that is, the early 1320s), and these were followed by a gap in output of more than 15 years. The more than one hundred extant manuscripts of Johannes de Muris's music treatises suggest his musical writings were more widely disseminated than his mathematical or astronomical ones, but Gushee affirms that his non-musical writings were also highly regarded in their day.⁴

Philippe de Vitry enjoyed a more conventional and profitable career, but with his activity as a music theorist and composer sidelined to his main employment as a diplomat and bureaucrat.⁵ Vitry's life is also well documented, as

must have been still alive after Philippe de Vitry's elevation to bishop, on account of the dedication text of Johannes's *Quadripartitum numerorum*.

³ Gushee, "Muris, Johannes," *GroveMO*.

⁴ Gushee, "Jehan des Murs and his Milieu," 339.

⁵ The excellent article on Philippe de Vitry in *GroveMO* by Andrew Wathey and Margaret Bent summarizes the current state of research on Vitry's biography (accessed August 10, 2008). Born in 1291, the first documented reference to Vitry is from 1321, when he was presented to a canonry with the expectation of a prebend at Cambrai. Although he did not eventually take this position, in 1322 he is found with a canonry from the collegiate church of Notre Dame in Clermont-en-Beauvais, probably with backing from Louis de Bourbon, Count of Clermont, for whom Philippe worked and had close ties with until the count's death in 1342.

are the numerous accolades and tributes he received from his contemporaries, both in the scientific and literary worlds.⁶

The few biographical facts we have pertaining to the author of *Speculum musicae* are the following:⁷

From 1340, Philippe worked in the royal administration, and was appointed Bishop of Meaux in 1351. He held a number of other cathedral and collegiate church canonries throughout his life. During his service to Louis and the royal administration, Vitry forged close contacts with the papal curia, and may have attended the papal calendar reform conference in 1344 that Johannes de Muris also attended. Because of his close links to the very politically active Louis de Bourbon, many of Vitry's poetic and musical compositions have been successfully contextualized in modern scholarship. Emma Dillon, "The Profile of Philippe V in the Music of Fauvel," in *Fauvel Studies: Allegory, Chronicle and Image in Paris, Bibliothèque Nationale de France, MS français 146* ed. Margaret Bent and Andrew Wathey (Oxford: Oxford University Press, 1998), 215-31; Andrew Wathey, "Gervès du Bus, the Roman de Fauvel, and the Politics of the Later Capetian Court," in *Fauvel Studies*, 599-613; Idem, "The Motets of Philippe de Vitry and the Fourteenth-Century Renaissance," *Early Music History* 12 (1993): 119-50; Idem, "Philippe de Vitry's Books," in *Books and Collectors 1200–1700: Essays Presented to A.G. Watson*, ed. J.P. Carley and C.G.C. Tite (London: 1997), 145-52.

⁶ Andrew Wathey, "The Motet Texts of Philippe de Vitry in German Humanist Manuscripts of the Fifteenth Century," in *Music in the German Renaissance: Sources, Styles, and Contexts*, ed. John Kmetz (Cambridge: Cambridge University Press, 1994), 195-201.

⁷ The biography of Jacobus is outlined in my article, which highlights the archival information I discovered relating to Jacobus's activity in Liège. Karen Desmond, "New Light on Jacobus, Author of *Speculum musicae*," *Plainsong and Medieval Music* 9/1 (2000): 19-40. I will summarize the findings here. I have included in this dissertation transcriptions of this newly-discovered archival documentation (see Appendix 1): these transcriptions were included in my 2000 article, but I include them here for the reader's ease of reference.

- 1) We know his name, Jacobus, due to an acrostic that was spelled out over the initials that begin each of the seven books of *Speculum musicae*.⁸
- 2) Jacobus may almost certainly be identified with the music theorist Jacobus de Montibus mentioned in the fourth treatise of the so-called “Berkeley manuscript.”⁹

⁸ “Si cui autem huius operis compilatoris nomen scire placet, librorum septem partialium litteras simul iungat capitales” (“If you wish to know the name of the compiler of this work, join together the seven capital letters of the parts of this book”). *SM* 1.1, 13 (references to *SM* will follow the convention of book.chapter, page: so this reference refers to the first chapter of the first book, page 13). This acrostic was first noted by Bessler. Heinrich Bessler, “Studien zur Musik des Mittelalters I,” *Archiv für Musikwissenschaft* 7 (1925): 180-81. Also see Roger Bragard, “Le *Speculum musicae* du compilateur Jacques de Liège I,” *Musica disciplina* 7 (1953): 59-104. The first lines begin as follows: “In principio huius operis . . .” (Bk. 1, Ch. 2); “Actus activorum . . .” (Bk. 2, Ch. 1); “Cum in superiori . . .” (Bk. 3, Ch. 1); “Ordo poscit . . .” (Bk. 4, Ch. 1); “Boecius musicæ doctor . . .” (Bk. 5, Ch. 1); “Unumquodque opus . . .” (Bk. 6, Ch. 1); “Simplicius in commento . . .” (Bk. 7, Ch. 1).

⁹ Oliver B. Ellsworth, ed., *The Berkeley Manuscript*, vol. 2, *Greek and Latin Music Theory* (Lincoln: University of Nebraska Press, 1984), 226-27. The reference to Jacobus de Montibus in the Berkeley manuscript is almost certainly the author of *Speculum musicae* (University of California Music Library, Ms. 744). For a description of this manuscript, see: Christian Meyer, Michel Huglo, and Nancy Phillips, eds., *The Theory of Music from the Carolingian Era up to c1500. Descriptive Catalogue of the Manuscripts in Great Britain and in the United States of America*, vol. B III/4, *Répertoire international des sources musicales* (Munich: 1961), 141-2. Both Richard Crocker and Oliver Ellsworth suggested that Jacobus de Montibus was the author of *Speculum musicae*, and in my article I offered substantiation for this claim. I suggested that *Speculum musicae* was a source for the Berkeley treatise: the selection and ordering of the content in the Berkeley treatise closely follows that of the second half of *Speculum musicae* Book 5, and this ordering is markedly different from the order found in Boethius. Desmond,

3) Jacobus studied in Paris and had ties to the city of Liège.¹⁰

In addition, the author of *Speculum musicae* is probably the same person as Jacobus de Montibus, canon of the collegiate church of St. Paul of Liège, and if so, we know the following additional facts of his biography:¹¹

“New Light,” 25-27.

¹⁰ I discuss the Paris and Liège references in *Speculum musicae* here: Desmond, “New Light,” 20-24. The studies in which this hypothesis was developed are: Bessler, ‘Studien,’ 180-181; Antoine Auda, *La musique et les musiciens de l'ancien pays de Liège* (Liège: Lib. St-Georges, 1930); Bragard, “Le *Speculum musicae* du compilateur Jacques de Liège I”; Idem, “Le *Speculum musicae* du compilateur Jacques de Liège II,” *Musica disciplina* 8 (1954); Suzanne Clercx, “Jacques d'Audenaerde ou Jacques de Liège?,” *Revue belge de musicologie* 7 (1953): 95-101; Joseph Smits van Waesberghe, *Musiekgeschiedenis der Middeleeuwen*, 2 vols. (Tillburg: 1938-42), 253-65; Idem, “Some Music Treatises and their Interrelation: A School of Liège c.1050-1200?,” *Musica disciplina* 3 (1949): 25-32, 95-118. In brief, Jacobus mentions Paris by name five times in *Speculum musicae*, at one point detailing how he had “heard” Boethius’s *De institutione musica* while there (*SM* 2.56, 136), the context suggesting that he may have been a student at the University of Paris, presumably at the Faculty of Arts. In Chapter 2 of this dissertation, I discuss in detail the indications that Jacobus had ties to the diocese of Liège (with reference to Book 6 of *Speculum musicae*).

¹¹ It seems extremely likely that Jacobus de Montibus, music theorist, is the same as Jacobus de Montibus, canon of St. Paul. I examined many of the extant archives from Liège (some of the archives I examined are listed here: Desmond, “New Light,” 29; in addition to these obituaries, I also looked at the charters from the relevant period from the cathedral of St. Lambert and from the abbey of St. Jacques), and while this search was not definitive, I found no record of activity for “Jacobus de Montibus” in any other Liège church, nor found any “Jacobus” that had any indicated involvement in music in Liège in the first decades of the fourteenth century. The dates for Jacobus de Montibus of St. Paul also make sense in terms of the general timeline that we understand for Jacobus’s activity. Moreover, the close ties between St. Paul and the Benedictine house of St. Jacques,

- 4) He was probably born in the 1280s in the diocese of Hainaut, and probably in the town of Mons.¹²
- 5) In 1316 he was granted a canonicate for the collegiate Church of St. Paul with expectative prebend.¹³
- 6) There are payments noted to Jacobus de Montibus in the Liège account books for the years 1321, 1322 and 1336 (he received monthly distributions).¹⁴

offer a sensible explanation for Jacobus's use of the books of that library (discussed in "New Light," 32-33; and in Chapter 2 of this dissertation).

¹² The date of birth is only a suggestion of a likely birthdate and is surmised from the fact that Jacobus de Montibus died between 1337 and 1344 and he called himself "old" when he was writing *Speculum musicae* (for the death dates see fn. 16; on the "old" reference, see *SM* 7.1, 6). Hainaut is proposed as a birthplace from the reference to "Jacobus de Montibus Anonie" in the expectative prebend (see fn. 13).

¹³ A letter from John XXII, dated 13 November 1316, from the Vatican and Avignon registers relating to the provinces of Cambrai and Liège, confers upon Jacobus de Montibus of Hainaut, a canonicate for the collegiate Church of St. Paul. Desmond, "New Light," 27; A. Fayen, ed., *Lettres de Jean XXII (1316-1324)*, vol. 1, *Analecta Vaticano-Belgica* (Rome: L'Institut historique belge 2, 1908-12), no. 176.

¹⁴ Desmond, "New Light," 28-31. For a transcription of the relevant passages in the account books, see Appendix 1. The account books for St. Paul only survive for the years 1307, 1310, 1321, 1322, 1336, 1344, 1346, 1347 and 1360. The financial year is from August to July, and Jacobus appears in the 1321 books for only the last two months of the year, June and July 1322. In the 1322 books, there is only one monthly payment made to Jacobus (March 1323),

- 7) In 1334, he purchased land in Wonck, an ecclesiastical seignory of the church of St. Paul.¹⁵
- 8) He appears in obits from 1347 at the latest (1347, 1348, 1349, 1360), and in the mid-sixteenth-century obituary of St. Paul. We can surmise that he died on 20 February, probably in Liège, between the years 1337-1344.¹⁶

suggesting that he was not resident at St. Paul for most of that year (August 1322-July 1323). The account books are not extant for the intervening years of 1323-1335 (August 1323-July 1336), and in 1336, Jacobus received a monthly distribution for the entire year, except for the month of February 1337.

¹⁵ Ibid., 30-32. For a transcription of the charter detailing the transfer of the land, see the last item of Appendix 1; there are also entries that refer to this land in the account books of 1307, 1310, 1321, 1322 (see Appendix 1, items 1-3, 8, 11, 13, 17-18). The charter outlines the transfer of land in Wonck from Thiriars Deniche to “mon singnor jakeme de mons,” with Pires de Hanayyes (Pierre of Hainaut), a chaplain of St. Paul, stipulating for Jacobus. The village of Wonck was an ecclesiastical seignory, and the charter states that the entire estate was directly transferred to Jacobus. The implication is that Jacobus de Montibus was a well-established figure in Liège in 1334, a significant land owner, and held some importance within the chapter of St. Paul, in that they allowed his ownership of this church property in Wonck.

¹⁶ Ibid., 29-31. The obit for Magister de Montibus is found on 20 February in the mid-sixteenth-century obituary for the chaplains of St. Paul (the other extant obituary for St. Paul, dating from the fifteenth century, is incomplete and contains only the months May to November. There are also lists of the annual obits in the account books for 1347, 1348, 1349 and 1360, and an obit for Jacobus de Montibus is recorded for each of these years. As Jacobus was deceased by 1347, and does not appear in the extant account books for 1344, we can assume he died some time between August 1337 and July 1344. In addition, the land that Jacobus had purchased in Wonck, begins to be listed again as income in the account books from 1344 on, lending support to the hypothesis that he was deceased by 1344, and the income from this land was intended to pay for Jacobus’s last foundations, specified

The activity of Jacobus de Montibus remains rather vague – in the period covered in the 1322 and 1323 account books (that is August 1322 to July 1324), he appears to have been resident only for a total of three months: June and July 1322 and March 1323. The next extant record book for 1336 shows him resident for the full year. His purchase of land in 1334 shows him to be a well-established and well-respected figure in Liège by that time, in that the church allowed his ownership of the seignory land. I have hypothesized previously, based on the inclusion of the title “magister” in all the references to him in the account books, that Jacobus may have held the position there of *magister scholarum*, also known as *rector scholarum*.¹⁷ It appears to have been customary in the accounts for St. Paul, when listing the canons by name, to give specific titles for four positions – *decanus*, *cantor*, *scholasticus*, and *magister*. During Jacobus’s tenure at St. Paul, from the account books and charters of the church, we may trace the identity of the deacons, the cantors, and the individuals who held the position of *scholasticus*.¹⁸ Similarly, Jacobus de Montibus is consistently listed in the accounts with the title “magister”

as a maintenance of vigils at the altar of Blessed St. Agnes.

¹⁷ As an aside, it is interesting that Johannes de Muris held a similar position – *rector scholarum* – in Evreux in the years 1332 and 1333.

¹⁸ Desmond, “New Light,” 33-34.

and it would seem to suggest a job title, rather than the fact that he held a master's degree, in that many other of the individuals listed also had university degrees, but did not receive the title "magister" in their listings in the account books. But this is just a hypothesis, and there is little else in the archival documents to show that Jacobus de Montibus had any sort of direct involvement with either music or music theory.¹⁹

So, other than the elements of straight biography, where else can we look to find the contexts of *Speculum musicae*? To the text, then. Considering the prominence nominally afforded to this treatise in most surveys of music history, we might expect the text itself to be better known. In fact, even though *Speculum musicae* is the largest tract on music in the Middle Ages, totaling about 1500 pages and 521 chapters in its modern edition, it is most often the same few passages of Book 7, namely, some of the detailed descriptions of the notational innovations of the *ars nova*, that are referred to, out of context, in the modern literature.²⁰ The rest

¹⁹ I also refer to a charter of St. Paul, dating from 1332, that implements rules for dealing with boys in the choir who misbehave, with particular reference to their incorrect singing of the chant. The *magister scholarum* is referenced several times in this document, although never directly by name. Jacobus does mention a method of teaching singing, a detailed step-by-step method, in book 6 of *Speculum musicae* (*SM* 6.69, 198-199). Desmond, "New Light," 34.

²⁰ The full text has been available in modern edition since 1973, thanks to the monumental and important work of Roger Bragard, who also published two seminal articles on *Speculum musicae* in *Musica disciplina*. Considering the size of

of Book 7, and the first six books of *Speculum musicae* (which represent about 93% of the text), have remained largely ignored, unstudied, and unknown. Part of this reluctance to deal with the complete treatise has to do with the size of the text in question. As a result, scholars have either focused on specific small-scale topics (such as Sarah Fuller's article on the discant technique of "fifthing"), or have produced superficial paraphrases of Jacobus's text (for example, the studies of Jurgen Ballke and F. Joseph Smith).²¹

The problem with the ways in which research on *Speculum musicae* has been carried out is actually reflective of more general problems in our approach to the whole field of fourteenth-century music theory. We are still in the preliminary stages of understanding; we are looking to these texts to provide answers to specific problems of notation, performance or transcription; and in so doing, we skim

the treatise, and the fact that it has been available in modern edition for over twenty-five years, the secondary literature that discusses the actual textual content of *Speculum Musicae* is, to say the least, rather sparse.

²¹ Sarah Fuller, "Discant and the Theory of Fifthing," *Journal of Musicology* 50 (1978): 241-75; Jurgen Ballke, *Untersuchungen zum sechsten Buch des Speculum musicae des Jacobus von Lüttich unter besonderer Berücksichtigung der Tetrachord- und Moduslehre*, vol. 36/3, *Europäische Hochschulschriften* (Frankfurt am Main and Bern: Lang, 1982); F. Joseph Smith, *Jacobi Leodiensis Speculum musicae: A Commentary* (Brooklyn, NY: Institute of Mediaeval Music, 1966); Idem, "Jacques de Liège's Criticism of the Notational Innovations of the *Ars nova*," *Journal of Musicological Research* 4 (1983): 267-313; Idem, "Jacques de Liège, an Anti-Modernist?," *Revue belge de musicologie* 17 (1963): 3-10.

through these dense texts on fact-finding missions, extracting from them the nuggets of information that are most useful to us. While there have been some exemplary studies of the biography of these music theorists, such as those of Gushee and Wathey mentioned above, few have delved into the actual texts of early fourteenth-century theory in meaningful ways. In recent years, however, scholars like Max Haas, Ellinore Fladt, Dorit Tanay, Frank Hentschel, Heinz Ristory, John Haines and Patricia Dewitt have begun to approach these texts with a fresh perspective.²² They point to the need to read these texts in context, and in

²² Max Haas, "Die Musiklehre im 13. Jahrhundert von Johannes de Garlandia bis Franco," in *Die mittelalterliche Lehre von Mehrstimmigkeit*, ed. Frieder Zaminer, *Geschichte der Musiktheorie* (Darmstadt: Wissenschaftliche Buchgesellschaft, 1984), 89-159; Idem, "Musik zwischen Mathematik und Physik: Zur Bedeutung der Notation in der 'Notitia artis musicae' des Johannes de Muris (1321)," in *Festschrift für Arno Volk* (Köln: Gerig, 1974), 31-46; Idem, "Studien zur mittelalterlichen Musiklehre I: Eine Übersicht über die Musiklehre im Kontext der Philosophie des 13. und frühen 14. Jahrhunderts," *Forum musicologum* 3 (1982): 323-456; Ellinore Fladt, "Die Musikauffassung des Johannes de Grocheo im Kontext der hochmittelalterlichen Aristoteles-Rezeption" (Ph.D. diss., Technische U. Berlin, 1981); Dorit E. Tanay, "Music in the Age of Ockham: The Interrelations between Music, Mathematics, and Philosophy in the Fourteenth Century" (Ph.D. diss., University of California, 1989); Idem, *Noting Music, Marking Culture: The Intellectual Context of Rhythmic Notation 1250-1400* (N.p.: American Institute of Musicology, 1999); Frank Hentschel, "Die Unmöglichkeit der Teilung des Ganztones in Zwei Gleiche Teile und der Gegenstand der *Musica Sonora* um 1300," in *Musik - und die Geschichte der Philosophie und Naturwissenschaften im Mittelalter. Fragen zur Wechselwirkung von 'musica' und 'philosophia' im Mittelalter*, ed. Idem, *Studien und Texte zur Geistesgeschichte des Mittelalters* (Leiden: Brill, 1998), 39-60; Heinz Ristory, *Denkmodelle zur französischen Mensuraltheorie des 14. Jahrhunderts*, vol. 81, *Musicological Studies* (Ottawa: The Institute of Mediaeval Music, 2004). John Haines and

particular, in the context of the interdisciplinary program of learning in the medieval university and its reliance upon Aristotelian modes of understanding.

In particular, the hypotheses of Dorit Tanay regarding developments in medieval music theory and their parallel relationships with developments in mathematics and natural philosophy are intriguing and very relevant to this study; however, I would contend that some of her conclusions are problematic. While I agree that it is indeed important to trace general trends of music theory within the history of ideas in the Middle Ages (she studies the time period from 1250 to 1400), by painting with so broad a brush, one is always in danger of oversimplifying, and, partially as a result of this, asserting connections between theorists and particular schools of thought, that, upon closer examination, are not really there. The reliance on secondary literature with respect to the non-music theory texts contributes to this tendency to trace relationships and spheres of influence that I believe (and will outline below) are stretching the facts a little too far. Specifically, I refer the parallels drawn by Tanay between Johannes de Muris and the Oxford Calculators and between Jacobus de Montibus and William of Ockham.²³ Another problem of approach in some of these studies is the reliance on

Patricia Dewitt, "Johannes de Grocheio and Aristotelian natural philosophy," *Early Music History* 27 (2008): 47-98.

²³ That Tanay draws attention to the mathematization of rhythm in the

the Aristotelian texts themselves, while the medieval music theorist most likely would have experienced Aristotle through some sort of intermediary filter, that is, through one of the contemporaneous medieval interpretations and commentaries on these texts.

By concentrating in detail on one treatise, I have the opportunity to trace and dissect specific philosophical and theological arguments and beliefs, and the impact of these beliefs upon the philosophy of music. Jacobus presents himself as an important and excellent subject for such an investigation, due to the length of his treatise, and the fact that there is so much of himself in the text: the number of personal comments, and the degree of information on his own particular philosophical bias and world view is unparalleled, in my opinion, in any other medieval text on music. My central concerns are: (1) determining where Jacobus's philosophies fit within particular schools of thought of the Middle Ages, as these philosophies are revealed through his choice of vocabulary, his supporting sources, or his methods of reasoning; and (2) extrapolating from these philosophies the

fourteenth century is important, although I would tend to see this as a manifestation a general trend towards quantification at the turn of the century, rather than specifically linking Muris with the Oxford Calculators as Tanay hypothesizes (I discuss this hypothesis further in Chapter 6). In her analysis of Book 7 of *Speculum musicae*, Tanay emphasizes the influence of Ockhamist logic on Jacobus's arguments (*Noting Music*, 146-181). Based on my reading of Books 1, 4 and 7 of Jacobus's treatise, I find this interpretation unlikely (see chapters 5 and 6 of this dissertation).

rationale (*ratio*) supporting his position on particular issues, such as, the division of the whole tone, the classifications of music, or the divisions of the note values within the mensural system; and (3) as a result of this investigation suggesting the possible purposes of and impetuses behind the production of this treatise.

This last question presents one of the most fundamental problems of this text. What prompted Jacobus to write a treatise of this size and nature? In other words, what was the purpose of *Speculum musicae* and who was it written for? It is tempting to suggest that the work was written at the urging of some ecclesiastical authority. Some have tried to link the promulgation of the John XXII's bull of 1323/4, which censures the lascivious style of modern singers, with Jacobus's condemnations of the *ars nova*.²⁴ As I noted elsewhere, the date of this papal bull

²⁴ Walter Grossmann, *Die einleitenden Kapitel des Speculum musicae von Johannes de Muris: Ein Beitrag zur Musikanschauung des Mittelalters, Sammlung Musikwissenschaftlicher Einzeldarstellungen* (1924, reprint; Nendeln / Liechtenstein: Kraus Reprint, 1976); Ulrich Michels, *Die Musiktraktate des Johannes de Muris*, vol. 8, *Beihefte zum Archiv für Musikwissenschaft* (Wiesbaden: F. Steiner, 1970), 50-55. On the bull, see Karl Gustav Fellerer, "Zur Constitutio Docta SS. Patrum," in *Speculum musicae artis: Festgabe für Heinrich Husmann zum 60. Geburtstag*, ed. Heinz Becker and Reinhard Gerlach (Munich: W. Fink, 1970), 125-52; Helmut Hucke, "Das Dekret Docte sanctorum patrum Papst Johannes' XXII," *Musica disciplina* 38 (1983): 119-31. Michael Klaper, "Verbindliches kirchenmusikalisches Gesetz' oder belanglose Augenblickseingebung? Zur Constitutio Docta sanctorum patrum Papst Johannes' XXII," *Archiv für Musikwissenschaft* 60/1 (2003): 69-95. Klaper suggests that the *Docta sanctorum* first came to be universally known and respected as a text of undisputed canonical status only in the sixteenth century.

has been used as a *terminus post quem* for *Speculum musicae*, but the fact that Jacobus did not mention the bull in *Speculum musicae* does not necessarily imply composition of his treatise before the issuance of the bull.²⁵ Moreover, once we begin to suspect Michels's dating of *Speculum musicae*, we have to call into question the dates he derives for the other *ars nova* treatises based upon the date of *Speculum musicae*.²⁶ In fact, there are several proscriptions against the new style of music, similar in language and content to Jacobus's criticisms, found in the constitutions and annual statutes of the religious orders, which predate the papal bull.²⁷ Throughout both Books 6 and 7, that is, within the contexts of mensural

²⁵ Desmond, "New Light," 35.

²⁶ "It is important to note here that for Michels, the dating of *Speculum musicae* with respect to the papal bull has implications for the dating of other *ars nova* treatises. Thus, his dating of Jehan des Murs's *Notitia* to 1321, and *Speculum musicae* to 1324/5, compels him to date the *Compendium* to 1322, as Jacobus certainly knew of this treatise, and, further, his dating of Vitry's *Ars nova* to 1322-3, is based on the datings of *Notitia* and the *Compendium*. Apart from the fact that Jacobus must have known the *Ars nova* in at least one of its versions and the works of Jehan des Murs, there is no reason to suppose that those other works themselves are related in a chronological progression moving from the less developed to the more developed presentations of *ars nova* doctrines. But even supposing that they are related in this way, Michels' datings are constructed as a house of cards, and once any of his criteria is called into question (e.g., his use of the date of the papal bull as a *terminus post quem* for *Speculum musicae*), all of the other datings become immediately suspect." Ibid, 35.

²⁷ For example, the 1320 statute issued by the Cistercian general chapter ordered that any abbots or abbesses who allowed these "ridiculous novelties," such as "syncopations of notes" and "forbidden hockets," which were contrary to the

music *and* plainchant, Jacobus describes the new style of music as lascivious, effeminate, immoral and monstrous, and contrasts it with the simplicity, modesty and honesty of the ancient art.²⁸ Chapter 2 of this dissertation examines the “reformist” aspects of *Speculum musicae* that are reflective of ecclesiastical concerns, looking in particular at the “rules” for the performance of liturgical chant,

ancient art of the chant, would be brought before the general chapter and punished: “Item, ridiculosas novitias superinductas in officio divino nolens sustinere de cetero, Capitulum generale ordinat et diffinit quod antiqua forma cantandi a beato patre nostro Bernardo tradita, sincopationibus notarum et etiam hoquetis interdictis in cantu nostro simpliciter quia talia magis dissolutionem quam devotionem sapient, firmiter teneatur; contra facientes ad praesidentes arbitrium puniantur. Abbates autem et abbatissae hoc statutum faciant inviolabiliter observari.” D. Josephus-Mia Canivez, ed., *Statuta capitulorum generalium ordinis cisterciensis ab anno 1116 ad annum 1786* (Louvain: Bureaux de la Revue, 1935), 349. Here is a typical example of Jacobus’s rhetoric: “Sunt autem aliqui qui, etsi aliquialiter discantare noverint per usum, modum tamen non observant bonum. Horum aliqui nimis hoketant, nimis voces suas in consonantiis frangunt, scandunt et dividunt, et in locis inopportunis saltant, hurcant, iupant et, et ad modum canis, hawant, latrant et, quasi amentes, incompositis et anfractis pascuntur vexationibus, harmonia utuntur a natura remota.” (“There are some who, although they know some method of discant, the use they observe is not a good one. They discant lasciviously, they multiply pitches superfluously. Some of them hocket excessively, they break up their consonances into too many pitches, they clamber about, divide, and pause in inappropriate places, they hurl, and jump, and like dogs, they haw, and bark, and like fools, they feed upon these ill-composed and shattered disturbances, using harmonies remote from nature”). *SM* 7.9, 23.

²⁸ In Chapter 18 of Book 1, Jacobus discusses the division of *musica* into two categories - simple music and lascivious music - a distinction also in Boethius, and one that echoes its earlier source, Plato’s *Republic*. Lascivious music is considered morally bankrupt, a force that corrupts its listeners, softening and weakening their souls.

and the discrepancies within these rules, as the tonary of Book 6 shows. In addition, I examine further the links between Jacobus and Liège, through an examination of the source material for the tonary, and evidence found in contemporaneous liturgical manuscripts.

Whatever the initial impetus and purpose of *Speculum musicae*, whether it was solely an aesthetic reaction to the sound of the new music (*ars nova*), or a reflection of a religious sensibility that was centered on simplicity of presentation, the ways in which Jacobus sought to prove the illogical nature and illegitimacy of the new art are firmly grounded in his own philosophical and scientific background. The majority of the non-musical material is contained in Books 1, 3, 4 and 7, with a few relevant chapters in the other books. (I do not, for example, spend much time on Book 5, which is a straightforward exposition of monochord theory, most of it taken directly from Boethius, and containing no philosophical chapters.) The philosophical problems treated in *Speculum musicae* include the philosophies that underlay medieval aesthetics, for example, the concepts of simplicity and perfection (dealt with in both philosophical and theological studies), metaphysical treatments of unity, number, and being, and the relationship between form and matter, between the universal and the particular, and the physical problems of motion and change, and the nature of time.

Much of Jacobus's philosophy appears grounded firmly in the late thirteenth century. In Chapter 3, I discuss the impact of thirteenth-century mathematical theory on the content of *Speculum musicae*, Book 3. The subject matter of Book 3 is the question of whether a whole tone is divisible into two equal parts, and Jacobus uses the arithmetic of the thirteenth-century mathematician Jordanus de Nemore as a primary source. In this chapter, I refer to the turn-of-the-century debate regarding the commensurability of ratios, and how there may be oblique references to this debate in Book 3 of *Speculum musicae* – a debate that Nicole Oresme continued in the mid-fourteenth century, where he argued against the theories on this topic propagated by none other than Johannes de Muris.

In Chapters 4 through 6 I look at Book 7 of *Speculum musicae* through a number of different prisms, and I also include much relevant material from Books 1 and 4. In Chapter 4, before delving into the philosophical underpinnings of Jacobus's arguments against the *ars nova*, I carefully dissect the main technical points of dispute Jacobus held against the modern theories of notation, and I attempt to identify the authorities he cites in this regard. Specifically, I want to trace the "innovations" identified by Jacobus, and whether these innovations represent outgrowths or changes from the Franconian mensural system, and in which treatises these innovations are described.

In Chapters 5 and 6 I discuss how particular metaphysical and philosophical debates influenced Jacobus. Chapter 5 outlines conceptions of motion and time at the turn of the fourteenth century, and situates Jacobus's theories in this context. Chapter 6 focuses in more detail on a controversial philosophical debate current at the turn of the century (the so-called "unity-of-form" debate): how it influenced Jacobus's reading of *ars nova* theory, and in turn provided the philosophical underpinnings for his rejection of it.

In medieval science, John Murdoch has discussed what he terms the "measure mania" of the fourteenth century (especially from the 1330s on) and the desire to translate the metaphysical abstractions of thirteenth-century philosophy into the concrete.²⁹ Rather than concentrating on deriving the appropriate definitions of things from the universal characteristics that constitute a particular class, and placing entities on a Porphyrian tree by dividing substance into a hierarchically ordered series of genera and species (the typical methodology of thirteenth-century philosophy), philosophers instead sought to describe each individual thing in the sense that it was "individual." An example from mensural

²⁹ John E. Murdoch, "From Social into Intellectual Factors: An Aspect of the Unitary Character of Late Medieval Learning," in *The Cultural Context of Medieval Learning: Proceedings of the First International Colloquium on Philosophy, Science and Theology in the Middle Ages, September 1973* (Dordrecht and Boston: D. Reidel, 1975), 271-343.

notation theory makes this distinction clear. In reference to the lengths of musical notes, Johannes de Muris says: “times are either short or long . . . they do not differ in species” (*Notitia*, 66). The length of any one individual note, in any specific instance, was measured by Johannes’s system of grades of perfection or imperfection.

For Jacobus, this is absolutely incomprehensible, the very organization of the hierarchical system of note lengths was based on the fact that longs and breves and semibreves were different in species - they each had their own formal definition, their own quiddity. This brings us full circle to the quote I used to open this chapter – if these monstrosities had not been *named*: Jacobus specifically objects to the *naming* of the notes, that is, making them formal “nouns” and identifying them as distinct existents within an ontological system.

Finally, in Chapter 7, I look at the divisions of music as outlined by Jacobus in Book 1 of *Speculum musicae*, and, in particular, I focus on the concept of *musica caelestis*. In this context we can appreciate some of the theological pursuits of Jacobus, and perhaps glimpse Jacobus’s personal objective in completing *Speculum musicae*. In the first chapter of Book 1, Jacobus paraphrases Seneca:

Ad animam revertamur qui . . . in tristi et obscuro corporis domicilio clausus, quotiens potest, carcerem appetit et in rerum naturae contemplatione requiescit. (*SM* 1.1, 8)

Those of us who are engaged in contemplation of the things of nature, and

reject the flesh, can return to the soul, even though it is imprisoned in this sad and obscure home of the body.

In the most general sense, the scientist is engaged in finding truth - the true nature of all existents. Exactly how the nature of things is perceived and understood is a product of the scientist's own cultural and societal background. For Jacobus, there was only one possible way in which the things (*res*) of music could exist, and only one way in which they could be explained: through the philosophical systems that he learned while a student in Paris at the turn of the century. His music theory was directly informed by this belief system - in both a superficial way (his rejection of the sonic complexities of the new art), and on a deeper level (the impact of theology upon his philosophy, in particular, his reliance upon the philosophy of Aquinas and Godfrey of Fontaines). It was impossible for him that another version of truth could exist. The contextualization of *Speculum musicae* lays open the deeper issues that underpin Jacobus's criticism of the *ars nova*: more than just a conflict between an old and a new "style" of music, Jacobus's world view is constructed upon philosophies of the late thirteenth century, and it is absolutely impossible for him to accept the theories of the *ars nova*, because of their basis in fourteenth-century conceptions of science and nature.

CHAPTER 2

LITURGICAL CONTEXTS

In this attempt to place the music theory of Jacobus within its temporal and geographical context, let us turn now to the tonary of *Speculum musicae*, appended by Jacobus to Book 6 of his treatise.³⁰ In *Les tonaires*, Huglo said that it was the evidence of the tonary that most convinced him of the Liège origins of *Speculum musicae*, citing the presence of the *Magna vox* antiphon proper to St. Lambert, the patron saint of Liège.³¹ Yet, although “le témoignage de Jacques de Liège sur l’état du plain chant au XIVe siècle . . . est l’un des plus précieux” (“the witness of Jacobus of Liège on the state of plainchant in the fourteenth century is one of the most important we have”), the tonary of Jacobus, containing citations of just over five hundred chants, has not received a comprehensive examination in the modern literature.³² In this chapter I will analyze Jacobus’s extensive tonary within the

³⁰ The tonary is in chapters 84 to 111 of Book 6 (*SM* 6.84-111, 237-306). The preceding four chapters (*SM* 6.80-83, 226-237), are closely related to the tonary, in their discussion of *differentiae* in general, and of psalm tone intonation.

³¹ Michel Huglo, *Les tonaires: Inventaire, analyse, comparaison* (Paris: Société française de musicologie, 1971), 432.

³² *Ibid.*, 432. There are four pages of discussion of the tonary in Huglo’s *Les tonaires*, and Ballke contains a chapter on the modal teaching of Jacobus, but focuses only on outlining the examples of the first mode. Ballke, *Untersuchungen zum sechsten Buch des Speculum musicae*, ch. 9.

context of chant practice and its theoretical exposition in the later Middle Ages.³³ A comparison of this tonary with tonaries included in contemporaneous liturgical manuscripts (in particular, the extant liturgical manuscripts from Liège), with tonaries associated with specific religious uses, and with the tonaries found in late medieval theoretical treatises, will clarify the tradition(s) from which Jacobus speaks. For instance, we need to ask if the tonary, as has been claimed, really display characteristics specific to liégeois practice, and does it point to a specific institutional background for its writer, whether secular or regular?³⁴ Can we decipher any particular agenda behind Jacobus's presentation and formulation of his tonary? Are there reformist tendencies to be found in this tonary, or recommendations for a "correct" method of intonation? Finally, who was the audience for this tonary?

³³ Huglo suggests that the post-thirteenth-century tonaries "apparently became manuals for teaching the theory of the eight tones rather than practical manuals for oral instruction in the chant. In this field, however, they are of purely documentary interest since late tonaries are only abridgments, and they provide much less information about the development of the concept of modality than can be obtained from treatises." Huglo, "Tonary," *GroveMO* (accessed November 4, 2007).

³⁴ On the basis of certain phrases in Book 6, criticizing the practices of the secular liégeois churches, Bragard states that Jacobus may have been a regular. Bragard, "Le *Speculum musicae* II," 15. The biography of Jacobus discussed in Chapter 1 of this dissertation does not support this speculation.

In the first chapter of Book 6, Jacobus makes the general statement that something may be considered is more worthy if it reaches out to more people - if it is more common (“communius”) - this is his reasoning for turning towards more practical matters in his final two books (inferring that the audience for the pure theory of the first five books would be a small elite group).³⁵ I will attempt to

³⁵ “Unumquodque opus tanto laudabilius est necnon utilius, quanto per illud ad bonum aliquod plures informamur, si quidem bonum tanto melius est quanto communius. Maius enim, secundum Philosophum, atque perfectius est bonum quod toti proficit civitati vel communitati quam uni de civitate. Et amabile si sit bonum quod idem valet uni et soli, melius tamen et divinius quod genti et civitati; juxta quod sumptum est quod bonum quanto communius, tanto divinius. Cum igitur musica, sicut libro primo tactum est, diversis hominum statibus se coaptet maioribus et minoribus, subtilioribus et rudioribus, minus peritis in scientiis et in philosophia magis imbutis, optavi iuxta modicum posse meum in hoc Musicae Speculo taliter me musicae dispositioni conformare ut variis hominum conditionibus deservirem, quatinus videlicet in eo subtiliores et ingeniis capaciores musicam theoreticam diligentes consonantiarum in naturis, in ipsarum proportionibus, in earundem propriis ac communibus proprietatibus, unde secundum intellectum recrearentur, aspicerent; simpliciores vero minusque capaces quibus praxis amplius convenit, unde in cantu aliquo atque in hiis quae cantum respiciunt informarentur, reperirent” (“Every work may be considered not only useful, but also more praiseworthy, insofar as it instructs more people toward good, and to an even better good when it is thought to be more communal. According to the Philosopher, a greater and more perfect good benefits the entire citizenry or community rather than just one citizen. And as attractive a good is that benefits one solitary person, it is nevertheless better and more divine when it relates to the citizenry and all of mankind; consequently, we take this to mean that something is as good as it is more common, and then so much more divine. So then, music, as we touched upon in the first book, can adapt itself to the diverse states of man, both greater and lesser, to the more subtle or the more obvious, losing itself less in the sciences, and become more imbued with philosophy. I looked, as much as I could in my little way, in this *Speculum musicae*, to conform to the dispositions of music,

derive answers to these questions by examining the order of musical examples given in the tonary and the exact language used to present them. There are several layers contained within Jacobus's tonary, which are derived from a variety of sources. Sifting through and identifying these layers will enable the reader to view more clearly the traditions to which Jacobus was aligned, and those which he criticizes or finds lacking.

In his tonary, for each of the eight modes, Jacobus systematically categorizes the types of beginnings (*principiae*) and endings (*differentiae*) of the office and introit antiphons, the intonation of the simple psalm tone, the Benedictus and Magnificat, the introit tone and the *cauda*, the Gloria Patri of the introit and the responsory, the intonation of the invitatory psalm with its Venite, and the more elaborate intonation of the responsorial Easter Alleluia. Jacobus spills a great deal more ink on the antiphon *differentiae* (the final endings of the psalm tone that lead into the repeat of the antiphon) than any other category of chant, and gives many more musical examples of these *differentiae*. It is in these *differentiae* that he finds

so that I might serve the various conditions of man. To this point, music theory appeals to those diligent practitioners, in its more subtle and ingenious aspects, in the nature of the consonances, in their proportions, in their proper and communal properties, where they might be recreated in the realm of the intellect. And it comes together in practice, for those who may be simpler and less capable, who may find here information regarding chant and such things.”). *SM* 6.1, 7. This is a theme that Jacobus makes repeated reference to throughout Book 6 – something is considered better if it is more communal, if it reaches the larger community.

the greatest variety of practices: “per regionum et ecclesiarum et animorum diversitatem variantur et temporum. Quaedam enim ecclesiae plures, quaedam pauciores habent differentias” (“[the *differentiae*] are varied throughout different regions, churches, individuals and throughout time. Certain churches have more *differentiae*, others have fewer”) (*SM* 6.85, 237-238).³⁶ For example, in his chapters on the first mode, Jacobus cites a number of variant practices for the *differentiae*: listing six antiphon *differentiae* of a “certain ancient doctor” (the “quidam antiquis” in this case is Johannes Cotto);³⁷ seven *differentiae* of modern

³⁶ Petrus de Cruce makes a similar observation in his tonary: “De differentiis seu principiis eorum, quot differentias seu principia unusquisque eorum habet, nulla musicae regula numerum certum declaravit, usus enim civitatum, qui diversi sunt, dant eis differentias diversimodo, tum quia unus plus, alter vero minus” (“Regarding the *differentiae* or the beginnings of these antiphons, and how many of these each chant might have, no rule of music can stipulate a definitive number. They are diverse, according to the use of each state, where one may have a larger number, others fewer”). *Petrus de Cruce Ambianensi Tractatus de tonis*, vol. 29, *Corpus scriptorum de musica* (N.p.: American Institute of Musicology, 1976), vii. The increasing repertory of chant taxed the medieval memory, where more than 3,000 antiphons existed by the end of the Middle Ages. Busse Berger views these various systems of classification of the chant beginnings and endings as “memorial promptbooks” that would allow the singer to quickly recall the correct antiphon and its appropriate *differentia* from his vast repertory. Anna Maria Busse Berger, *Medieval Music and the Art of Memory* (Berkeley: University of California Press, 2005), 48. The structure of Jacobus’s tonary and synopses of his citation of these variant practices are outlined in the table provided as Appendix 2.

³⁷ *Johannes Affligemensis, De musica cum tonario*, ed. J. Smits van Waesberghe, vol. 1, *Corpus scriptorum de musica* (N.p.: American Institute of Musicology, 1950), tonary at 163-200.

practice that are used in the secular churches of Liège (“saeculares ecclesiae leodiensis”); eight *differentiae* of the French and Roman churches (“in gallicanis et romanis”) (this is the practice which Jacobus states he now follows); two *differentiae* of the Cistercian order, and one other little-used and irregular *differentia* (*SM* 6.85, 237-248).³⁸

The references to various practices Jacobus acknowledged in his tonary can be broken down into these basic categories: certain ancient teachers (“quidam antiqui”) such as Johannes Cotto; the Moderns (“moderni”); the rather vague “some” or “others” (“aliqui” or “alii”) referred to throughout and which indicate different sources depending on the context; the secular Liège churches; French or Roman uses; and the regular religious orders. Jacobus also at times uses the first person (singular and plural) and even directly refers to the use that he now follows (“nunc sequor”).³⁹ The rhetorical pattern that Jacobus follows is first to give

³⁸ For the seven *differentiae* of the French and Roman use, he includes the antiphon *Apparuit Augustinus*, used by certain regular canons and certain secular churches in Paris. The antiphons he includes here for St. Nicolas, *Auro virginum*, *Pontifices almi* and *O Pastor eterne*, were also very well known. *SM* 6.85, 244. Huglo, *Les tonaires*, 432. “From the 12th century, however, the increasing systematization of the liturgy of the religious orders is reflected in the development of distinctive tonaries.” Idem, “Tonary,” *GroveMO*.

³⁹ “. . . secundum istos quorum nunc doctrina sequimur” (“. . . according to those whose teachings we now follow”) (*SM* 6.85, 242); “. . . secundum doctrinam quam nunc sequor” (“. . . according to the teaching I now follow”) (*SM* 6.85, 244).

examples for traditions other than his own, while usually the final examples come from the practice he approves. In general, these last examples match those found in a treatise known as the *Tractatus intonatione tonorum*.

Before analyzing the tonary in more detail, then, let us first consider a manuscript source closely related to Jacobus's tonary: *B-Br* 10162/66, the manuscript that contains the *Tractatus intonatione tonorum*.

BRUSSELS, BIBLIOTHÈQUE ROYALE, MS. 10162/66

As we can see from Appendix 2, much of the content of Jacobus's tonary is also found in the *Tractatus intonatione tonorum*, a treatise whose only extant manuscript source is *B-Br* 10162/66. This fifteenth-century manuscript belonged to, and perhaps was copied for, the Benedictine abbey of St. Laurent in Liège.⁴⁰

⁴⁰ The inscription on the verso of f. vii (a parchment flyleaf), written in red ink in fifteenth-century cursive, reads: "Ecclesie laurentii liber" ("A book from the Church of St. Laurent"). A brief description of this manuscript is in Joseph Smits van Waesberghe, Pieter Fischer, and Christian Maas, *The Theory of Music from the Carolingian Era up to 1400. Descriptive Catalogue of the Manuscripts. Austria, Belgium, Switzerland, Denmark, France, Luxembourg, Netherlands*, vol. B/III/1, *Répertoire international des sources musicales* (Munich and Duisburg: 1961), 58-62. See also C. Vivell, "Die Quaestiones in Musica, Ihre handschriftliche Quelle und ihr mutmasslicher Verfasser," *Gregoriusblatt* 38 (1913). We know that this period (the mid-fifteenth century) was an intense copying and writing period in the abbey. Baudouin Van den Abeele, "The *Macrologus* of Liège: An Encyclopedic Lexicon at the Dawn of Humanism," in *Schooling and Society: The Ordering and Reordering of Knowledge in the Western Middle Ages*, ed. Alasdair A. MacDonald and Michael W. Twomey (Leuven: Peeters Publishers, 2004), 43-60.

Appendix 3a is a codicological description of *B-Br* 10162/66, with drawings of the watermarks given as Appendix 3b and the manuscript collation as Appendix 3c.⁴¹

The manuscript contains treatises and fragments of classic medieval theory by Guido of Arezzo, Berno of Reichenau and Aribo, the anonymous *Quaestiones de musica*, and some more contemporary treatises, in particular, the three treatises that were attributed to Jacobus by Bragard and Smits van Waesberghe: the *Tractatus de*

⁴¹ *B-Br* 10162/66 is a paper manuscript with 119 folios (excluding the six modern and one parchment flyleaves), quarto format, with dimensions of 221x141 mm. The binding is modern (the date of 1970 is noted on one of the paper flyleaves). When the manuscript was bound the bifolios were cut into separate folios and pasted onto paper guards, so it is difficult to reconstruct the original gathering structure of the manuscript. The structure given in Appendix 3 is the best possible supposition of the gathering structure based primarily on an examination of the watermarks, and also on the page ruling, the pattern of columns and the scribal hands. In Appendix 3a I also indicate the *RISM* foliation, although this does not include the blank folios at the beginning and end of the manuscript (hence *RISM*'s enumeration of only 96 folios). There appear to be four different paper types used in this manuscript: I have labeled the watermarks A, B, C and D and have provided drawings of the watermarks as Appendix 3b. These are composite drawings: as can be surmised from their arrangement in Appendix 3c, the watermark is found across the fold of the bifolio; in other words each mark is bisected by the fold, and therefore there are equal amounts of bifolios containing no watermark. Comparison with watermarks in Gerhard Piccard's *Watermarks* volume N/1-3 ("Buchstabe P") would match watermark C with Nos. 201-457, which are dated to the 1460s/1470s in Northern Europe (Utrecht, Liège, Ghent, Cologne, Leuven). Watermark A and D are very similar and may indeed be twins. Watermark D is dated to the 1470s/1480s in the same Northern European area (vol. VIII, Nos. 108-239). See Gerhard Piccard, *Die Wasserzeichenkartei Piccard im Hauptstaatsarchiv Stuttgart: Findbuch / bearbeitet von Gerhard Piccard*, 17 vols. (Stuttgart: Kohlhammer, 1961-<1997>). It is possible that C may also be part of the same batch of paper as A and D, leaving paper type B as the only odd one out (private communication, Stanley Boorman, October 2007).

consonantiis musicalibus, the *Tractatus de intonatione tonorum* and the *Compendium de musica*.⁴²

I can discern the work of two primary scribes, and three layers of copying, in this manuscript.⁴³ The first layer appears as the best planned section of the manuscript, comprising the four Guido treatises and the anonymous *Dialogus* (attributed in Gerbert's edition to Odo) that are contained within gatherings 3 and 4.⁴⁴ They make a complete set with consistent gatherings of 6 bifolios, the same ruling pattern, consistent paper choices (only the twin paper types A and D are found), and were copied by one scribe, whom I have called Scribe *b*.⁴⁵ The second

⁴² *Jacobi Leodiensis Tractatus de consonantiis musicalibus. Tractatus de intonatione tonorum. Compendium de musica*, ed. Joseph Smits van Waesberghe, E. Vetter, and E. Visser, vol. A.IXa (Buren: Frits Knuf, 1988).

⁴³ There are also two other scribes who made later additions on three separate folios of the manuscript: Scribe *c*, who copied a table of Roman numbers and weights on f. 99 and a table of interval proportions on f. 100-100v; and Scribe *d*, who copied a fragment of Aribó's *De musica* on f. 108-108v.

⁴⁴ This treatise is attributed here (and elsewhere) to Guido: "explicit *Dialogus domini guidonis*" (f. 46).

⁴⁵ It is the case that the collected works of Guido were often preserved together in this way in medieval manuscripts. For example, *B-Br* II 4141, a fourteenth-century parchment manuscript, contains (in this order): *Micrologus*, *Regule rithmice*, *Prologus in antiphonarium*, *Epistola ad Michaelem*. *A-Wn* Cpv 2502 (a twelfth-century parchment manuscript) contains these same works grouped together at the beginning of the manuscript as does another twelfth-century manuscript *D-Mbs* Clm 14663. While *Micrologus* has been available in a modern

discernible layer is that which contains the *Quaestiones de musica*, comprising gatherings 7 and 8, and copied by a different scribe (Scribe *a*). A variety of paper types were used in this layer (A, B and C), and the compilation is more haphazard: the number of bifolios in the gatherings is not consistent and neither is ruling for the pages; part of one folio has been removed (the vertical outside half of f. 79 has

edition for some time, the three other treatises have been recently edited and translated. Joseph Smits van Waesberghe, ed., *Expositiones in Micrologum Guidonis Aretini* (Amsterdam: North-Holland Publishing Company, 1957). Guido of Arezzo, *Regule rithmice, Prologus in antiphonarium, and Epistola ad Michahalem: A Critical Text and Translation, with an Introduction, Annotations, Indices, and New Manuscript Inventories.*, ed. Dolores Pesce, vol. 73, *Musicological Studies* (Ottawa: The Institute of Mediaeval Music, 1999). Ilnitchi discusses the “collected works” phenomenon in her review of Pesce’s new edition: “A careful codicological analysis of the manuscripts that according to Pesce transmit Guido’s texts in a quadrivial or trivial context suggests that some of them are in fact the products of late medieval or even Renaissance binding practices: Darmstadt, Hessische Landes- und Hochschulbibliothek, Ms. 1998; Pommersfelden, Graf Schönbornschen, Schloßbibliothek, Hs.45 (2915); Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Ms. Philos. 84; and Munich, Bayerische Staatsbibliothek, clm 14663, among others. Although some of these codicological data can be located in the inventory of manuscript contents that Pesce provides later in the volume (see the description of Darmstadt 1988 on pp. 60-3 above, for example), they had little impact on Pesce’s arguments. In some of these sources, such as Darmstadt 1988 or Munich clm 14663, Guido’s texts are transmitted in what originally were independent manuscripts with exclusively music-theoretical content, sources that were only later bound with other manuscripts with differing sorts of content.” Gabriela Ilnitchi, “Book Review: *Guido d'Arezzo's Regule rithmice, Prologus in antiphonarium, and Epistola ad Michahalem* by Dolores Pesce,” *Plainsong and Medieval Music* 10 (2001): 198. Ilnitchi suggests that the collected works may often have circulated as an independent *libellus*, resulting in quite complicated patterns of transmission for these treatises.

been cut away); and some figures and musical examples have not been completed.⁴⁶ It appears as if Scribe *a* at first wanted to continue the column ruling

⁴⁶ Although papertype B is used here, it is only used for the bifolio that makes up folios 78 and 92, which wraps around the gathering of folios 79 to 91. Both the recto and verso of 78 and 92 are blank, making it very likely that this wrapper is a later addition, which would mean that only paper types A and C were used in gatherings 7 and 8. Indeed, papertype B is only ever used as a blank bifolio: once in the blank gathering 1, in the middle of the gathering; and in gathering 11, which is also a blank gathering. The only way to explain the strange pattern of watermarks in *Quaestiones de musica* layer is that a number of folios in the gathering were single folios (indicated in Appendix 3c by the use of dotted lines): my best guess, given the patterning of the watermarks, is that folios 79-81 were three single folios. Given the content of the text at this point (that is, the fact that the second part of the treatise begins on f. 82r), it seems that folios 79-81 probably belong to the end of gathering 7, but in later binding were wrapped within the blank bifolio of papertype B (folios 78 and 92). To explain in more detail: Scribe *a* continued, very consistently through gathering 7, to copy the treatise in two columns (as Scribe *b* had done for the Guido treatises of gatherings 3 and 4). But on f. 77r, he changes this pattern, possibly based on the fact that some figures needed to be copied. He copies f. 77r on a full page (even though the paper has been ruled for two columns). On f. 77v, in very light ink, a note has been made that a figure is to follow (“sequitur figura”), and then on f. 79r (the cut folio mentioned earlier), this figure is begun but not completed. On f. 79v, the text begins again in two columns, but again, a note is made in a very small hand in lighter ink that something is missing (“hic nihil de est”). On f. 81v, the text “Incipit pars secunda” is written in red ink and the second half of this page is left blank. The second part of the treatise then begins on f.82r, the first real bifolio of a gathering of originally five bifolios, I believe. It seems that the scribe was confused about how many space would be needed to complete the first part of the treatise, and this explains the addition of the extra folios 79-81, and possibly the implies that the first and second parts of the treatise were being copied simultaneously rather than consecutively (or that the ruling and chapter titles were copied into the gatherings first, and then the text was added later). This inexperience is possibly also evident in the incompleteness of the figures, the switching back and forth from one to two columns, and the possible removal of an incorrectly copied figure.

that was used by Scribe *b* in the Guido layer (that is, in two columns), but then from f. 88r decided to switch to a one-column ruling. The scribe of this second layer, Scribe *a*, also made corrections in the Guido layer, indicating that he had access to this layer and was possibly either continuing or directing the work of copying these music treatises begun by Scribe *b*. The remainder of the manuscript, with the other treatises copied by Scribe *a*, comprise the third layer of copying. These are mostly *compendia* and other works dealing with tonary and modal issues and are contained in gathering 2, gatherings 5 and 6, and gatherings 9 and 10. Within this layer, different levels of completeness may be discerned. Gathering 2, which includes the *Tractatus de consonantiis* and the *Tractatus de intonatione tonorum*, is a well-planned gathering of six bifolios, ruled in two columns and using one paper-type (C). In gatherings 5 and 6, containing a treatise apiece (the anonymous *Compendium de musica* and Berno's tonary), the first folio of each gathering (recto and verso) is left blank, both are ruled in one column, and they use just one papertype (A). These gatherings do not follow the pattern of six bifolios, but contain four and five bifolios respectively. Gatherings 9 and 10 appear unfinished. Although they are gatherings of six bifolios and are consistently ruled in one column, Scribe *a* has only entered a couple of treatise fragments and short treatises at the beginnings of the gatherings and the rest of the gatherings were left blank: at some later time two other scribes (*c* and *d*) added some tables and an

Aribo fragment (see fn. 52). In terms of the copying order of these layers, I would posit that the Guido layer was completed first, but the order of copying of layers 2 and 3 is harder to discern. It is possible that the *Quaestiones* layer (layer 2) was copied next, for, as I described, it started out in a manner consistent with the first layer, but the scribe got a little off track. If the third layer was copied last, it is interesting to note the use of papertype C in gathering 2 (the gathering we are most interested in since it contains the *Tractatus de intonatione tonorum*). This papertype is only used for three other bifolios in the manuscript: a blank wrapper for gathering 6; as the outside bifolio for gathering 7; and the inside bifolio for gathering 9. Does this imply that these gatherings were copied after gathering 2 and used its leftover paper? In any case, it implies some degree of separateness of existence for gathering 2.

The compilation hypothesis I have outlined is supported by a comparison of *B-Br* 10162/66 with *D-Ds* 1988. *B-Br* 10162/66 has been shown to be in large part a copy of the twelfth-century manuscript *D-Ds* 1988, a manuscript that has been assigned to the abbey of St. Jacques, and which has been shown to be Jacobus's source for much of Book 6.⁴⁷ Appendix 4 outlines the concordances between these two sources.⁴⁸

⁴⁷ *D-Ds* 1988 appears in Bouxhoun's catalogue of 1667 of St. Jacques (*B-Br* 13993) as entry L.21. This volume also appears in Basile Ernotte's catalogue of

Steglich claimed that these two manuscripts were the only sources for the anonymous *Quaestiones de musica*, and used this fact to bolster the Liège ties of Jacobus (since he quotes large excerpts from this treatise); however, Smits van Waesberghe added a third manuscript to the list of sources for the *Quaestiones* (*D-Kk Ny Kgl S. 73*).⁴⁹ *B-Br 10162/66* is the only known extant source for the *Tractatus intonatione tonorum*. Appendix 4 shows that, while the central portions of *D-Ds 1988* are clearly related (with the slight rearrangement in this table of the

1731 and Jean-Noël Paquot's catalogue of 1788. See Christine Mortiaux-Denoël, "Le fonds des manuscrits de l'Abbaye de Saint-Jacques de Liège," *Revue bénédictine* 101 (1991): 186. The scribe of *B-Br 10162/66* indicates that he is copying from the St Jacques volume by writing on f.48v: "Sic hic est defectus nescio quia in libro ex quo scripsi (de s. Jacobo) adhuc maius est spacium derelictum." For a brief discussion of provenance and codicology of *D-Ds 1988* see *RISM BIII/1*, 39-41. See also Vivell, "Die Quaestiones in Musica, Ihre handschriftliche Quelle und ihr mutmasslicher Verfasser." Initchi comments on Jacobus's use of this source in "Aribo's *De Musica*: Music Theory in the Cross Current of Medieval Learning" (Ph.D. diss., New York University, 1997), 76-81. Idem, *The Play of Meanings: Aribo's De musica and the Hermeneutics of Musical Thought* (Lanham, Md: Scarecrow Press, 2005).

⁴⁸ In the table structure of Appendix 4 I have shuffled the order of some of the gatherings of *B-Br 10162/66* (based upon the manuscript collation I have posited for this manuscript), so that the alignment between the two sources may be seen more clearly. The reader should take careful note of the folio numbers of *B-Br 10162/66* in this table.

⁴⁹ Rudolf Steglich, ed., *Die Quaestiones in musica: ein Choraltraktat des zentralen Mittelalters und ihr mutmasslicher Verfasser Rudolf von St. Trond* (Leipzig: 1911), 257. Smits van Waesberghe, "Some Music Treatises," 98.

gatherings of *B-Br* 10262/66 this becomes evident), the second and fifth gatherings of *Br* 10262/66 have another exemplar.⁵⁰ But while the codicological examination outlined above does show that gatherings 2 and 5 belong within a separate layer of *B-Br* 10162/66 (layer 3 in my analysis), it also shows the same scribe (Scribe *a*) as responsible for work across all layers (even with layer 1, the Guido layer, where he made notes and corrections), and the use of common paper types and ruling patterns throughout. One plausible explanation is that, in addition to *D-Ds* 1988, the manuscript from which the fifteenth-century scribe of *B-Br* 10162/66 copied the *Tractatus intonationem tonorum* was also in the library of St. Jacques, and this would suggest a Liège-related (and St. Jacques-related) exemplar for the *Tractatus intonationem tonorum*. If this were the case, then it is conceivable that Jacobus also came across this exemplar in the library of St. Jacques, while he was perusing the contents of *D-Ds* 1988. It is not necessary to postulate, as Bragard did, that Jacobus was the author of *Tractatus intonationem tonorum*: the furthest we can go, I

⁵⁰ So, to return for a moment to the layers postulated in my codicological analysis of *B-Br* 10162/66, the gatherings of *B-Br* 10162/66 that are copied from *D-Ds* 1988, in the order that they appear in *D-Ds* 1988, are gatherings 3 and 4 (layer 1), gatherings 7 and 8 (layer 2), and gatherings 6, 9 and 10 from layer 2 (not including the work of the later Scribes *c* and *d*). Gatherings 2 and 5 (containing the three treatises ascribed to Jacobus), and the two Aribo fragments within gatherings 9 and 10 have another exemplar (the third layer of copying that I postulate).

believe, is to show that Jacobus relied upon it as a primary authority.⁵¹ So it is important, then, to describe how and where Jacobus uses the material from *Tractatus intonatione tonorum*, and to try to localize its tonary to some extent, since Jacobus quotes from it at length, and implies at several points during his tonary that the practices outlined in the *Tractatus intonatione tonorum* represent those he now follows.

Table 1 lists the chapters where large sections of text were found to be concordant between the tonary of *B-Br 10162/66* and Jacobus's tonary.

Table 1 Comparison of *B-Br 10162/66* and Jacobus Book 6

<i>Speculum musicae</i> , Book 6	<i>Tractatus de intonatione tonorum</i>
75. De cantuum et tonorum regularibus distinctionibus	I. In huius opusculi capitulo primo ars tonorum traditur generalis
76. De tono cantuum terminatorum in <i>ut</i> vel in <i>la</i>	
77. De cantuum irregularitate	
78. De tono cantuum irregularium	
79. De cantuum tenoribus	
80. De differentiis tonorum vel "Seculorum, Amen" in generali	
81. Qualiter, per tenores et "saeculorum" differentias, antiphonarum et introitum tonus cognoscatur	II. In hoc capitulo declaratur qualiter antiphonarum tonus per ipsarum Seculorum agnosci valeat

⁵¹ Bragard, "Le *Speculum musicae* II," 11.

83. Quid sit psalmodialis intonatio	III. Capitulum in quo traditur notitia generalis intonationis tonorum
85. De differentiis “saeculorum” primi toni	IV. Hic fit prosecutio in speciali de tonorum diversorum inchoatione et primo tanguntur ea quae ad primum tonum spectant
86. De intonatione primi toni quantum ad antiphonas	
87. De differentiis et missarum introitum intonatione et quibusdam aliis ad tonum primum pertinentibus	
88. De principiis cantuum toni secundi	V. Capitulum de pertinentibus ad secundum tonum
89. De differentiis secundi toni, de intonatione et aliis quibusdam	
90. De principiis cantuum tertii toni	VI. Capitulum de pertinentibus ad tertium tonum
91. De differentiis tertii toni	
92. De intonatione tertii toni quantum ad antiphonas	
93. De differentiis et intonatione missarum, introitum et quibusdam aliis pertinentibus ad tertium tonum	
94. De principiis et differentiis quarti toni	VII. Capitulum de pertinentibus ad quartum tonum
95. De intonatione antiphonarum et introitum quarti toni et de aliis quibusdam ad ipsum pertinentibus	
96. De principiis, differentiis et intonatione quinti toni	VIII. Capitulum de pertinentibus ad quintum tonum
97. De principiis et differentiis sexti toni	IX. Capitulum de pertinentibus ad sextum tonum
98. De intonatione sexti toni et aliis quibusdam ad ipsum pertinentibus	

99. De principiis septimi toni	X. Capitulum de pertinentibus ad septimum tonum
100. De differentiis septimi toni	
101. De intonatione septimi toni et de quibusdam aliis ad ipsum pertinentibus	
102. De principiis et differentiis octavi toni	XI. Capitulum de pertinentibus ad octavum tonum
103. De intonatione octavi toni et de quibusdam aliis ad octavum tonum pertinentibus	

The treatise of *Tractatus intonatione tonorum* is much more concise than the comparable chapters of *Speculum musicae*, Book 6. As I stated above, the possibility exists that the source for *Tractatus intonatione tonorum* was also at St. Jacques and that Jacobus was excerpting passages from both *D-Ds* 1988 and from the exemplar of *Tractatus intonatione tonorum*. So may anything be surmised from a textual examination and comparison of the two texts? The comparison is interesting because the relationship between the two is by no means a word-by-word quotation of one source in another: rather the same topics and examples are dealt with in the same order, but the actual words used are different. This is an example of a paragraph from each with the identical words or phrases in each highlighted:

Quamvis autem ad perfecte **iudicandum** de cantu quocumque cuius fuerit toni diligens requiratur inspectio totius cantus, **principii scilicet, medii atque finis, plus tamen valet ad hoc medii et finis quam principii**

consideratio. Propterea regulae quae dantur et dabuntur de distinctione et natura tonorum mentionem faciunt **de mediis et fine cantuum**, non de principiis. (*SM* 6.75, 216)

Notandum igitur, ut tactum est, quod ex tribus perpenditur antiphonae tonus vel alterius cantus cuiuscumque, **scilicet ex principio, medio** seu processu **atque fine**, et neutrum istorum trium per se sufficit ad secure **iudicandum** de tono cuiuslibet cantus regularis. **Plus tamen** facit **ad hoc medii atque finis consideratio quam principii. Propterea de medio** seu processu **atque fine cantuum** diversorum tonorum figuraliter breviterque nunc dicemus. (*Tractatus de intonatione tonorum* 1.2)

Although, if someone wishes to achieve a more perfect understanding of the tone of a chant, they ought to diligently study the entire chant, its beginning, middle and end, nevertheless, it is valuable to give a more careful consideration to the middle and end of the chant rather than the beginning. Therefore, the rules which were given and which will be given on the distinction and nature of the tones, make mention of the middles and end of the chants, and not of the beginnings.

It must be noted that, as was touched upon, the tone of an antiphon or other chant depends upon three parts, the beginning, the middle (or procession) and the end, and none of these by themselves is enough to know the mode of a regular chant. More consideration ought to be given to the middle and end, rather than the beginning. Therefore we shall now (figuratively and briefly) speak about the middle (or procession) and end of the diverse tones of the chant.

What kind of relationship may be determined between these two treatises?

While chapters 75-80 of *Speculum musicae* Book 6 have ideas and threads similar to those in the first chapter of the *Tractatus intonatione tonorum*, the discussion in *Speculum musicae* is a good deal more expansive. The beginning of Chapter 81 of

SM Book 6 is almost *verbatim* the same as *Tractatus intonationem tonorum* Chapter 2, but is elaborated with several musical examples. Similarly Chapter 83 (*SM* 6) contains some direct quotes from the third chapter of *Tractatus intonationem tonorum*, but again a musical example is added in the *Speculum musicae* text. Chapter 4 to 11 of *Tractatus intonationem tonorum* work through each of the eight modes, as do Chapters 85 to 103 of *Speculum musicae*. There are some direct quotes and musical examples common to both, but Jacobus intersperses the text in *Speculum musicae* with quotations from many other tonaries (see Appendix 2). I think we may conclude that Jacobus used *Tractatus intonationem tonorum* as one of many texts that he relied on for his tonary, but he was not necessarily its author.

Can the order of the chapters in the tonary of *Speculum musicae* and the way in which the tones are outlined tell us anything more about the order of compilation of Jacobus's tonary and its exemplars? According to Huglo: "This classification [of the psalm tone endings, the *differentiae*] varies occasionally from one tonary to another, depending on the individual preferences of the compilers; the number of endings, too, is not the same for each tone and varies for any single tone from tonary to tonary. The order in which the endings are presented varies greatly."⁵² *Tractatus intonationem tonorum* outlines the *differentiae* and intonations

⁵² "Tonary," *GroveMO*.

for each mode, but unlike Jacobus's tonary, specific chant examples are given to illustrate the tonal classification. Jacobus relies solely on the text and examples given in the *Tractatus intonatione tonorum* for his sections on the intonation of the simple psalm tone, the *Benedictus* and the *Magnificat*, the cauda, the introit *differentiae*, and its *Gloria patri*, the *Gloria Patri* of the responsory, and the invitatory psalm with its *Venite*. Other than the passages that focus on the antiphon *differentiae*, which will be analyzed in more detail later, the only elements that Jacobus adds to those given in the *Tractatus intonatione tonorum* are specific examples of introit *principiae*, the intonation of the psalm tone with a median inflexion (according to Dominican practice), and the intonation of the responsorial Easter Alleluia.

LATE-MEDIEVAL LITURGICAL SOURCES FROM LIÈGE

Table 2 lists the relevant fourteenth-century Liège liturgical manuscripts. There are five surviving manuscripts from the collegiate church of Sainte-Croix: a pair that make up the winter and summer antiphonary, a single summer antiphonary, a fragmentary antiphonary and a gradual. A Carthusian antiphoner from the fourteenth century is also extant, which details the introit *differentiae*;⁵³ and in

⁵³ This antiphoner contains a tonary that gives the intonation of the introit psalm and *differentia* and *Gloria Patri* for the eight tones on f. 197v-200 and on f.200v-204 outlines the intonation for the prayers in the mass and the hours and the

addition, the introit *differentiae* from the fourteenth-century gradual of St. Paul and the gradual of Sainte-Croix were examined. Transcriptions of the relevant sections of these manuscripts are given as Appendix 5.

readings of the gospels and epistles.

Table 2 Liège late-medieval liturgical manuscripts containing tonaries

<i>Manuscript</i>	<i>Type</i>	<i>Comments</i>
Belgium, Liège, L'église Sainte- Croix, Ms. 1	ANTIPHONER (winter), Ste. Croix	Hufnagel notation; 311 folios (1320s/1330s, parchment). Contains a tonary (f. 257-260v).
Belgium, Liège, L'église Sainte- Croix, Ms. 2	ANTIPHONER (summer), Ste. Croix	Hufnagel notation; 352 folios (1320s/1330s, parchment). Contains a tonary (f. 292-295v).
Belgium, Liège, Musée d'art religieux, no shelf mark	ANTIPHONER (summer), Ste. Croix	Hufnagel notation; 342 folios (14 th century, parchment).
Belgium, Liège, Musée d'art religieux, no shelf mark	ANTIPHONER, (fragmentary) probably from Ste. Croix	Hufnagel notation; 103 folios (14 th century, parchment); miscellaneous items gathered together in one binding.
Belgium, Liège, Musée d'art religieux, no shelf mark	GRADUAL, Ste. Croix	Hufnagel notation; 323 folios (14 th century, parchment). Contains a tonary (f. 3-4v).
<i>B-Br</i> II 261	GRADUAL, Chartreuse de Mont-Cornillon	Square notation (1367, parchment). Contains a tonary (f. 197v-204).
<i>B-Br</i> 223/4	ANTIPHONARY, Dominican	Square notation (14 th century, parchment); 276 folios. Contains a tonary (f. 2-5).
<i>B-Ls</i> 32 A 8	GRADUAL, St. Paul	Hufnagel notation; 325 folios (dates after 1347-49, parchment).

All five of the Sainte-Croix manuscripts are written in *hufnagel* notation, with yellow and red staff lines (to indicate the notes C and F respectively) and with similar initial decoration.⁵⁴ Based on their paleographical characteristics, and certain dates of biography, Oliver dates the manuscripts to the 1320/1330s (specifically, a date of after 1320 for the gradual and before 1334 for the

⁵⁴ On the subject of notation, it is worth noting here that Jacobus devotes a long and interesting chapter on the history of notation, beginning with Boethius and continuing up through to the notation of his contemporaries. He says the following with respect to the use of *hufnagel* notation and square notation in chant manuscripts: “Est autem notandum quod modum notandi per figuras non quadratas usque ad haec tempora tenent Allemanni quantum ad multas saeculares ecclesias, quicquid sit de aliquibus <regionibus>, ponuntque pro .C. ubique colorem croceum et pro .F. ubique colorem rubeum de minio, ceteras litteras protrahentes de <incausto> nigro. Sed ecclesiae gallicanae tam saeculares quam claustrales illis iam non utuntur notis sed quadratis quae ceteris perfectiores videntur et quibus usus sit in musica mensurabili . . . Similiter inconveniens et superfluum videtur ut eidem lineae duo colores deputentur” (“It must also be noted that the way of notating with non-quadratic figures is still being used up until this time by the Germans in many of their secular churches, and some other regions, and they place a yellow line for C and a red line for F, the other letters in black. But the French churches, both secular and regular, use only quadratic notes, and this would seem to be more seem more perfect, and these are what are used in mensural music . . . they also find it superfluous to notate the the lines in two different colors”). *SM* 6.213-214. Oliver suggests that the use of *hufnagel* notation in the Sainte-Croix manuscripts is worth noting, since liturgical manuscripts from the diocese prior to this time employed square notation. She mentions that there were two other fourteenth-century manuscripts from this region that employ *hufnagel* notation: the missal of St. Jacques, *B-Br* IV 1045, and another Liège missal, Tilburg, Bibliothek van de Theologische Faculteit, Haaren Ms. 26. I would add the St. Paul gradual (*B-Ls* 32 A 8) to this list.

antiphoners).⁵⁵ Philippe Bruni, who was deacon of Sainte-Croix from 1324-1361 commissioned this set of liturgical books for his church.⁵⁶ According to Oliver, the four large choir-books that she examined had been part of a private collection and were recently returned to Sainte-Croix. Frisque's study of these manuscripts posits an individual known as *B. cantor* as the scribe and notator.⁵⁷ The antiphoner, although it has no gold, has a wider vocabulary of ornamentation, more varied and more modern than that of the gradual. The only extant chant manuscript from St. Paul (the collegiate church where Jacobus held a canonicate) is the manuscript *B-Ls* 32 A 8. This gradual contains not only the proper of the mass but also items for the mass ordinary and sequences.

⁵⁵ Judith Oliver, "L'Héritage de Philippe Bruni, Doyen du Chapitre de Sainte-Croix, de Retour à Liège," *Bulletin de la Société d'art et d'histoire du Diocèse de Liège* 60 (1995): 47-63. X. Frisque, "Un reflet de l'école liégeoise de chant grégorien à travers des manuscrits de l'ancienne collégiale Sainte-Croix à Liège," *Bulletin de la Société liégeoise de musicologie* 68 (1990): 1-30. Joseph Daris, *Notices Historiques sur les Églises du Diocèse de Liège*, Vol. 15, Editions Culture et Civilisation (Brussels, 1975). These studies do not discuss the fragmentary antiphoner. I am led to understand by the curate of Sainte-Croix that this antiphoner is a very recent acquisition (private communication, May 1999).

⁵⁶ Oliver, "L'Héritage," 49.

⁵⁷ Frisque, "Un reflet," 4. Oliver says that *B. cantor* was Baudoin de Mol (d. 1334), mentioned in the 1361 will of Philippe de Bruni as having led the production of the Sainte-Croix manuscripts. However, she differs from Frisque in that she does not view Baudoin as the scribe, but finds it more probable that Philippe de Bruni installed a lay artisan in the church to complete the manuscripts ("L'Héritage," 60).

Frisque suggests that there are some German characteristics of the chants contained in the Sainte-Croix manuscripts, alongside the *hufnagel* notation.⁵⁸ Because of these French and German traits, Frisque concurs with Huglo's description of Liège as a transitional zone. In terms of their plainchant traditions, Oliver notices similar transitional qualities in manuscript illumination techniques of Liège during this time:

In the 1260s-80s northern French centers in Artois and Hainault had a predominant influence on the stylistic development of manuscripts produced within the diocese. Itinerant artists from France and northern France and northern Hainault were active both in the capital of Liège and in the duchy of Brabant where a distinctive local school was to continue into the early fourteenth century. In the last few decades of the thirteenth century, the Court Style of Saint Louis triumphed in the Liège diocese, imported by artists from Paris or Champagne and from Lorraine. . . . Liège was an administrative, ecclesiastical, and political center, not a center of trade or industry. Dominated by the entourage of the prince-èveque, the capital lacked a secular court, and the large clerical population had a pervasive influence on the culture of the diocese as a whole. Patronage in the diocese of Liège was not only largely clerical but also largely middle class rather than aristocratic. Hence there is an absence of highly refined, lavishly illuminated manuscripts among the psalters that survive.⁵⁹

⁵⁸ Frisque, "Un reflet," 5-6.

⁵⁹ "Manuscript Production in the Diocese of Liège," Chapter 8 in Judith Oliver, *Gothic Manuscript Illumination in the Diocese of Liège (c.1250 - c.1330)*, vol. 2-3, *Corpus of Illuminated Manuscripts from the Low Countries* (Leuven: Peeters, 1988), 203-04. In Chapter 7 Oliver discusses three manuscripts produced by the Abbey of St. Jacques *scriptorium*: *D-Ds* 2777, *B-Br* IV 1045 (a Missal) and *D-Ds* 344. From my examination of *B-Ls* 32 A 8, I believe the illumination may also be by the same workshop as *B-Br* IV 1045. (This Missal contains only three

Oliver describes Liège as “conservative” in comparison to Bruges or Paris. Of the abbey of St. Jacques, Oliver contends that “after a period of decline in the early thirteenth century, [it] became a flourishing center of manuscript illumination under the reforming abbot Guillaume de Julémont (1285-1301) and his successors.”⁶⁰ In the surviving *Liber Ordinarius* from St. Jacques we see that Guillaume de Julémont codified the customs of the abbey “and introduced reforms in its spiritual and temporal affairs under the influence of Cistercian and Dominican usages.”⁶¹ Did these reforms include musico-liturgical reforms such as, for example, bringing intonation practices closer in line with the reformed Dominican practice?⁶²

pages with musical notation, again *hufnagel* notation.) Although I have not had the opportunity to examine the Turin motet manuscript (*I-Tr* Vari 42) in person, from facsimile reproductions it also seems to have similar initials to these manuscripts. This manuscript did appear in Bouxhon’s 1667 catalogue of the Abbey of St. Jacques as item E 73.

⁶⁰ *Ibid.*, 204.

⁶¹ Oliver, “The *Crise Bénédictine* and the Revival of the Abbey,” 324. See also P. Volk, “Der ‘*liber ordinarius*’ des lütticher St-Jakobklosters,” in *Beiträge zur Geschichte des alten Mönchtums und des Benediktinerordens* (Münster: Aschendorff, 1923).

⁶² In chapter 83, Jacobus introduces the topic of psalm tone intonation and says that Guido and Boethius did not treat this subject sufficiently, and that he will see what is required to do this properly according to modern use. He indicates that the secular churches in Liège, although they followed the common intonation practice at the beginnings of the verses, do not follow it in the middle of these chants.

Unfortunately, these kinds of details are not to be found in the *Liber Ordinarius* of St. Paul, although we do know that, in general, the reforms of the Dominican liturgy outlined in Humbert's Correction, which arranged the entire liturgy in one volume and was formally approved by papal bull in 1267, emphasized the sobriety and simplicity of the rite.⁶³ The manuscript of Humbert's correction was preserved for many centuries in the monastery of Saint-Jacques at Paris, until the French revolution.⁶⁴ The master general's own copy is still extant (*GB-Lbl* Add. 23935). Bonniwell states the "in addition to Religious Orders, certain monasteries and dioceses also welcomed the Dominican arrangement. Thus, the Benedictine monastery of St. Jacobus in Liège embraced a considerable part of Humbert's work."⁶⁵ Although many different theories have been put forth concerning the origin of the Dominican liturgy, Bonniwell believes that it represents the genuine

⁶³ There is an interesting study of the extensive body of legislation contained in the constitutions of the Dominican order between 1220 and 1300 (and in several acts of the general and provincial chapters) regarding construction and decoration of its churches and buildings (including a ban on all types of architectural ornamentation). See: Richard A. Sundt, "'Medioces domos et humiles habeant fratres nostri:' Dominican Legislation on Architecture and Architectural Decoration in the 13th Century," *The Journal of the Society of Architectural Historians* 46/4 (1987): 394-407.

⁶⁴ W. R. Bonniwell, *A History of the Dominican Liturgy, 1215-1945*, 2nd ed. (New York: Joseph F. Wagner, Inc., 1945), 93.

⁶⁵ *A History of the Dominican Liturgy*, 166.

Roman rite of the early thirteenth century, enriched with certain non-Roman variations and additions.⁶⁶ In the late thirteenth century preachers were enlisted by the pope to reform monasteries and dioceses: for example, trained generations of friars who studied at the Dominican priory of St. Jacques in Paris returned to the provinces to teach, following the dictates of their order (“contemplare et contemplare aliis tradere” [“to contemplate and to give to others the fruits of contemplation”]).⁶⁷ According to Oliver, the center of theological studies in Liège in the thirteenth century was the Dominican house.⁶⁸ The Dominican friars were

⁶⁶ Ibid., 174.

⁶⁷ William A. Hinnebusch, *The History of the Dominican Order, Volume One: Origins and Growth to 1500* (London: Alba House, St. Paul Publications, 1965), 120-4 (quoting Aquinas, *ST II II* q. 88, a.6). For an overview of early Dominican history, see Georgina Rosalie Galbraith, *The Constitution of the Dominican Order, 1216 to 1360* (Manchester, The University Press; London, New York: Longman, Green & Co., 1925); William A. Hinnebusch, *The History of the Dominican Order, Volume Two: Intellectual and Cultural Life to 1500* (London: Alba House, St. Paul Publications, 1973); B. M. Reichert, *Acta capitulorum generalium (1220-1303)* (Rome: In Domo Generalitia, 1898); Idem, *Acta capitulorum generalium (1304-1378)*, vol. 2 (Rome: In Domo Generalitia, 1899). Hinnebusch’s two volumes are good, detailed surveys of the period in question. On particular musical aspects of the reform, see Michel Huglo, “Règlement du XIII^e siècle pour la transcription des livres notés,” in *Festschrift Bruno Stäblein zum 70. Geburtstag*, ed. Martin Ruhnke (New York: Kassel Bärenreiter, 1967), 121-33; Kenneth Levy, “A Dominican *organum duplum*,” *Journal of the American Musicological Society* 27 (1974): 183-211..

⁶⁸ Unfortunately the libraries of the Dominican and Franciscan houses were destroyed in the sack of the city in 1468. Oliver, *Gothic Manuscript Production*, 105.

known to teach not only in their schools but also in those of the other ecclesiastical groups: Mandonnet, in his study of Dominican history, found records of more than a hundred friars teaching in Episcopal schools and abbeys, and particularly in cathedral schools.⁶⁹ So, taking as a given the known Dominican influence and reforms at the abbey of St. Jacques in Liège at the turn of the fourteenth century, can we postulate that these reforms would have also influenced the collegiate church of St. Paul, noting that there was close relationship between these institutions, which was possibly the result of the same Dominican friar or friars teaching at both institutions?⁷⁰

Before we finish these general introductory remarks with respect to the liturgical dependencies within the ecclesiastical institutions of Liège, I will mention one more possibly interesting connection. During the term of Guillaume de Julémont as abbot, the abbey of St. Jacques acquired numerous manuscripts, particularly from his friends and acquaintances, including many manuscripts from the theologian and philosopher Godfrey of Fontaines (d. c1306). Godfrey held a canonicate at the cathedral of St. Lambert in Liège, and was a master of theology

⁶⁹ Hinnebusch, *The History of the Dominican Order*, Volume 2, 12.

⁷⁰ For a discussion of the relationship between the collegiate church of St. Paul and the Abbey of St. Jacques, see Desmond, “New Light,” 32.

from the University of Paris (1286-7). He was famous as a great book collector and was Guillaume's advisor in reforming the abbey of St. Jacques.⁷¹ He left most of his manuscripts to the Sorbonne, but he left copies of his *Quodlibets* and works by Augustine and Henry of Ghent to the Liège abbey.⁷² The connection between Godfrey and Guillaume with St. Jacques (and Paris incidentally) is interesting if we

⁷¹ On Godfrey, see: Maurice Wulf, *Un théologien-philosophe du XIIIe siècle. Étude sur la vie, les oeuvres et l'influence de Godefroid de Fontaines* (Brussels: L'institut supérieur de philosophie de l'université, 1903). Godfrey was born in the principality of Liège around 1250 and he maintained close connections with Liège during his career at Paris. On the biography of Godfrey see John F. Wippel, "Godfrey of Fontaines at the University of Paris in the Last Quarter of the Thirteenth Century," in *Nach der Verurteilung von 1277. Philosophie und Theologie an der Universität von Paris im letzten Viertel des 13. Jahrhunderts*, ed. K. Emery J.A. Aertsen, Andreas Speer, *Studien und Texte (Miscellanea Mediaevalia, 28)* (Berlin, New York: Walter de Gruyter, 2001).

⁷² Oliver, "Crise Bénédictine," 324. Regarding other clerics who left manuscripts to St. Jacques see also S. Balau, "La bibliothèque de l'abbaye de Saint-Jacques à Liège," *Bulletin de la Commission royale d'histoire* 71 (1902): 4-6. I did examine a manuscript of Godfrey's *Quodlibets*, F-Pn lat. 3117, that had an incipit on the first folio in a fourteenth-century hand saying that the manuscript belonged to brother Jacobus ("Iste liber est fr[ater] Iacobi d[omi]ni ordinis car[thusiensis?] quem accom[mod]avi Gilberto fratri suo [et] existit lect[us]"). This was only visible under UV light and the abbreviations were difficult to decipher. Many of the books of this Liège library were purchased by Baron von Hüpsch of Cologne and are now in Darmstadt. Judith Oliver, "The 'crise bénédictine' and Revival at the Abbey of Saint-Jacques in Liège," *Quaerando* 8 (1978): 320. On the Darmstadt collection, see: Leo Eizenhöfer and Hermann Kraus, *Die liturgischen Handschriften der Hessischen Landes- und Hochschulbibliothek Darmstadt* (Wiesbaden: O. Harrassowitz, 1968); Herman Knaus, "Bilderhandschriften der Hessisches Landes- und Hochschulbibliothek Darmstadt," in *Die Sammlungen des Barons von Hüpsch: Ein kölnner kunst Kabinett um 1800* (Köln: Schnütgen-Museum, 1964).

consider Jacobus as part of this *milieu*, particularly given the strong influence of Godfrey's philosophical positions on Jacobus, which I shall detail in Chapters 5 and 6.

TONARIES IN LATE-MEDIEVAL THEORETICAL WORKS

Table 3 outlines the contemporary theoretical treatises that include tonaries. I have listed the tonaries that are contained within late-thirteenth-century treatises, including one from the Dominican tradition, as set forth in the tonary of Hieronymus de Moravia.⁷³

⁷³ *Ameri Practica artis musicae*, ed. Cesarino Ruini, vol. 25, *Corpus scriptorum de musica* (Neuhausen-Stuttgart: Hanssler-Verlag, American Institute of Musicology, 1977), 38-75. The anonymous *Summa musicae* is edited in Christopher Page, *The Summa musicae: A Thirteenth-Century Manual for Singers* (Cambridge: Cambridge University Press, 1991), tonary at 178-95. According to Auda, the anonymous *Tractatus de musica plana et organica* had only one manuscript source: a thirteenth-century manuscript from St. Jacques (the manuscript was at the University of Louvain but was destroyed in a fire in 1914). Antoine Auda, ed., *Les "Motets Wallons" du Manuscrit de Turin: Vari 42*, 2 vols. (Brussels: The Author, 1953), 8; Patricia Norwood, "Performance Manuscripts from the Thirteenth Century?," *CMS* 26 (1986): 92-96. Auda dated the treatise to the twelfth century. The edition is found in *CS* 2, 484-498. Guy de Saint-Denis, *Tractatus de tonis*, edn. in Johannes de Garlandia, *De mensurabili musica, kritische Edition mit Kommentar und Interpretation der Notationslehre*, edited by Erich Reimer, *Beihefte zum Archiv für Musikwissenschaft* (Wiesbaden: Steiner, 1972), 6-10. Jerome of Moravia, *Tractatus de musica*, ed. Simon M. Cserba (Regensburg: F. Pustet, 1935), tonary at 160-68. Johannes de Garlandia, *De musica plana*, ed. Christian Meyer (Baden-Baden: V. Koerner, 1998). *Petrus de Cruce Ambianensi Tractatus de tonis*, vol. 29, *Corpus scriptorum de musica* (N.p.: American Institute

Table 3 Late-medieval theoretical treatises containing tonaries

<i>Author</i>	<i>Treatise</i>	<i>Source</i>
Amerus	<i>Practica artis musicae</i>	D-Baa Lit 115
Anonymous	<i>Summa musicae</i>	A-SPL 264/4
Anonymous	<i>Tractatus de musica plana et organica (CS 2, Anon. 2)</i>	Louvain (destroyed 1914)
Guy de Saint-Denis	<i>Tractatus de tonis</i>	GB-Lbl Harley 281
Hieronymus de Moravia	<i>Tractatus de musica</i>	F-Pn lat. 16663 ⁷⁴
Johannes de Garlandia	<i>Introductio musicae planae</i>	BR-Rn 50, 18 E-Bbc 883 F-SDI 42 US-Wc Music Division, ML 171.J6

of Musicology, 1976). Magister Lambertus, *Tractatus de musica* in CS 1, 251-281. Elias Salomo, *Scientia artis musicae*, in CS 2, 16-64, tonary at 28-54.

⁷⁴ In a codicological study of this manuscript, Huglo has arrived at the dates 1285-1290 for the copying of this manuscript. Michel Huglo, "La place du *Tractatus de Musica* dans l'histoire de la théorie musicale du XIIIe siècle: étude codicologique," in *Jérôme de Moravie: un théoricien de la musique dans le milieu intellectuel parisien du XIIIe siècle*, ed. Christian Meyer (Paris: Créaphis, 1992), 23-42.

⁷⁵ Everist contends that the scribe of this manuscript was trained in the University of Paris and links it with *F-Pn* lat. 16607, a manuscript that was copied after 1268 for Godfrey of Fontaines: “The hand responsible for the motets also shows signs of university provenance: a comparison with Paris, Bibliothèque Nationale *fonds latin* 16607 . . . showed that the scribes shared some habits . . . [this manuscript was] copied after 1268 for Godefridus de Fontibus, a Master of Theology at the University of Paris. The manuscript contains St. Thomas Aquinas’s commentaries on Aristotle’s *De causis* and the *De caelo et mundo*.” Mark E. Everist, “Music and Theory in Late Thirteenth-Century Paris: The Manuscript Paris, Bibliothèque nationale, fonds lat. 11266,” *RMA Research Chronicle* 17 (1981): 54. Everist references the plate of this manuscript found in Charles Samaran and Robert Marichal, *Catalogue des manuscrits en écriture latine portant des indications de date, de lieu ou de copiste*, vol. 3, *Comité Internationale de Paléographie* (Paris: Centre Nationale de la Recherche Scientifique 1964), plate xv.. See also Palémon Glorieux, *La faculté des arts et ses maîtres au xiii^e siècle* (Paris: J. Vrin, 1971), 338v. The final section of Lambertus is also contained in *D-B* Th. 1520, *D-Mbs* Clm. 24809 and *I-Vnm* XX, 6. Anderson contends that the manuscript *F-Pn* lat. 6755 was Jacobus’s source for Lambertus, based on Jacobus’s ascription of the work to “quidam Aristoteles.” Gordon Anderson, “Magister Lambertus and the Nine Rhythmic Modes,” *Acta musicologica* 45 (1973). The manuscript under this call number in the Bibliothèque nationale has 8 folios, and is actually the second part of a manuscript: the first part contains treatises misattributed to Aristotle: “it is certain that Jacobus knew this work from the manuscript *Paris, Bibl. Nat. lat. 6755* or one like it, which begins with the ubiquitous *Secreta secretorum* ascribed to *cuiusdam Aristotelis*; the second half of this manuscript contains the treatise of Lambert as an independent item. Using this copy, Jacobus mistakenly assigned both works to the same author.” Anderson, “Magister Lambertus,” 57. Finally, relating again to the possible ties between Godfrey and Jacobus, there is the explicit of the manuscript *B-LVu* G. 30 (a source of the *Quodlibets*) that states “Quaestiones de uno quodlibet magistri G de Fontibus concessa fratri St de montibus ab exquitoribus dictis magistri G(odfredi).” Could it be “Jacobus” instead of “Stephano” (that is, “ia” instead of “st”)? Unfortunately I have not yet had the opportunity to examine *B-LVu* G. 30 in person. It is possible that this manuscript is the same *Quodlibets* source that appears in the catalogue of the library of St. Jacques listed as item E10. C. Denoël, “La bibliothèque de

		<i>F-Pn</i> lat. 6755 <i>I-Su</i> C.V.30 <i>D-EF</i> Arupl. 8°94
Petrus de Cruce	<i>Tractatus de tonis</i>	<i>GB-Lbl</i> Harley 281
Elias Salomo	<i>Scientia artis musicae</i>	<i>I-Ma</i> D.75.inf.

Table 4 is an analysis of the antiphon *differentiae* in Jacobus's tonary compared with other sources for the antiphon *differentiae* in tonaries mentioned in this chapter. To simplify the presentation of the data, the table employs a classification scheme I constructed for the antiphon *differentiae*. The key to this classification scheme is elaborated in Appendix 6, where I assigned a number to each variant of the *differentia* for each mode.⁷⁶ The reader may also refer to Appendix 2 for detailed comments regarding the context of Jacobus's examples. In Appendix 2, we can see that Jacobus sometimes used detailed phrases when describing where certain *differentiae* were in use (for example: "seculares ecclesiis leodiensis"), but often he just used very generic terminology, such as "some"

l'abbaye de Saint-Jacques à Liège" (Mémoire de licence en histoire, Université de Liège, 1971), 171.

⁷⁶ In Appendix 6, the uppercase and lowercase letters represent whether a pitch is notated as single note, or is contained within a ligature. For example, a three-note ligature descending from A is indicated "Agf."

(“aliqui”) use this set of *differentiae*, or others (“alii”) use these *differentiae*. This table and the analysis that follows attempts to show specifically which traditions Jacobus was alluding to with the particular examples in his tonary.

Table 4 Antiphon *differentiae* comparison

Key: *SM* = Jacobus, *Speculum musicae*; *Tr inton* = Anonymous, *Tractatus intonatione tonorum*; *Amerus* = Amerus, *Practica artis musicae*; *Lam* = Magister Lambertus, *Tractatus de musica*; *Dom* = Dominican; *Ancient* = “quidam antiquus doctor”; *Liège* = “saeculares ecclesiae leodienses”; *Fr/Ro* = “ecclesiis gallicanis et romanis”; *Rel* = “aliqui religiosi”; *Irr* = “”; *Common* = “communius”; *Some* = “Aliqui”; *Others* = “Alii”; *Diverse* = “Diversi.” For a key to the numerical representation of the pitches of the *differentia* variants, please see Appendix 6.

<i>Mode</i>	<i>SM</i>		<i>Tr inton</i>	<i>B-Lsc</i>	<i>B-Lsc</i>	<i>Amerus</i>	<i>Lam</i>	<i>Dom</i>	<i>B- Br</i>				
				2	1				<i>II/261</i>				
I	<i>Ancient</i>	<i>Liège</i>		<i>Fr/Rom</i>	<i>Rel</i>	<i>Irr</i>							
	1.11	1.3		1.14	1.5	1.1	1.9	1.2	1.10	1.15	1.7	1.18	1.21
	1.18	1.19		1.6	1.1		1.15	1.20	1.22	1.10	1.14	1.14	1.22
	1.20	1.14		1.9			1.14	1.10		1.6	1.5	1.9	
	1.16	1.2		1.15			1.6	1.3		1.17	1.9		
	1.13	1.10		1.7			1.7	1.19		1.14	[1.18]		
	1.12	1.15		1.17			1.17	1.6		1.24	1.14		
		1.6		1.8			1.4	1.21		1.25			
				1.4			1.8	1.22		[1.18]			
								1.23					
II	<i>Common</i>	<i>Some</i>											
	2.2	2.3					2.2	2.2	2.2	2.2	2.2	2.1	2.5
		2.1					2.3						
							2.1						

<i>Mode</i>	<i>SM</i>				<i>Trinton</i>	<i>B-Lsc 2</i>	<i>B-Lsc 1</i>	<i>Amerus</i>	<i>Lam</i>	<i>Dom</i>	<i>B- Br II/261</i>
VI		<i>Ancient</i>									
	6.2	6.1			6.2	6.1	6.1	6.1	6.1	6.1	6.3
VII	<i>Some</i>	<i>Ancient</i>	<i>Common</i>								
	7.2	7.2 (7.1, 7.7)	7.3		7.3	7.3		7.2	7.2	7.2	7.9
	7.1	7.9	7.8		7.8	7.5			7.4	7.4	
		7.8	7.1		7.1	7.9			7.1		
		7.6	7.2		7.2	7.1					
		7.5				7.2					
		7.4									
		7.2									
VIII	<i>Some</i>	<i>Ancient</i>	<i>Others</i>	<i>Some</i>							
	8.1	Not listed	8.1	8.6	8.3	8.5		8.3	8.3	8.1	8.7
	8.3		8.2		8.1	8.3		8.1	8.5	8.3	
			8.4		8.7	8.4		8.10	8.1		
			8.3		8.8	8.3					
			8.5			8.9					
						8.10					

As outlined in the key for Table 4, the first five columns give the *differentiae* of Jacobus's tonary, separated according to the phrases Jacobus used to describe the variant practices. The next columns give the *differentiae* of the *Tractatus intonatione tonorum*, those of the two Sainte-Croix tonaries (representing secular Liège practice), and those given by Amerus (Roman use), by Lambert, the Dominican tonary and in *B-Br* II/261 (Carthusian).⁷⁷

The presentation of the data in this table allows certain patterns in Jacobus's usage of sources to come into clearer focus. There are some modes (namely, modes 2, 3, 5 and 6 and to some degree mode 7) where there is quite a degree of concordance in the antiphon *differentiae* across the board. There does not seem to have been great debate or divergence with respect to the *differentiae* to be used for antiphons in these modes. By contrast, Mode 1 is the most diverse, mode 4 also shows a great deal of variety, and there are some disputed aspects within the *differentiae* of mode 8 (where Jacobus discusses the irregular *differentia* of this mode that should belong with the first mode).

To elaborate further: for the first mode, those of the "antiqui" are the *differentiae* found in Johannes Cotto; those that Jacobus ascribes to the secular

⁷⁷ The sources included in Table 4 are a representative sample of the sources discussed in this chapter: the table would have been quite unwieldy if I had included all the manuscripts and theorists mentioned here. The *differentiae* from the Dominican tonary are taken from the recent edition: Christian Meyer, "Le tonaire des frères prêcheurs," *Archivum fratrum praedicatorum* 76 (2006): 117-137.

Liège churches are almost identical to those found in the Sainte-Croix tonaries, with just two *differentiae* being slightly variant; those that Jacobus describes as French or Roman *differentiae* are very similar to those given by Amerus and also match those of the *Tractatus intonatione tonorum*. The *differentiae* Jacobus ascribes to the religious orders are not the same as those given in the Dominican tonary or from the Carthusian source *B-Br* II/261. When citing one of the *differentia* of the first mode that was used in many churches, both French and Roman, Jacobus states that this is the “doctrina” (the term “doctrina” being best translated as “teaching”) that he now follows (and, as stated, concords with Amerus and *Tractatus intonatione tonorum*). I have classified this *differentia* as 1.9 and it is the same as the third *differentia* of the first mode given in the Dominican tonary. Jacobus assigns this particular *differentia* to chants beginning on F and either immediately ascending to a, or descending through E and D, whereas the Dominican tonary assigns this *differentia* for chants beginning on a. The eight *differentiae* given by Jacobus for the first mode exactly match those given in *Tractatus intonatione tonorum* (albeit listed in a different order) and a marginal note in the *Tractatus intonatione tonorum* employs a phrase similar to one used by Jacobus when describing the fact that some of these have fallen from use (“hic ab usu nostro frequenti recesserunt”).⁷⁸

⁷⁸ *Tractatus intonatione tonorum*, 61.

There are not many variants in the *differentiae* of the second mode: in general there is only one *differentia* that is common (2.2), although Jacobus cites two others that “some” use – these are also listed in *Tractatus intonationem tonorum*. For the third mode, he refers to the *differentiae* “others” use, which match those found in the Sainte-Croix manuscripts (in this case the generic term “others” refers to the secular Liège practice that Jacobus singled out more specifically in his treatment of the first mode). Finally, he gives another three examples of *differentiae* some other “others” use: these three examples match those in *Tractatus intonationem tonorum*.

For the fourth mode, when Jacobus first refers to the *differentiae* “others” use, these *differentiae* most closely match those given by Magister Lambertus. The second grouping of *differentiae* given by Jacobus (where he yet again just refers to them using the generic “others”) exactly match those found in *Tractatus intonationem tonorum*. With the fifth mode, there is general agreement that only one *differentia* is commonly used, but Jacobus does give examples of three other *differentiae* found in various tonaries: these examples again exactly match *Tractatus intonationem tonorum*. The sixth mode also shows little divergence amongst the various sources. In contrast, the seventh mode has a wide variety of *differentiae*, but the use that Jacobus refers to as “common” (that is, *better*, according to the criteria he laid out in the introduction to this

book) again matches that of *Tractatus intonatione tonorum*. Finally, for the eighth mode, there is a grouping of five *differentiae* used by “others” and in this case, these examples most closely match the Sainte-Croix antiphoners, and are therefore representative of the secular Liège practice.

In general, this analysis shows that the Liège endings we find in the representative Sainte-Croix manuscripts agree with what Jacobus quotes as the Liège use. The *differentiae* used by those he refers to by the pronoun “aliqui” most often agree with those given in the *Tractatus intonatione tonorum* and/or the French/Roman use (represented by Amerus in Table 4). It is with the practice of the latter that Jacobus aligns himself. The *differentiae* from the Dominican tonary represent a simplified or redacted version of these French/Roman *differentiae*. Therefore, if the churches of St. Jacques or St. Paul were undergoing some sort of liturgical reform that also affected chant practice, it appears that in this particular aspect, the reform did not follow Dominican use to the letter, but it did agree with Dominican practice more than with that of the other secular Liège churches (such as Sainte-Croix). The important point here is that the practice that Jacobus states he now follows is the one more “commonly” used, that is, he appears to be trying to bring some sort of consistency to the myriad practices that existed for bridging the psalm verses to their antiphons, not unlike that which was happening in the abbey of St. Jacques, where their

Benedictine traditions were being brought under reform. The practice that Jacobus and the *Tractatus intonatione tonorum* follows seems to be just a little bit more elaborate than that of the Dominican or Carthusian practice.

To summarize: in his outlining of the various traditions of antiphon endings, we see Jacobus referring specifically to a tradition that he now follows, a tradition replicated in a manuscript that through codicological examination displays connections to the Benedictine abbey of St. Jacques in Liège, the same Benedictine abbey that had close ties to the collegiate church of St. Paul, the church where Jacobus de Montibus held a canonicate position.⁷⁹ It is plausible to hypothesize that these two institutions (St. Jacques and St. Paul) may have been attempting to reform their intonation practices, along with the other more general liturgical reforms that were being carried out under Dominican influence. This reform of these intonation practices, although having some similarities to Dominican practice, but with a slightly more elaborate style of intonation, contrasted with those presented by Jacobus as being examples from

⁷⁹ There is a charter of St. Paul from 1113 that affirms the confraternity between the canons of St. Paul and the monks of St. Jacques. The terms outlined in the charter were the following: that both institutions should celebrate a Requiem Mass and an Office of Remembrance with a vigil and procession for each monk or canon of the fraternal institution who should die during the year; St. Jacques should celebrate the feasts of St. Paul and its Dedication; in turn, the canons of St. Paul should especially venerate the feasts of St. James; and if either institution was in need of assistance, it should turn to the other institution for aid. See Desmond, “New Light,” 32.

the secular churches in Liège (and which agree with the extant examples from the collegiate church of Sainte-Croix). It may also explain why, if Jacobus had ties to a secular Liège institution (that is, St. Paul), he singled out the secular practice of Liège as being from a tradition other than the one he follows, since his institution (St. Paul) was now following a reformed practice (whether or not Jacobus himself originated these particular reforms). These conclusions, then, do not contradict the hypothesis we have suggested of Jacobus writing Book 6 while he was at St. Paul in Liège.

CHAPTER 3

MATHEMATICS

Quae igitur ex hisce prima discenda est nisi ea, quae principium matrisque quodammodo ad ceteras obtinet portionem? Haec est autem arithmetica. Haec enim cunctis prior est, non modo quod hanc ille huius mundanae molis conditor deus primam suae habuit ratiocinationis exemplar et ad hanc cuncta constituit, quaecunque fabricante ratione per numeros adsignati ordinis invenere concordiam, sed hoc quoque prior arithmetica declaratur.

Which then of these disciplines ought to be studied first unless it is that one which holds the first principle and position of a mother, as it were, to the others? This one is indeed arithmetic; for it is prior to all the others, not only because God the Creator of the great universe considered arithmetic first as the model of his reasoning and created all according to it, having rationally forged all things through numbers of assigned order to find concordance, but also because arithmetic is prior by nature.⁸⁰

This Platonic worldview held sway in circles of learning throughout most of the Middle Ages and up to the time of the writing of the *Speculum musicae*.

Arithmetic was held as the prior discipline, with the related disciplines of music, geometry and astronomy predicated upon it.⁸¹ In this well-known passage,

⁸⁰ A.M.S. Boethius, *De arithmetica*, ed. H. Oosthout and J. Schilling, vol. 2, *Ancii Manlii Severini Boethii Opera* (Turnhout, Brepols: 1999), 10; Calvin M. Bower, "Boethius, *The Principles of Music*, an Introduction, Translation and Commentary" (Ph.D. diss., George Peabody College, 1967), 27-28.

⁸¹ Boethius defines two types of quantity, discrete (multitude) and continuous (magnitude). The unit was the source of discrete quantity and could

Boethius outlines the rationale for considering arithmetic as prior, and how the very existence of music, geometry and astronomy can only be considered as they relate first to number.⁸² It is to this worldview that Jacobus subscribes absolutely, and thereby sets himself up against what was to be the prevailing trend in scientific inquiry during the early fourteenth century. With the deeper understanding and assimilation of the newly-translated Greek texts, mathematicians began to rely to a greater extent on an empirical understanding

be infinitely multiplied, and a magnitude could be infinitely divided. Multitude is best represented by number and can either be considered in itself (arithmetic) or in relation to another (music); magnitude is best represented by shapes which can be either fixed and immobile (geometry) or in motion (astronomy). Calvin M. Bower, "The Transmission of Ancient Music Theory into the Middle Ages," in *The Cambridge History of Western Music Theory*, ed. Thomas Christensen (Cambridge: Cambridge University Press, 2002), 142.

⁸² "Quae ipsa quidem natura incorporea sunt et inmutabili substantiae ratione vigentia, participatione vero corporis permutantur et tactu variabilis rei in vertibilem inconstantiam transeunt. Haec igitur quoniam, ut dictum est, natura inmutabilem substantiam vimque sortita sunt, vere proprieque esse dicuntur" ("Indeed these things themselves are incorporeal in nature and thrive by reason of their immutable substance, but they suffer radical change through participation in the corporeal, and through contact with variable things they change in veritable inconsistency. Therefore, since, as has been said, nature has allotted [sic] these things immutable substance and virtue (*vis*), they can truly and properly said 'to be.' Therefore wisdom professes knowledge of these things which are in and of themselves, and which are called 'essences'"). Boethius, *De arithmetica*, 10; trans. Bower, *The Principles of Music*, 24.

of the physical world, more rooted in practice, and in the world of the senses and observation.⁸³

Book 3 of *Speculum musicae* is an anomaly in Western music theory. The entire book, consisting of fifty-six lengthy chapters, is dedicated to proving the single proposition that the whole tone cannot be divided into two equal parts. As a primary source, Jacobus relies upon the *De elementis arithmetice artis* of the thirteenth-century mathematician Jordanus de Nemore.⁸⁴ Jordanus is the

⁸³ Edward Grant and John E. Murdoch, eds., *Mathematics and its Applications to Science and Natural Philosophy in the Middle Ages: Essays in Honor of Marshall Clagett* (Cambridge, New York: Cambridge University Press, 1987); David C. Lindberg, *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious and Institutional Context, 600 B.C. to A.D. 1450* (Chicago: University of Chicago Press, 1992); John E. Murdoch, *Album of Science: Antiquity and Middle Ages* (New York: Charles Scribner's Sons, 1984).

⁸⁴ Jordanus de Nemore, *De elementis arithmetice artis: A Medieval Treatise on Number Theory*, ed. H. H. L. Busard, 2 vols. (Stuttgart: F. Steiner, 1991). Apart from the passing citation of Jordanus by Anonymous 4, the only music theorists who cite Jordanus come later: Salinas, Gaffurius, Ugolino of Orvieto all quote from Jordanus. Fritz Reckow, *Der Musiktraktat des Anonymus 4*, 2 vols., vol. 4-5, *Beihefte zum Archiv für Musikwissenschaft* (Wiesbaden: Steiner, 1967), 64; *Francisci Salinae Burgensis Abbatis Sancti Pancratii de Rocca Scalegna in regno Neapolitano, et in academia Salmanticensi musicae professoris, de musica libri septem, in quibus eius doctrinae veritas tam quae ad harmoniam, quam quae ad rhythmum pertinet, iuxta sensus ac rationis iudicium ostenditur, et demonstratur* (Salamanca: Mathias Gastius, 1577), 8, 9, 24, 36; Franchinus Gaffurius, *Theorica musicae* (Milan: Ioannes Petrus de Lomatio, 1496; reprint ed., New York: Broude Bros., 1967), 72, 74; Ugolino of Orvieto, *Declaratio musicae disciplinae*, ed. Albert Seay, vol. 7, *Corpus scriptorum de musica* (Rome: American Institute of Musicology, 1959), 46, 51, 59, 71. More significantly, the music theorist and French theologian, Jacobus Faber

only non-music theorist to be singled out to such an extent by Jacobus in the entire *Speculum musicae*. The first half of Book 3 is built around Boethian material, but in the latter half, Jacobus elaborates on proposition after proposition carefully selected from Jordanus's *De elementis arithmetice artis*. These propositions are all marshaled in Euclidean style and format in support of the argument "that the tone is not divisible into two equal parts." But why Jordanus de Nemore? Why this stubborn focus on this particular debate regarding the division of the whole tone? On the face of it, to read the contemporaneous music treatises, it appears that there was actually significant concord on this issue, and so it is unclear at whom Jacobus is targeting this assault. Is it simply that he is the old-fashioned, conservative theorist that musicological literature has portrayed, relentlessly focusing on this argument because it holds such a prominent place in Boethius's own treatise, and in the history of music theory? Or can the various threads of the argument be untangled to reveal a more subtle debate? This chapter will explore the context

Stapulensis published the treatise of Jordanus, along with editions of Boethius's *De arithmetica*, and his own *Musica libri demonstrata quattuor* in 1496. Interestingly, in this treatise: "on the basis of Euclid's *Elements*, he [Faber] also offered a new geometrical method by which intervals represented by superparticular ratios (e.g. the tone, 9:8) might be divided into two equal parts. In so doing he opened up a new approach to questions of tuning and temperament; his treatment was quoted up until the 18th century" (*GMO*, accessed March 22, 2009).

behind the mathematical theories used in *Speculum musicae* Book 3 and suggest possible candidates for the un-named individuals on the opposite side of the argument.

MATHEMATICS IN THE LATER MIDDLE AGES

Along with the more practical *De computo vel loquela digitorum* of the Venerable Bede (a brief treatise discussing the method of finger counting), Boethius's *De arithmetica* was the primary textbook for the medieval mathematician during most of the Middle Ages.⁸⁵ The main aspects covered in Boethius's work are elementary Pythagorean number theory: even and odd numbers; primes; perfect, abundant, and deficient numbers; figurate numbers; names and classes of numerical ratios; arithmetic, geometric, harmonic and other means. Euclid was virtually unknown through much of the medieval period, until the translations of the twelfth century. During this time, mathematics was "rarely pursued for its own sake, it served philosophical, pedagogical, and practical ends, and the internal technical development it

⁸⁵ The best starting places for an overview of medieval mathematics are Michael S. Mahoney, "Mathematics," *DMA* 8; Idem, "Mathematics," in *Science in the Middle Ages*, ed. David Lindberg (Chicago and London: Chicago University Press, 1978), 205-22. The brief history of medieval mathematics outlined in these two paragraphs is for the most part, unless otherwise noted, condensed from these articles.

underwent was largely dictated by those ends.”⁸⁶ With the new translations from Arabic into Latin of Euclid (the authoritative translation being by Campanus of Novara in the 1250s), and the arithmetic (*Algorismus*) and algebra of al-Khwarizmi, there were abundant new source materials for the mathematicians of the later Middle Ages; however, their potential was exploited only to varying degrees in the centuries that followed.⁸⁷

The two pre-eminent mathematicians of the thirteenth century were Leonardo Fibonacci of Pisa and Jordanus de Nemore. Fibonacci’s main works were his *Practica geometriae* (1220), *Flos* (1225) and *Liber quadratorum*

⁸⁶ Mahoney, “Mathematics,” 146.

⁸⁷ The *Algorismus* of al-Khwarizmi became the foundational arithmetic text for John of Holywood’s (Sacrobosco) *Algorismus vulgaris*, which was written around 1240 for the new arts curriculum of the university. It also contained some material from Boethius’s *Arithmetica* and became, along with the commentary on it by Peter of Dacia (1291), the standard university text for several centuries. Al-Khwarizmi’s algebra became the prototype for medieval algebraic texts. The first part was translated by Robert of Chester in 1145 and later by Gerard of Cremona. The second part belonged to the Arabic tradition of *al-misaha*, or “science of measure” but attracted little attention during the medieval period. Johannes de Muris’s *Quadripartitum numerorum* and *De arte mensurandi* were exceptional: “in the knowledge of al-Khwarizmi and Fibonacci shown by part of the *Quadripartitum* and in the familiarity with Abu Bakr and Archimedes displayed by the second part of chapter 5 and chapters 6-12 of the *De arte mensurandi* ... [they are] quite uncharacteristic of the other texts being produced by masters of the arts curriculum in the universities.” Mahoney, “Mathematics,” 158. The *Quadripartitum* was completed in 1343 at Mézières-en-Brenne, and there are five sources that contain the entire work. Ghislaine L’Huillier, ed., *Le Quadripartitum numerorum de Jean de Murs : introduction et édition critique* (Genève: Droz, 1990).

(1225).⁸⁸ Jordanus's largest and most original work is the *De numeris datis*; however, the four-hundred proposition *De elementis arithmetice artis* was his best-known text and became the standard source of theoretical arithmetic in the Middle Ages.⁸⁹ One of the most influential features of Jordanus's treatises was their Euclidean format: his system of axioms and propositions was widely disseminated and commented on during the Middle Ages and the Renaissance.⁹⁰ Little is known about the author, the vast majority of sources simply refer to "Jordanus" although several *De elementis arithmetice artis* texts mention "Jordanus de Nemore."⁹¹ Jacobus refers to him as "Jordanus" only and mentions him by name six times in Book 3 and once in Book 7.⁹²

⁸⁸ Fibonacci, *Collected Works*, ed. Baldassarre Boncompagni, 2 vols., *Scritti de Leonardo Pisano* (Rome: 1852-1862).

⁸⁹ Jordanus de Nemore, *De numeris datis*, ed. Barnabas B. Hughes (Berkeley: University of California Press, 1981). Neither Fibonacci nor Jordanus had much of a following either in their own lifetime or for a century or more, and Jordanus's algebra was not much known at all – Oresme is an exception in citing the *De numeris datis* in his *De proportionibus*. Mahoney, "Mathematics," 161.

⁹⁰ Ron B. Thomson, *Jordanus de Nemore and the Mathematics of Astrolabes: De plana sphaera* (Toronto: Pontifical Institute of Mediaeval Studies, 1978), 8-10.

⁹¹ The Paris manuscripts of *De elementis arithmetice artis* that name Jordanus de Nemore are *F-Pn* lat. 16644 (Sorbonne, a mid-thirteenth-century text that was part of the collection of Richard de Fournival's library), *F-Pn* lat. 7364, *F-Pn* lat. 16198 (Sorbonne), *F-Pn* lat. 14737 (St. Victor). Interestingly,

BOOK 3 OF *SPECULUM MUSICAE*

The central topic of Book 3 - whether the tone was divisible into equal parts – was the subject of a centuries-old debate.⁹³ Its most prominent and influential articulation was by Boethius in his *De institutione musica* where he refutes the Aristoxenians on the matter.⁹⁴ According to Pythagorean tradition, the consonance of the tone is represented by the superparticular ratio of 9:8, the

the Sorbonne library is the same collection that also contained the Lambert source (*F-Pn* lat. 11266) and the Godfrey *Quodlibets* source (*F-Pn* lat. 16607) discussed above in Chapter 2 (the two manuscripts that were copied by the same thirteenth-century scribe). Gushee discusses a manuscript in this same library (*F-Pn* 16646) that has annotations in the hand of Johannes de Muris.

⁹² Here is one example of Jacobus's citation of Jordanus: "sic ulterius ut patet in secundo aritmetice Boetii, et idem vult Jordanus in aritmetica sua" ("and beyond this is demonstrated in the second book of Boethius's *Arithmetic* and also by Jordanus in his *Arithmetic*). *SM* 7.14, 31.

⁹³ See Hentschel, "Die Unmöglichkeit der Teilung des Ganztones in Zwei Gleiche Teile und der Gegenstand der *Musica Sonora* um 1300." Hentschel discusses the importance of this debate as it related to the question of descriptions of sound in the theoretical realm versus the experience of sound in reality – "in the realm of *things*" – and how it related to philosophical trends at the beginning of the fourteenth century. The primary sources discussed in his article are Jacobus, Johannes Boen, Thomas Aquinas and Robert Kilwardby. Also on this issue also see Norman Cazden, "Pythagoras and Aristoxenus Reconciled," *Journal of the American Musicological Society* 11/2 (1958): 97-105; Richard Crocker, "Aristoxenus and Greek Mathematics," in *Aspects of Medieval and Renaissance Music. A Birthday Offering to Gustave Reese* ed. Jan LaRue, et al. (New York: W. W. Norton & Company, 1966), 96-110; Malcolm Litchfield, "Aristoxenus and Empiricism: A Reevaluation Based on His Theories," *Journal of Music Theory* 32/1 (1988): 51-73.

⁹⁴ Boethius, *De institutione musica*, 5.16-18, 365-371.

sesquioctave ratio. The semitone is found as the remainder when ratios representing two tones are subtracted from the ratio of the diatessaron, that is, the sesquitertia ratio (4:3), using arithmetical operations.⁹⁵ Aristoxenus, on the other hand, used a geometric approach to find the semitone, and in this way dividing the tone into two equal parts.⁹⁶

The Pythagoreans divided the tone into two unequal semitones: the diatonic semitone, or major semitone, or *apotome*, is in the ratio of 256:243 – the semitone which is found when two tones are subtracted from the diatessaron. The chromatic semitone, or minor semitone, or *limma* is in the ratio of 2187:2048, and is found by subtracting the diatonic semitone from the whole tone.⁹⁷ The *comma* is the difference between the major and minor semitone and is in the ratio of 531441:524288.⁹⁸

⁹⁵ Arithmetic operations were used to calculate combinations of intervals: the addition of intervals was computed by the multiplication of their ratios, the subtraction of intervals was computed by their division. For example, the semitone is found by the following operation: $((4:3 \div 9:8) \div 9:8) = 256:243$.

⁹⁶ The three means may be represented algebraically by the following formulae: $A = a + b/2$ (arithmetic); $A = \sqrt{ab}$ (geometric); $A = 2ab/a + b$ (harmonic).

⁹⁷ $9:8 \div 256:243 = 2187:2048$

⁹⁸ This ratio is the result of subtracting the ratio 2187:2048 from the ratio 256:243. The Pythagorean comma is infamous as the discrepancy in Pythagorean tuning in that twelve perfect fifths are not exactly equal to seven

Jacobus begins Book 3 with the statement that he will now “demonstratively” (“demonstrative”) discuss the consonance of the whole tone (*SM* 3.1, 5). The first half of the book (chapters 1-23) contains selected texts from Boethius’s *De institutione musica* with Jacobus’s discussion of them, and this is then supplemented with a selected series of propositions from Jordanus’s *De elementis artis arithmetice*, reorganized sequentially to prove that the tone is not divisible into two equal parts (chapters 24-56). Table 5 outlines the layout of Book 3.

Table 5 Book 3 structure

Chapter	Contents	Source
1	Prologue	
2	Comparing greater and lesser ratios	Boethius, <i>Musica</i> 2.9
3	On ratios that are measured by other numbers	Boethius, <i>Musica</i> 2.9
4-6	Examples of compounding ratios	Boethius, <i>Musica</i> 2.3, 2.7-8
7	A certain propriety of superparticular proportions	Boethius, <i>Musica</i> , 2.21
8-13	Demonstrations of the ratios that the diapente, diatessaron and tonus, the	Boethius, <i>Musica</i> 2.22-2.26

perfect octaves, and the Pythagorean comma is the amount of the discrepancy.

	diapason-plus-diapente and bisdiapason are founded on	
14-17	Four demonstrations that the semitone included in the diatessaron along with two tones is not the integral half of a tone	Boethius, <i>Musica</i> 3.1
18-23	On the tone and the parts of it (the major and minor semitone, the apotome and the comma)	Boethius, <i>Musica</i> 3.14-16
24	Prologue	
25	Every number is either prime and incomposite, or composite, that is, numbered from a prime number other than unity. Similarly composite proportions are known from the simple ratios they include.	Jordanus, <i>Arithmetic</i> 3.3
26	The sum of two prime numbers will also be prime against either of those numbers	Jordanus, <i>Arithmetic</i> 3.9
27	All the products of two prime numbers will be prime against each other	Jordanus, <i>Arithmetic</i> 3.12
28	Any two numbers prime against themselves are also in their least ratio	Jordanus, <i>Arithmetic</i> 3.20
29	When $a:b$ is in its least proportion, $a:b = a^2:\sqrt{\quad}$	Jordanus, <i>Arithmetic</i> 3.29
30	Regarding numbers in a continuous proportion, $a:b$ are commensurable, and	Jordanus, <i>Arithmetic</i> 4.1

	b:c are commensurable but a:c are not	
31	In a continuous proportion, the two extremes are communicant if they can be numbered from one number	Jordanus, <i>Arithmetic</i> 4.2
32	In a continuous proportion, if the two extremes are prime against each other then they are in their least ratio	Jordanus, <i>Arithmetic</i> 4.4
33	If the first term of continuous proportion does not number the second term, then it does not number the last term either	Jordanus, <i>Arithmetic</i> 4.13
34	If two numbers are prime against themselves then it is not possible to insert a third term in between them	Jordanus, <i>Arithmetic</i> 4.21
35-47	Outline of the denominations produced by compounding various types of ratios (e.g., if two superparticular ratios are compounded, the composite will be either duple, superparticular or superpartient, and so on)	Jordanus, <i>Arithmetic</i> 9, propositions 21, 23, 28, 29, 45, 48, 50, 59, 62, 63, 45, 67, 22
50	A multiple proportion cannot be distributed into any equal proportions, except in multiples	Jordanus, <i>Arithmetic</i> 9.60
51	A superparticular proportion cannot be divided into equal parts, and a number cannot be proportionally inserted as a mean	Jordanus, <i>Arithmetic</i> 9.61
52	Demonstration of Boethius that a	Boethius, <i>Musica</i> 3.11

	superparticular proportion is indivisible into equal parts	
53	Other reasons why a superparticular proportion is indivisible into equal parts	Jordanus, <i>Arithmetic</i> 9.61
54	That a twinned ratio is not a multiple nor creates a multiple nor a superparticular proportion	Boethius, <i>Musica</i> 4.2
55	That a tone is not divisible into equal parts	
56	Conclusion	

The first major section of Book 3 (chapters 1 to 24), mostly consisting of glosses and commentary on selected chapters of Boethius's *De institutione musica* Books 2 and 3, was familiar material to the medieval reader, and is also quite familiar to the modern reader, so I will only summarize the contents briefly. First, Jacobus discusses how ratios may be ranked: that is, the criteria by which one ratio may be considered greater than another, and another may be considered lesser. In particular, he focuses on superparticular ratios, where the greatest is 3:2, then 4:3, then 5:4 decreasing into infinity (*SM* 3.2, 8). In modern terminology, this would be described by representing the difference between the terms of the ratio as a fraction, and so in the series outlined above, a $1/2$ is larger than a $1/3$ which is larger than a $1/4$ and so on. Chapter 3 outlines the

proposition that if the terms of a ratio are multiplied by the same number then they retain the same ratio (in other words, proving 18:16 equals 9:8). In Chapters 4 to 6, Jacobus proceeds to outline how the double octave is made up of the diapente and diatessaron consonances and then discusses the division of these consonances according to Boethius, understanding all this through the conceptual framework of the compounding of ratios.⁹⁹ Chapters 8 through 13 contain demonstrations of consonances that are founded on superparticular proportions, ranking them as greater or lesser according to the principle Jacobus had laid out in the second chapter. Beginning in chapter 14, Jacobus spends four chapters discussing how Boethius demonstrated that the semitone that is included within the diatessaron is not the integral half of a tone. The first demonstration shows that 17 is indeed the arithmetical mean between 18 and 16, but that the ratio 18:17 is not equal to the ratio 17:16.¹⁰⁰ Three more

⁹⁹ Noting again that addition of ratios is achieved through the arithmetical concept of multiplication and subtraction of ratios by their division. This notion of compounding ratios is quite important and will be returned to later in this chapter.

¹⁰⁰ This first demonstration Jacobus says is taken from a gloss on Boethius (“quaedam antique glossa super Boethium”). *SM* 3.14, 314. The concordances between Jacobus’s elaborations on Boethius and the surviving glosses on the Boethian text would merit further study. Of the 135 extant manuscripts of *De institutione musica*, about half are glosses. Most date from the tenth and eleventh century; however, there are two manuscripts from Paris dating from the thirteenth to fourteenth centuries, one of which was the property of the University of Paris. See Michael Bernhard, “Glosses on Boethius’ *De*

demonstrations supplement this proof, and then all this material is summarized in chapter 18 by means of a large and detailed arithmetical chart. Chapters 14 to 16 of Boethius's *De institutione musica* Book 3 (on the issues that a minor semitone is greater than three commas and less than four; that the apotome is less than five commas but greater than four; and that the tone is less than nine commas but greater than eight) are then quoted almost *verbatim*.¹⁰¹

It is worthwhile to explain the second half of Book 3 (the Jordanian material) in more detail, in order to clarify the mathematical precepts to which Jacobus is referring and to better understand Jacobus's line of reasoning in this book. I will do this in the order of the chapters given, since this is how Jacobus intends his reasoning to play out, in Euclidean fashion, each proof building on the previous one, so that when the final chapter is read, the conclusion reached therein will be seen to be irrefutable, provided the reader has accepted the premise of each preceding chapter and moved on to the next in accord with the

institutione musica," in *Music Theory and its Sources: Antiquity and the Middle Ages*, edited by André Barbera, 136-49 (Notre Dame: University of Notre Dame, 1990).

¹⁰¹ Barbera discusses these same chapters of Boethius and the arithmetical error contained within them. The error involves the representation of a musical interval by a number rather than by a ratio of numbers. Barbera shows how the same method can be used to "prove" that three whole tones are larger than a fifth. André Barbera, "Interpreting an Arithmetical Error in Boethius's *De institutione musica* (iii.14-16)," *Archives internationales d'histoire des sciences* 31/106 (1981): 26-41.

writer. The proofs are layered to bring Jacobus to the inevitable conclusion that is represented in Jordanus's proposition 4.21 of *De elementis arithmetice artis*: "Si fuerint duo numeri contra se primi tertium eis in continua simili proportione coniungi non est possibile" ("If two numbers are prime against themselves then it is not possible to insert a third term in between them") (*SM* 3.34).

The argumentation may be summarized as follows.¹⁰² First, the following understanding of number is a prerequisite: all integers are either prime and incomposite, or they are composite numbers (that is, multiples of another number other than 1). The two integers 9 and 8 are considered composite numbers, being multiples of 3 and 2 respectively. Simple ratios are next described using terminology derived from arithmetic of integers, in that the two next proofs describe ratios as *prime* (the sum of two prime numbers will also be prime against either of those numbers, that is, the ratios 17:9 and 17:8 are considered prime; also the products of two prime numbers are prime against each other, that is, $9^2+8^2=145$; 145:9 and 145:8 are considered prime). Furthermore, if two numbers are prime against each other, then they are considered to be in their least proportion (therefore 9:8 is in its least proportion)

¹⁰² Where appropriate, I will insert arithmetical sentences using the 9:8 ratio to show how each proof discussed relates to this ratio: the superparticular sesquioctave ratio that refers to the consonance of the whole tone.

(SM 3.28).¹⁰³ If two numbers are in their least proportion, then $a:b$ is equal to $a^2:ab$ (for example, $9:8 = 81:72$).¹⁰⁴

From here, Jacobus moves on to a discussion regarding numbers in continuous proportion and a discussion of their commensurability and incommensurability.¹⁰⁵ The argument is that if there are three integers in a series, then the first and second terms are said to be in a commensurable ratio, and the second and third terms are in commensurable ratio, but that the ratio of these ratios (that is, the *proportio* or “ratio of ratios”) is incommensurable: that is, there is no common measure between these two ratios.¹⁰⁶ The outer terms may be termed *communicantes*, or mutually non-prime, if they are measured from one number (that is, if they are multiples of one number: in this way the

¹⁰³ Jordanus, De elementis arithmetice artis 3.20.

¹⁰⁴ This axiom was also be understood geometrically, that is, the ratio between two sides of a rectangle is equal to the ratio between the area of the rectangle and the area of the square of one of the sides of the rectangle.

¹⁰⁵ Commensurability is defined as the relationship between quantities when they are exactly divisible by the same unit an integral number of times. Some ratios, such as the ratio of the diagonal to the side of a square, could not be expressed in whole numbers, and were said to be incommensurable, that is, they were numerically inexpressible geometric phenomena.

¹⁰⁶ For example: the continuous series 18:17:16 would be incommensurable proportion, whereas the series 8:4:2 would be commensurable as there is a common measure between both sets of ratios.

9:8 ratio would not be considered a *ratio communicans*, but 18:16 is, since both terms within that ratio contain a common measure, that is they can both be measured by 2).¹⁰⁷ Jordanus and Jacobus use the term “prime” not only to describe a type of integer (that is, an integer that has no factors other than itself and 1), but also to describe ratios, so that if there is a continuous proportion between two terms, then these two terms are said to be prime against each other, and they are in their least proportion.

The next chapter outlines the axiom that if the first term of a continuous proportion does not number the second term then it does not number the last term either. At Chapter 34 the conclusion of Proposition 4.21 of *De elementis arithmetice artis* is reached: if two numbers are prime against each other then it is not possible to insert a third term between them. The next thirteen chapters (chapter 35 to 47) supplement this proposition with examples of how compounding ratios work (that is, what is the result when two superparticular

¹⁰⁷ Medieval authors often seem to use these two terms, commensurable and *communicans*, interchangeably. Here is the definition of *quantitates communicantes* from Campanus of Novara: “Quantitates quibus fuerit una quantitas communis eas numerans, dicentur communicantes. Quibus vero non fuerit una communis quantitas eas numerans, dicentur incommensurabiles” (When quantities can be measured by one common quantity, they are termed communicant. When there is no common quantity by which they may be measured, they are said to be incommensurable”). *Euclid’s Elementorum libri ex traditione Campani*, ed. H.L.L. Busard, <http://www.dm.unipi.it/pages/maurolic/instrume/campanus/liber10.html> (accessed April 10, 2009), liber X, i.

ratios are compounded, and so on), and concludes with Jordanus's Proposition 9.61, which is the subject of chapters 51 and 53: "Superparticularis proportio scindi in aequa, medio proportionaliter interposito numero, non potest" ("A superparticular proportion cannot be divided into equal parts, and a number cannot be proportionally inserted as a mean") (*SM* 3.51, 127). Chapter 53 outlines yet again, in repetitious fashion, all the reasons why a mean cannot be inserted in a superparticular proportion and closes with the following demonstrative example:

Et gratia exempli ponantur hi tres termini: 18 | 15 | 12. Et vocetur primus .a., secundus .b., tertius .c. Est igitur inter .a. et .c., superparticularis proportio quam dividit in duas proportiones superparticulares terminus medius qui est .b. Modo dico quod illae nullo modo possunt esse aequales tum quia alias periret illa medietatis arithmeticae famosa proprietas quod in minoribus numeris maior est proportio et in maioribus minor, tum quia inaequalitas partium inaequalitatem arguit proportionum. Pars autem quinta et quarta sunt inaequales in quantum idem totum respiciunt et maior est alicuius totius pars quarta quam quinta. Non est igitur aequalis proportio inter .a. et .b. et inter .b. et .c., quia nec aequalis denominatio (prima enim, quae est sesquiquinta, minor est quam secunda, quae est sesquiquarta), nec duae sesquiquintae proportionem possent complere sesquialteram et duae sesquiquartae superant illam; et suo modo est de quibuscumque terminis aliis superparticularibus. (*SM* 3.53, 144)

This example gives these three terms of a series: 18 | 15 | 12. Let us call the first .a., the second .b., and the third .c. There is a superparticular ratio between .a. and .c., and this ratio itself is divided by a middle term, .b., into two further superparticular ratios. As such, it is impossible to make these ratios equal: first, because of the well-known property of the arithmetical mean, which is that there is a greater ratio in smaller numbers and a lesser ratio in larger numbers; and second, because of the

inequality of the parts argues for the inequality of the ratio. A fifth and a quarter are unequal insofar as they relate to the whole, where a fourth part is larger than a fifth part. There is not an equal ratio between .a. and .b. as between .b. and .c., because they are neither of equal denomination (the first is a *sesquiquinta* ratio, and this is less than the second ratio which is a *sesquiquarta*). Neither can two *sesquiquinta* ratios be compared to a *sesquialtera* and so on with two *sesquiquartas*, and similarly with any other terms of other superparticular ratios.

Jacobus states that he is refuting both the “Ancients” and some musicians of his own time (“Dubitatum est ab Antiquis et ab aliquibus nostri temporis musicis de toni partibus quae semitonia nuncupamus, aliis dicentibus illa esse aequalia, aliis quod inaequalia” [“there is dispute between the Ancients and between some musicians of our own time who divide the tone into the parts that we call semitones, some of these saying that they are equal and others that they are unequal”]) (*SM* 3.55, 149). We know it was the followers of Aristoxenus / Archytas who were the targets of Boethius’s criticism, in particular for their use of the geometric mean to divide the tone into two integral equal parts. Most of the theorists contemporary with Jacobus (such as Johannes de Muris, Walter Odington, Engelbert of Admont, John of Tewkesbury, and the author of the Berkeley Manuscript treatise), when discussing the division of the tone and the division of the superparticular proportion to any great extent, all concur that a tone is not divisible into equal parts. In these treatises the discussion usually takes place either within the context of the

Boethian/Pythagorean division of the monochord, and the consonances produced by the ratios contained therein, and/or within the context of a general discussion of mathematics as it relates to music. For example, the first and second parts of Walter Odington's *Summa musicae* are concerned with arithmetic as it relates to music. In this passage, Odington gives a succinct explanation of the concepts of ratio and proportion:

Proportio est habitudo quantitatum. Proportionalitas est habitudo proportionum. Ut duo ad quattuor est proportio, quattuor ad octo est proportio, quae duae faciunt proportionalitatem unam. Est enim proportionalitas una inter tres terminos. Numeri proportionales sunt quattuor: primus in secundo, tanquam tertius in quarto aut in primo, tertius tanquam in secundo, quartus ut duo, quattuor, sex, duodecim. Sicut se habet duo ad quattuor sic sex ad duodecim, et sicut duo ad sex sic quattuor ad duodecim. Continua proportionalitas est quotiens secundus ad tertium se <habet> sicut primus ad secundum, quotlibet fuerint in ordine ut quattuor, sex, novem. Sicut sex continet quattuor et medietatem, sic novem tenet sex et medietatem. Media proportionalitas est quotiens medius numerus se habet proportionaliter ad extremos, licet non eadem specie proportionis ut duo, tres, quattuor. Ternarius cum binario facit sesquialteram habitudinem, quaternarius cum ternario sesquiterciam. Numerus a numero metitur cum continet pluries, ut binarius metitur bis, quaternarium; ter, senarium; quater, octonarium vocaturque binarius numerus numerans ternarius et quaternarius numeri quotiens. Vocatur etiam numerus maior dux cum minorem numerat, minor vero comes cum maiorem numerat, ut quater tria, ter quattuor. Differentia est qua a se invicem numeri differunt, ut binarius est differentia inter sex et quattuor. Intervallum est distantia proportionalium. Maior inaequalitas est cum maior numerus comparatur ad minorem, minor vero inaequalitas cum minor refertur ad maiorem.

Ratio is the relationship of quantity. Proportion is the relationship of ratio. So, two is to four is a ratio, four is to eight is a ratio, and these two ratios together make one proportionality. There is one proportion

existing between three terms. And if there are four numbers contained in a proportion: there is a ratio between the first term and the second, and the third to the fourth or the first, and the third to the second, and fourth, just as in the series two, four, six, twelve. Just as it has two to four and six to twelve, and just as it has two to six it has four to twelve. The continuous proportion is as much as to the second to the third as it has with the first to the second, as with whatever terms there are in order, just as in four, six, nine. And so six contains four and its median, just as nine contains six and its median. The median proportion is as much as the median number that is held proportionally between the two extreme terms, just as there is not the same species of ratio between two, three and four. A ternary with a binary makes a sesquialtera ratio, a quaternary with a ternary a sesquitertia. Number is measured by number when it contains more, so when a binary measures twos, it makes a quaternary; threes make a senary, fours an octanary. The greater number is called the leader when it numbers the lesser, and the lesser is the follower when it numbers the greater, As four is to three, or three is to four. The difference is the amount by which the numbers differ, so that a binary is the difference between six and four. An interval is a proportional distance. A greater inequality is when a greater number is compared to a minor, a lesser inequality is when a lesser number is compared to a greater.¹⁰⁸

Relating specifically to the division of the whole tone, Chapters 5 to 8 of the second part of Odington's treatise deal with the partition of the tone, and repeat the standard formulations regarding its indivisibility into equal parts.

In his discussion of consonances (within a discussion of the monochord division), the terminology of Engelbert of Admont is somewhat different. His

¹⁰⁸ Walter Odington, *Summa de speculatione musicae*, ed. Frederick Hammond, vol. 14, *Corpus scriptorum de musica* (N.p.: American Institute of Musicology, 1970), 48. Parts 1 and 2 of *Summa* are on arithmetic and music.

conceptual language is geometrical, and he speaks of ratios being distances

between points:

Proportiones enim vocum sumuntur ex quantitate suarum distantiarum. Quantitas vero distantiarum ex numero et quantitate mediorum spatiorum inter distantes voces. Numerus vero et quantitas mediorum spatiorum colligitur ex divisione et distinctione vocum seu sonorum in monochordo iuxta divisionem et distinctionem longitudinis et brevitatis spatiorum inter claves et puncta ipsius monochordi: vel ex proportionibus ponderum cymbalorum horologii.

The ratios of a pitch are determined from the quantity of their distances. The quantity of the distance is determined through number and the quantity of the mediating spaces between the distant pitches. The number and quantity of these mediating spaces may be determined from the division and distinction of the pitches or sounds in the monochord next to the division and distinction of the length or shortness of the spaces between the keys or points on the monochord: or from the proportion of weights of the horology cymbals.¹⁰⁹

Engelbert deals with the tone and its division in six chapters of the second treatise of *De musica* (Chapters 16-21), and again he reiterates the traditional Boethian dogma regarding its indivisibility. His “spatial” terminology gives the passage a slightly different twist on this familiar material. Here, he describes the octave as a greater consonance than the tone since the octave has a greater distance between its two terms:

Sciendum ergo, quod unitas in numeris est indivisibilis in quantum stat in ratione discreti secundum arithmetica, sed divisibilis, in quantum

¹⁰⁹ Engelbert of Admont, *De musica*, in *CS 2*, 311.

stat in ratione medii continui harmonici inter duos numeros extremos. Ergo per consequens medium intervallum inter duas voces toni erit indivisibile in quantum stat in ratione medii discreti: sed divisibile, in quantum stat in ratione medii continui harmonici, cum musica sit de sono, ut de numero numerato, qui in quantum sonus, est quid continuum, et sic divisibile: sicut quodlibet unum continuum est divisibile, sicut unum lignum vel unus lapis.

It is known that unity in number is indivisible, insofar as it exists as a discrete entity, according to arithmetic, but divisible, to the extent that it exists as the proportion of the continuous harmonic mean between two extreme numbers. As a consequence, the mediant interval between the two pitches of a tone will be indivisible insofar as it is a proportion of a discrete mean; but divisible, inasmuch as it is a proportion of a continuous harmonic mean, since music comes from sound, as from numbered number, and this sound is continuous, and thus divisible, just as any one continuum is divisible, such as a line or a stone.¹¹⁰

Johannes de Muris treats this question in several passages. In *Notitia* he uses some different arithmetical formulations than are usually provided but uses them to arrive at the same conclusion – that the tone is not divisible in equal parts:

Quia dictum est diapason constare ex quinque tonis et duobus semitoniis, quae non perveniunt usque ad perfectionem sex tonorum, restat ostendere, quod semitonium secundum vocem non sit vera medietas toni, quod quidam antiquitus aestimabant. Quodlibet dimidium duplicatum debet reddere suum totum. Sed semitonium duplicatum non integre tonum reddit, quod patet in numeris ordinatis: 243 et 256 proportionem semitonalem reddunt. Nam 256 ad 192 comparatus sesquitertia proportione diatesseron complet, a quo demptis duobus tonis remanet semitonium. Differentia igitur inter 243 et 256 est 13, cuius duplum est

¹¹⁰ Ibid., 311.

26, quod additum super 243--si vere semitonium est-- debet reddere numerum facientem tonum sesquioctava proportione, quod est 269. Sed non facit, quia si super 243 octava sui pars addatur, exhibit numerus faciens tonum sesquioctava proportione, qui est 273 et tres octavae, qui maior est praecedenti. Ergo non est vere semitonium. Amplius regula arithmeticae: Si duo numeri sint in aliqua proportione, procreati ex eisdem in eadem proportione manebunt, ut 2: 3 in sesquialtera proportione se habent: procreati ex hiis sunt 4: 6: 9, inter quos est eadem proportio sesquialtera. Igitur sic 243 in se ductum 59049 procreat, sed 256 in se extensum 65536 generat. Quod ex ductu unius radicis in aliam fit, medium proportionale est, scilicet <<62208>>. Sicut igitur inter radices est proportio semitonalis, sic inter procreatos. Sed cum ibi sint duae, ergo--si sit vere semitonium--de maximo ad minimum tonus erit, quod tamen non est. Si enim super primum octava sui pars adiungatur, tertium superabit. Ergo inter primum et secundum non fuit vere semitonium nec inter secundum et tertium. Ideo tonum complere non potuerunt. Igitur similiter inter radices, quae sunt 243 et 256, non fuit vera semitonii medietas immo minus: quod est propositum declaratum. Et haec de theorica musicae sufficiant audienti quoad praesens. (*Notitia*, 61-63)

Since it is said that the *diapason* consists of five tones and two semitones, which does not quite reach the perfection of six tones, it is worth pointing out again, that with respect to the semitones, according to their pitch, they are not truly the median of a tone, which a certain ancient theorist once proposed. Regardless of the fact that a half doubled ought to produce a whole. But a semitone doubled does not produce an integral tone, which is shown in these ordinal numbers: 243 and 256 represent the ratio of the semitone. For 256 compared to 192 gives the *sesquitertia* ratio of the diatessaron, and if we take away two tones from this we are left with a semitone. The difference between 243 and 256 is 13, of which doubled is 26, which added onto 243 – if this truly is a semitone – ought to produce the number making the *sesquioctave* ratio, which is 269. But it does not, because if we add the eighth part of 243 to it, we see this makes the *sesquioctave* ratio of the tone, which is 273 and three octaves, which is greater than the preceding. Therefore it is not truly a semitone. A rule of arithmetic amplifies this: if two numbers are in some ratio, those created from them ought to remain in the same ratio, so that 2:3 having a *sesquialtera* ratio, the continuous proportion 4:6:9

coming from this ratio, retains within it the *sequialtera* ratio. Therefore, 243 squared produces 59049, the square of 256 produces 65536. From these roots, the proportional mean is 62208. Just as within the roots is the proportion of a semitone, so too is it within the proportion of its squares. But since there are two – if it is a true semitone- from the greatest to the least, there will be a tone, but nevertheless there is not. If over the first an eighth part is added, it goes over by a third. Therefore within the first there is not a true semitone, nor between the second and third. Therefore they cannot make up a whole tone. Similarly between the roots, which are 243 and 256, there was not a true semitone mediating the least terms: that is the declared proposition. And we have heard enough of these things of music theory for the present.

Johannes Boen also has an interesting take on the issue of the division of the whole tone, which Hentschel deals with at length in his article on this subject.¹¹¹ Boen even goes so far as to say that there is a fourth genre of division of the monochord, beyond the usual diatonic, chromatic and enharmonic – he terms it “commatic.”¹¹² Marchettus da Padova also famously asserted that the whole tone is divisible into five equal parts, but this is not really

¹¹¹ Hentschel, “Die Unmöglichkeit der Teilung des Ganztones.”

¹¹² “Sic ergo novum genus modulaminis, quod nec dyatonicum nec cromaticum nec enarmonicum ymmo commaticum dicetur, posset inveniri” (“Thus, there is a new genre of modulation to be found, which is neither diatonic, nor chromatic, nor enharmonic but may be termed ‘commatic’”). *Johannes Boens Musica und seine Konsonanzenlehre*, ed. Wolf Frobenius (Stuttgart: Musikwissenschaftliche Verlags-Gesellschaft, 1971), 36. On Boen, see also: Sarah Fuller, ““Delectabuntur in hoc auris”: Some Fourteenth-Century Perspectives on Aural Perception,” *The Musical Quarterly* 82/3-4 (1998): 466-81.

the same issue that Jacobus is addressing, as Jacobus is taking issue with the practice of dividing the tone into *two* equal parts.¹¹³

So, if as it seems, there was, by and large, concurrence among the early fourteenth-century theorists regarding the division of the whole tone within the context of the Boethian-Pythagorean greater perfect system, was Jacobus using the multiple arithmetical proofs he compiled in Book 3 (“blinding with science” as it were) to attack a particular contemporaneous musical practice of the time, relating to the sizes in practice of the major and minor semitones? The question is, however, would the practical musicians of the day have cared about the rather academic argument put forth in this book? Also, if Jacobus was dealing with a purely practical matter, one might have expected him to cover it in either books 6 or 7, the practical books of his treatise, rather than within one of the speculative books. Was there something else in play? There are two

¹¹³ Herlinger has dealt at length with the fractional division of the whole tone: Jan W. Herlinger, "Fractional Divisions of the Whole Tone," *Music Theory Spectrum* 3 (1981): 74-83; Idem, "Marchetto's Division of the Whole Tone," *Journal of the American Musicological Society* 34/2 (1981): 193-216; Idem, "Medieval Canonics," in *The Cambridge History of Western Music Theory*, ed. Thomas Christensen (Cambridge: Cambridge University Press, 2002), 168-92. As Herlinger states, 13 of 143 monochord tunings given in Meyer are enharmonic or chromatic. C. Meyer, *Mensura monochordi: la division du monocorde (IXe-XVe siècles)* (Paris: Klincksieck, 1996). Also see Ferreira on the practical evidence for microtonal tunings in eleventh- and twelfth-century chant. M. P. R. Ferreira, "Music at Cluny: The Tradition of Gregorian Chant for the Proper of the Mass - Melodic Variants and Microtonal Nuances" (Ph.D. diss., Princeton University, 1997).

possibilities as candidates for these “Moderns” that Jacobus refers to in this context: either he is talking about something that was occurring in musical practice, the use of an actually smaller semitone than the conventional large leading tone that would result from a 256:243 ratio; or he is targeting trends in mathematical practice of the day, and he is disputing the concept of using geometrical methods to divide continuous proportions, and then applying this argument to music. Using geometrical methods to divide continuous proportions would go against Jacobus’s traditional conception of arithmetic (in particular, the inability to understand irrational numbers, or numbers that are not whole integers, since ratios could only be formed between whole numbers) and would in turn corrupt the essence of music, which is rightfully founded upon arithmetic.

What is the larger context of the argument regarding the division of the whole tone within entire treatise of *Speculum musicae* itself? In Table 6, I outline the instances in *Speculum musicae* (other than Book 3) where this topic is discussed.

Table 6 Semitone discussion in *Speculum musicae*

<i>Book/Chapter</i>	<i>Content</i>
2.38-43	(Within the discussion of the consonances) What a tone is; how it is contained within the monochord; in what numbers it exists; that it is a simple consonance; how it is divided

into integral parts.

- 2.55-76 On the minor semitone and the 18:17 ratio, its name and how it is situated on the monochord; on the *diesis* and *apotome* and the *semiditone*.
- 5.39-42 The chromatic tetrachord does not contain an integral proportion of consonances.
- 5.46-52 Reiterates the Aristoxenus/Archytas debate, using the practical notation of the monochord division and the numerical proportions.
- 6.66 Discusses pitches of irregular mutation; notes that on ‘other artificial instruments’ the tone is able to be divided equally in half.
-

Book 2, Chapter 42 discusses the division of the whole tone:

Aliqui etiam moderni musicae tractatores hoc sentire videntur propterea quia inter voces ipsius *alamire* et *mi* ipsius *bfa*[sqb]*mi* est integer tonus et, inter voces illas, mediat *fa* de *bfa*[sqb]*mi* dividens tonum illum in duas partes. Et dicendum quod, licet dicta *fa* dictum tonum dividat in duas partes, non sequitur quod ipsum dividat in partes aequales, nec hoc ille probat; sed, secundum veritatem, tonum illum in duas scindit partes inaequales, in semitonium scilicet minus, quod ad graviorem partem se tenet, et maius, quod acutiorem. (*SM* 2.42, 102)

And there are some modern musical treatises that seem to understand this point, because between the two pitches *alamire* and *b*[sqb]*fami* there is a whole tone, which is mediated by *bfa* into two parts. And it must be said that just because this so-called *fa* divides this whole tone into two parts, it does not follow that it divides it into two equal parts, nor does it prove it. Because, in truth, this tone is divided into two unequal parts, into the minor semitone, which holds the lower part, and the major semitone, which is the one above.

In chapter 56 of Book 2, within a refutation of what Philolaus had to say on the minor semitone (known through Boethius's account), Jacobus adds a more personal note. Jacobus begins with Boethius's text about the minor semitone and how he came to his own opinion about it. Using the first person, Jacobus outlines his own intentions in discussing Boethius with the following:

Consideransque quod errans in principiis errare potest amplius in aliis ad scientiam aliquam spectantibus, et cum illa sint quasi ianuae fundamentumque scientiae, aedificium vel tractatum facere nequit bonum qui errat in illis, qui igitur aequaliter in consonantiarum proportionibus numeralibus credebam esse sciolus, coepi rursus musicae scientiae, de qua tractare proponebam, quasi novus et diligens esse discipulus, ardentem in Musica studere Boethii quam ceteris, quantum ad consonantiarum numerales proportiones, reperi meliorem. Quantum autem ex tunc in arte illa profecerim, subitico. Timens autem ne tacta Boethii Musica mihi concessa tolleretur a me, ut de ea memoriale <aliquid> mihi retinerem, ut amplius in ea proficerem, ut confidentius illa uti possem, qui de duobus primis libris, quos Parisius audieram, aliqua extraxeram, plura coepi et de illis et de aliis excerptare, in aliquibus locis textum Boethii quem habebam nudum, sine scriptis, sine glossis abbreviare, in aliquibus locis qui mihi difficiliore videbantur, ut occurrebat, exponere in textu et figuris. Illud autem opus occasione semitonalium proportionum compilatum me non modicum detinuit et hoc opus retardavit; sed expedit nonnunquam, retrocedere, ut longius saliat. In hoc autem opere praesenti, de multis me iuvo quae habentur in opere illo. (*SM* 2.56, 136)

Taking account for the fact that is more common to make mistakes when one is beginning to look into something scientific, and since the things of which we speak are in some respects the foundation of this science, or their edifice, and in making a good treatise one does not always know who errs in such things, I believed myself to be more of a scholar, particularly in the numerical proportions of consonances, and so I began again to study the science of music. And, I was like a new and diligent disciple, with regard to the topics that I planned to cover, ardently

studying Boethius more than the rest, and as much as those topics dealt with the numerical proportions of the consonances, so much the better. As much as I wanted to bring forth in this art, I did so. Fearing that these things I had learned from Boethius's *Musica* might someday escape me, and so that I might retain them in my memory, and so that I might use them with more confidence, I excerpted some passages from the two first books, which I had heard in Paris, and I began to excerpt these and other passages. In some places of Boethius's text I added no notes, nor abbreviated with glosses, and in other places which seemed to me more difficult, wherever this occurred, I endeavored to explain in text and figures. The work that I compiled then on the proportions of the semitone delayed me somewhat, and detained me in some respects, but in a way it also prepared me to take a step back, and dwell longer on these things, so that they were brought forth. In this work, I have presented many things from the work of my youth.

Whereas Book 1 is concerned primarily with arithmetic and the properties of the numbers as numbers, in Book 2 Jacobus makes frequent reference to actual practice, how the consonances are used within discant, and the proper and appropriate uses of them. In Book 5 he is primarily concerned with canonicis (monochord divisions), and so discussion of the division of the tone occurs again in this book, and the positions of Aristoxenus and Archytas are replayed here, and then refuted again (*SM* 6.46-52). Finally, in Book 6, there is a brief reference to how artificial instruments divide the tone into two parts.¹¹⁴

¹¹⁴ “Dicendum igitur quod, etsi possibile sit ponere vocem mediam inter .A. primam et .B. secundam ibique dividere tonum in duo semitonia inaequalia, sicut in aliquibus instrumentis artificialibus fit, ut in organis, in quibus quasi ubique tonus in duo semitonia dividitur inaequalia ut ibi plures cantus possint fieri pluresque concordiae discantusque reperiri, non est tamen hoc utile quantum ad cantus vocis humanae” (“I should point out that, although it is

COMPOUNDING RATIOS

Let us return now to the issue of compounding ratios, which I touched on briefly above. Medieval mathematicians relied on denominations (that is, names given to ratios) to express and communicate the meanings of particular ratios and proportions. Ratios were said to be equal once their denominations were equal. The denominations of these ratios were categorized by Boethius in his *De arithmetica* (for example, the *sesquitertia*). Medieval texts on ratio and proportion relied on Boethius's scheme, where ratios were expressed by their denomination rather than by a pair of numbers, so that they would refer to a *sesquiquarta* ratio rather than a 5:4 ratio. This denomination scheme could not be applied to and did not work for irrational numbers (as in the previously-mentioned example of the relationship between the diagonal and side of a square), for there were no denominations in the inherited vocabulary for these types of ratios or proportions.

This denominational practice was extended to the theory of compound ratios, or ratios of ratios, and as defined by the Latin word *proportionalitas*, where the relation of two ratios was described as *proportio*. John E. Murdoch

possible to place a mediant pitch between the points .A. and .B. which divides the whole tone into two unequal semitones, in some artificial instruments, like organs for example, the tone may be divided into two unequal semitones, and many tunes and a greater variety of concords of discant may be found, but these are nonetheless not as useful as the human voice"). *SM* 6.55, 146.

discusses the development of the medieval theory of ratio and *proportio* with respect to the fundamental misunderstanding of Euclid's solution to Menelaus's theorem that persisted through the late Middle Ages. Menelaus's theorem (sometimes known as the "sector theorem") demonstrated the ratios between the line segments of a triangle and a line which bisects it, and Arabic writers and medieval astronomers found multiple uses for this proof.¹¹⁵ Medieval Latin writers misunderstood the original geometric context and interpreted Euclid's solution through the distorting lenses of Boethius's *De arithmetica*.¹¹⁶ Murdoch gives examples from Jordanus de Nemore and Campanus of Novara to illustrate

¹¹⁵ Mahoney, "Mathematics," 165.

¹¹⁶ "Moreover, by the time Oresme was writing his *De proportionibus proportionum*, two sorts of ratios were being denominated. Medieval writers had combined two minor definitions in book 5 of the *Elements* with traditional music theory and with a theorem transmitted through Arabic sources but dating back to Menelaus to develop a theory of compound ratio, or ratio of ratios" Mahoney, "Mathematics", 165. H.L.L. Busard, "Die Traktate *De proportionibus* von Jordanus Nemorarius und Campanus," *Centaurus* 15 (1971): n.67; A.G. Molland, "The Geometrical Background to the 'Merton School': An Exploration into the Application of Mathematics to Natural Philosophy in the Fourteenth Century," *British Journal for the History of Science* 4 (1968-69): 108-12. Especially see John E. Murdoch, "The Medieval Language of Proportions: Elements of Interaction with Greek Foundations and the Development of New Mathematical Techniques," in *Scientific Change: Historical Studies in the Intellectual, Social, and Technical Conditions for Scientific Discovery and Technical Invention, from Antiquity to the Present*, ed. A.C. Crombie (London: Basic Books, 1963), 237-71. Also see Grant's introduction to Oresme's *De proportionibus* in Edward Grant, *Nicole Oresme: De proportionibus proportionum and Ad pauca respicientes* (Madison, Wisconsin: University of Wisconsin, 1966).

this fact. For Jordanus, to produce or compound a ratio from ratios is to produce the denomination of the ratio by multiplying the denominations of the ratios by one another.¹¹⁷ Only Leonardo Fibonacci among the early European writers recognized and recorded the original Greek geometric context.

The conflict was brought to head with the writings of Nicole Oresme on the probable incommensurability of planetary motions, first discussed in his *De proportionibus proportionum* (*On the ratio of ratios*), written in the 1350s.

Prior to this, Johannes de Muris was one of the first Latin scholars to enter into a detailed mathematical discussion of commensurability in his 1343

Quadripartitum numerorum. Lawrence Gushee has written that:

. . . [Jehan des Murs's] relationship to other scholars and intellectuals of the fourteenth century, and above all, of the connections between his writings on music and those on astronomy, arithmetic and geometry, still call out for answers."¹¹⁸

And so, we must ask the question: in choosing to feature Jordanus in such a prominent fashion, was Jacobus setting all this up against the more modern (and

¹¹⁷ “The conceptually vague notion of "compounding" two relations to produce a third had become the operationally clear and simple matter of multiplying two fractions, and, through the notion of denomination, compound ratio followed simple ratio out of the domain of geometry into that of arithmetic, not to return until the emergence of trigonometry in the fifteenth century.” Mahoney, “Mathematics,” 166.

¹¹⁸ Gushee, “Jehan des Murs and his Milieu,” 343.

controversial) mathematical theories of Johannes de Muris, including Muris's extensive and unusual familiarity with the Arabic science of measure?¹¹⁹ Was Jacobus aware of Muris's work in this area? If so, Jacobus was aligning himself with the arithmetical side of the argument that Nicole Oresme would choose at a later time. Oresme wrote extensively on the commensurable and incommensurable proportions (and against de Muris):

The various propositions of chapters 2 and 3 establish first the ways in which rational and irrational ratios can be decomposed and then the conditions under which rational ratios are commensurable with one another. The discussion leans heavily on Jordanus's *Arithmetica* and Euclid's *Elements* VII-IX to provide criteria for the existence and number of proportional means between integers. . . Therefore, as Oresme pointed out here and in his other writings, it is most unlikely that the as yet unknown exact ratios of planetary motions will be commensurable. But astrology rests on the commensurability of those motions, else the cycles of conjunction and opposition are destroyed. Hence, astrology is

¹¹⁹ L'Huillier, ed., *Le Quadripartitum numerorum de Jean de Murs : introduction et édition critique*. Also see Louis C. Karpinski, "The Quadripartitum numerorum of John of Meurs," *Biblioteca mathematica* 13 (1912-13): 99-114; A. Nagl, "Das Quadripartitum numerorum des Johannes de Muris," *Abhandlungen zur Geschichte der Mathematik* 5 (1890): 135-46. Portions of *De arte mensurandi* (containing Archimedean material) appear in vol. 3 of Marshall Clagett, *Archimedes in the Middle Ages* (Madison: University of Wisconsin Press, 1964). Idem, "Johannes de Muris and the Problem of Proportional Means," in *Medicine, Science and Culture*, ed. L. G. Stephenson and R. Multhauf (Baltimore: Johns Hopkins Press, 1968), 35-49. H.L.L. Busard, "The Second Part of Chapter 5 of the *De arte mensurandi* by Johannes de Muris," in *For Dirk Struik: Scientific, Historical, and Political Essays in Honor of Dirk J. Struik*, ed. R. S. Cohen, J. J. Stachel, and M. W. Wartofsky (Dordrecht, Boston: D. Reidel Pub. Co., 1974), 147-67.

at best scientifically suspect.”¹²⁰

So, to some extent, Oresme can be seen as the inheritor of an arithmetical tradition passed through Jordanus, whereas the relationship between Oresme and Muris has been described as as “passionate and lifelong antagonism.”¹²¹

Oresme took particular issue with Johannes de Muris’s “treatment of means in continuous proportionality.”¹²² It is of course impossibility of inserting a mean within a continuous proportion that is at the center of Jacobus’s discussion of the whole tone. Gushee illustrates one attack of Oresme on Johannes de Muris related to the popular mid-century debate: “whether, if the orbits of two (or more) bodies are in an irrational proportion, they will ever make a conjunction

¹²⁰ Mahoney, “Mathematics,” 168.

¹²¹ Gushee, “Jehan des Murs and His Milieu,” 366. Gushee suggests that some of the books owned by Julian des Murs were given to Oresme, including *F-Pn* lat. 7380, a manuscript of *De arte mensurandi*. This manuscript is in part in the hand of Jehan des Murs and has an explicit (not in Jehan’s hand) that includes a date of 1340 (the watermarks in the paper section of the manuscript are dated to 1340). S. Victor, “Johannes de Muris’ Autograph of the *De arte mensurandi*,” *Isis* 61/3 (1970): 389-95. Nicole Oresme was a canon of Roen and dean of the chapter in 1364 and in residence there for the rest of the decade. He began translating works of Aristotle into French for Charles V and was in residence in Paris 1370s, then bishop of Lisieux 1380, and died there in 1382. Grant, *Nicole Oresme: De proportionibus proportionum and Ad pauca respicientes*.

¹²² Gushee, “Jehan des Murs and His Milieu,” 367. Quoting from Grant, *De proportionibus*, 298.

in exactly the same location.” Greek and Roman authors believed that the planetary motions were commensurable, that is, related by rational ratios.¹²³ Johannes de Muris’s argument was that it is impossible to know planetary motions with sufficient exactness to dispense with the need for constant correction through observation. Oresme, on the other hand, used mathematical probability to assert that the planetary motions were most likely incommensurable, a proof that had political undertones:

By advocating the probability of celestial incommensurability, Oresme sought to persuade others that celestial effects were inherently unpredictable. As a dedicated foe of judicial astrology, he hoped to weaken its foundations and strike a blow at the astrologers, who had aroused his deep concern by virtue of their considerable influence on the King of France, Charles V. He was annoyed by their pretentious claims of punctual exactness, claims they could never fulfill. His treatises on celestial incommensurability were partly intended to deflate the astrologers, as well as to emphasize our inability to acquire exact knowledge.”¹²⁴

Oresme takes issue with the pragmatic approach of the astronomer, who relies on the senses, or instruments, whereas he (Oresme) employs a strict mathematical approach.¹²⁵

¹²³ Grant, *Planets, Stars and Orbs*, 498.

¹²⁴ Grant, *Planets, Stars and Orbs*, 508. For a detailed discussion of this controversy, see Grant, *idem*, 498-513.

¹²⁵ It was not only that the senses were imperfect and unable to measure these motions, but that it was also mathematically impossible to ever be able to

It may be that we can posit a continuum of thought between Jordanus de Nemore, Jacobus de Montibus and Nicole Oresme, with Johannes de Muris representing the detractor to this tradition. It is unlikely that Jacobus and Oresme knew each other (Oresme was studying for his arts degree in Paris in the 1340s and we have suggested a death date of no later than July 1344 for Jacobus). I would propose that they were coming from the same side of the aisle in their treatment of mathematics, and in particular its foundational basis in arithmetic, and to offer this as an explanation for the lengthy treatment and discussion of Jordanus de Nemore within Book 3 of *Speculum musicae*, as it related to the thorny problem of compounding ratios and their commensurability or incommensurability.

do so: “If the celestial motions are probably incommensurable, as Oresme believed on the basis of his own mathematical demonstrations, we can derive a set of consequences that may be revealing, and even startling, about the “real” celestial aspects that we can never actually detect. Incommensurability meant that precise relationships could never be known, not only because our senses are weak, but more importantly because of the nature of mathematics or by virtue of the very structure of the universe itself, either of which reason guarantees that astronomical aspects never repeat. Predictions of future celestial configurations are therefore not possible, nor is the determination of exact past relationships.” Grant, *Planets, Stars and Orbs*, 513. Also see, Edward Grant, *Nicole de Oresme and the Kinematics of Circular Motion (Tractatus de commensurabilitate vel incommensurabilitate motuum celi, The University of Wisconsin Publications in Medieval Science 15* (Madison, Milwaukee, London: University of Wisconsin, 1971).

CHAPTER 4

MATTERS OF DISPUTE

“Where is the text?” Sarah Fuller poses this question midway through her provocative article on the treatise best-known in modern musical scholarship as the *Ars nova* by Philippe de Vitry.¹²⁶ She goes so far as to claim that there was no fixed text of the *Ars nova* (no definitive “treatise” as we would conceptualize it today), and that the various *compendia* of *ars nova* doctrine represent redactions of a “fluid teaching tradition.”¹²⁷ Leech-Wilkinson takes the extreme

¹²⁶ Sarah Fuller, “A Phantom Treatise of the Fourteenth Century? The *Ars nova*,” *Journal of Musicology* 4 (1985): 32.

¹²⁷ *Ibid.*, 43. Reaney had also suggested this possibility in his edition of Vitry: “the theoretical work of Vitry must have been imparted mainly by word of mouth, for it is exceptional to find a treatise in such widely differing forms.” *Philippi de Vitriaco Ars nova*, ed. Gilbert Reaney, André Gilles, and Jean Maillard, vol. 8, *Corpus scriptorum de musica* ([Rome]: American Institute of Musicology, 1964), 79. Fuller has proposed that “no exemplar of the *Ars nova* is known at present” (27). She suggests that the versions of the treatise in the various sources present the material in very different ways, and the order of presentation, the language used and the concepts set forth suggest that these treatises did not originate from a common exemplar. The version in *I-Rvat* 307 (f. 19-20v) is incomplete (edited in *Philippi de Vitriaco Ars nova*, 23-31; incipit “Sex minime possunt poni pro tempore imperfecto”), hereafter *Vitry anon. 1964a* (*I-Rvat* 307); the version in *F-Pn* lat. 14741 (f. 4-5) is also incomplete (*ibid.*, 25-29; incipit “Cum de signis temporis”), hereafter *Vitry anon. 1964b* (*F-Pn* 14741); Fuller terms the version in *F-Pn* lat. 7378A (f. 61v-62) as an “abridged digest” (*ibid.*, 55-69; incipit “Sex sunt principales”), hereafter *Vitry anon. 1964c* (*F-Pn* 7378A). There are two further “versions” edited in *CSM* 8, which according to Fuller are not witnesses to the Vitry teaching tradition: they

position that the “*Ars nova* texts now offer us *so little*” (emphasis mine) in terms of answering the questions of how this new style of music was developed and by whom.¹²⁸ As I hope to demonstrate in this chapter, however, a close reading of Book 7 of *Speculum musicae* offers evidence for a lost text, and perhaps even a central one at that, which was more expansive and detailed than the remnants surviving today.

Book 7 of Jacobus’s *Speculum musicae* is best-known for its vehement criticisms of the *moderni* and their new notational practices.¹²⁹ This one book is

are *GB-Lbl* Add. 21455 (f. 1-6) (ibid., 73-78; incipit “Cum de mensurabili musicae”), hereafter *Vitry anon. 1964d* (*GB-Lbl* 21455); and *I-Su* L.V.30 (ibid., 80-81; incipit “Sub brevissimo compendio”), hereafter *Vitry anon. 1964e* (*I-Su* L.V.30), which has correspondences with the *Libellus* of Johannes de Muris. See Table 7 below for the abbreviations used herein for these and other anonymous *ars nova* treatises.

¹²⁸ D. Leech-Wilkinson, “The Emergence of *Ars Nova*,” *Journal of Musicology* 13 (1995): 285.

¹²⁹ There have been a number of studies on the notation systems of the fourteenth century, in particular by Gallo and Frobenius: F. Alberto Gallo, “Die Notationslehre im 14. und 15. Jahrhundert,” in *Die mittelalterliche Lehre von der Mehrstimmigkeit*, ed. Frieder Zaminer, *Geschichte der Musiktheorie* (Darmstadt: Wissenschaftliche Buchgesellschaft, 1984), 259-356; Idem, “Figura and Regula: Notation and Theory in the Tradition of *Musica mensurabilis*,” in *Studien zur Tradition in der Musik: Kurt von Fischer zum 60. Geburtstag*, ed. H.H. Eggebrecht and M. Lütolf (Munich: Musikverlag Katzschichler, 1973), 43. W. Frobenius, “Prolatio,” “Semiminim,” “Longa – Brevis,” “Perfectio” “Modus (Rhythmuslehre),” “Proprietas (Notationslehre)” in Hans Heinrich Eggebrecht, ed., *Handwörterbuch der musikalischen Terminologie* (Wiesbaden: F. Steiner, 1972). Of particular relevance to this transitional period is the discussion of mensural notation in the introduction to the facsimile edition of the *Roman de*

an unparalleled source of information on the transitional period of expansion and overhaul of the Franconian mensural notation system that we now term the *ars nova*.¹³⁰ Despite this, the intricate threads of Jacobus's argument, the exact theories he disputed, and the methods he used in his attempt to disprove these theories have yet to be fully unraveled. The next three chapters of this dissertation tackle different aspects of Book 7: first, in this chapter, I articulate the main technical points that Jacobus takes issue with, and try to trace the source of each disputed theory. I analyze the vocabulary used, the order in

Fauvel: Edward H. Roesner, ed., *Le Roman de Fauvel in the Edition of Mesire Chaillou de Pesstain: A Reproduction in Facsimile of the Complete Manuscript*, Paris, Bibliothèque nationale, fonds français 146, introduction by François Avril, Nancy Freeman Regalado, and Edward H. Roesner (New York: Broude Brothers, 1990).

¹³⁰ The term *ars nova* is somewhat problematic, in this modern usage that refers in general to polyphony of the fourteenth century, and is of course inexorably linked to the treatise known as Philippe de Vitry's *Ars nova*. The reference to an *Ars nova* by Philippe de Vitry is only found in the explicit from the early fifteenth-century Italian source *I-Rvat* 307, where Philippe de Vitry's name is misspelt ("Explicit ars nova magistri Philippi de Vetri"). On aspects of the *ars nova* see N. Pirrotta, "Ars Nova e stil novo," *RIM* 1 (1966): 3-19. However, as David Fallows has noted, "it is hard to resist the claims of Nino Pirrotta (1966) that the fundamental change in both France and Italy in the years around 1320 was the same: that for the first time 'it required that the length of every sound be precisely determined so that the different voices could proceed on schedule and fall precisely into the combinations of sound and rhythm determined by the composer'. While that was just the culmination of processes that had been in hand for the preceding half-century, it remains one of the most startling and important moments in the history of music." David Fallows, "Ars Nova," *GroveMO* (accessed 3 April 2007).

which the arguments are presented, and the sources quoted and discussed. I assess whether we can find a core group of treatises or theories that represents Jacobus's exemplar.¹³¹ In Chapters 5 and 6, I focus on the philosophical background of Jacobus's reasoning.

We have fewer than a hundred theoretical treatises that deal with mensural notation from the late thirteenth through the fourteenth century.¹³² These mensural treatises include exponents of the pre-Garlandian, Garlandian and Franconian traditions, as well as sources for the "transitional" and "stable" *ars nova*.¹³³ The vast majority survive in only one source. When considering

¹³¹ An interesting parallel to this study would be to assess the musical notation present in contemporaneous manuscript sources in the emerging theories. Unfortunately there are few manuscript sources that document this transitional period, the *Roman de Fauvel* source *F-Pn* fr.146 being the most important: "There is no iron-clad evidence that any of the music in the collection is the work of Philippe de Vitry, but it is far from inconceivable that the most important of all early 14th-century composers had a hand in the preparation of the music—indeed, it is possible that he was the "music editor" of *F-Pn* 146, perhaps even the copyist of its music, and that he composed or arranged many of its compositions specifically for this manuscript. Such speculation should take into account not only the virtuoso motets at the conclusion of the collection, but also many of the more modest pieces, including the three that open the collection." Roesner, "Postscript 2006," Leo Schrade, ed., *Le Roman de Fauvel: Complete Polyphonic Pieces ed. (1956), with a New Introduction and Notes on Performance by E.H. Roesner (1982) Postscript 2006, Bibliography* (Paris: L'Oiseau Lyre, 1956; 1982).

¹³² For the full list of treatises accessible in a published version, please see the table given as Appendix 7.

¹³³ The treatise that has traditionally been associated with Johannes de

this list of music “treatises,” we also must take account of our own assumptions regarding the transmission of these theories, and of what constitutes an “opus” in terms of music theory. Many of these texts are commentaries on, or *compendia* of, the more well-known and widely distributed treatises of the time, such as Franco of Cologne and Johannes de Muris, or are short practical manuals

Garlandia, *De mensurabili musica*, copied in a Parisian manuscript dating from the 1260s (*I-Rvat* lat.5325), is now thought to be anonymous. Johannes de Garlandia, *De mensurabili musica, kritische Edition mit Kommentar und Interpretation der Notationslehre*, ed. Erich Reimer, 2 vols., vol. 10-11, *Beihefte zum Archiv für Musikwissenschaft* (Wiesbaden: Steiner, 1972). Pinegar has reasonably suggested that the author Johannes de Garlandia is rather the reviser of this anonymous text that was included by Hieronymus de Moravia in his compilation treatise. Sandra Pinegar, "Textual and Conceptual Relationships among Theoretical Writings on Mensurable Music of the Thirteenth and Early Fourteenth Centuries." (Ph.D. diss., Columbia University, 1991). Similarly, there have been shifting opinions on the date of the Franco's treatise. Hughes sums it up succinctly: "For some time the treatise was thought to date from about 1280, but since it deals with rhythmic principles that probably appeared in manuscripts several decades earlier, Besseler accepted 1260 as a more likely date; this was also preferred by Huglo. 1240 would seem to be somewhat early. Frobenius revived the possibility of a date around 1280 on the grounds that Franco must have written after Lambertus and the anonymous St Emmeram theorist (published by Sowa), both of whom wrote about 1279. Certain of Franco's comments regarding other theorists seem to refer to their writings. If this date were accepted, several of Franco's innovations would have to be credited elsewhere, since they appear in Lambertus and the Anonymus [sic]. Reckow's terminal date of about 1280 for the treatise of Anonymus 4, if correct, would necessitate an earlier authorship of *Ars cantus*. Opinion in more recent scholarship has remained divided: Huglo preferred a date of 1260–65, whereas Reaney and Gilles and Arlt and Haas settled on the later date of 1280." Andrew G. Hughes, "Franco of Cologne," *GroveMO* (accessed May 11, 2007). Franco de Colonia, *Ars cantus mensurabilis*, ed. Gilbert Reaney and Andre Gilles, vol. 18, *Corpus scriptorum de musica* ([Dallas, Texas]: American Institute of Musicology, 1974).

or handbooks illustrating key points of *ars nova* theory. In general, we could break down the list into two categories: the short, “bullet style,” manuals (those from the so-called “*Gaudet brevitate moderni*” tradition fall into this category); and the longer, more discursive, philosophical treatises that pertain more to a scholastic mindset, such as Jacobus’s treatise, the *Notitia* of Johannes de Muris, or the *Quatuor Principalia*.¹³⁴

¹³⁴ For a comprehensive survey on music theory and intellectual context including questions of genre see: Ristory, *Denkmodelle zur französischen Mensuraltheorie des 14. Jahrhunderts*. Gushee also addresses the important question of genre here: Lawrence Gushee, “Questions of Genre in Medieval Treatises on Music,” in *Gattungen der Musik in Einzeldarstellungen: Gedenkschrift Leo Schrade*, ed. Wulf Arlt et al. (Berne and Munich: Francke, 1973), 365-433.

Table 7 Transitional anonymous treatises on the *ars nova*¹³⁵

<i>Treatise</i>	<i>Date</i>	<i>TML</i>	<i>Source</i>
<i>Anglès anon. 1929.</i>	Late 14 th / early 15 th c	AGANONT	<i>E-Sc</i> 5.2.25
<i>Anglès anon. 1958; De cantu organico.</i>	c1350	AGANOCO	<i>E-Bbc</i>
<i>CS 1, Anon.6; Tractatus de figuris sive de notis.</i>	Mid-14 th century	TRADEF	<i>GB-Lbl</i> Add. 4909 (18 th -century copy of <i>GB-Lbl</i> Cotton Tiberius B. IX); <i>GB-Lbl</i> Royal 12. C. VI
<i>CS 3, Anon.1; De musica antiqua et nova.</i>	14 th century	ANO1DEM	<i>GB-Ob</i> Digby 90
<i>CS 3, Anon.2; De valore notularum tam veteris quam novae artis.</i>	early 14 th century	ANO2DEV	<i>F-Pn</i> lat. 15128
<i>CS 3, Anon.3; Compendiolum artis veteris ac novae.</i>	early 14 th century	ANOART	<i>F-Pn</i> lat. 15128

¹³⁵ Please refer to Appendix 7 for the convention used to abbreviate information in this table.

<i>CS 3, Anon.4; Compendium musicae mensurabilis tam veteris quam novae.</i>	early 14 th century	ANO4CMM	<i>F-Pn lat.</i> 15128
<i>CS 3, Anon.6; De musica mensurabili.</i>	c1321	PSDTRA	<i>US-Cn</i> 54
<i>CS 3, Johannes de Muris Ars discantus [incipit: Quedam notabilia utilia Quocumque sola brevis]</i>	15 th century	MURARSD	<i>Ghent 70(71)</i>
<i>CS 3, Philippe de Vitry Ars perfecta in musica [incipit: Omni desideranti notitiam artis mensurabilis musice]</i>	late 14 th century	VITARSP	<i>US-Cn</i> 54
<i>Michels anon. [OP anon., Anon. OP].</i>	c1320	ANOPTRA	<i>GB-Ob Bodley 77; F-Pn lat.</i> 14741
<i>Sweeney anon.; De musica mensurabili [formerly attributed to Theodoricus de Campo]</i>	late 14 th century	ANODEM	<i>I-Rvat</i> 307
<i>Vitry anon. 1964a (I-Rvat 307) [incipit: Sex minimae possunt poni pro tempore imperfecto]</i>	c1320	VITARNO	<i>I-Rvat</i> 307

<i>Vitry anon. 1964b (F-Pn 14741) [incipit: Cum de signis temporis variationem demonstrantibus]</i>	c1320	ANOQUAE	<i>F-Pn 14741</i>
<i>Vitry anon. 1964c (F-Pn 7378A); Sex sunt species principales sive concordantiae discantus (incipit)</i>	c1320	ANOARS	<i>F-Pn 7378A</i>
<i>Vitry anon. 1964d (GB-Lbl 21455); [incipit: Cum de mensurabili musica sit nostro]</i>	c1320	REGDEM	<i>GB-Lbl 21455</i>
<i>Vitry anon. 1964e (I-Su L.V.30) [incipit: Sub brevissimo compendio Philippo de Vitriaco in musica]</i>	c1320	ANOOMD	<i>I-Su L.V.30</i>
<i>Wolf anon. 1908; Compendium totius artis motetorum [Wolf Anon.3].</i>	c1340	WFANON3	<i>D-EF Arupl. 8°94</i>

In this chapter, I will concentrate on the treatises that best reflect the “transitional” stage of *ars nova* practice, when - particularly with respect to smaller note values - concepts, terminology and practice were in a state of flux (the subset of treatises I have focused on are given in Table 7).¹³⁶ Jacobus provides a key

¹³⁶ I have used an abbreviated format in Table 7 to refer to these anonymous treatises: the bibliographical reference to the most recent editions will be listed here. Higini Anglès, "Dos tractats medievals de música figurada," in *Musikwissenschaftliche Beiträge: Festschrift für Johannes Wolf zu seinem sechzigsten Geburtstag*, ed. H. Osthoff W. Lott, and W. Wolffheim (Berlin: Breslauer, 1929), 6-10. Idem, "De cantu organico: tratado de un autor catalán del siglo XIV," *Anuario musical* 13 (1958): 18-24. CS 1, Anon. 6; *Tractatus de figuris sive de notis*, in Ms. Oxford, Bodley 842 (Willelmus), *Breviarium regulare musicae*. Ms. British Museum, Royal 12. C. VI., *Tractatus de figuris sive de notis*. Johannes Torkesey, *Declaratio trianguli et scuti*, ed. Gilbert Reaney, vol. 12, *Corpus scriptorum de musica* (Rome: American Institute of Musicology, 1966), 40-51. CS 3, Anon. 1; *De musica antique et nova*, 334-64. CS 3, Anon. 2; *De valore notularum tam veteris quam novae artis* in Anonymous, *De valore notularum tam veteris quam novae artis* (Ms. Paris, Bibl. Nat., lat. 15128). Anonymus, *Compendium musicae mensurabilis tam veteris quam novae artis* (Ms. Paris, Bibl. Nat., lat. 15128). Anonymus, *De diversis maneriebus in musica mensurabili* (Ms. Saint-Dié, Bibl. Municipale 42), ed. Gilbert Reaney, vol. 30, *Corpus scriptorum de musica* (Neuhausen-Stuttgart: Hänssler-Verlag, American Institute of Musicology, 1982), 13-28. CS 3, Anon. 3; *Compendiolum artis veteris ac novae*, in *Philippi de Vitriaco Ars nova*, 84-93. CS 3, Anon. 4; *Compendium musicae mensurabilis tam veteris quam novae* in *Anonymus de valore notularum*, 33-41. CS 3, Anon. 6; *De musica mensurabili* in *Johannes de Muris Notitia artis musicae et Compendium musicae*. *Petrus de Sancto Dionysio Tractatus de musica*, 147-59. CS 3, *Johannes de Muris Ars discantus* [no longer attributed to Muris], 107. *Coussemaker III, Philippe de Vitry Ars perfecta in musica* [no longer attributed to Vitry], 28-35. *Michels anon.* in Ulrich Michels, "Der Musiktraktat des Anonymus OP," *Archiv für Musikwissenschaft* 26 (1969): 55-72. *Sweeney anon.*; *De musica mensurabili* [formerly attributed to Theodoricus de Campo] in [Anonymous], *De musica mensurabili*. [Anonymous] *De semibrevis caudatis*, ed. Cecily Sweeney and André Gilles, vol. 13, *Corpus scriptorum de musica* ([Dallas, Texas]: American Institute of Musicology, 1971), 29-56. *Vitry anon. 1964a (I-Rvat 307)* in *Philippi*

witness to this stage: more than any other theorist of the time, he provides a synthesis of a broad range of sources and practices from this developmental stage. When Jacobus refers to or quotes from the “works” of these modern teachers and authors, we must pay close attention to the way in which he structures his references. In what format did Jacobus know these works: that is, was he reading (or recalling) from a fixed text, or was he aware of a more generalized oral transmission or presentation of these ideas and teachings? Can this analysis provide answers to an important question about this time period of music theory: that is, other than the treatises of Johannes de Muris, was there another central written document that first transmitted this new expanded system of mensural notation, and from which the other various *ars nova* treatises can be seen to be derived? Is there evidence in Book 7 of *Speculum musicae* of an *Ars nova* exemplar, written by an author central to the development of this idiom, who “invented” a new notational system that enabled a new musical style, as evidenced in the motets of the *Roman de Fauvel*; or is the variety of theoretical manuals now surviving evidence of a much more fluid teaching tradition (lecture notes if you like), or even efforts to document an already existing musical practice, or to clarify

de Vitriaco Ars nova, 23-31. Vitry anon. 1964b (F-Pn 14741), *ibid.*, 25-29, 32. Vitry anon. 1964c (F-Pn 7378A), *ibid.*, 55-69. Vitry anon. 1964d (GB-Lbl 21455), *ibid.*, 73-78. Vitry anon. 1964e (I-Su L.V.30), *ibid.*, 80-81. Wolf anon. 1908 in Johannes Wolf, "Ein anonymes Musiktraktat aus der ersten Zeit der “Ars Nova”, " *Kirchenmusikalisches Jahrbuch* 21 (1908): 33-38.

aspects of the notation for scribes or performers of this musical style? Was the emergence of the *ars nova* and its accompanying musical notational systems an organic process or was it “invented” in a more artificial way?¹³⁷

In order to analyze the influences and sources for Jacobus’s version of *ars nova* theory, I will focus in this chapter on the sections of Book 7 that deal specifically with the technical details of the notation – the “figuring” of the notes. Table 8 gives an outline of the chapters of Book 7 and imposes a logical grouping of the chapters in order to better understand the book’s structure and scholastic argument.

Table 8 *Speculum musicae* Book 7 content summary

<i>Theme</i>	<i>(Chapters) Chapter Titles</i>	<i>Disputation section</i>
Introduction	(1) Introduction	

¹³⁷ I should preface this analysis by clarifying that this is primarily a textual study, concentrating on the relationships of ideas, vocabulary and concepts between these texts. A paleographical or codicological examination of the manuscripts that transmit these texts, focusing on the fifteen or so manuscripts represented in Table 7, would presumably bring us some degree closer to answers regarding the origins and modes of transmission of *ars nova* theory (and particularly a consideration of which text or texts traveled together – for instance, were they circulated as independent *libelli*, and later bound together, or was there scribal intention in the grouping of certain texts in a certain order): however, such an examination is outside the scope of this present study.

The genus of mensural music	(2) What is mensural music?	
Discant, its name, definition, and species	(3-10) Why is it called discant? What is discant? Which consonances must be used in discant? Whether a P4 before a P5 is a consonance? That a P4 before a P5 is a consonance That the pitches of the P4 sound more concordant above the P5 than below Concerning inept discantors The divisions (<i>distinctio</i>) of discant	
Tempus and measure	(11-17) What is <i>tempus</i> as it pertains to mensural music? How the moderns impugn this definition of <i>tempus</i> That a perfect tempus is not divisible into two equal parts Confirmation of what has been said That a semibreve is not divisible into integral parts The rationale of the opposition Excusing (<i>excusatio</i>) the ancients	 <i>videtur</i> <i>sed contra</i> <i>responsio</i> <i>videtur</i> <i>sed contra</i> <i>responsio</i>
Modes	(18-19) What is mode? How many modes are there?	
The figures (Notation)	(20-37)	

	The figures of the notes according to the ancients	<i>videtur</i>
	The division of the notes according to the ancients	
	Concerning <i>plicas</i> , according to the ancients	
	The figures according to the moderns	<i>sed contra</i>
	The division of the notes according to the moderns	<i>responsio</i>
longs	That a duplex long may not be ligated	
	That a duplex long is not worth nine <i>tempora</i>	
	That the duplex long which they call (<i>vocatur</i>) a <i>larga</i> is irrational	
	That imperfect duplex longs are not necessary	
	That imperfect simple longs are not necessary	
	That songs composed of perfect longs are referred to the highest trinity	
	That it is not necessary for a simple long to be equilateral	
breves	That the imperfect breve is not necessary	
semibreves	A prologue to the following	
	That the moderns irrationally put tails on semibreves	
	That this is even more irrational for the <i>minim</i>	
	That the tails would be better obtuse than acute	
	That solitary semibreves must not be placed	

Imperfections	(38-40) What the moderns say concerning imperfections What is required to imperfect or to be imperfected That one note cannot imperfect another	
The nine conclusions	(41-44) A response to the nine conclusions of the moderns A response to the first conclusion A response to the second, fifth, sixth, seventh, eighth A response to the fourth, seventh, eighth, ninth	<i>Responsio</i>
Rhetorical conclusion	(45-49) Comparison of the ancient art to the new With respect to perfection and imperfection With respect to subtlety and rudeness With respect to liberty and servitude With respect to stability Conclusion of this complete work	

Chapters 20 to 37 mark the section of Book 7 that deals specifically with the figures of mensural notation: it is within these chapters that Jacobus methodically disputes each point regarding the shapes and symbols of the notes. Chapters 20 to 24 serve as an introduction to this section, first by generally outlining the principles the *Antiqui* followed in their note figurations (*per* Franco of Cologne and Magister

Lambertus) and then outlining the divisions according to the Moderns. Jacobus follows this introduction with a chapter-by-chapter discussion of each note form and his concerns with the use of these notes. In the Bragard edition of *Speculum musicae*, close attention was paid to these introductory chapters (20-24), insofar as sources were identified, and so on, but there has been little analysis of the details of the argument that follows in chapters 25 to 37, where the sources and influences are more varied.¹³⁸

LONGS

Duplex longs should not be placed in ligatures

Jacobus begins Chapter 25 contesting the claim that the duplex long may be contained within a ligature. The moderns say: “It either is a figure or it is not. If it is a figure then it is ligable” (“Aut figura est aut non. Si figura est, ergo ligabilis est”) (*SM* 7.25, 53). Jacobus states that only simple figures ought to be ligated. In Chapter 10 of the *Ars cantus mensurabilis*, Franco of Cologne lists out in great

¹³⁸ The first five chapters are interesting in that they define what exactly Jacobus understands by the term *figura*, and this is important for understanding the philosophical basis for Jacobus’s arguments. This aspect has not been examined in the modern literature either. It is also in these five chapters that we can glean Jacobus’s understanding of species and form. I deal with these aspects at length in Chapter 6.

detail exactly which figures may be ligated, although he does not refer specifically to the case of the duplex long.¹³⁹ Jacobus is following Franco's lead with the argument that only simple figures can be ligated.¹⁴⁰ Throughout Chapter 25, Jacobus refers to his opposition to ligating longs with the generic "they say," but in Chapter 27, he gives musical examples which he says are from *this teacher* ("hic

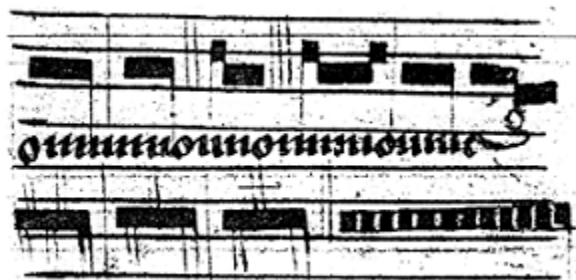
¹³⁹ With regard to the long, Franco says the following: "Item sciendum quod figura ligabilis non ligata vitiosa est, sed magis non ligabilis ligata. Unde notandum quod plures longae adinvicem ligari non possunt, nisi in binaria ligatura quae est sine proprietate et cum perfectione. Nec adhuc in tali loco sunt vitiosae si non ligentur, eo quod longa nusquam alibi cum longa ligabilis invenitur. Ex quo sequitur quod vehementer errant qui tres longas aliqua occasione, ut in tenoribus, adinvicem ligant. Similiter illi qui inter duas breves longam ligant, cum de impositione mediarum, ut visum est prius, omnes mediae brevientur" ("Be it known that not to bind a figure that can be bound is a fault, but to bind a figure that cannot be bound a greater fault. Whence be it observed that longs cannot be bound together except in the binary ligature that is without propriety and with perfection. Nor is it a fault if even in this situation they are not bound, for nowhere else are longs bound together. From this it follows that those who occasionally bind three longs together, as in tenors, err exceedingly, as do those who bind a long between two breves, since as we have seen, all middle notes become breves by rule"). Franco de Colonia, *Ars cantus mensurabilis*, 59. Translated Strunk, revised by McKinnon, in James McKinnon, ed., *Strunk's Source Readings in Music History: Vol. 2, The Early Christian Period and the Latin Middle Ages, Revised Edition* (New York: Norton, 1998), 128.

¹⁴⁰ Later in the fourteenth century we see Prosdocimo upholding Jacobus's argument in a reference to the *maxima*: "Octava regula est ista, quod nulla maxima atque longa ligabilis est in medio ligature; hanc regulam affirmant omnes auctores musice, sicut Franco et alii in suis capitulis de ligatures" ("The eighth rule is this, a maxima long is never ligable in the middle of a ligature; this rule is attested to by all musical theorists, such as Franco and others in their chapters on the ligatures"). Prosdocimo de' Beldomandi, *Tractatus practice de musica mensurabili*, in CS 3, 220.

doctor”) who places duplex longs within binary and triple ligatures (this is the same teacher he refers to Chapter 26 as holding that the duplex long is worth nine *tempora*). The musical examples given by Jacobus match the musical examples in *CS 3, Anon.4; Compendium musicae mensurabilis tam veteris quam novae* (see Figure 1).¹⁴¹

¹⁴¹ *Anonymus de valore notularum*, 34.

Figure 1 Musical examples of the duplex long in CS 3, Anon. 4 (*F-Pn* lat. 15128, f.129r)



Some Moderns say a duplex long equals 9 tempora

Here Jacobus essentially disputes the name but also the need for the note value at all. In chapter 26, Jacobus argues against some amongst the Moderns (“aliqui inter Modernos”) who claim that any note can be tripled in value, so that the duplex long, or *larga*, is worth three longs or nine *tempora* (rather than six *tempora*):

Cum enim, ut dicit hic doctor, quaelibet notula in valore debeat triplicari, ut semibrevis tres valet minimas, breves tres semibreves, longa tres breves, ergo duplex longa, vel melius larga, procul dubio tres longas, scilicet novem tempora valere debet. (*SM* 7.26, 54)

Since, as this teacher says, any note may be tripled in value, so that a semibreve is worth three minims, breves three semibreves, a long three breves, therefore a duplex long, or better a *larga*, is undoubtedly worth three longs, and so obviously is worth nine tempora.

By saying this, Jacobus says, this teacher (“hic doctor”) implies that “Franco, Petrus de Cruce and certain others” got it wrong. A similar concept may be found in *Quatuor Principalia*, although the author does not refer to a *larga* – he calls it a duplex or triplex long:

Unde patet manifeste quod musica mensurabilis crescere potest in infinitum, namque sicut ex brevibus rectis fit simplex longa, ita ex longis simplicibus fit duplex longa ac triplex. Et iterum illi duplices longae et triplices duplicari ac triplicari possunt in infinitum. Sed ad praesens sufficit duplices et triplices longas demonstrare, incipiendo a minima duplici longa, duplicando minima simplicem longam.

And so it is obvious that measurable music can extend towards infinity, for just as a simple long is made from *recta* breves, so duplex longs and triplex longs are made from simplex longs. And again these duplex longs and

triplex longs may be doubled or tripled into infinity. But, for the moment, it is enough to show duplex and triplex longs, beginning with the least long doubled, that is, doubling the simplex long.¹⁴²

Jacobus disputes the use of the term modern teacher (“hic doctor”) *duplex longa* or *larga* to denote a note that is worth three longs. The crux of the problem for Jacobus, however, is the idea that any note can be *tripled* to produce another note. Rather, according to Jacobus, a particular note form and its name may *signify* a length of time that is divisible into three parts (with the caveat that not every note is divisible into three equal parts), and so a perfect long is divisible into three parts:

Non enim longa valet tres longas, nec brevis tres breves, nec semibreves tres semibreves, sed bene significant notulae illae tempus ut divisibile in tres partes aequales. (*SM* 7.26, 55)

For a long is not worth three longs, nor a breve three breves, nor a semibreve three semibreves; but rather these notes represent a time that is divisible into three equal parts.

¹⁴² *Quatuor Principalia*, CS 4, 264. Johannes Vetulus de Anagnia appears to refer more directly to this note value that may be doubled or tripled: “Et si duplicatur corpus dictae longae, potest duplicari et triplicari valor. Et quando valor praedictae longae duplicatur, praedicta duplicata vocatur imperfecta larga vel duplex longa” (“And if you double the notehead of this long, its value is doubled or tripled. And insofar as the value of this said long is doubled, this doubled long ought to be called an imperfect *larga* or a duplex long”). Johannes Vetulus de Anagnia, *Liber de musica*, ed. Frederick Hammond, vol. 27, *Corpus scriptorum de musica* (Neuhausen-Stuttgart: Hänssler Verlag, American Institute of Musicology, 1977), 66.

It is not that a certain note is worth three of another note, or is a multiple of another note, because all different note forms are different species and one is not predicated on another (that is, a breve is not worth three semibreves) but that a certain note may be divisible into three equal parts (that is, it is possible to divide the length of time a long would take into three shorter notes). So, larger notes should not be thought of as multiples of smaller notes, but rather the length of time taken up by a number of smaller notes may be equivalent to the length of time taken up by a larger note.

Jacobus would prefer that if this note were used it would more properly be called a triplex long (rather than a *larga* or duplex long), but he deems it as unnecessary in any case. In the next chapter he will take to task the same teacher concerning the note form called a *larga*.

The use of the larga, or the long as long as many strokes it contains

Jacobus closes Chapter 26 with the words “ponit enim tactus doctor quasdam largas duplices [sic] de quibus aliquid statim dicatur” (“this teacher puts forward certain duplex largas [sic] that we will now discuss”) (*SM* 7.26, 55). He continues in Chapter 27 to take this same teacher to task. He opens Chapter 27 with the phrase “inquit praetactus doctor” (“this teacher, discussed earlier, says”) and ascribes to him the following teaching:

. . . corpus eius ultra modum consuetum valet tot perfectiones vel

imperfectiones quot continet caudas sive breves divisas. (*SM* 7.26, 55)

... its notehead, which is extended beyond its normal size, is worth as many perfections or imperfections as strokes or divided breves it contains.¹⁴³

Bragard identified this passage as quote from *CS 3, Anon.4; Compendium musicae mensurabilis tam veteris quam novae*. A closer examination of the context of this quote within *CS 3, Anon.4* shows that this particular treatise could not have been Jacobus's source. Here is the entire quote:

Duplex longa valet sex tempora in modo perfecto, in imperfecto valet quatuor. Sed in perfecto modo duobus modis imperficitur: vel cum sola brevi et sic valet quinque tempora, vel cum diuabus brevibus et sic valet quatuor. Corpus ultra modum consuetum valet tot longas quot caudas sive breves in se continet diversas.

A duplex long is worth six *tempora* in the perfect mode, or in the imperfect mode it is worth four. But in the perfect mode it may be imperfected in two ways, either with a single breve and then it will be worth five *tempora*, or with two breves and then it will be worth four. Its notehead, which is extended beyond its normal size, is worth as many perfections or imperfections as strokes or divided breves it contains.¹⁴⁴

CS 3, Anon.4 states that a duplex long is worth six *tempora*, and not nine *tempora*, as discussed above. The note is never referred to as a *larga*, and is only discussed

¹⁴³ The only other author to use this particular phrase “ultra modum consuetam” is Ugolino of Orvieto. Ugolino of Orvieto, *Declaratio musicae disciplinae*, 2:64.

¹⁴⁴ *CS 3, Anon.4*, in Anonymous, *De valore notularum*, 34.

within the context of perfect and imperfect *modus*: this is not the same context as the Jacobus passage. The vocabulary and word order of these quotes are certainly similar in both treatises, but one is not an exact word-for-word exact quotation of the other.

Jacobus immediately goes on to quote from what he calls the eleventh chapter of this same work:

Et idem infra undecimo capitulo sui operis: Quadrata, inquit, nota habens figuram ultra modum consuetum, sive metam duplicis longae, plures caudas continens, sive duas, sive tres, sive plures ascendentes <vel descendentes> alias et alias, sive breves in se continens divisas, larga vocatur, ut haec quae sequitur. (*SM* 7.26, 55-56)

And similarly in the eleventh chapter of his work: A square note, he says, having a figuration beyond the usual way, or like a duplex long, containing many strokes, or two, or three, or many other ascending ones (or descending), or containing divided breves in itself, is called a *larga*, as this which follows.

So, the author of the work that Jacobus is referring to specifically calls this square note that is extended beyond its normal size a *larga*. *CS* 3, *Anon.4; Compendium musicae mensurabilis tam veteris quam novae artis* does not contain the term *larga*, and furthermore, as it has been transmitted to us, has only ten chapters, and so Jacobus is not quoting from the “eleventh” chapter of this particular version. The specific term *larga* is found in English theorists such as Robert de Handlo, John of Tewkesbury, John Hanboys, Thomas Walsingham, Willelmus, *CS* 1, *Anon. 6; Tractatus de figuris sive de notis*, John Torkesey, and Vitry anon. 1964d (*GB-Lbl*

21455); also in *CS 3, Anon.6; De musica mensurabili*; and *Sweeney anon.; De musica mensurabili*.¹⁴⁵ In *Sweeney anon.; De musica mensurabili* the same subject matter is discussed, yet the note is referred to as a *maxima* (elsewhere the author does use the term *larga*). In a passage from this treatise we also see the same grammatical construction “valet tot . . . quot” being used:

Quidam etiam dictas maximas signant per caudas, ponentes in figura dictae maximae plures caudas, et quot sunt caudae in dicta maxima, tot valet longas.

Those which are called *maximas* are signified through strokes, which are placed in these figures called *maximas*, and as many strokes as there are in this so-called *maxima*, it is worth as many longs.¹⁴⁶

¹⁴⁵ *Robertus de Handlo, Regule, The Rules and Johannes Hanboys, Summa, The Summa: A New Critical Text and Translation*, ed. Peter Lefferts. (Lincoln: University of Nebraska Press, 1991). John of Tewkesbury, *Quatuor principalia*, *CS 4*, 200-298; modern edition in Luminita Florea Aluas, "The 'Quatuor principalia musicae': an Introduction, Critical Text, and English Translation with Commentary" (Ph.D. diss., Indiana University, 1996). Walsingham edn. in *Johannes Hothby, Opera omnia de musica mensurabili. Thomas Walsingham, Regulae de musica mensurabili*, ed. Gilbert Reaney, vol. 31, *Corpus scriptorum de musica* (Neuhausen-Stuttgart Hänssler Verlag, American Institute of Musicology, 1983), 74-98. Editions of Willelmus, *CS 1, Anon. 6* and Torkesey in *Ms. Oxford, Bodley 842*, 15-31, 40-51, 58-61. Hanboys, in Chapter 13 of his treatise, discusses longs such as these, containing from three to nine *longae* (within the context of a chapter quoting from Johannes de Garlandia); in this context, however, he calls them longs, not *largae* (elsewhere he does use the term *larga*). Peter Lefferts, ed., *Robertus de Handlo, Regule, The Rules and Johannes Hanboys, Summa, The Summa*, 263-69. The same note is discussed in Handlo, Rubric 5, Rule 1; here, he also calls them longs. *Ibid.*, 116.

¹⁴⁶ [Anonymous], *De musica mensurabili. [Anonymous] De semibrevibus*

In the treatise *Anglès anon. 1958; De cantu organico*, this note is called a *longa duplex* :

De longa duplici est sciendum quod longa duplex quandoque continet duas longas simplices, aliquando tres, quandoque IIIor, quandoque quinque, quandoque .VI. Et ne contingat errare, debent poni puncta ad maiorem certitudinem, ut patet hic.

On the duplex long: it is known that the duplex long may contain as many as two simplex longs, sometimes three, sometimes four, five or six. In order to avoid mistakes, points ought to be placed to give more certainty as shown here.¹⁴⁷

caudatis, 46-47.

¹⁴⁷ Anglès, "De cantu organico: tratado de un autor catalán del siglo XIV," 23.

Figure 2 *Larga perfecta* and *larga imperfecta* in Vitry anon. 1964d (GB-Lbl Add. 21455), f. 5r

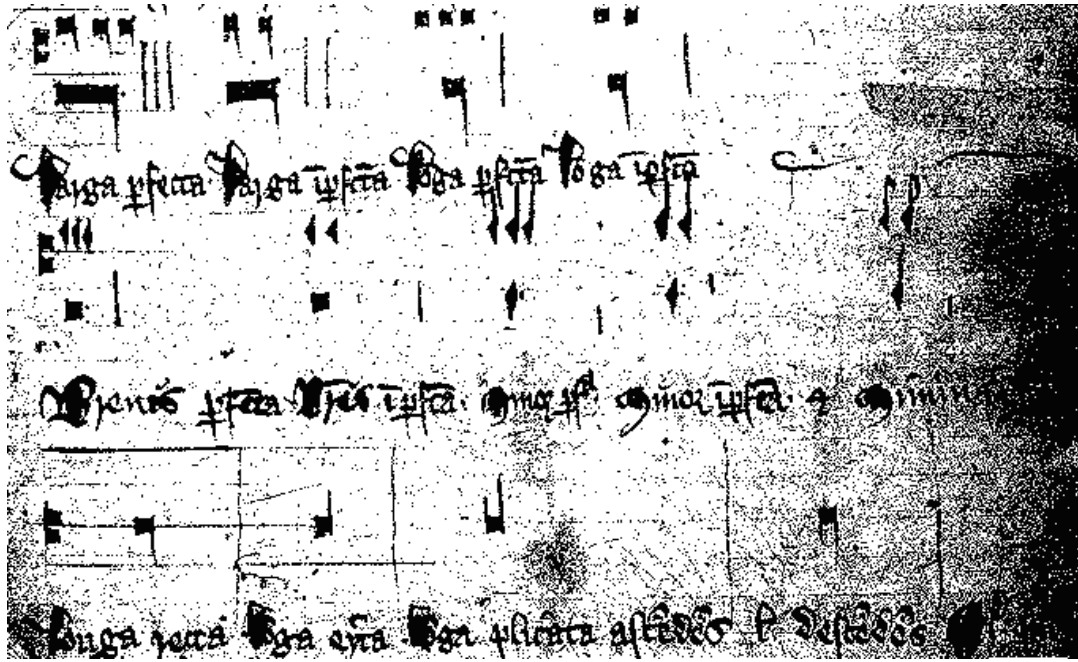


Figure 3 *Caudae* through the *maxima* long in Sweeney anon.; *De musica mensurabili* (I-Rvat 307, f. 24v)



Figures 2 and 3 illustrate musical examples from *Vitry anon. 1964d (GB-Lbl Add. 21455)* and *Sweeney anon.; De musica mensurabili (I-Rvat 307)* that demonstrate these types of longer longs, with strokes indicating their length. In closing this section, Jacobus launches an attack against the teacher who “named” these notes, these *largae* or *maximae*, and who deformed their nature by adding caudae in improper places on the note form:

Utinam tales monstruosas nominasset! Cum monstrum sit quando aliquid plus habet quam pertineat ad eius naturam consuetam, sicut defectus in natura est quando minus habet. Notulae autem quadratae in suis extremitatibus vel angulis caudari solent et nunquam in medio. O quanta abusio, quanta illegalitas, quanta vanitas, quanta insolentia, quanta inutilitas, quanta ruditas! O in notarum figuris quanta praesumptio, quanta confusio! (*SM* 7.27, 56)

Oh, if only he had not named such monstrosities! For it is a monstrosity when something goes against its usual nature, just as in nature something is considered defective when something is missing from it. A square note ought to be caudated at its extremities or at the angles and never in the middle. Oh, so much abuse, so much illegality, so much vanity, so much insolence, so much uselessness, so much rudeness! Oh, so much presumption in the figuring of the notes, so much confusion!

So, while there are many similarities in specific points of doctrine, or even musical examples, between the source that Jacobus is using and the three sources *CS 3*, *Anon. 4*, *Sweeney anon.; De musica mensurabili* and *Vitry anon. 1964d (GB-Lbl Add. 21455)*, none of these contain all of the points that Jacobus ascribes to “hic doctor” and none contain an eleventh chapter.

The use of the imperfect duplex long

In this same chapter, Jacobus condemns the use of duplex longs in a triple ligature, and also the imperfecting of duplex longs by one or two breves (this last point seems to have been a contentious one, and one on which quite an emphasis is placed in many of these transitional treatises). Jacobus gives musical examples illustrating this practice, and the music examples again look similar to those given in *CS 3, Anon.4* (see Figure 1).

Jacobus quotes a lengthy passage and this time attributes it to the eighth chapter of the work he mentioned earlier (note again the particular use of the phrase “suis operis” [“of his work”], not doctrine, or teaching, but *opus*). I compare this passage here with similar passages from the *Ars nova* tradition:

Jacobus, *SM*

Dicit enim in octavo capitulo suis operis sic: Videmus in arte veteri quod, quando sola brevis ligatur cum longa duplici, duplex illa longa quinque tantum valet tempora et, quando duo breves a quolibet latere illi iunguntur, quattuor valet tempora. (*SM* 7.27, 57)

For he says in the eighth chapter of his work: we see in the old art that whenever a single breve is joined with a duplex long, the duplex long is worth five *tempora*, and, whenever two breves are joined to whichever side of it, it is worth four *tempora*.

CS 3, Anon.3; Compendiolum artis veteris ac novae

Item in veteri arte vidimus quod quando sola brevis ligatur cum duplici

longa, illa duplex longa non valet nisi quinque tempora, ut hic patet.

Similarly, we saw in the old art that whenever a single breve is joined with a duplex long, that duplex long is only worth five *tempora*, as shown here.¹⁴⁸

Vitry anon. 1964a (I-Rvat 307)

. . . duplex longa imperficitur duobus modis, sive cum sola brevi, et tunc non valet nisi 5 tempora, sive cum duabus, et tunc non valet nisi 4.

A duplex long may be imperfected in two ways, either by a single breve, and then it is worth but five *tempora*, or by two, and then it worth but four.¹⁴⁹

CS 3, Anon.2; De valore notularum tam veteris quam novae artis

Notandum est ulterius quod duplex longa perfecta a duabus brevibus imperficitur, aliquando, ita quod illa duplex longa remanet sub valore quatuor temporum quae prius valebat sex tempora ut hic . . . Si autem illam longam duplicem sola brevis praecedat vel sequatur, tunc illa longa valet quinque tempora ut hic . . .

It also must be pointed out that a perfect duplex long may be imperfected by two breves, sometimes, so that the duplex long remains under the value of four *tempora*, which was previously worth six, like this . . . Also, if a single breve precedes or follows this duplex long, then this long is worth five

¹⁴⁸ *Philippi de Vitriaco Ars nova*, 89.

¹⁴⁹ *Ibid.*, 25.

tempora as here.¹⁵⁰

CS 3, Anon.4; Compendium musicae mensurabilis tam veteris quam novae

Duplex longa valet sex tempora in modo perfecto, in imperfecto valet quatuor. Sed in perfecto modo duobus modis imperficitur: vel cum sola brevi et sic valet quinque tempora, vel cum duabus brevibus et sic valet quatuor . . .

A duplex long is worth six *tempora* in the perfect mode, in the imperfect mode, it is worth four. But in the perfect mode it is imperfected in two ways: either with a single breve and then it is worth five *tempora*, or with two breves and it is worth four.¹⁵¹

The two most similar texts are the first two: the concepts are the same in all four quotations, but the word-for-word similarity exists only between Jacobus and the anonymous *CS 3, Anon.3; Compendiolum artis veteris ac novae*. From the way that Jacobus refers to this work, it again appears as if he is quoting from a treatise he has read, or is reading, and that he believes it to be written by one author (again continuing his reference to “hic doctor” and “praetactus doctor”). With respect to the material we have discussed so far on the long, the treatises that bear the strongest relationship to the texts quoted by Jacobus are *CS 3, Anon.3* and *Anon. 4*,

¹⁵⁰ Anonymous, *De valore notularum*, 14.

¹⁵¹ *Ibid.*, 39.

and possibly also *Sweeney anon.: De musica mensurabili*. Jacobus describes the author of the work he has been referring to as follows:

Hic doctor, qui veterem artem atque novam intendit in opere suo divulgare fideliter quae veteris sunt et quae novae, debet repetere et non imponere Veteribus quae minime dixerunt. Utrum autem hoc observent, iudicent qui Antiquorum opera de hac materia nec non et Modernorum diligenter inspexerunt. Sed forsitan tactus doctor aliquam artem vocat veterem quae de novo cantandi modo tractat et notandi. Tanta enim variatio inter Modernos iam facta est ut priores ipsorum veteres vocentur respectu aliorum. (*SM* 7.27, 57)

This teacher, whose supposed intention in his work is to faithfully lay out those elements which are of the old art and those of the new, ought to repeat what the Ancients actually said and ought not to read other meanings into the few words they have left us. The Moderns have gone beyond observation, and indeed they have gone so far as to judge the work of the Ancients that they had not themselves sufficiently studied. This teacher even calls some practices old that are actually only found in the new ways of singing and notating. Indeed, there is so much variation among the moderns that they ought to refer to those who came before them with a little more respect.

The beginning of this passage appears to refer to an intention, set forth in the opening of the so-called “Omni desideranti” treatise of the *ars nova* family of treatises (*Vitry anon. 1964e [I-Su L.V.30]*; *Anglès anon. 1929*; *CS 3, Philippe de Vitry Ars Perfecta [US-Cn 54]*), to compare faithfully (“fideliter”) the old and new practices.¹⁵² Many of these transitional treatises refer to comparisons between the

¹⁵² “Omni desiderunt notitiam artis musicae mensurabilis tam novae quam veteris obtinere, certas regulas hic presentes sub brevi compendio proposse non postpono fideliter assignare” (“For all who who desire to have an acquaintance with the art of mensural music, both new and old, certain rules are presented here

old and new arts of mensural music (“vetus” and “nova”), often in either their title or introduction or explicit. We will return to this topic presently.

Jacobus closes his section on the *longa* with a number of chapters that deal succinctly with a couple of remaining issues. In the short chapter 28 (“Quod longae duplices imperfectae huic arti non sunt necessariae”), Jacobus does not directly quote from any of the moderns. His argument here is purely logical: that is, if I have just proven that a duplex long is unnecessary to this art, then it follows that the imperfect duplex long is even more unnecessary. A short chapter on the use of imperfect longs made up of imperfect breves follows (“longarum simplicium quadruplex est species: quaedam quae dicitur perfecte perfecta, alia perfecte imperfecta, alia imperfecte perfecta, alia imperfecte imperfecta” [“There are four species of simple longs: which are called perfectly perfect, others perfectly imperfect, others imperfectly perfect, others imperfectly imperfect.”]) (*SM* 7.29, 58). He concludes: “Finaliter in cantibus ex imperfectis omnia reducuntur ad aequalitatem” (“Finally in their songs made up of imperfects everything is reduced to equality”) (*SM* 7.29, 58). The next chapter has a philosophical argument regarding perfection, the trinity and the ternary number, prompted presumably by a reference to the trinity in the Moderns (there are references to the trinity in *Vitry*

within this short compendium, to display and not ignore that which is faithfully compared”). *Philippi de Vitriaco Ars nova*, 80.

anon. 1964d [GB-Lbl 21455] and *Vitry anon. 1964e [I-Su L.V.30]*).¹⁵³ Finally, the actual figuration of the long is discussed briefly in passing. Jacobus states that the Ancients did not require the simple long to be an equilateral rectangle (i.e., square), and not all the Moderns do either. He also notes the difficulty of actually making the note form equilateral.

BREVES

*They call the semibrevis maior an imperfect breve,
and give it the form of a breve*

After the seven chapters Jacobus spent discussing the long he only devotes one chapter to the breve. In chapter 21, Jacobus had briefly mentioned the fact that the Moderns use a note form that they call the imperfect breve, giving it the form of the breve, a note which the Ancients called the major semibreve. He says he will return to this subject presently, which he does in chapter 32. In Chapter 32, he does not preface any of his statements with a direct reference to “they say” or “in his work he states” as he did in earlier chapters, rather he simply states that an imperfect breve is one of the note forms that the Moderns use and goes on to argue why it is unnecessary to this art.

¹⁵³ *Philippi de Vitriaco Ars nova*, 74, 80.

When do we first start to see references to the imperfect breve in the transitional treatises? One of the early references is in *CS 3, Anon.2* - to a *recta brevis imperfecta*:

[*semibreves*] quod tales tres valent brevem rectam...*Recta brevis* valet tres semibreves maiores si sit perfecta; si vero sit imperfecta, duas.

Three of which [*semibreves*] are worth a *recta brevis*...A *recta brevis* is worth three major semibreves if it is perfect; if it is imperfect, two.¹⁵⁴

CS 1, Anon.6; Tractatus de figuris sive de notis uses the term *recta altera* to refer to both the minim and the semibreve:

Brevis vero sic dividitur: quedam est perfecta et quedam imperfecta et utraque subdividitur. Brevium perfectarum quedam perfecte perfecta et quedam imperfecte perfecta. Brevis perfecte perfecta dicitur que valet tres semibreves quarum quelibet tres minimas. Brevis imperfecte perfecta dicitur illa que valet tres semibreves quarum quelibet valet tantum duas minimas

A breve is divided like this: that which is perfect and that which is imperfect, and between these it is further subdivided. Of perfect breves, there is that which is perfectly perfect and that which is imperfectly perfect. A perfectly perfect breve is said to be that which is worth three semibreves, each of which is worth three minims. An imperfectly perfect breve is said to be that which is worth three semibreves, of which each is worth two minims.¹⁵⁵

¹⁵⁴ Anonymous, *De valore notularum*, 13.

¹⁵⁵ *Ms. Oxford, Bodley 842*, 46.

CS 3, *Anon.3* refers to both a perfect breve and a *breve tempus imperfectum*, and so conceptualizes a breve within imperfect time.

Breve tempus imperfectum dividitur in duas semibreves aequales, et quaelibet illarum semibrevium dividitur in tres minimas, et quaelibet illarum minimarum subdividitur in duas semiminimas iterum...sic est in nova arte quod eodem modo, quando sola semibrevis sequitur brevem, vel quando plures quam tres semibreves sequuntur, illa brevis non valet nisi duas semibreves.

An imperfect breve tempus is divided into two equal semibreves, and each of these semibreves is divided into three minims, and each of these minims is subdivided into two semiminims again...thus it is in the new art that whenever a single semibreve follows a breve, or whenever more than three semibreves follow, that breve is worth only two semibreves.¹⁵⁶

CS 3, *Anon.4* begins with the traditional Franconian division of the breve into *recta* and *altera*, but then also discusses the equivalence between a breve imperfecting a long and a semibreve imperfecting a breve:

Brevis est duplex, scilicet recta et altera. Quoniam quotienscumque duae breves ponuntur inter duas longas vel inter longam et pausam, vel quando aequipollens brevi et brevis ponuntur inter duas longas, vel quando inter longam et punctum ponuntur duae breves vel e converso, secunda illarum brevium vocatur altera et valet duo tempora, ut patet hic in exemplo...

There are two types of breve, *recta* and *altera*. Because as many as two breves may be placed between two longs and between a long and a rest, or the equipollent value of a breve and a breve are placed between two longs, or whenever two breves are placed between a long and a dot, or the converse, the second of these breves is called *altera* and is worth 2 *tempora*,

¹⁵⁶ *Philippi de Vitriaco Ars nova*, 86.

as shown in this example...¹⁵⁷

Prima brevis imperficiet primam longam...Et sic est de semibrevis...prima semibrevis imperficiet primam brevem...Sicut longa imperficitur a brevi, sic brevis a semibrevis et semibrevis a minima.

The first breve imperfects the first long...and it is the same with respect to semibreves, the first imperfects the first breve . . . Just as a long is imperfected by a breve, thus a breve by a semibreve and a semibreve by a minim.¹⁵⁸

A similar parallel is drawn by the author of *Vitry anon. 1964d (GB-Lbl 21455)*, who also brings in the terminology of prolation (note the mistaken use of the word *tempus* in this definition):

Item sicut in veteri arte, ut praedictum est, quando duae breves inter duas longas inveniuntur (prima recta dicitur) et secunda alteratur, sic in nova arte, quando duae semibreves inter duas breves de tempore perfecto vel inter brevem et longam inveniuntur, prima unum tempus habebit et secunda erit altera. . . . Eodem modo quando duae minimae inter duas semibreves de majori prolatione inveniuntur.

And just as it is in the old art, as was already said, whenever two breves are found between two longs (the first is called *recta*) and the second *altera*, so it is the new art, whenever two semibreves are found between two breves in *tempus perfectus*, or between a breve and a long, the first of them will have one *tempus* and the second will be altered. . . . In the same way two minims

¹⁵⁷ Anonymous, *De valore notularum*, 36.

¹⁵⁸ *Ibid.*, 38.

are found between two semibreves in the major prolation.¹⁵⁹

The most notable concordances in concept and vocabulary as they relate to Jacobus's analysis are again with *CS 3, Anon. 4* and *CS 3, Anon. 3*.

SEMIBREVES/MINIMS/SEMIMINIMS

It is not appropriate to the form of the semibreve to add a tail to it

Jacobus spends a number of chapters discussing semibreves and other smaller divisions of the breve tempus (chapters 33 to 37).¹⁶⁰ Within the rapidly expanding system of rhythmic values at the turn of the fourteenth century, there was great variety in the description and use of semibreves and other smaller notes.¹⁶¹ Chapter 34 (“That the Moderns place tails on semibreves irrationally”) is by far the longest chapter in Book 7. In it Jacobus summons a variety of arguments, musical

¹⁵⁹ *Philippi de Vitriaco Ars nova*, 75.

¹⁶⁰ Since this section is one of the most extensive in early fourteenth-century music theory in dealing with these controversial smaller note values I have included a full translation of these chapters as Appendix 8.

¹⁶¹ Fuller lists the variety of nomenclature for these smaller note values in these transitional treatises of the *ars nova* tradition (30-31). They include the following: *semibrevis signata*, *semibrevis altera*, *major semibrevis*, *semimajor semibrevis*, *recta et vera semibrevis*, *minor semibrevis*, *altera minima*, *minima*, *semiminima*, *minor imperfecta*, *semibrevis perfecta*, *semibrevis imperfecta*, *altera minima*.

examples, and rhetorical flourishes. He derides the modern confusion with the valuation of these smaller note values and their figuration (“confusio in notarum valoris distinctione figurandique difficultas”) and outlines the four objectionable issues of modern practice: 1) that it is possible at all to divide the integral “wholeness” of the the semibreve; 2) that it is possible to add a tail to the semibreve (whether or not it is “caudable”); 3) that a semibreve may be placed alone, without another semibreve joined to it; and 4) that semibreves can imperfect longs, breves and each other (*SM* 7.33, 66). Jacobus begins his discussion with the second point, spending an entire chapter discussing various aspects of tails on semibreves. He opens his first argument with a lengthy quote from one of the moderns, one that I have not been able to identify in any extant treatise. The author quoted by Jacobus first outlines possible objections to the use of strokes or plicas, and then the author states his disagreement with these objections:

Dicit enim unus ipsorum sic:

Quid dicetur si quisquam instet quascumque notas cuiuscumque generis fuerint aut speciei (longas duplices et simplices perfectas aut imperfectas, breves primas et alteras perfecti temporis imperfective, semibreves maiores, minores et minimas, si sic eas nuncupare liceat) nullis novis signis, figuris aut tractibus indigere, plicis superfluentibus, cum quisque cantus mensurabilis lente celeriterque proferri valorque notarum omnium sine plicis et tractibus possint compendiusque praenosci? Confusio quidem diversorum tractuum cantorem quemvis etiam disertum praepedit, ipsum non sinens cantum, alias invisum, variis tractibus et plicis occupatum canere prolatis vocibus indilate, nam intuendo continendoque pariter ocellus seducitur decantantis, causa figurationis pereunte finaliter adinventata. Ob

hoc enim praecise notarum inventa fuit figuratio ut cantor, de ipsarum valore primitus hesitans, praenotata figuratione quiesceret canere non requiret incertitudine procul mota.

Haec sunt verba actoris qui consequenter dicit:

Quid ad dictam instantiam sim responsurus? Non invenio eidemque consentirem pro maiore parte, Vetustos imitando, nisi usus potentia cohiberet. (*SM* 7.34, 66)

One of them says it thus:

“It could be said that if someone were to place any of these noteshapes of whichever genus or species (duplex and simple longs, perfect and imperfect, breves, or altered breves, of imperfectly perfect time, major and minor semibreves, and minims – if one may be permitted to name them such), then there would be no need for any new signs, figures or strokes, or superfluous *plicas*, and the value of the all the notes in any measurable song (performed slowly or quickly) could be deciphered without the need for *plicas* or strokes. Indeed, the confusion of these diverse strokes proves an impediment to the singer, for some marks seem to be missing, and some invisible on the page, and the singer, preoccupied by the various strokes and *plicas*, prolongs the pitches awkwardly. For it is only with this prolonging of some notes and then the continuation of the song in a balanced manner that the ear is seduced, and this is why the figuration of the notes was finally invented. The figuration of the notes was invented for this precision, so that the singer, instead of hesitating about the value of the notes, can use the prenotated figuration to remove any doubts about how to perform the song, without any uncertainty about the length of the notes interfering with the performance.”

These are the words of the author, who goes on to say:

“What might I respond to this? I find that I do not agree with this for the most part, since by imitating the Ancients, the power of this practice is constrained.”

He goes on to compare the Moderns to the “vain Athenians” who delight in such novelties.¹⁶² We see in this passage a real conversation between the various factions of the modern movement, and there are three voices at play in this passage. The modern author quoted by Jacobus gives an argument posed by others (Philippe de Vitry – or at least the representative notation extant in the *Roman de Fauvel* motets) – that there is no need for extra strokes or plicas or other indications in the notation, because the pattern of the notes will indicate to the singer how to interpret groups of semibreves according to stock rhythmic patterns.¹⁶³ Their aim was to have a notation that could be easily interpreted and that would not have multiple strokes or dots or other adornments distracting the singer, causing them to delay inappropriately while they were trying to figure out the meaning of the unfamiliar notational modifications. It seems that Jacobus quotes this passage not to agree

¹⁶² Presumably a reference to the criticisms of novelty by Plato in *Laws* 2 (“For the love of novelty which arises out of pleasure in the new and weariness of the old, has not strength enough to corrupt the consecrated song and dance, under the plea that they have become antiquated” Thomas L. Pangle, *The Laws of Plato, Translated, with Notes and an Interpretive Essay*, (New York: Basic Books, 1980), 227.

¹⁶³ The stock rhythmic patterns of smaller note divisions within the imperfect *tempus* are found in Chapter 15 of *Vitry anon. 1964a (I-Rvat 307)*. As Roesner notes: “several treatises that either related to the *Ars nova* in a general way or directly descended from it – Anonymous III, Anonymous IV, Anonymous dictus Theodoricus de Campo – include sections on the reading of semibreves in imperfect *tempus* that are virtually identical with Vitry’s but are preceded by parallel discussions on *tempus perfectum*.” Roesner, “Introduction to *Roman de Fauvel*,” 33.

with one side or the other, but rather to illustrate the confusion within these emergent approaches, with one group favoring a standard system for the interpretation of these groups of smaller note values (which were, as Roesner terms them, the “stock rhythmic patterns [that are the] . . . last vestiges of a ‘modal’ approach”),¹⁶⁴ and the other side favoring a more flexible approach, utilizing signs as visual aids (such as strokes or *plicas*) appended to *specific* note values, aiding the interpretation of the rhythmic values.

This quote is also interesting because Jacobus again specifically refers to the words of the *author* (“verba actoris”), again implying a written text.¹⁶⁵ He refers to this same author in the following passage, this time referring to him, as before, as a teacher (“huius doctor”). For the rest of this chapter he returns to the third person plural and speaks of the Moderns as a group, and refers to their teachings with the introductory phrase “they say.”

Jacobus goes on to say that the ancients did not need to plicate semibreves, since if there were two unequal semibreves, it was always the custom to make the first one shorter, in this way imitating nature so that that which is stronger is at the

¹⁶⁴ Ibid., 34.

¹⁶⁵ See Mary Carruthers on the term “author” and “authority” and the distinction of its use in the Middle Ages (Mary Carruthers, *The Book of Memory: A Study of Memory in Medieval Culture* (Cambridge: Cambridge University Press, 1990), 189-91.

end rather than the beginning. The moderns claimed the contrary was possible, that the first semibreve could be held longer than the second, and they indicated this by plicating the other (the second and shorter) one.¹⁶⁶ Jacobus attempts to show that

¹⁶⁶ “Adhuc dicunt: Semibreves non fuit necessarium, secundum Antiquos, plicari cum pro brevi perfecta duas semibreves inaequales ponentes haberent pro consuetudine primam minus, secundam magis tenere, moti forte ex imitatione naturae quae fortior est in fine quam in principio. Dicunt autem Moderni istud non esse necessarium cum e contrario possit fieri, scilicet quod prima semibrevis amplius teneatur quam secunda, sicut ipsi nunc observant. Ideo ad distinctionem ipsarum oportet ut dicant alteram plicari. Dicunt etiam quod non oportet ut ars semper naturam imitetur. Dicendum quod verum est quod duarum semibrevium inaequalium potest prima fieri maior et secunda minor, sicut e contrario. Hoc tamen videtur convenientius quod minor primo ponatur, deinde maior, sicut fecerunt Antiqui, quia, etsi ars naturam non possit imitari, debet tamen imitari eam ut potest, nec sequitur, quodsi nunc prima dictarum semibrevium amplius teneatur, quod ad discernendum eas oporteat alteram plicari.” (“To this they say: it was not necessary for the Ancients to plicate semibreves, for when they placed two unequal semibreves, according to their custom the first was less and the second greater, imitating nature so that that which is stronger comes at the end rather than the beginning. The Moderns say this is not necessarily true as the contrary argument can be made, that is, the first semibreve could be held longer than the second, and it is this way that they now follow. And they indicate the distinction between the two semibreves by plicating the other one. They say that it is not appropriate for art always to imitate nature. It must be said that it is true that two unequal semibreves can be made where the first is longer than the second, just as the contrary. But nevertheless it seems more appropriate that the smaller one is placed first, rather than the greater, just as the Ancients did, because, although art cannot imitate nature, it nevertheless should try to imitate it as much as it can, and also it does not make sense to indicate the first is longer than the second by plicating the other one”). *SM* 7.34, 67-68. For a detailed discussion of the interpretation of two semibreves within a perfect breve tempus and the interpretation of two semibreves *minimae* equal to a *recta* breve, see Roesner, *ibid.*, 34-35. He concludes that: “In view of the manifest connection between the musical texts in our manuscript and the doctrine of Philippe de Vitry, the conclusion seems inescapable that the many works in the *Fauvel* collection that use no more than three semibreves to the breve .

these notes are unnecessary because such rhythmic patterns could be notated in the old notation (“plus autem de re quam de nominibus curandum est” [“there is more to a thing than finding names for it”]) (*SM* 7.34, 69). He gives the musical example of *A l’entrade*, and he says that there are four *species* of notes used in this song: perfect long, imperfect long, *brevis recta* and semibreve, and that the Moderns would replace these with *semibrevis parva*, *semibrevis minor*, *semibrevis minima* and *semiminima*.¹⁶⁷ Finally, he stresses that the nature of the figure of a semibreve itself, that is, the lozenge, does not naturally lend itself to having a tail added to it.

Jacobus then logically proceeds to the controversy over the use of *caudae*.¹⁶⁸ *CS* 3, *Anon.3* gives an interesting description of the use of *caudae*, in particular in these two passages that discuss the *dragma*:¹⁶⁹

[Chapter 3] ... ad quod breviter dico quod semibrevis recte caudata a parte superiori vocatur minima, ut hic et minima recte bis caudata a parte

. . . should be read with pairs of semibreves rendered long-short” (34). This conclusion is supported by Jacobus’s text here.

¹⁶⁷ The following treatises/authors mention the semibreve parva: *CS* 3, *Anon.6*: *De musica mensurabili*; Sweeney anon: *De musica mensurabili*; Johannes de Muris, *Notitia*; Johannes de Muris, *Compendium*.

¹⁶⁸ Their meaning has continued to be controversial in modern musicological interpretations. See Roesner, “Introduction,” 32-34, on the interpretation of the *caudae* in polyphonic pieces in the *Roman de Fauvel*.

¹⁶⁹ The *dragmae* or *fuisse* were notes that had both an ascending and descending tail and were worth two minims.

superiori vocatur semiminima.

To this it must be quickly added that the note which has a tail to the right on the upper part is called a minim, and the minim with twice a tail to the right is called a semiminim.¹⁷⁰

Item nota quod quaedam sunt semibreves quae caudantur a parte superiori et inferiori, ut patet hic. Et tales notulae sic caudatae dragmae vocantur, gallice *fuis*, et non possunt aliquo modo valere nisi duas minimas.... Sic est in proposito, quia talis notula ex propria natura ejus valet tres minimas, scilicet quando est caudata a parte inferiori; sed quando est caudata a parte superiori, hoc generaliter est unum signum minimitatis. A proposito non valet nisi duas minimas, quia quando apponitur tali notulae cauda a parte superiori quasi minima apponitur.

Moreover it is noted that there are certain semibreves that are tailed at the upper and lower parts, as shown here. And such notes tailed in this way are called *dragmae*, by the French *fuis*, and in any mode they are only worth two minims. And it is so, because the proper nature of such a note is that it is worth three minims, obviously tailed from its lower part; but whenever it is tailed from its higher part, generally is a sign of lesserness. And as such, it is only worth two minims, because whenever such a note is drawn with a tail above as if one were making a minim.¹⁷¹

CS 3, Anon.4 only discusses *caudae* on notes when discussing breves and longs, as in this passage (there is no discussion of *caudae* on semibreves):

Quae vero a sinistro latere habet caudam, illa dicitur brevis et debet cani sine plica; quae vero habet duas caudas cantatur cum plica. Unde si sinistra sit longior, brevis est; si vero dextra sit longior, longa dicitur ut hic.

¹⁷⁰ *Philippi de Vitriaco Ars nova*, 86.

¹⁷¹ *Ibid.*, 88.

That which has a tail on the left side is said to be a breve and ought to be sung without a *plica*; that which has two strokes ought to be sung with a *plica*. When the left is longer, it is a breve, when the right is longer it is said to be a long as here.¹⁷²

The semibrevis minima

Jacobus discusses the *cauda* on the *semibrevis minima* in Chapter 35.¹⁷³ He lists five reasons why some Moderns say that is better to put a *cauda* on a major or minor semibreve rather than on a *semibreve minima*, including the following: the *cauda* or *plica* is a sign of slowness or delay and therefore ought to be attached to

¹⁷² Anonymous, *De valore notularum*, 34.

¹⁷³ Semiminims begin to be mentioned fourteenth-century treatises. Johannes Boens *Musica und seine Konsonanzenlehre*. Ellsworth, ed., *The Berkeley Manuscript. CS 3, Anon.1, De musica antiqua et nova. CS 3, Anon.3. CS 3, Anon.5* in Anonymous, *Ars cantus mensurabilis mensurata per modos iuris / The Art of Mensurable Song Measured by the Modes of Law*, ed. C. Matthew Balensuela, vol. 10, *Greek Latin Music Theory Series* (Lincoln: University of Nebraska Press, 1994). Gallo anon. 1966e, *Musice compilatio*; Gallo anon. 1966f, *Tractatulus de figuris et temporibus* in [Anonymous], *Mensurabilis musicae tractatuli*, ed. F. A. Gallo, vol. 1, *Antiquae musicae italicae scriptores* (Bologna: Antiquae musicae italicae studiosi, Università degli studi di Bologna, 1966). Gallo anon. 1971b, *Tractatulus de cantu mensurali seu figurativo musicae artis* [Melk anon.] in [Anonymous], *Tractatulus de cantu mensurali seu figurativo musicae artis. Ms. Melk, Stiftsbibliothek 950*, ed. F. A. Gallo, vol. 16, *Corpus scriptorum de musica* ([Dallas, Texas]: American Institute of Musicology, 1971). Johannes de Muris, *Libellus cantus mensurabilis*. John of Tewkesbury, *Quatour Principalia*. Sweeney anon., *De semibrevibus caudatis*, in [Anonymous], *De musica mensurabili*. [Anonymous] *De semibrevibus caudatis*. Sweeney anon.; *De musica mensurabili*; Vitry 1964a (I-Rvat 307), Vitry anon. 1964c (F-Pn 7378A), Vitry anon. 1964d (GB-Lbl 21455); Wolf anon. 1908; *Compendium totius artis motetorum* [Wolf Anon.3].

the note to be lengthened; attaching them to the longer notes would minimize the effort on the part of the scribe, as there would be fewer major semibreves than minims and so the scribe would have less strokes to draw; and to make life easier for the singer, as it would be easier for him to focus on the major semibreves (since there are fewer of them) if they were signified in some way (by a *cauda*) and so he could more easily make a pronounced delay on them (*SM* 7.35, 72). Jacobus's main argument against the tailing of the semibreve reiterates his position that the semibreve is indivisible:

Arguitur sic: Illi notulae repugnant caudari vel plicari per se positae cui repugnant divide divisione totius integralis, quia cauda vel plica signum est divisionis vel inflexionis soni notulae cui iungitur ad ascendendum vel descendendum, ut supra visum est. Cum enim signum et signatum sibi correspondere debeant, cauda vel plica, cum signum sit divisionis, non debet addi nisi ei quod est divisibile. Semibrevis autem repugnat divisioni, ut supra probatum est. (*SM* 7.34, 66)

It is argued in this way: it is antithetical to add *caudas* or *plicas* to these note forms because it is antithetical to divide their intact *wholeness*. The *cauda* or *plica* is a sign of division or inflexion of the sound of the note to which it is joined ascending or descending, as was seen above. Since the sign and the signified ought to correspond, the *cauda* or the *plica*, since it is a sign of division, should not be added to something unless it is divisible. And it is antithetical to the nature of the semibreve to divide it, as was proved above.

Various fourteenth-century treatises discuss *caudae*, including the *Quatuor Principalia* (which also refers to the *dragma*):

Figura vero semibrevis est corpus oblongum ad modum Losongae carens omni tractu, ut hic [S,S] tamen potest caudari et aliter figurari ut patebit

inferius. Figura vero minimae est corpus oblongum ad modum Losongae gerens tractum recte supra caput qui tractus signum minitantis dicitur . . .

A semibreve figure has an oblong body, like a lozenge, lacking a stroke, as here [S,S] nevertheless it can be tailed and figured otherwise as will be shown below. A minim figure has an oblong body like a lozenge with a stroke above to the right, this stroke is said to be a sign of minuteness.¹⁷⁴

In another interesting passage, the author of *Anglès anon. 1958; De cantu organico* says that the Moderns added a tail above to the form of the minim:

In Cathalonia et aliquibus aliis locis observatur iste modus. In aliquibus, vero, terris, quando sunt due semibreves pro tempore, faciunt primam maiorem, secundam minorem. Et quando sunt tres, equales, ut patet hic superius. Et ista est doctrina quam omnes tenuerunt a .XXX. annis et citra. Moderni tamen superaddunt aliquid et dicunt: quandocumque sunt tres note, vel. .III., vel plures pro tempore unius brevis note posite, si una plus alia teneatur, debet fieri aliqua distinctio. Et ideo supra illam notam que minus tenetur ponunt tractulum et vocant eam minimam, eo quod minorem eam dicunt esse semibreui, ut patet hic supra.

In Catalonia and some other places this practice is observed. In some places, whenever there are two semibreves placed for one *tempus*, they make the first major, the second minor. And whenever there are three, they make them equal, as shown above. And this is the teaching that everyone held for thirty years and more. The Moderns nevertheless went beyond this and they said, whenever there are three notes, or four or more, placed for one breve *tempus*, if one is held for longer than the others then there ought to be some distinction made between them. And so, above this note which

¹⁷⁴ Book 4, f. 34v. John of Tewkesbury (*fl* 1351–92) was an English friar and was the author-compiler of the *Quatuor principalia musice* (*GB-Ob* Digby 90; *CS* 4, 200–98, shortened version *CS* 3, 334–64) and was also the scribe, maker and owner of the earliest extant copy of this work, completed at Oxford on 4 August 1351 and donated by John to the Oxford Franciscans in 1388; see Aluas, “John of Tewkesbury,” *GroveMO* (accessed November 28, 2006).

is held less, they placed a little stroke and called it a minim, by which they mean it is less than a semibreve as was shown above.¹⁷⁵

CS I, Anon. 6 is also relevant. The author begins his first chapter with a discussion of the minim, yet does not mention the actual figuration of the minim until Chapter 2, when he compares it to the semibreve:

Dicto de minima et aliquantulum de eius proprietatibus, dicendum est de ista nota quae semibrevis nuncupatur, et figuratur ad modum losengae in scuto, sicut et minima excepto quod caret tractu desuper.

With respect to the minim and some of its properties, these have been discussed earlier, but some things must be said about that note which is called a semibreve, and which is figured like a lozenge on its side, just as a minim, except it lacks a stroke above.¹⁷⁶

The author of this treatise orders his chapters proceeding from the least note to the largest (“*minima vox prima est in voce sive in prolatione*” [“the minim is the first in the voice or in length”]), for the minim is the first in the voice: “*nulla vox sit minor minima, quia minus minimo non est dandum in rerum natura*” (“there is no pitch less than the least, because less than the least is not possible within the realm of nature”).¹⁷⁷ This is important, because rather than going from that which would

¹⁷⁵ Anglès, “*De cantu organico: tratado de un autor catalán del siglo XIV*,” 21.

¹⁷⁶ *Ms. Oxford, Bodley 842*, 41.

¹⁷⁷ *Ibid.*, 40. This phrase is also found in Muris, and in many other mensural treatises of this time. This is also the argument Jacobus uses against the

be more familiar (the breves, longs and semibreves), and then adding the newer smaller note values, instead, this author imposes a new systematic ordering upon the note values, beginning from the logical point of the smallest note value. For the author of *CS 3, Anon.2* the *minima* is a real *minima*: “Recta semibrevis valet semper tres minimas, quae quidem minimae sunt aequales quia amplius dividi non possunt” (“A recta semibrevis is worth three minims, which are equal minims and are not able to be divided further”).¹⁷⁸ Later he states: “nunquam duae minimae solae inveniuntur et quod sint aequalis valoris” (“two minims are never found that are of equal value”).¹⁷⁹ *Sweeney anon.; De musica mensurabili* discusses how certain ancients used to put a tail on the minim below, or even on the sides (“At quidam musici antiqui praedictas appropriaverint a parte inferiori, ut hic . . . et

name of the semiminim, that is, if they have named a note called the minim - the least - then it makes no sense to have a note called “half the least”: “Adhuc secundum dicta nomen minimitatis non videtur usquequaque rationabile cum pro minima duae ponantur semiminimae. Minimo autem non est dare minus. Ideo notarum antique nomina saltem aliqua videntur rationabiliora quam moderna” (“And this name of miniminity does not seem to be rational insofar as you can place two semiminims for a minim. There ought not be less than the least. Thus the ancient names of the notes seem more rational than the modern”). *SM* 7.34, 69. See the discussion in Lefferts, ed., *Robertus de Handlo*, 193, fn.16.

¹⁷⁸ Anonymous, *De valore notularum*, 14.

¹⁷⁹ *Ibid.*, 23.

deorsum et desursum”).¹⁸⁰ Finally, in a passage analyzed by Fuller, *CS 3, Anon. I*

says that Philippe de Vitry invented the *minim*:

Minima autem in Naverina inventa erat, et a Philippo de Vitriaco, qui fuit flos totius mundi musicorum, approbata et usitata; qui autem dicunt predictum Philippum crochatam sive semiminimam aut dragmam fecisse aut eis concessisse, errant, ut in motetis suis manifeste apparet. Dividebat autem Franco longam in tres breves, et brevem in tres semibreves, sed non minus quam in duas semibreves quarum prima major, secunda minor semibrevis ab eo appellatur vel e contra; major semibrevis pro tanto dicitur, quia duas minores includit, et signari debet ut brevis recta, quia equipollet imperfecte; minor semibrevis figurari debet ad modum losange ut supra.

The *minim* was invented in Navarre, and by Philippe de Vitry, he who was the flower of the whole musical world, who gave it his approval and used it himself. Those who say that Philippe also approved of the *crochet*, the *semiminim* and the *dragma*, are wrong: this is manifestly apparent in his motets. Franco divided the long into three breves, and the breve into three semibreves, but not any further than two semibreves, of which one was called major and one was called minor; and that which was said to be major comprised of two minor semibreves, and it ought to be written like a *recta* breve (which is the equivalent of an imperfect breve), and the minor semibreve ought to be figured like a lozenge.¹⁸¹

¹⁸⁰ [Anonymous], *De musica mensurabili*. [Anonymous] *De semibrevis caudatis*, 33. In an extended passage in this same treatise, the author gives a history lesson of the use of smaller note values in mensural music, highlighting by name the contributions of Franco of Cologne, Philippe de Vitry and Marchettus (53-54).

¹⁸¹ *CS 3, Anon. I*, 337. This is the aforementioned shortened version of the *Quatuor Principalia* text. Another English theorist, Willelmus, also has an interesting chapter regarding the dissent with respect to these small note values. *Ms. Oxford, Bodley 842*, 25.

Jacobus closes his chapters on the semibreves with some finer points of figuration, first outlining five reasons why it is better to put the tail on a semibreve at an acute angle rather than an obtuse angle (that is, it is better at the top or bottom of the note rather than at the sides).¹⁸² He ends with this observation:

Illa enim dici poterat maior semibrevis quae caudabitur in latere dextro inferius vel superius sic . . . illa vero dicetur semibrevis <minor> quae in latere sinistro inferius vel superius hoc modo . . . illa autem minima quae carebit omni cauda sic... (*SM* 7.36, 73-4)

Those which could be called major semibreves are tailed on the right side, above or below, like this . . . those which are called minor semibreves, are tailed on the left side, above or below in this way . . . those which are minims lack all strokes, as here . . .

All this is outlined with the caveat that he, of course, does not recommend putting any tails semibreves at all. The last issue covered in Chapter 37 is that the semibreve should never be placed alone.¹⁸³

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¹⁸² The placement of the stroke at an obtuse angle is also mentioned by *Vitry anon. 1964d (GB-Lbl 21455)*: “per tractum a sinistra parte ab angulo obtuso” (“through a stroke on the left-hand side at an obtuse angle”). *Philippi de Vitriaco Ars nova*, 76.

¹⁸³ “Sed, dicunt Moderni, semibrevis nec secundum nos, nec secundum Antiquos sola reperitur sed semper invenitur iuncta vel cum longa, vel cum brevi, vel cum alia semibrevis” (“But, the Moderns say, the semibreve, neither according to us, nor according to the Ancients, is found alone, but is always found with a long, or with a breve or with another semibreve”). *SM* 7.37, 75.

Many of the treatises discussed in the above analysis use a comparative rhetorical device that attempts to convey an equivalence, or at least a balance and symmetry, between the old and new arts of mensural music. Fuller quotes from four treatises (*CS 3*, *Anon. 3* and *Anon. 4*, *Anglès anon. 1929*, and *Vitry anon. 1964c [F-Pn 7378A]*) that express a desire to outline, in a *compendium* format, the principles of both the new and old practices.¹⁸⁴ All of these texts employ the same word pairing and juxtaposition of the comparative adjectives *vetus/nova*. Jacobus calls attention to the same intent of the author and treatise in question here: “Hic doctor, qui veterem artem atque novam intendit in opera suo divulgare fideliter quae veteris sunt et quae novae” (“This teacher, whose supposed intention in his work is to faithfully lay out those elements which are of the old art and those of the new”) (*SM 7.27, 57*). Similar juxtapositions of opposition and reversals, and comparisons of old and new styles, where an old form mutates into something new,

¹⁸⁴ Fuller, *ibid.*, 47-48. To this list, we may also add the opening phrases of *Vitry anon. 1964e [I-Su L.V.30]* and *CS 3, Philippe de Vitry Ars perfecta in musica (US-Cn 54)*: “Omni desideranti notitiam artis musicae mensurabilis tam nove quam veteris obtinere certas regulas hic presentes sub brevi compendio propono non postpone fideliter assignare” (*Philippi de Vitriaco Ars nova*, 80); “Omni desideranti notitiam artis mensurabilis musice tam nove quam veteris obtinere, certas rationes presentes sub brevi compendio, pro posse meo, propono fideliter assignare” (*CS 3*, 29). I will offer one translation for both passages: “For all desiring knowledge of the art of mensural music, both new and old, will find certain rules presented here in a brief compendium, which I promise to represent faithfully, inasmuch as I am able.” *Vitry anon. 1964d (GB-Lbl Add. 21455)* also makes reference to the two styles.

are manifold within the manuscript that contains the largest surviving corpus of music from this transitional era, the interpolated *Roman de Fauvel*.¹⁸⁵

Courtenay discusses the general concepts of ancient and modern in medieval thought, and notes a shift in their conception around 1310. *Moderni* was a term used for one's contemporaries, and might be used in a somewhat pejorative way "inasmuch as a writer rarely mentioned contemporary opinion except to attack

¹⁸⁵ This is encapsulated in the quotation from Ovid's *Metamorphoses* that opens the closing *Roman de Fauvel* motet *Garrut Gallus/In nova fert*: "In nova fert animus mutatas dicere formas" ("My mind leads me to tell of forms changed"). On transformations of genre, see the contributions in *Fauvel Studies*, in particular the essays by Wulf Arlt and Ardis Butterfield. Lawrence Earp, in his review of *Fauvel Studies*, expands on Arlt's observation that the musical style of a given interpolation is significant for the message: "We now need to take seriously the fact that the progressive new style, as Fauvel's preferred musical language, represents – what is bad! . . . To us, *Garrut / In nova fert* seems the epitome of modernist progress, the victory of rational control over the caprice of the Petrus de Cruce style: but in the context of the *Roman de Fauvel*, does the music, with its red tenor notes leering at us, not instead represent the ultimate state of transformation, so dangerous to the well-being of France, the victory of perversion." Lawrence M. Earp, "Review: *Fauvel Studies*," *Plainsong and Medieval Music* (2000) 9/2, 202. Also see Roesner on these juxtapositions: "All this raises tantalising questions, not only about the *oeuvre* of Philippe de Vitry but also about the role he might have played in the preparation of MS fr. 146, perhaps as its music scribe, perhaps as someone whose involvement in the production of its Fauvel was even more central. It also suggests the need for further enquiry into the difference between 'old' and 'new' musical idioms at the dawn of the *Ars nova*, about whether we know what those differences actually consisted of and how (if at all) they relate to the notions of 'simple' and 'complex' that we have just used to characterise those idioms, about how deep-seated those distinctions are in fact, and about their relevance in discussions of attribution and chronology." Edward H. Roesner, "Labouring in the Midst of Wolves: Reading a group of Fauvel motets," *Early Music History* 22 (2003), 241.

it, the term had a slightly negative connotation.”¹⁸⁶ But around 1310, the dividing line becomes fixed, and the *Antiqui* were considered to be figures such as Thomas Aquinas, Albertus Magnus and Giles of Rome, and the *moderni* were figures such as Ockham. “Modern,” “intricate,” or “subtle” were adjectives used to describe these sorts of thinkers, regardless of whether they were actual contemporaries. Also, “for these authors who viewed positively many of the scholastic achievements of their age, particularly in the areas of logic, physics, and theology, “modern” tended to be used positively. For those who viewed most contemporary scholastic innovations as dangerous or erroneous, as did Wyclif, the negative tone of “modern” remained.”¹⁸⁷ For Jacobus, the “moderni” were viewed suspiciously, and this is the tone of his pairing and comparison of the theories of the Ancients and the Moderns, whereas the *vetus/nova* comparisons in the treatises of the *ars nova* tradition would have been intended to demonstrate, as Max Haas has noted, complementary, rather than oppositional practices.¹⁸⁸ Perhaps at the time of the compilation of *Fauvel*, these contemporary innovations were intended to be

¹⁸⁶ William J. Courtenay, "Antiqui and Moderni in Late Medieval Thought," *Journal of the History of Ideas* 48/1 (1987): 4.

¹⁸⁷ *Ibid.*, 5-6.

¹⁸⁸ Fuller points out the parallel that Max Haas draws between the categories of *logica vetus/logica nova*, where the terms designate complementary, not conflicting, practices. "Studien zur mittelalterlichen Musiklehre I," 387-88.

recognized as dangerous and viewed with suspicion (and the performers were in need of a straightforward manual that elucidated for them the keys to notational interpretation of the both new and old styles of music contained within),¹⁸⁹ however by the time of the transmission of some of these later versions, the edginess of the juxtaposition of the modern art against the new art had faded, and the two began to be presented as complementary practices, worthy of equal regard.

In this chapter, I hope I have shown how the entire central section of *Speculum musicae* Book 7 is an attack on the notational theories of *one* specific author (who is not Muris). Jacobus takes the work (*opus*) of this author (*auctor*) to task (using these specific terms), point by point, and appears to know this work in detail, disputing each element of notational theory. This *opus*, as referred to and quoted from by Jacobus, is lost to us today, yet we can outline some of its characteristics from Jacobus's text. It definitely appears to be a specific written work (whether recalled orally or being copied) with chapter headings, rather than a recalled memorization of teachings or doctrine. Similar phrases and concepts, and formulations and examples, are found in a small group of related sources, yet none of these appear to be a candidate for Jacobus's source for this section of Book 7,

¹⁸⁹ Indeed, it is fascinating the degree to which elements of the *ars antiqua* are explained within some of these treatises, such as the interpretation of ligatures, the extensive discussions of *recta* and *altera* breves and the mensural modes, which suggests that *ars antiqua* elements were in need of as much interpretative assistance as the *ars nova* elements.

indeed they themselves may be derived from this specific work. This treatise probably had a title such as *Ars vetus et ars nova musicae mensurabili*, for it would seem to be primarily concerned with presenting both the ancient and modern arts of mensural notation. It would have had an introduction like the afore-mentioned “Omni desideranti” family of treatises, promising to faithfully (“fideliter”) divulge aspects of both arts. It was a discursive treatise rather than abbreviated.¹⁹⁰ It treated the figuration of the notes in traditional fashion, moving from the long through to the smaller note values. Its writer named the notes possibly for the first time (they may have existed before but this teacher gave them names – that is, gave them validity and approval within the mensural system). The treatise discussed and gave musical examples of duplex longs within ligatures; a duplex long worth nine

¹⁹⁰ Fuller has used the model of “lecture notes” to describe the abbreviated versions of the *Ars nova* that are extant today. This implies that original work never existed in written form. Perhaps the model of a set of instructions is more helpful, the transmission of which is dependent upon the level of expertise of the person receiving the instructions. For example, when copying the set of instructions found in a recipe, an expert bread maker may just jot down the measurements, the oven temperature, and perhaps a few key turns of phrase, whereas someone less familiar with the technique may make a more literal copy. If the expert bread maker then passes their recipe on to a friend, the friend may expand on some of the abbreviated notes, their expansions of course differing from the original recipe. All the copies will share some characteristics of the original recipe in written form, but will also contain evidence relating to the expertise of each particular copyist. The “lecture notes” model also implies a particular circle of transmission for these theories (that is, the classroom), whereas I read them much more as manuals for practicing musicians, and very different from the theoretical formulations found in treatises such as those by Muris.

tempora; discussed the use of strokes to indicate the length of a duplex long or *larga* beyond the usual length, and specifically referred to it as a *larga*; and wrote of the imperfecting of duplex longs by one or two breves reducing its length to five or four breves. It contained a reference to the ternary number and the trinity. The notion of an imperfect breve was included. There was discussion of the interpretation of groups of semibreves within perfect and imperfect time and discursive and lengthy commentary on strokes and plicas on the semibreves; it stated the *cauda* on a semibreve indicates the longer semibreve, and it listed five lengthy reasons why the *cauda* is more appropriate on the major semibreve. It may have also contained sections on mensuration signs and red notation, and perhaps contained musical examples taken from well-known polyphonic motets, although these topics were not discussed within my analysis here. This outline of suggests a treatise a lot like *F-Pn 7378A*, but much more discursive in style.¹⁹¹

This analysis is only a beginning (a glance through a medieval mirror as it were): a longer analysis would take all of these texts and do a word-by-word, phrase-by-phrase comparison to sort out the relationships between all of these texts and sort out the other references to this lost treatise. More detailed codicological

¹⁹¹ Why was this treatise lost? Perhaps the content of the *ars vetus* section grew out of vogue, if the *ars antiqua* style pieces were no longer being performed. The sections that contained information on the rhythmic patterns, the interpretation of smaller note values, interpretation of red and workings out of the *tempus* and prolation systems were retained and disseminated in various redactions.

and paleographical examinations of the manuscript sources, and a contextual examination of the treatises within them, might also allow us to better trace relationships and chronology between these texts. But given Jacobus's intimate familiarity with the work of Johannes de Muris, we can surmise that he had similar familiarity with "this teacher" ("hic doctor") who is the focus of his criticisms here? Can we stipulate that the source Jacobus was using was a central one – a possible central source whose subject matter was the *Ars vetus et ars nova musicae mensurabili* and which had a written incarnation? Is this work the ephemeral *Ars nova* and could its author have been Philippe de Vitry, or another individual central in the propagation of these theories and music, perhaps even the composer, identity unknown, proposed by Daniel Leech-Wilkinson (the so-called "Master of the Royal Motets")?¹⁹² Perhaps we may never be able to answer this last question, however, if we agree that there is plausible evidence that points to the existence of an *Ur*-treatise, a written exemplar, and not to a fluid teaching tradition, then perhaps we need to apply Ockham's razor to the multiple references to Vitry having "invented" this new art. Fuller's work was critical in her deconstruction of the five treatises assembled by Reaney *et al.* in their 1964 edition, and I would agree that they no more deserve a direct attribution to Vitry than do the dozen or so other treatises listed in Table 7 that transmit similar points of doctrine. However, can we use the

¹⁹² Leech-Wilkinson, "The Emergence of *ars nova*," 316.

negative evidence systematically assembled by Fuller to conclude that such a document *never* existed? Because a variety of individuals compiled and abbreviated several versions of a text, can we assert that there was no original text? The situation is somewhat parallel to the dissemination of the Franco's earlier mensural theories, which also resulted in many redacted and edited formats: the difference being that we do have a handful of extant manuscripts containing a stable version of Franco's text.

While the notational practices and sources discussed by Jacobus in this section present a complicated picture and intertwined group of sources, the sources for the other sections of Book 7 that deal with the issues of time, perfection and imperfection, and the nine conclusions are much more narrow and focus specifically on the treatises of Johannes de Muris, and its related sources, such as *Michels anon.*, [*AnonOP*]. In the next chapter, I concentrate on the discussions of time and motion, and the basis for the opposition between Jacobus and Johannes on these issues.

CHAPTER 5

TIME AND MOTION

Mensurabilis musica est cantus longis brevibusque temporibus mensuratus. Gratia huius diffinitionis, videndum est quid sit mensura et quid tempus. Mensura est habitude quantitative longitudinem et brevitatem cuiuslibet cantus mensurabilis manifestans. Mensurabilis dico, quia in plana musica non attenditur talis mensura. **Tempus est mensura tam vocis prolatae quam eius contrarii, scilicet vocis amissae, quae pausa communiter appellatur.** Dico autem pausam tempore mensurari, quia aliter duo cantus diversi, quorum unus cum pausi, alius sine sumeretur, non possent proportionaliter adinvicem coaequari.

Mensurable music is song measured by long and short units of time. To understand this definition, let us consider what measure is and what time is. Measure is a quantitative attribute showing the length and brevity of any measurable melody. I say measurable, because in plainsong this kind of measure is not present. **Time is the measure of a sound's duration as well as of the opposite, the omission of sound, commonly called a rest.** I say rest is measured by time, because if this were not the case two different melodies – one with rests, the other without – could not be proportionally accommodated to one another.¹⁹³

Ut in primo <<libro>> ostensum est, vox generator cum motu, cum sit de genere successivorum. Ideo quando fit, est, sed cum facta est, non est. Successio non est sine motu. Tempus inseparabiliter consequitur motum. Igitur vocem necessario oportet tempore mensurari. **Est autem tempus mensura motus. Sed hic tempus est mensura vocis prolatae cum motu continuo.** Eadem autem diffinitio temporis et unius <<temporis>> assignatur. (*Notitia*, 65-66)

¹⁹³ Franco de Colonia, *Ars cantus mensurabilis*, 24-5. Trans. Strunk, revised by McKinnon in McKinnon, ed., *Strunk's Source Readings*, rev. ed., 117-118 (bold-face type mine).

As is shown in Book 1, sound is generated by motion, because it belongs to the class of successive things. For this reason it exists while it is being made, but it no longer exists once it has been made. Succession does not exist without motion. Time is inseparably united with motion. Therefore it follows necessarily that time is the measure of sound. **Time is also the measure of motion. But for us time is the measure of sound prolonged in one continuous motion**, and we apply this same definition of time to the single *tempus*.¹⁹⁴

At first glance, these two well-known definitions of *tempus* by Franco of Cologne and Johannes de Muris (note in particular the highlighted sentences) appear quite similar. But, in fact, the addition by Johannes de Muris of the phrases “mensura motus” and “cum motu continuo” reveals a great deal about the conceptual shift he had made in his understanding of musical time from that outlined by Franco of Cologne. The study of motion, its nature and composition, was a preoccupation of late medieval natural philosophers and theologians. Since time was most often discussed as a type of motion, a preliminary discussion of the basic definitions of motion will be necessary here before we can properly consider the concept of musical time. In this chapter, I will focus on the medieval conceptualizations of both physical motion and time to understand better the fundamental shift that took place in the conception of musical time in the decades around the turn of the fourteenth century, and the impact that this had on fourteenth-century music

¹⁹⁴ Trans. Strunk, revised by McKinnon in McKinnon, ed., *Strunk's Source Readings*, rev. ed., 152.

theory.¹⁹⁵ This analysis will throw into focus the discrepancies between Jacobus's understanding of musical time and that outlined by Johannes de Muris.

MOTION

The central issue of the classification of motion, that is, of answering the most basic question, what kind of an entity is motion, and into which category it should be placed, preoccupied medieval commentators.¹⁹⁶ In Book 1, Chapter 24, of *Speculum musicae*, Jacobus devotes an entire chapter to the consideration of the question “Quid sit motus” and gives a synopsis of several definitions and current theories of motion. This chapter is unique in contemporaneous music theory in its in-depth consideration of this question in isolation, without reference to particular “musical” contexts.

¹⁹⁵ As mentioned in Chapter 1, a number of musicologists have emphasized the necessity of reading late medieval music theory within the particular context of the interdisciplinary program of learning in the medieval university and its reliance upon Aristotelian modes of understanding. Tanay, in particular, deals with some of the issues that I cover in this chapter: however, I outlined the problems with some of her conclusions in Chapter 1 of this dissertation.

¹⁹⁶ Because of the close relationship between the concepts of time and motion, many music theorists included at a least a brief definition of motion prior to their discussions of musical time. These include Jacobus, Hieronymus de Moravia, Robert Kilwardby, Johannes de Muris, Engelbert of Admont, Marchettus da Padova, Johannes Grocheio, Johannes Aegidius Zamorensis, *Sweeney anon. 1971; De musica mensurabili*, Petrus de Sancto Dionysio, and John of Tewkesbury.

According to Aristotle, time is considered as “motion or a kind of change” (“*motus vel mutatio*”) and consequently Jacobus’s chapter on motion precedes his chapter on time (Book 1, Chapter 25). It is important then, firstly, to step through Jacobus’s chapter on motion, and to consider carefully his understanding of motion, for it will have implications for his understanding of musical time. It is also worthwhile to analyze this chapter with an eye to identifying the scientific developments with which Jacobus was conversant. After such an analysis, we can assume that if a theory or development is not included in this chapter, either Jacobus was unaware of it or he considered it irrelevant to the subject matter of his treatise. If a particular scientific development seems very relevant to the topic under discussion, and yet Jacobus still fails to mention it, we might conclude that either he was writing prior to that development, and use this information to date *Speculum musicae*, or, at the time of the writing of *Speculum musicae*, he was physically isolated from this sort of scientific discussion, and so was not aware of these new definitions or conceptions of motion.

Motion as an entelechia

Motus, secundum Philosophum, tertio Physicorum, est <entelechia>, id est actus existentis in potentia. (*SM* 1.24, 73)

Motion, according to the Philosopher in his *Physics*, Book 3, is an *entelechia*, that is, the act of existing in potentiality.

The first definition of motion given by Jacobus is from Aristotle, *Physics* 3, Chapter 1.¹⁹⁷ He then cites the example from Aristotle of the motion of something turning white: something becomes white by receiving successive degrees of whiteness until it receives the perfect degree of whiteness, then the motion ceases (*SM* 1.24, 73). The motion is to be found in the *action* of turning from one thing into something else. The Dominican theologian and natural philosopher, Albertus Magnus (c1200-1280), discusses the “*motus est entelechia*” concept in Chapter 4 of his commentary on the third book of the *Physics*.¹⁹⁸ He places motion within the genus of *perfectio*: motion is contained within the act of perfecting that which had

¹⁹⁷ “Diviso autem secundum unumquodque genus hoc quidem ἐντελέχεια esse alio autem potential, potentie existentis ἐντελέχεια secundum quod huiusmodi est, motus est” (“We have distinguished in respect of each class between what is in fulfilment and what is potentially; thus the fulfilment of what is potentially, as such, is motion”). Aristotle, *Physica: Translatio Vetus*, ed. Fernand Bossier and Jozef Brams, vol. 7/1, *Aristoteles Latinus* (Leiden, New York: E. J. Brill, 1990), 98-99, 201a10; Aristotle, *Physics*, ed. Jonathan Barnes, trans. Jonathan Barnes, 2 vols., vol. 1, *The Complete Works of Aristotle: The Revised Oxford Translation* (Princeton: Princeton University Press, 1984), 343.

¹⁹⁸ Albertus Magnus, *Physica*, ed. Bernard Geyer, *et al*, vol. 3, *Opera omnia* (Cologne: Aschendorff, 1951), 179-80. Albertus Magnus was the first German Dominican to become master of theology at the University of Paris (1245). He established a *studium generale* in Cologne in 1248 and died in 1280. It is generally thought that he wrote all his Aristotle paraphrases and commentaries between 1250 and 1270.

existed potentially. Albertus's definition ends up as: "motus est perfectio eius quod est in potentia" ("motion is the perfection of that which is in potency").¹⁹⁹

Motion as a passio

Dicitur autem motus actus existentis in potentia, id est ipsius mobilis subiective et passive, licet sit ipsius moventis active, quia actio et passio sunt unus motus et ambo sunt in passo [sic] in subiecto sive in mobili. (*SM* 1.24, 73)

It is said that motion is the act of existing in potentiality, that is *of* this mobile, subjectively and passively. It may be of this moving thing actively, because an action and a passion are one motion and both may be in a passive state, within the subject or mobile.

One of the early influential debates regarding the classification of motion was whether motion could be defined as an action or a *passio* (the passive state, or being acted *upon*, that is, the corollary to an action). Medieval commentators on this issue relied on the *Physics* commentaries of Avicenna and Averroës. Avicenna designates motion as a *passio* and conceives of it in four ways: 1) the middle between two extremes or two contraries; 2) as a perfection; 3) as a genus of which there are several species; and 4) as one species that becomes another.²⁰⁰ He

¹⁹⁹ *Ibid.*, 191.

²⁰⁰ E. J. McCullough, "St. Albert on Motion," in *Albertus Magnus and the Sciences: Commemorative Essays 1980*, ed. James A. Weisheipl (Toronto: Pontifical Institute of Mediaeval Studies, 1980), 133-34.

categorizes motion as a genus having four species, of quantity, quality, location and position. Averroës argues that motion should be formally located within the *passio* category but materially in the categories of place, substance, quantity and quality.²⁰¹

Motion as a forma fluens or Motion as a fluxus formae

Dicitur quod est forma fluens vel fluxus formae, quia per motum, ut est tactum, fit processus ad habendum formam aliquam perfecte, in quo processu continue recessus fit a termino a quo, secundum diversos gradus individuales illius formae, et accessus ad terminum ad quem. Patet hoc in motu aquae a frigiditate ad caliditatem; qui motus calefactio dicitur, quia denominatur motus non a termino a quo, sed a termino ad quem. In illo igitur motu, terminus a quo, id est frigiditas, a calefaciente plus et plus corrumpitur et dispositiones ad calorem introducuntur, ut tepiditas, donec introducatur aliquis gradus, etsi minimus, ipsius caloris; quo introducto continue, forma illa caloris intenditur donec perfecte habeatur. Non enim calefaciens, quod agit per formam caloris in frigidum, statim introducit in passum calorem, sed sufficit ut remittat frigiditatem plus et plus donec totaliter corrupta fuerit et iam passum dispositum ad caloris aliquem gradum recipiendum; agens enim naturale, communicans in materia cum patiente, in agendo repatitur, quia passum, per formam suam, sibi resistit, ut potest, donec illud, quod est fortius, aliud vincit et superat et sui similitudinem in illius inducit materiam.

Ex his patet quod, in forma per quam et ad quam est motus proprie dictus, latitudo requiritur graduum individualium. Ideo in formis indivisibilibus ut in figuris, in formis et in numeris substantialibus, non est proprie motus secundum Philosophum. (*SM* 1.24, 74)

It is said that [motion] is either a flowing form (*forma fluens*) or a flow of

²⁰¹ *Ibid.*, 133-134.

forms (*fluxus formae*), because through motion, as was touched upon, a process is completed towards the perfect attainment of some form. In this process there is a continuous receding from one end to the other end, according to the different individual degrees of its form. This is apparent in the motion of water from freezing to boiling, this motion is called heating, because it is named not of the end *from* which, but of the end *to* which. Therefore, in such a motion, the end from which, that is, freezing, is gradually destroyed by the heating, and its parts are led towards heat, until some grade of heat (however small) may be introduced. By the continuous addition of these grades, the extension of this heat is continued until it held perfectly. For it is not the heating, which acts through the form of heat into the frozen thing, introducing heat into a passive thing, but rather it is that the motion pushes back the grade of freezingness more and more until it is totally destroyed and becomes receptive now to some degree of heat. A natural action exists in matter alongside the passive element (which is undergoing the action), since the passive, through its form, resists until that which is stronger overcomes it and introduces itself simultaneously into the matter.

From this, it is obvious that in a form through which and to which there is properly said to be motion, there ought to be a latitude of the individual degree. Therefore in indivisible forms, such as in figures, in forms and in substantial numbers, there is not properly motion, according to the Philosopher.

I have included almost this entire section from Jacobus on motion as a *forma fluens* or *fluxus formae*, because this concept is quite important to fourteenth-century expositions on musical time, as we shall explain more fully in Chapter 6 (note in particular the concluding paragraph of this passage). It was Averroës who made the distinction between what he termed the more common view, of motion as a process (*via*) toward some terminus (therefore it is either a category *per se* or belongs to the category of passions) (the *forma fluens*), and the truer view, that

Averroës preferred, which is that motion is a part-by-part generation of the terminus and so belongs to the same category as the terminus (the *fluxus formae*, or flux of forms).²⁰² Jacobus describes motion in the above as a part-by-part generation of the terminus, through diverse individual degrees of form, each form being destroyed as the next is introduced. He describes it as a “latitude” of individual degrees, which is posited against indivisible forms, where he states there is no motion.²⁰³ Jacobus is referring, in this paragraph, to the scientific theory developed around the turn of the century, which has become known as the “latitude of forms” or the “intension and remission of forms.”²⁰⁴

²⁰² Sylla, “The Science of Motion,” 215. Sylla defines the distinction between the *forma fluens* and the *fluxus formae* as such: “One way of broaching the question in these later discussions was to ask whether motion was merely the terminus or form achieved by the motion (*forma fluens*) or whether it was an additional flux or transformation (*fluxus formae*) distinguishable from the terminus or form acquired.” Ibid., 215.

²⁰³ This is an important point to keep in mind, especially pertaining to the discussion of form to follow in the next chapter of this dissertation.

²⁰⁴ In the thirteenth century, in medical texts, Galen had spoken of the latitude of forms: “One could become hot . . . “in the first degree, the second degree, the third degree, or the fourth degree . . . there developed a clear concept of a latitude or range of degrees of qualities, often with numerical values assigned.” Sylla, “The Science of Motion,” 232. For the development of medieval pharmacy see *Arnaldi de Villanova Opera medica omnia*, ed. M. R. McVaugh, J. A. Paniagua, and Luis García Ballester, trans. Dianne Bazell, *Universidad de Cantabria Seminario de Historia de la Ciencia* (Barcelona: Edicions Universitat Barcelona, 1999).

The “latitude of forms” theory was thought to have received its first full exposition by the Liège theologian and natural philosopher, Godfrey of Fontaines (d. c1306).²⁰⁵ Godfrey discusses this theory in his *Quodlibet* 2, question 3: “Utrum quantitas remanens possit transmutari oporteat praeter quantitatem determinatam ponere aliam quantitatem indeterminatam.”²⁰⁶ This question deals primarily with

²⁰⁵ On Godfrey of Fontaines and his ties to Liège, see Chapter 1 of this dissertation (77-78). The “latitude of forms” theory “was originally taken and seriously worked out carefully as an explanation of the alteration and augmentation or diminution of the Eucharist. The theory appears in this context in the work of Godfrey of Fontaines, who was regularly cited as the originator of the theory; and Walter Burley, who developed the theory to its fullest extent, also used the problem of the Eucharist for his theoretical exposition. In the succession of forms theory, alteration is explained as the a result of the a subject’s taking on a continuous series of forms of varying degrees, each form being corrupted as the next one is introduced. In the alteration of the Eucharist, according to Godfrey of Fontaines, one simply has the continuous series of forms without any underlying subject.” John E. Murdoch and Edith D. Sylla, “The Science of Motion,” in *Science in the Middle Ages*, ed. David C. Lindberg (Chicago and London: Chicago University Press, 1978), 221. The transubstantiation of the Eucharist had caused a dilemma to philosophers and theologians of the late thirteenth and early fourteenth centuries in that it had to be explained how the properties or accidents of the bread (its whiteness, taste, smell and so on) were present, but could not inhere in the substance of the bread, because that did not exist after transubstantiation. The succession of forms theory would then be found in later commentaries as a theory of motion without any reference to the theological context of the argument within the explanation of the transubstantiation of the Eucharist. “The fourteenth century saw an increased emphasis upon looking at what was happening in motion at every point along its path rather than considering only the mobile and its starting and finishing points.” Sylla, “The Science of Motion,” 220-221.

²⁰⁶ Godfrey of Fontaines, *Les Quodlibets de Godefroid de Fontaines*, ed. M. de Wulf and J. Hoffmans, vol. 3, *Les philosophes belges: textes et études* (Louvain: L’institut supérieur de philosophie de l’université, 1904-1937), 12.

the issue of the transubstantiation of the Eucharist. This topic allows Godfrey to debate the nature of motion, since after transubstantiation the elements could be moved and altered and diminished, and so their change could be described as a kind of motion. Godfrey comes close to giving his definition of motion in the following:

Motus autem vel transmutatio est fluxus quantitatis indeterminatae inter istos gradus determinatos habens esse inter illos secundum gradus quasi infinitos et indeterminatos inter medios non existens in actu simpliciter sed secundum successionem et in actu permixto potentiae.

Motion is either a transmutation or a flow of indeterminate quantity among its determined grades, having existence, through these grades, as infinite and indeterminate points, existing not simply in the action, but according to their succession and within the combined action of potency.²⁰⁷

Marshall Clagett describes Godfrey's analysis of qualitative change (and how it was extended by Walter Burley):

. . . it was held that in the case of an intensively increased form or quality, e.g., when there is "more" charity, no identical numerical part of the preexisting less intensive quality remains. The preexisting "individual" (individuum) is destroyed and replaced by a more perfect individual which does not contain that preexisting individual as a numerical part of it and in fact is absolutely distinguished from it. Burley embraces this opinion and develops it further. He concludes that in every formal motion, that is, intensive increase in qualitative forms, something completely new is acquired, and this is a form. And so in such a formal movement, the whole preceding form from which the movement begins is destroyed, and a totally new form (una forma totaliter nova), non-existent in the subject before, is acquired. Since, then, there is a whole series of distinct forms involved in intension, Burley maintained that "no form is intended or remitted, but

²⁰⁷ Ibid., 20.

rather the subject is intended and remitted according to form.”²⁰⁸

Within questions 3 to 7 of his commentary on the *Physics*, John Duns Scotus (*d.* 1308) discusses the concept of motion within the context of this debate regarding the latitude of forms.²⁰⁹ Reading these texts as a background to Jacobus’s chapter on motion, I believe Jacobus was fully cognizant of this debate, at least in its early stages between Godfrey of Fontaines and John Duns Scotus. Duns Scotus in *Quaestio 3* asks: “Utrum in alternatione qualitas acquiratur subito tota simul, vel pars post partum” (“Whether an alteration of quality is acquired suddenly all at once, or part by part”). He argues that a quality must be changed all at once because “nullum indivisibile acquiritur successive: sed omnis forma est indivisibilis” (“nothing indivisible is acquired successively: but every form is indivisible”).²¹⁰ The vocabulary in this question is the same vocabulary used by Jacobus (“gradus,” “introducere,” “corrumpere”), and Duns Scotus also uses the

²⁰⁸ Marshall Clagett, "Richard Swineshead and Late Medieval Physics," *Osiris* 9 (1950): 135.

²⁰⁹ John Duns Scotus, *Ordinatio*, ed. Carl Balić *et al.*, vol. 1-10, *Opera omnia* (Rome: Vatican Scotistic Commission, 1950-). John Duns Scotus (*b.* Scotland, c1266; *d.* Cologne, November 1308) was a Franciscan philosopher and theologian, who studied at Oxford and Paris University and returned to Oxford in 1300 to complete the requirements for his doctorate. He was doctor of theology at Paris from 1305.

²¹⁰ *Ibid.*, 125.

same example used by Jacobus (the “hot to cold” phenomenon). The philosopher against whom Duns Scotus is arguing in this question is Godfrey of Fontaines, and in particular Godfrey’s *Quodlibet* 7, question 7.

In *Quaestio* 4, “Utrum in intensione formae pars prius acquisita maneat cum parte secundo acquisita” (“Whether in the intension of form the part previously acquired remains with the second acquired part”), Duns Scotus argues that no degree of the form remains after the next degree has been introduced.²¹¹ In his third argument he asks whether “gradus primo acquisitus corrumpitur in adventu secundi” (“the first acquired grade is corrupted by the coming of the second”). In *Quaestio* 5, “Utrum formae contrariae possint esse simul”, Duns Scotus argues that it is impossible for contrary forms to stand at the same time.²¹²

Another important aspect of this debate, and also pointed to by Jacobus in his discussion, concerns having a “latitude,” which was the opposite of indivisible.²¹³ The problem was how to relate the indivisible degrees of a motion or a quality to the whole continuum of that motion or quality:

²¹¹ Ibid., 179.

²¹² Clagett argues that Duns Scotus briefly alludes to a part-by-part addition of quality: “there is a new reality added to the preexisting one. This reality is like parts or non-quidditative degrees, which are individual and existing.” Clagett, “Richard Swineshead,” 136.

²¹³ According to a TML search, only fourteenth-century authors use the term “latitude” within this particular context: Jacobus in Books 1 and 4 and

. . . latitude became a “scale of perfection” and was imagined as a dense series of indivisible perfections corresponding to the species of all things in the universe. In similar fashion, some authors, Walter Burley in the fourteenth century, for instance, visualized the degrees of a single quality as a dense series of indivisible perfections. The ontology behind this view was the so-called “succession theory” of qualitative intensification, according to which, when a quality was made more intense, each successive degree of the quantity was destroyed and replaced by a new higher degree.

Of perhaps greater interest, however, are the contexts in which philosophers and theologians treated both latitudes and degrees not as a series of closely packed, but discrete, individuals, but as continua, very like lines in their mathematical properties. The ontology that allowed this representation of latitudes and degrees was the so-called “addition theory” of qualitative intensification. According to this theory, put in circulation by Duns Scotus early in the fourteenth century, a quality is made more

Johannes de Muris in *Notitia* here: “Quoniam ergo vox tempore mensurata unionem duarum formarum, naturalis scilicet et mathematicae, comprehendit, licet quod ratione alterius fractio non cessaret, tamen propter aliam vocis divisionem necessarium est alicubi terminari. Nam sicut omnium natura constantium positus est terminus et ratio magnitudinis et augmenti sic parvitas et diminuti. Demonstrant enim naturales, quod natura ad maximum et minimum terminatur. Vox autem est per se forma naturalis iuncta per accidens quantitati. Igitur oportet eam habere terminos fractionis, quorum latitudinem nulla vox quantacumque frangibilis valeat praeterire. Hos autem terminos volumus comprehendere ratione” (“Seeing, on the other hand, that sound measured by time consists in the union of two forms, namely the natural and the mathematical, it follows that because of the one its division never ceases, while because of the other its division must necessarily stop somewhere; for just as nature limits the magnitude and increase of all material things, so it also limits their minuteness and decrease. For natural things demonstrate that nature is limited by a maximum and a minimum. Sound, moreover, is in itself a natural form to which quantity is artificially attributed; it is necessary, therefore, for there to be limits of division beyond which no sound, however fractionable, may go. These limits we wish to apprehend by reason”) (70). Trans. Strunk, revised by McKinnon in McKinnon, ed., *Strunk’s Source Readings*, rev. ed., 153.

intense by the addition of a new part of a form which combines with the old form to produce a higher degree. Perhaps contrary to expectations, this theory did not assume that the previous form survived as such, but that, within the new higher degree, there was a part equal to the old lower degree. *Thus, degrees, like latitudes, came to be imagined as lines, rather than points, and higher degrees contain lower degrees, just as longer lines contain shorter ones.* That is, within the latitude of quality, the degrees were not only ordered on a scale, but, like the lines imagined to represent them, they were also additive.²¹⁴

In terms of motion considered as flux of form, Jacobus closes the chapter with the idea that motion may also be placed within the categories of generation and corruption:

. . . in quantum scilicet generatio dicit ultimam introductionem ipsius formae substantialis quae est instantanea, corruptio autem illius corruptionem. Dicuntur tamen motum includere, ut sumuntur pro alterationibus praecedentibus ultimam introductionem ipsius substantialis. Adhuc motus distinguuntur qui alius est continuus, alius discontinuus (ad hoc autem, ut motus sit continuus, et unus numero, requiritur unitas mobilis formae et <temporis>). (*SM* 1.24, 76)

As such, the generation or the final introduction of the substantial form, which is instantaneous, is the corruption of its corruption. They say that this motion may be taken as the preceding alterations toward the final introduction of its substantial form. And so they distinguish motion as one which is continuous, and another which is discontinuous (in other words, motion may be continuous, and one in number, which requires a unity between the form and time of the mobile).

²¹⁴ Sylla, “The Science of Motion,” 232-233 (italics mine). The highlighted concept in this quote is an important point if we apply it to visualizations of the mensural system propagated in fourteenth-century music theory. This will be discussed in more detail in the following chapter.

Is this idea of these two different types of motion (that is, successive things versus permanent things) possibly a reference to the work of Walter Burley, indicating that Jacobus may have also been aware of Burley's addition to the debate? Walter Burley's *De primo et ultimo instanti* discusses the distinction between permanent things and successive things and posits that time is considered a successive thing.²¹⁵ In his *De intensione et remissione formarum* (c1320) Burley talks about permanent things having an indivisible degree of perfection. He favored the theory of a succession of forms, rather than an alteration of form.

Motion as a via (process) to a form

. . . dicitur quod est via in formam, quia per ipsum forma in esse perfecto acquiritur. Ideo etiam dicitur quod motus non est praeter res ad quas vadit, vel quod est de genere ad quod vadit . . . (*SM* 1.24, 74)

. . . it is said that [motion] is a process to a form, because through itself the form is acquired in perfection of being. It is said that motion does not exist as an entity beyond the thing[s] to which it advances . . .

²¹⁵ Walter Burley (1275 – 1345?) was a fellow of Merton College (taught there from 1300-1307). He studied theology in Paris and was doctor of theology there in the 1320s. He then returned to London where he was Almoner to Queen Philippa and tutor to Edward the Black Prince. His *De intensione et remissione formarum* is thought to date from c1320. His other important treatise is *De vita et moribus philosophorum*. Walter Burley's contribution to the debate on the "latitude of forms" is discussed in more detail in chapter 6.

Another articulation of the concept of motion was that it was a process, or a path, or a way to a form. The form is acquired in the perfection of being. So it is said that motion does not exist as an entity beyond the things to which it advances, and it is of the genus to which it advances (related to the Averroës *forma fluens* view of motion discussed earlier). Albertus Magnus, as mentioned above, in his commentary on the *Physics*, discusses motion as a “perfectio” but also as a path (“via”) to this perfection:

. . . perfectio prima ensis est figura ensis et perfectio secunda est incidere . . .
. hoc autem modo motus nec prima perfectio est entis, nec secunda, sed est via prima perfectionem.

. . . the first perfection of being is the figure of being and the second perfection is its existence . . . in this way motion is neither the first perfection of being nor the second, rather it is the path to first perfection.²¹⁶

He clarifies this later as “motus est via ad perfectionem alia ab ipsa perfectione.”²¹⁷

The problem lies in deciding into which species to classify motion: it is both an action, and a *passio* (the mobile as the passive object of the motion – the “moved”). Albertus regards the Averroës solution mentioned above as obscure (Averroës says that motion is not a *passio* and elsewhere states that it is a *passio*), and so he approaches the problem differently. The solution he comes up with is the “fluxum

²¹⁶ Albertus Magnus, *Physica*, 179-80.

²¹⁷ *Ibid.*, 182.

alicuius entis” theory: “Motion as a flowing being can be said to be (a) related to an end (“fluxus a fine in quo stat”) or (b) essentially different from the end (“fluxus per essentiam . . . differt ab eo a quo fluit.”²¹⁸ Albertus approaches his discussion of motion from the idea of perfection: perfection as process that advances through time from an imperfect state. He eventually sides with the view that motion is a process which is essentially the same as its terminus but differing from it, since it is flowing form rather than a static form.²¹⁹

Jacobus ends his paragraph on the “motus est via in formam” theory with a return to the “latitude of forms” theory, thus positing these theories in opposition. He concludes with the caveat: “Utrum autem in motu intentionis alicuius formae primus gradus corrumpatur, adveniente secundo, non est praesentis speculationis enodare” (“Whether, in the motion of intension of some form, the first degree is corrupted with the coming of the second, we have not considered in the present speculation) (*SM* 1.24, 75).”²²⁰ He is only willing to hint at which side of the

²¹⁸ McCullough, “St. Albert on Motion,” 140.

²¹⁹ *Ibid.*, 143. “Albert states that motion is the generation of one part after another of a perfection to which the motion is directed” (142). Albertus certainly disagrees with the Avicennian view of motion as a flux of form but does not clearly come down on the side of motion as a form of flow either.

²²⁰ This is the argument between John Duns Scotus and Godfrey of Fontaines outlined above.

argument he falls on, and to indicate that he is aware of this debate, but not to elaborate upon it within the current context.²²¹ Further to the discussion of motion as a process or path to a form, Jacobus also discusses into which category motion ought to be placed. He briefly outlines the views of Albertus Magnus and Averroës that motion is in the genus of continuous things or continuities: “Est autem motus de genere continuorum, ut dicit viam vel fluxum ad formam” (“Motion is in the category of continuities, as he says the path or flow to the form”) (*SM* 1.24, 75).

* * * * *

So, from the above, what can we ascertain regarding Jacobus’s understanding of the concept of motion in the context of the concurrent scientific developments? He was certainly familiar with Aristotle’s *Physics* and the classic commentaries by Avicenna, Averroës and Albertus Magnus. He also seems to be aware of the work of Godfrey of Fontaines regarding the intension and remission of forms, and of the debates on this issue with Henry of Ghent and John Duns Scotus, which date from the turn of the fourteenth century. He was also possibly familiar with the work of Walter Burley in this area, regarding his theory of motion as a succession of forms (thought to date from around 1320). He seems to have no knowledge of later theories regarding motion, such as those propagated by the

²²¹ As we shall see in Chapter 6, Jacobus later clearly indicates that he favors the successive theory.

Oxford Calculators, and, in particular, he makes no mention whatsoever of Ockham's very influential theories on motion.²²² The presentation of his arguments, in line with his customary scholastic treatment, offers four different conceptions of motion as two pairs of opposites or contraries: motion as action *versus* motion as a passion; and motion as a flux of form *versus* motion as a flow to a form. The order in which the arguments are presented, and the fact that Jacobus returns to motion as a flux of form at the end of his chapter may be an indication that this is the theory he favors, but it is actually far from obvious from the text of this chapter alone on which side of the philosophical debate Jacobus wishes to place himself. We shall have to delve further into the discussion of motion and how it relates to time, and to sound, and ultimately to form and matter, to arrive at some conclusions.

TIME

. . . musica mensurabilis non modo respicit tempus continuum in quo nimis se fundant moderni doctores, sed tempus numeratum et discretum. (*SM* 7.13)

²²² Tanay spends a chapter of her book postulating links and influences of Ockham's work on Jacobus, yet it seems unlikely if Jacobus were truly aware of Ockham's logical works to this degree of detail, that he would display no knowledge of Ockham's theories of motion in this chapter. Ockham's theories of motion were very influential: "his resolution of the problem of the nature of motion quickly became considered at length by everyone who came after him." Murdoch and Sylla, "The Science of Motion," 216.

. . . mensural music does not concern continuous time, upon which modern teachers have theorized to an excessive extent, but rather numbered and discrete time.

In Chapters 11-14 of *Speculum musicae* Book 7, Jacobus extensively discusses and defends the ancients' definition of musical time in opposition to that defined by their modern counterparts. In these chapters, he lays out his central argument: that mensural music is not in fact based upon continuous time but rather it is based upon discrete time. Chapters 15-17 concern the smaller note values, in particular the divisibility or indivisibility of the semibreve, and also touch on this modern notion of continuous musical time. Jacobus discusses time as a general concept in Book 1: directly following his chapter on motion, he devotes an entire chapter to the consideration of the question, "Quid sit tempus?"

Let us return for a moment to the quotation from Johannes de Muris used to open this chapter. Johannes affirms that pitch is generated by motion, and therefore may be placed in the category of successive things (whenever it is being made, it "is", but when it is made, it no longer "is"). Time is inseparable from motion, therefore it is appropriate to measure pitch (the length of a pitch) by time. And so, just as time generally is the measure of motion, time in music is the measure of the length of a pitch that has a continuous motion. In his ninth conclusion, he realizes the implications of this statement: "omne continuum divisibile est in quotlibet partes eiusdem proportionis, sicut in duas vel tres vel quatuor et cetera. Tempus

est de genere continuorum, ergo potest dividi in quotlibet partes aequales” (“every continuum is divisible in however many parts of its proportion, so in two or three or four and so on. Time is in the category of continuities; therefore it is able to be divided into as many equal parts”) (*Notitia*, 140).

Aristotle, however, was far from clear in his *Physics* regarding the nature of time, and, in fact, gave several definitions. This ambiguity gave medieval commentators much material with which to work. To be sure, the definition used by Johannes (“time is the measure of motion”) is one statement made by Aristotle.²²³ In Book 1 of *Speculum musicae*, Jacobus paraphrases another definition from Aristotle: “tempus est numerus motus secundum prius et posterius” (“time is the number of motion according to before and after”) (*SM* 1.25, 76).²²⁴ In the *Physics*, Aristotle follows this definition with the statement that time in fact “is not motion, but only motion in so far as it admits of enumeration” (“non ergo

²²³ “Non solum autem motum tempore metimur, sed motu tempus” (“Not only do we measure motion by time, but also time by motion”). Aristotle, *Physica, Translatio Vetus* 4.12, 220b15, 179. Sorabji suggests that this is even a throwaway comment by Aristotle and not really part of the definition of time: “Aristotle certainly calls time the measure of motion but he does not offer this as part of the *definition* of time . . . time is continuous, but number (whole number) is discrete. How, then, can time be number?” Richard Sorabji, *Time, Creation and the Continuum: Theories in Antiquity and the early Middle Ages* (Ithaca, NY: Cornell University Press, 1983), 87.

²²⁴ See Aristotle, *Physica, Translatio Vetus* 4.12, 219b1, 175.

motus est sed secundum quod numerum habet motus”).²²⁵ The integral parts of time are joined through the now or the instant, just as a line is joined through the point. But the now is not time, because the now is indivisible.²²⁶ In *Speculum musicae*, Jacobus parses the definition of time further, stating that number makes up the *formal* aspect of time, whereas motion makes up the *material* or fundamental aspect (that is, the matter).²²⁷

With respect to the numbering of time, Aristotle goes on to say that it is this numbering by the soul that distinguishes time from motion; without the soul there would be no time.²²⁸ So, in this way, human time is the measure of motion, since

²²⁵ Aristotle, *Physica, Translatio Vetus* 4.12, 219b3, 175. Aristotle further defines time as a kind of number. However, there are two types of number, that which is counted and that by which we count. Time is the first of these, that which is counted (“quod numerator et numerabile numerum dicimus et quo numeramus”) Aristotle, *Physica, Translatio vetus*, 4.11, 219b7, 175.

²²⁶ Aristotle in *Physics* 4.11 describes our perception of the before and after as two “nows,” and that we perceive that there is something intermediate between these two “nows”: it is this intermediate thing that is time.

²²⁷ “Et sic duo sunt de ratione temporis: numerus scilicet, et illud est formale, et motus et illud est materiale et fundamentale et, quia, quod numeretur prius et posterius in motu, provenit ab anima, dicitur tempus suum formale et actuale recipere ab anima” (“And there are two aspects of time: number, obviously, and this is the formal aspect, and motion, and this is the material and fundamental aspect, and because the numbering of the before and after of motion takes place in the soul, it is said that formal and actual time is received by the soul”). *SM* 1.25, 77.

²²⁸ Aristotle, *Physics* 4.13.

everything that exists in time is variable, changeable and corruptible. In his discussion, Jacobus introduces the following concept: in addition to human time, there are incorruptible or eternal things that are not continuous; and so there are, accordingly, three different measures - eternity, perpetuity (*aevum*) and human time.²²⁹ Eternity has neither a beginning nor end to its duration; perpetuity is the measure of incorruptible things lacking matter, which have a beginning to their being, like angels or souls; and time is the measure of extrinsic things that have a beginning and end to their existence and are in continual flux or motion (“tempus est principium corruptionis”). The concept of angelic time (perpetuity or *aevum*) may be traced back to Augustine’s *City of God* (XII.16). Augustine distinguishes a time that depends upon the mental movements of the angels, and gives this time a status between time and eternity. This angelology was further developed by Peter Lombard, whose doctrine of angels may be summed up in three parts: angels are *simul* with the elements, prior to creation; they are located within the *empyrean*; and they are of a simple essence, indivisible and immaterial.²³⁰

Whereas eternity was considered to be proper to God, and time

²²⁹ Sorabji, *Time, Creation and the Continuum: Theories in Antiquity and the early Middle Ages*, 29-32.

²³⁰ Marcia Colish, *Peter Lombard* (Leiden, New York: E. J. Brill, 1994), 347. As a result, commentaries on Lombard’s *Sentences* (core to a medieval university education) afforded medieval scholars ample opportunity to comment on the nature of angelic time.

characteristic of changeable things, aeviternity (sometimes called “created eternity”) was considered to be characteristic of creatures incapable of substantial change, such as the angels, which were subject only to accidental changes as regards knowledge, volition, etc., or the heavenly bodies which, though incorruptible, were subject to locomotion or change of place. While these accidental changes were measurable by time, the substantial nature was possessed whole and entire, as it were, at all times, and thus resembled eternity, but, being created, was properly called aeviternal duration. Scholastic philosophers and theologians, though agreeing that aeviternity was intermediate between time and eternity, explained it differently.²³¹

Jacobus closes his chapter on time by stating that theologians in fact divide time into continuous time and discrete time: 1) continuous time concerns continuous motion and it is not interrupted, it is not discontinuous; 2) discrete time looks into discrete and divided things, distinct in their substantial form and in the introduction of matter. Discrete time is not infinitely divisible, just as numbers are discrete and not infinitely divisible.²³²

²³¹ From glossary of John Duns Scotus, *Ordinatio*, 2:497.

²³² “Dividitur autem tempus, secundum theologos, in continuum et discretum; continuum respicit motum continuum, non interruptum, non discontinuum; discretum autem respicit aliqua discreta et divisa invicem sibi succedentia, ut distinctas sibi succedentes formae substantialis in materiam introductions” (“Time is divided, according to the theologians, into continuous and discrete: continuous with respect to continuous motion, not interrupted, and not discontinuous; discrete with respect to the discrete and divided successive parts of it, so that the substantial form is introduced into the matter by these discrete succeeding parts”). *SM* 1.25, 78-79.

To summarize, Jacobus begins his exposition on time with a discussion of Aristotle's various definitions, and, in typical scholastic fashion (and following well-established tradition) fully exploits the inconsistencies and ambiguities of Aristotle's theories in order to introduce a distinction that would become very important in his discussion of musical time in Book 7, and becomes relevant within the context of his defense of the ancient definition of time. This is of course the distinction between continuous time and discrete time.²³³ The concept of discrete

²³³ Tanay (*op. cit.*) discusses the opposition between discrete and continuous time in music theory, analyzing the texts of Jacobus, Johannes de Muris, John of Tewkesbury, Marchettus da Padova and Johannes Vetulus de Anagnia (105-124; she does not, however, discuss the theological distinction between continuous and discrete time). I will try to avoid here duplicating arguments already presented in her study. When Tanay discusses Jacobus, she focuses exclusively on Book 7, and does not refer to the discussion of this topic in Book 1, that I believe inform those that take place in Book 7. This omission leads her to make statements such as: "Jacobus avoided the preliminary question of the inner composition of general time and stressed that his critique concerned time as it was signified by rhythmic figures" (114); but we have seen in Book 1 that Jacobus actually does discuss the composition of general time in great detail. Her general conclusion regarding the other authors who refer to the discrete measurement of time (particularly John of Tewkesbury and Marchettus) is that they reflect an 'atomistic' conception of time (in which the smallest unit, the *minim*, is compared to unity, as in number, and that all other note values are multiples of this smallest value into infinity), and that they were unaware of the advances made in the measurement of *continua* (*vis-à-vis* the Oxford Calculators), unlike Johannes de Muris, according to her hypothesis. She makes an interesting comment regarding Jacobus: "Since perfect time and imperfect time are both equally divisible into two or three parts, they must share their essential definition. Therefore, perfect and imperfect time differ not in their form (essence) but in their matter. But according to Aristotle, matter is not the principle of individuation. Thus, Jacobus argued, there is no real distinction between perfect and imperfect time-values" (110). She continues by asserting that Jacobus did not understand the Aristotelian concept

measurement in music was tied to the Boethian worldview of music as one of the quadrivial sciences concerned with discrete quantity. As Tanay points out, the concept of *tempus discretum* is actually only found in a small number of treatises (which also happen to be contemporaneous with *Speculum musicae*). In addition to the treatises mentioned and discussed by Tanay (John of Tewkesbury, *Quatuor Principalia* 4, c. 5 [“Quod tempus sit discretum et non continuum, et quod aliqua unitas est indivisibilis”]; Marchettus da Padova’s *Lucidiarum*), discrete time is mentioned by Walter Odington:

Sed quia continuum est divisibile in infinitum, et tempus continuorum est, voces quidem sunt mensurate temporibus quare divisibiles erunt in infinitum. Sicut ergo longa in breves et brevis in semibreves dividitur, ita semibreve primo divido in tres partes quas minutas voco.

But because a continuum is divisible into infinity, and time is of continuous things, pitches which are measured by time will be divisible into infinity. Just as a long is divided into breves and breves into semibreves, so a semibreve first may be divided into three parts which are the least in

properly, and she states that, in Aristotelian physics, matter does in fact individualize one individual from another of the same species. I will discuss this further in Chapter 6, and show how Tanay may be simplifying the issue here, as this argument of how a species was individuated from another was hotly debated in the fourteenth century, and it is a debate that Jacobus engages in full force in Book 4 of *Speculum musicae*: the side he takes on this particular issue has implications for his conceptualization of mensural music theory. Thomas Aquinas for one, rejected the Aristotelian assertion that matter gives the principle of individuation (see p. 212 below).

voice.²³⁴

and in a peripheral way by Johannes Hothby:

Notandum est quod maxima dicitur una dupliciter. Primo ratione quantitatis continuae, et sic maxima dicitur totum et proprie maxima. Secundo dicitur una ratione quantitatis discretæ, et sic proprie etiam dicitur una cum sit minima in numeris. Nam id quod maximum est in quantitate continua est minimum in quantitate discreta, cum per eius divisionem nascatur quantitas discreta, id est numerus, et cum partes eius diminuuntur tendentes ad minimum, numerus crescit tendens ad maximum.

It should be noted that the *maxima* may be interpreted in two ways. First, according to the rationale of continuous quantity, and in this way, the *maxima* may be said to properly whole and the largest. Secondly, according to the rationale of discrete quantity, and so it is properly said to be one since it is least in number. For, that which is greatest in continuous quantity and least in discrete quantity, that is number, so that the parts of it become smaller while reaching towards the least, as the numbers increase towards the greatest.²³⁵

There are also a few other scholastic references to Aristotelian definitions of time in earlier authors. In Chapter 25 of his *Tractatus de musica*, Hieronymus de Moravia, states that a *tempus* is a distinct pitch (*tonus*), which is divisible into three

²³⁴ Walter Odington, *Summa de speculatione musicae*, 128.

²³⁵ Johannes Hothby, *Opera omnia de musica mensurabili*. Thomas Walsingham, *Regulae de musica mensurabili*, 59. This last sentence may be understood easily by conceptualizing it in terms of modern fractions: if we understand the *maxima* by the numeral “1,” then as we divide it, the parts of it become smaller, but the numbers of it (represented by the denominator of the fraction) increase.

instants. An instant is something which is considered the least time, and is indivisible, and this was the opinion of the ancients (*veteres*). In modern opinion (and the better opinion in his view), time should be taken as the succession in the motion of the harmonic subject (“in tempore harmonico motui subjecto successionem”). He continues:

. . . naturaliter successio non invenitur nisi in illis, quae sunt aliquantulum motui subjecta. Prius enim et posterius causant temporis successionem. Ex hoc enim, quod numeramus prius et posterius in motu, apprehendimus tempus, quod nihil aliud est, quam numerus prioris et posterioris in motu. Cum igitur tempus harmonicum motui progressivo sit subjectum, oportet omnino in ipso ponere successionem trium scilicet instantiarum, quam veteres tollunt ponentes quid indivisibile tempus, unam scilicet solam instantiam. Potest tamen, licet improprie, instantia dici tempus, sicut et vulgariter dicitur nunc temporis esse quoddam tempus brevissimum.

. . . naturally succession is only in found in things which are somehow within the motion of the subject. The before and after results in the succession of time. From this, we number the before and after in motion, and we understand time as nothing more than the before and after in motion. Since time is the harmonic subject of progressive motion, so everywhere that we place the succession of three instants, which were considered by the ancients to be indivisible time, one sole instant. It can, nevertheless, be taken improperly, an instant itself may be said to be time, just as that which is the shortest time is now commonly said to be a *tempus*.²³⁶

We can see then, at the turn of the century, music theorists grappling with the implications of the recognition of time as existing with the category of successive

²³⁶ Jerome of Moravia, *Tractatus de musica*, 180.

things (as Johannes de Muris would clearly state a decade or so later [*Notitia*, 140]). Hieronymus then goes on to list the note values of the ancients and moderns, using comparative adjectives to describe their length (long, longer, longest, etc.), but also assigning them values according to the number of *tempora* they contained, or, interestingly, the number of *instantia*. Johannes de Grocheio also attempts to reconcile Aristotelian concepts of time with the musical definition of *tempus*:

. . . dicitur, sive in re fuerit, sive secundum intellectum tantum. Est enim tempus mensura motus et etiam primi motus et primi mobilis et ex consequenti cuiuslibet alterius, prout a physico subtiliter perscrutatur. Istam autem mensuram antiqui consideratores ad sonos et voces applicaverunt, quam tempus communi nomine vocaverunt. Est autem tempus, prout hic specialiter accipitur, illud spatium, in quo minima vox vel minimus sonus plenarie profertur seu proferri potest. Dico autem spatium, in quo et cetera, quia pausa quemadmodum sonus mensuratur. Ista autem mensura totum cantum mensurat, quemadmodum una revolutio totum tempus.

It is said to be either in the realm of things, or in the realm of the intellect. And so time is the measure of motion, and of the prime motion and of the prime mobile, and from things which follow other things, as it is so subtly scrutized in the Physics. That measure, which the ancients applied to the consideration of sounds and pitches, we commonly now call by the name *tempus*. And this *tempus*, just as it is specifically taken as that space, in which the least of a voice or the least of a sound is brought forth or could be brought forth. I say a “space” because sound may also be measured by a rest. That measure is that which a whole song is measured by, which is one revolution of a whole *tempus*.²³⁷

²³⁷ Johannes de Grocheio, *De musica*, ed. Ernst Rohloff, vol. 2, *Der Musiktraktat des Johannes de Grocheo nach den Quellen neu herausgegeben mit Übersetzung ins Deutsche und Revisionsbericht* (Leipzig: Gebrüder Reinecke,

We find a parallel discussion of discrete *versus* continuous time in contemporaneous theological treatises. Appendix 9 outlines a representative sampling of the types of questions that treat this topic posed by the major late thirteenth- and early fourteenth-century theologians. The following paragraphs contain a brief synopsis of the important points of this dispute, insofar as they relate to points covered by Jacobus in Book 1 or his discussion of musical time in Book 7. The theological underpinnings of this discussion reveal an additional rationale for the argument Jacobus takes (or provides) in this particular musico-theoretical dispute.

In the question “An tempus sit unum vel plura?” Albertus Magnus summarizes the traditional conception of time as it relates to spiritual entities:

Adhuc, si in motu inter prius et posterius continuans non esset, tempus non esset continuum, sed discretum. Sed in motu spiritualis creaturae, quo movetur secundum affecta vel secundum concepta, nihil est continuans. Ergo talis motus discretus est et non continuans; tempus ergo mensurans ipsum discretum et non continuum.

So, if there is no continuum in motion between the before and after, time is not continuous but discrete. But in the motion of spiritual creatures, which are moved in effect, or in concept, nothing is continuous. Therefore, such motion is discrete and not continuous, and so measuring discrete time and not continuous.²³⁸

1943), 54-56.

²³⁸ Albertus Magnus, *Summa theologiae sive de mirabili scientia Dei, libri*

According to Albertus, nothing is continuous in the movement of a spiritual creature, and therefore the time that measures their motion must also be discrete. Within this context, Albertus introduces the idea of a division between the theologian's conception of time and that of the natural philosopher (this division was referenced by Jacobus in his chapter on time in Book 1).²³⁹ Albertus returns to this point again in article 10 of the fifth question of *De quatuor coaequaevis*.²⁴⁰ According to the *De quatuor coaequaevis*, the time of theologians, which is the measure of any motion whatsoever, corporeal or spiritual (the latter is a discontinuous series of "nows"), differs from that of the natural philosophers, which is continuous.²⁴¹ Quinn summarizes: "Lower beings sharing in divine

I, pars I, questiones 1-50A, ed. Siedler and Kübel, vol. 34, *Opera omnia* (Cologne: Aschendorff, 1978), tr. 5, q.23, c.3, a.2, 138.

²³⁹ This also may be understood (in very generalized and simplified terms) within the larger argument between metaphysicians (theologians) and their theories regarding separated substances or abstractions from reality and those of the mathematicians and natural philosophers with their insistence on what is sensible.

²⁴⁰ Albertus Magnus, *De quatuor coaequaevis*, ed. Stephen C. A. Borgnet, vol. 34, *Opera omnia* (Paris: Vivès, 1894), q. 5, a. 10, 384.

²⁴¹ "A word should be said to balance the discrete and continuous aspects of time. As already remarked, not motion as such (else motion would be subsumed under quantity) but local motion is continuous. While motion as such is incidentally continuous, time is per se continuous, for prior and posterior are not actually separated in its flow. Yet because it numbers the continuum, it is discrete. Thus time is formally discrete, and materially (but truly) continuous. Since time is formally number, it is disclosed more through the discrete than through the

unchangeableness or interminability, such as angels, human souls, celestial substances, and simple bodies, may analogously be called eternal. These participative eternals are not truly in eternity but are measured by the *aevum* and time in their respective nows.”²⁴²

Bonaventure (*d.* 1274), in his question “Utrum Angelus pertranseat medium moto subito, vel successivo” from his *Commentary on the Sentences*, suggests a compromise on whether the angels move in time or *in aevo*: substantially the angel’s measure is *in aevo*, because change or motion would mean generation and corruption, and no change of this kind can occur in an angel; on the other hand it is absurd to say that they could exist in many places at the same time, and so the angels must move with successive motion, therefore their properties or accidents are measured by time.²⁴³ Gilson says the following: “angels are presented to us as spiritual substances, wholly independent of bodies, composed of matter and form

continuous. Absolutely, time numbers the ‘parts of the continuum of an undivided unit,’ i.e., in terms of undivided units. Relatively, time numbers the parts of the continuum seen as dividedly emergent, i.e., seen as parts proceeding one after another to make a line.” John M. Quinn, “The Concept of Time in Albert the Great,” in *Albert the Great: Commemorative Essays*, ed. Francis J. Kovach (Norman, Oklahoma: University of Oklahoma Press, 1980), 32.

²⁴² *Ibid.*, 43.

²⁴³ Bonaventure, *Commentaria in quatuor libros sententiarum*, ed. Quaracchi, vol. 1-4, *Opera omnia* (Ad claras aquas, Florence: Collegium S. Bonaventurae, 1885), 1: dist. 37, pars 2, a. 2, q. 3, 527-30.

and numerically distinct from one another.”²⁴⁴ On the measure of *aevum*, Bonaventure holds that its mode of duration differs essentially and formally from time, therefore it must have its own measure. He also states that the measure of *aevum* is in the category of quantity.

While Bonaventure posited that angels were composed of both matter and form, Thomas Aquinas wrote against this position, disagreeing that matter was present in angels. Aquinas’s argument for the existence of discrete time is the following: “the angel may simply be in A one instant, and in B the next. Thus its motion would be discrete rather than continuous and, necessarily, the time which measures its motion would also be discrete.”²⁴⁵ In Lecture 23 on Book 4 of Aristotle’s *Physics*, Aquinas deals with certain difficulties regarding the existence and unity of time. Time is a certain accident of motion and nothing can number time except the soul.²⁴⁶ The totality of time is established by the ordering of the

²⁴⁴ Etienne Gilson, *The Philosophy of St. Bonaventure* (London: Sheed and Ward, 1940), 250. Bonaventure adopted the theory of a composition of matter and form in all creatures, including the angels and the human soul. J.C. Brady, “Bonaventure,” *NCE* 2:661.

²⁴⁵ J. J. MacIntosh, “St. Thomas on Angelic Time and Motion,” *Thomist* 59/4 (1995): 562. See also Piero Ariotti, “Celestial Reductionism of Time: On the Scholastic Conception of Time from Albert the Great and Thomas Aquinas to the End of the 16th Century,” *Studia internazionale di filosofia* 4 (1972): 91-120.

²⁴⁶ Thomas Aquinas, *In octo libros physicorum Aristotelis expositio*, ed. P. Maggiolo (Turin, Rome: Marietti, 1954), lect. 23, 279. The numbering represents the formal aspect. On the numbering of time by the soul, see my discussion above

soul according to the before and after in motion. The philosophy articulated in this lecture is the closest so far to that expressed by Jacobus in his chapter on time.

Henry of Ghent (*d.* 1293) discusses the thoughts of angels in *Quodlibet 12*, question 8: “Utrum cogitationes substantiae separatae mensuretur mensura composite ex indivisibilibus.”²⁴⁷ With reference to discrete time he says:

Et est tempus discretum et ex discretis, habens potius rationem numeri quam temporis; de quo loquitur Aristotelis. Non tamen est quantitas illa quae est numerus, sicut nec oratio, licet sit quantitas discreta.

And there is discrete time, and from such discrete things, having a basis in number rather than of time; Aristotle spoke regarding this. Nevertheless, it is neither this quantity, which is number, nor speech, but it may be thought of as discrete quantity.²⁴⁸

He concludes that the thoughts of angels can be constructed from indivisibles – discretos – just as in speech:

(pp. 188-189).

²⁴⁷ Henry of Ghent (*b.* Ghent *c.*1217; *d.* Tournai, June 29, 1293) was a secular scholastic philosopher and theologian. From 1276-1292 he lectured in Paris as regent master in theology. He was an active supporter of the condemnation of 1277 and considered a violent opponent of the mendicant orders. He was strongly attacked in the writings of Duns Scotus and William of Ockham, but attracted Platonists who wanted an alternative to Thomism. “An independent thinker in the Augustinian tradition, equally opposed to the Christian Aristotelianism of St. Thomas Aquinas and to the Averroist Aristotelianism of Siger of Brabant.” “Henry of Ghent,” *NCE* 6:1036.

²⁴⁸ Henry of Ghent, *Quodlibet 12*, ed. R. Macken, vol. 16, *Opera omnia* (Leiden: Leuven University Press, E. J. Brill, 1991), q.8, 41.

. . . et distinguitur secundum speciem ab oratione, quod partes orationis, licet sint discretæ inter se, quaelibet in se potest habere rationem continui et mensuri vero tempore, secundum quod moveri possumus in prolatione cuiuslibet syllabæ, et eius prolatio mensuretur tempore.

And its species is distinguished from speech, because these parts of speech can be discrete from each other, any of them within themselves can have a basis in continuous and measured time, which has motion in the utterance of each syllable, and its length measured by time.²⁴⁹

Henry of Ghent again uses the example of speech in another question dealing with time and the measure of angels, in *Quodlibet 13*, question 7 on whether two instants in angelic time are the same as in our earthly time. He defines angelic time in a Thomistic fashion as follows:

. . . tempus angeli discretum est, sicut et suæ actiones sive motiones quarum est mensura, discretæ sunt sibi succedentes absque medio continuante.

. . . angelic time is discrete, just as the measure of both their actions and motions are discrete, following one another without a continuous medium.²⁵⁰

This question is interesting because Henry again compares discrete time to *oratio* and even gives examples of syllabic length to illustrate his point (we can easily see how such an analogy could be extended to musical time).

²⁴⁹ Ibid., 43-44.

²⁵⁰ Henry of Ghent, *Quodlibet 12*, q.7, 43.

Finally, the theories of John Duns Scotus represent very well the turn-of-the-century view on this issue, and considering one of his expositions on this topic in detail will help us appreciate the pertinent arguments of the day regarding discrete and continuous time. His question “Utrum operatio angeli mensuretur aevo?” (*Ordinatio* II, dist. 2, pars 1, q. 4) puts forward two contrary positions. The first position stated is that the operation of the angels is not measured by time. Duns Scotus asserts that according to the author of *De causis* (proposition 31) between things whose substance and act are measured by time, and those whose substance and act are measured by eternity, there are intermediate things whose substance is measured by eternity, and whose act is measured by time. Also, because Aristotle says that nothing is created so that it immediately will not be (*Physics* 8), therefore the operation of an angel must have some duration in time. The contrary position is that time is measured by *aevum*.

According to Duns Scotus (and as we have seen above), Henry of Ghent’s opinion was that the intrinsic operation of an angel is measured by discrete time (*Quodlibet* 12, q. 8). He quotes from Henry:

Mensura quae est durationis rei, est modus quo res mensuratur, et ipsa proportionatur mensuratio (sicut mensura permanentis est permanens et fluentis fluens); igitur talem proportionem oportet invenire inter cogitationes vel operationes angeli et mensuras earum.

Measure (which is the duration of a thing) is the way by which a thing is measured, and this thing is proportioned by measurement (just as the

measure of a permanent thing is permanent and the measure of a flowing thing is flowing); therefore, it is fitting for such a proportion to be found among the thoughts or operations of an angel and the measure of these.²⁵¹

According to Henry, the thoughts of the angels are transient, because they do not hold the same thought constantly, but they also do not hold one thought after another: there is no connection or succession between their thoughts (unlike the way humans think, in a discursive fashion), their knowledge is *simul*, and indivisible. Therefore, their measurement will correspond to those things having transient and indivisible parts: that is, discrete time. Discrete time is defined by comparing it to other species of discrete quantity, number and *oratio*. Aristotle did not place “discrete quantity” among his species of quantity because it is considered divine. Finally, Henry of Ghent compares the instant of angelic time with the instant of our time by saying they cannot be compared proportionally, as the “now” of discrete time can co-exist with whatever number of instants in our time.

Duns Scotus disagrees with Henry of Ghent’s opinion. His first argument is this:

Quae habent uniformem modum manendi, dum manent, habent mensuram eiusdem rationis in morando, liceat tunc diutius maneat quam alia sed ista cogitatione angeli, dum manet, habet eundem modum manendi cum existentia angeli, licet non habeat tantam durationem sicut eius existentia; igitur habet mensuram eiusdem rationis cum illa existentia, et ita

²⁵¹ Henry of Ghent, as quoted in John Duns Scotus, *Ordinatio*, 7: liber II, dist. 2, pars 1, q. 4, 220.10-14.

mensuratur aevo sua cogitation et non tempore.

Those things which have a uniform way of remaining, while they remain, have measure in some proportion of delaying, one thing can remain longer than another; but that thought of an angel, while it remains, has the same way of remaining as the existence of the angel, it cannot have as much a duration as its existence; therefore it has measure in some proportion of its existence, and thus its thought is measured by *aevum* and not by time.²⁵²

The proper *ratio* of measurement corresponds to the formal cause of the angel's existence, and as Henry himself also stated, there are three such measurements, *aevum* corresponding to that intermediate measurement that has an indivisible delay. It is incorrect to say that the thought of an angel will not always be, for if it were possible for something of an angel to end, then it would not be measured by *aevum*. The fact that it can choose not to have this thought is not relevant, because the difference between potency and act does not affect the formal cause of its existence. Also, all concede that the beatific act of an angel is measured by *aevum*, and not time.

Duns Scotus also believes that Henry is incorrect when he says that one instant of angelic time coexists with many instants of our time, as this would imply that if their time is discrete then ours is also, and this is obviously not so. Angels' thoughts are not in time, they do not think as the human intellect, with one thought

²⁵² Ibid., 222.199-223.4.

after another, but have all knowledge *simul*. Furthermore, Duns Scotus thinks that Henry's reasoning implies that we too think in discrete time, but this is plainly false, as Aristotle says (*De memoria*), "quia intelligimus cum continuo et tempore."

Duns Scotus's solution to the question is as follows:

Concedo conclusionem duarum primarum rationum, quod scilicet intellectiones angeli mesurantur aevo, - et breviter, quaecumque existentia actualis et invariabilis, hoc est cui repugnant ut secundum ipsam sit variation sive fluxus seu acquisition partis post partem; nec perpetuitas aliquorum vel corruption sive annihilation aliquorum variat mensuram formaliter, dummodo existentia sit eiusdem rationis dum manet.

I concede that there are two grounds for my conclusion: that the thoughts of an angel are measured by *aevum*, - and briefly, whatever their actual existence is, it is invariable, and variation or flux or acquisition of a part after a part is against its nature; and their measure does not vary formally according to either perpetuity or corruption or annihilation, as their existence is of the same rationale while it remains.²⁵³

There are two more objections that Duns Scotus must deal with: (1) concerning the measure of the revolution, which is the primary motion, and that it must be measured by time whenever it is not in motion; and (2) that all things that have the potential to be generated or corrupted are measured by the instant of time and therefore everything, after it is created, must be measured by time. In dealing with the first, he gives five possible states that can be measured:

Fluxus formae, forma secundum quam est actualis fluxus, et forma

²⁵³ Ibid., 230.8-14.

secundum quam potest esse fluxus partium; et quarto, permanentes, in quo non est natus esse fluxus partium, tamen necessario habet formam consequentiam in qua natus est esse fluxus; quinto, illud in quo non potest esse fluxus, nec in aliquot consequente ipsum naturaliter.

[1] The flux of form, [2] form according to that which is actual flux, and [3] form according to that which can be the flux of its parts; and fourth [4], a permanent thing in which there is not yet born a flux of its parts, but necessarily has the consequent form in which is born the being of flux; and fifth [5], that in which there can be no flux, and this can naturally not be in any consequent thing.²⁵⁴

The first is essentially measured by time, its formal cause is that there be a succession of part after part; the second and third are diverse oppositions of the same form, one is the act of motion, the other the act of quiet; the fourth is not measured by time *per se*, but is only in rest by accident (generable and corruptible things); and the fifth is not measured by time, because it invariably remains the same. Obviously an act of motion is measured by time, and cannot be measured by *aevum*, as *aevum* repudiates change, but does it follow that act of quiet is measured by *aevum*? It does follow, because quiet is only defined in terms of motion: according to Aristotle, quiet is the privation of motion, therefore this privation can be measured by time. He concludes that every form having a variable existence is measured by time, and some permanent things are not measured by *aevum*, and

²⁵⁴ Ibid., 231.17-22.

generable and corruptible things, although they are measured by *aevum*, are nonetheless able to be measured, *per accidens*, by time.

The second objection to which Duns Scotus must respond concerns creatable and corruptible things. Something is created or corrupted in one indivisible instant, and that which is measured by indivisible instants is in time. But it does not follow that angels, which are created in an instant, have the same reason for being following this instant, as their final cause is in their conservation, their invariable existence, thus not measured by time. So, to the first two principals, Duns Scotus responds that the first was handed down according to erroneous Avicennian doctrine. To the second, he concedes that the intellect of an angel has its duration along with our time, but it does not necessarily follow that it is measured by it.²⁵⁵

* * * * *

The fourteenth-century music theorists who refer to this issue at all (Jacobus, Johannes de Muris, Marchettus da Padova, John of Tewkesbury, Walter Odington) are all writing in the self-consciously scholastic genre of music theory, and are concerned with presenting some sort of coherent system that can be logically defended and explained with the realms of science, and within the context

²⁵⁵ Duns Scotus's question "Utrum illud positivum caritatis praeexistentis quod manet in augmento, sit tota essential caritatis intensae" (*Ordinatio* I, pars 2, q.2, 252-260) also discusses this topic in detail.

of current philosophical arguments. The practical music guides (Franco or the variety of *compendia* of the *ars nova* doctrine, and so on) are more concerned with the provision of a manual on how to read the notation, and indeed barely even mention the concept of time, or bother to define it, in the manner that many of the *Gaudet brevitate moderni* treatises sometimes do not even term the long and the breve as perfect, imperfect, proper, and so on. The precise terminology or the origins or logical explanations for the *nomini* of these entities is not important to these authors. But when we are dealing with the impetus behind or the reasoning used by Jacobus in his criticisms of Johannes de Muris, it becomes important to remove these texts temporarily from previously characterized scenarios and view them through other lenses. We may then see particular arguments and ideologies that were ongoing between opposing schools of thought at the turn of the century, and in turn interpret Jacobus's writings as Thomist, and the opposing theories advocated by Johannes de Muris as being located within a post- or even anti-Thomist faction, perhaps Scotist. The particular example of terminology explored in this chapter has a rather narrow focus, and it is necessary to examine these debates in more detail, and in particular the question of form and matter raised by Jacobus as one of his principal objections to the theories of de Muris, and how these theories are articulated with the context of the philosophical debates on the perfection of form and the individuation of species.

CHAPTER 6

FROM TREES TO DEGREES

FORM, MATTER, AND MENSURAL THEORY

Philosophical meditation cannot be reduced to a man's monologue with himself. To a greater or lesser extent, it always originates and explicates itself as a critical dialogue with one or more interlocutors with whom the philosopher is placed in contact by historical circumstances.²⁵⁶

Shifting perceptions concerning the participation of form and matter in being dominated metaphysical discourse at the close of the thirteenth century. At the center of this discussion was the theologically controversial "unity of form" thesis. This thesis, most closely identified with Thomas Aquinas, and supported by most Dominican and some secular masters, proposed that matter is pure potentiality, and that a single form defines the essence of any individual entity; its opponents (including John Duns Scotus) asserted that matter has some degree of actuality, and that there are, in fact, many forms in each being.²⁵⁷ The thesis

²⁵⁶ Efrem Bettoni, *Duns Scotus: The Basic Principles of his Philosophy*, trans. Bernardine M. Bonansea (Washington, DC: Catholic University of America Press, 1961), 28.

²⁵⁷ "In his *Metaphysics* Aristotle had described matter as 'that which in itself is neither a something nor a quantity nor any of those other things by which being is determined.' This description led many scholastics such as Albert, Thomas, Siger of Brabant, Giles of Rome, and Godfrey, to conclude that *prime* matter is pure potentiality, that is, that it is completely devoid of any actuality in and of itself apart from its corresponding substantial form. To assign any degree of

escaped the 1277 Paris condemnations, but drew fire from Franciscan thinkers and was condemned by John Peckham at Oxford in 1286. In this chapter, I examine the influence of this controversy on the discourse of music theory. How were the concepts of form and matter applied in theoretical treatments of mensural notation? Jacobus was sharply critical of Johannes de Muris on this front: the details and implications of his argument are examined here. Further to this, I will also analyse how the debate on the unity of form may have influenced Johannes de Muris in his new conceptualization and articulation of mensural notation, particularly as set forth in his *Notitia*, and the degree to which this debate had any influence on other fourteenth-century music theorists.

actuality to matter in itself would, they feared, make of it something substantial in itself rather than a mere constituent or principle of an existing substance. And if matter were a substance in itself, then any superadded form or actuality acquired through change could only be accidental not substantial. . . . Many assigned some degree of actuality to matter in and of itself, and some contended that it could be sustained in existence by God through his absolute power apart from any substantial form. Versions of this were defended especially by Franciscans, such as John Peckham, Richard of Middleton, and somewhat later, Duns Scotus and Ockham” Marilyn Accord Adams, "Universals in the Early Fourteenth Century," in *The Cambridge History of Later Medieval Philosophy: From the Rediscovery of Aristotle to the Disintegration of Scholasticism*, ed. Anthony Kenny Norman Kretzmann, Jan Pinborg (Cambridge: Cambridge University Press, 1982), 410.

THE UNITY OF FORM

Thomas Aquinas, in his *Commentary on the Metaphysics*, stated that form is universal and disagreed with those who claimed that matter had some degree of actuality. He rejected the Aristotelian assertion that matter gives the principle of individuation.²⁵⁸ He contended instead that form, or signate matter, related to quantity, follows the principle of individuation (that is, the principle that constitutes an undivided being divided from all other beings).²⁵⁹ During the thirteenth century,

²⁵⁸ Aristotle, *Metaphysics*, ed. Jonathan Barnes, trans. Jonathan Barnes, 2 vols., vol. 2, *The Complete Works of Aristotle: The Revised Oxford Translation* (Princeton: Princeton University Press, 1984), 1034a 5-8, 74a 33. "The pluralists, considering the components in the structure of the composite as substantial entities, posited unity of composition . . . Thomas Aquinas, establishing the transcendental relation of matter and form on potentiality and actuality and on the real composition of essence and the act of being, necessarily postulated one simple substance, or form, in all composites. He made it the cornerstone of his metaphysics and a fundamental tenet of his synthesis." D.A. Callus, "Forms, Unicity and Plurality of," *NCE*, 1026.

²⁵⁹ On this point, see D. A. Callus, "The Origins of the Problem of the Unity of Form," in *The Dignity of Science*, ed. James A. Weisheipl (Washington: The Thomist Press, 1961), 121-49; R. Zavalloni, *Richard de Mediavilla et la controverse sur la pluralité des formes* (Louvain: Éditions de l'institut supérieur de philosophie, 1951). (The summary of this controversy in the following two paragraphs is based on Callus's study.) "In accord with Aristotle, St. Thomas maintained that the form, which is the basis of the substantial essence, cannot be the basis of individuality; for form itself is universal and can be received into one or more substrata. Also, accidents cannot account for individuality, for the individual belongs to the category of substance. Since the principle of individuation must then be substantial, but cannot be in the form, which is a principle of specification, it follows that the principle of individuation must be matter. However, recognizing that primary matter, just as form, is by nature common and can be determined by many forms, St. Thomas introduced into his

there was tremendous interest, indeed controversy, in this relationship between form and matter and the various articulations of this relationship developed into distinctive and opposing schools of thought. One central question concerned the unity of the soul, that is, how are the vegetative, the sensitive and the rational united in man in one single substance?

The crux of the problem consists in determining: (1) whether primary matter is absolutely passive potency or contains some actuality of its own (*potentia activa*); (2) whether privation is the disappearance of all previous forms or is an incomplete form (*inchoatio formae*); and (3) whether substantial form, including virtually all preceding forms, confers on primary matter its complete and specific determination, and alone actualizes all its perfections and activities, or imparts one perfection only. In the first alternative one must posit oneness of form; in the latter, plurality of forms.²⁶⁰

At first a philosophical problem, this became theological problem and controversial during Thomas's second regency in Paris from 1269 to 1272. The theological implications centered on the question of whether the body of Christ in the tomb is numerically the same as the living Christ. Thomas answered that since Christ's soul and body were united with the Divine Person in life and death, Christ living and dead was identically the same man. But since the soul makes the body human,

doctrine the notion of quantity. He proposed that signate matter, matter related to quantity, as the principle of individuation (*De ente 2*)." Rosenberg, "Individuation," *NCE*, 477.

²⁶⁰ Callus, "Form, Unicity and Plurality of," *NCE*, 1024.

at their separation (that is, in Aristotelian terms, the privation of form), with the soul remaining the same, Christ's body also remained the same and the form of corporeity, not being distinct from the specific form but one and the same with it, therefore does not remain.²⁶¹

Robert Kilwardby forbade teaching that the vegetative, sensitive and rational were one form, and also forbade related teachings: that is, the absolute potentiality of prime matter; the absence of any complete form in privation; the immediate union of substantial form with prime matter; and the equivocal predication of a living and dead body. Kilwardby held that the true unity of forms consists in the composite of incomplete forms, the plurality of forms. This prohibition on the unity-of-form thesis was ratified by John Peckham in 1286. Peckham claimed that it was impossible without the plurality-of-forms thesis to safeguard the teachings of the Incarnation, the Eucharist, the Resurrection of the body and other Catholic teachings. He condemned the unity thesis and all its implications as heretical and excommunicated its defenders. The Dominicans countered that it was not a question of theology but rather philosophy and could therefore be debated without danger to the faith. The condemnation was strongly

²⁶¹ Callus, "Form, Unicity and Plurality of," 1025.

criticized in Paris, particularly by Godfrey of Fontaines.²⁶² Callus evaluates the implications of the controversy in this passage:

The controversy was not a conflict between Dominicans and Franciscans. They certainly had a prominent share in it; but other religious and secular masters in theology and arts joined issue. Nor was it a hair-splitting question. Indeed it was of the highest metaphysical importance. It is an explanation of the essential unity of man and of any composite. The answer betrays two concepts of unity: composite unity and simple unity. The pluralists, considering the components in the structure of the composite as substantial entities, posited unity of composition, although they varied considerably in their interpretations. Thomas Aquinas, establishing the transcendental relation of matter and form on potentiality and actuality and on the real composition of essence and the act of being, necessarily postulated one simple substance, or form, in all composites. He made it the cornerstone of his metaphysics and a fundamental tenet of his synthesis. The conflict, therefore, was between two opposite tendencies; two different interpretations of potentiality and actuality, of matter and form; two different methods of approaching philosophical problems. For metaphysicians, the controversy over unicity or plurality of forms is of universal significance and permanent value, and is as relevant in the 20th century as it was in the 13th.²⁶³

QUANTIFYING QUALITIES AND THE LATITUDE OF FORM

This issue of quantifying qualities was referred to briefly in the last chapter with respect to motion and the related theory of the latitude of form. This concept will

²⁶² Callus quotes the implications for scholars at Oxford in the first half of the fourteenth century: “John Baconthorp . . . [comparing Oxford to Paris] deplored that, whereas the Parisians were free to accept whatever opinion they preferred, the Oxford masters were compelled to discuss it in Peckham’s terms.” Callus, “The Problem,” 123.

²⁶³ Callus, “Form, Unicity and Plurality of,” 1026.

be explored in greater depth here as it is relevant to the issue of differentiation of species and perfection of form and thus the unity-of-form debate. In mensural music, at least in its Franconian incarnation, the length of notes and the names given to these figurations (*figurae, notulae*) were given in terms of quality - contrary qualities, to be precise (that is, “long” *versus* “short”) - and so the means by which these entities were differentiated is central to a properly philosophical outlining of a musico-theoretical system. First, I will take a quick look at how qualities were being described in natural philosophy and theology, and review the pertinent issues, and later I will discuss how these concepts were used in the formulation and reformulation of music theory.

The distinctions between the categories of quality and quantity were articulated in Aristotle’s *Categories* (Chapters 6 and 8). Shapiro summarizes the differences as follows: “. . . the characteristics of quantity are as follows: they consist in parts; they have no contraries; they do not admit of variation of degree; and equality and inequality can be predicated of them. The essential characteristics of qualities, on the other hand, are as follows: they have contraries (although this is not true of all qualities: e.g., red, yellow, etc.); they admit of variation of degree (with some exceptions: e.g., justice, health, etc.); and, finally, likeness and

unlikeness (*not* equality and inequality) can be predicated of them.”²⁶⁴ Aristotle

says:

. . . strictly speaking, only the things which I have mentioned belong to the category of quantity (that is, number, speech, lines, surfaces, solids, time and space); everything else that is called quantitative is a quantity in the secondary sense. It is because we have in mind some one of these quantities, properly so called, that we apply quantitative terms to other things. We speak of that which is white as large, because the surface over which the white extends is large; we speak of an action or a process as lengthy, because the time covered is long; these things cannot in their own right claim the quantitative epithet. For instance, should any one explain how an action was, his statement would be made in terms of the time taken, to the effect that it lasted a year, or something of that sort. In the same way, he would explain the size of a white object in terms of surface, for he would state the area which it covered. Thus, the things already mentioned, and these alone, are in their intrinsic nature quantities; nothing else can claim the name in its own right, but, if at all, only in a secondary sense.²⁶⁵

By the early fourteenth century, two theories concerning how qualities change were prevalent. The first, known as the addition theory, posited that qualities consist in parts, and that intension and remission of qualities may be understood as the addition or subtraction of these parts from the whole. This theory was articulated by John Duns Scotus and John Dumbleton among others. The second, known as the succession theory, held that when qualitative change happens, the entire form of

²⁶⁴ Herman Shapiro, "Walter Burley and the Intension and Remission of Forms," *Speculum* 34/3 (1959): 415.

²⁶⁵ Aristotle, *Categories* 6, 5a-5b. Shapiro quotes this from Aristotle in the context of his discussion of Burley's theory of intension and remission of forms.

the being undergoing the change is destroyed and replaced with a new form. This theory was first fully developed by Walter Burley, but developed from the theories first articulated by Godfrey of Fontaines.²⁶⁶ In its most simplistic form, the difference between the two theories is that the succession theory assumes each individual form is indivisible and the addition theory assumes that a given form contains parts within itself.

Duns Scotus in his question “Utrum tota caritas praeexistens corrumpitur ita quod nulla realitas eadem numero maneat in caritate maiore et minore” inquires into how the quality of grace increases, and specifically whether, upon change, the whole pre-existing grace is destroyed, so that no reality of the pre-existing grace remains in the greater and lesser grace.²⁶⁷ In this question, his primary interlocutor is Godfrey of Fontaines, and the theory of intension and remission Godfrey put forth in his *Quodlibet* 2, question 10. Duns Scotus argues that after an intension or remission of grace what remains changes from imperfection to perfection, but that the underlying form has not changed (“Et quod sic, arguo: Quia alias ipsa forma augetur subiective, quia eadem manens transmutaretur ab imperfectione ad

²⁶⁶ See my discussion of this and how it relates to theories of motion in Chapter 5.

²⁶⁷ John Duns Scotus, *Ordinatio*, par. 2, q.1, 233-64.

perfectionem; sed forma est invariabilis.”²⁶⁸ The action that prompts the increase in grace, the new part of the form, still exists in the increased grace, and the increased grace is then added to the previous form.²⁶⁹ John Dumbleton also favored the addition theory and in his development of the theory made it exactly analogous to distance in space.²⁷⁰

For Godfrey of Fontaines, who favored the succession theory, the central issue was whether that which was intended or remitted was the quality itself, or the form, or the subject that receives the quality?²⁷¹ In *Quodlibet* 2, q. 10, Godfrey

²⁶⁸ Ibid., 234.

²⁶⁹ “. . . iste actus qui meretur augmentum caritatis, est meritorius, - ergo praesupponit caritatem in illo instanti in quo elicitur. Quaero quam? Non illam partem quae acquiritur, quia illa sequitur actum sicut praemium meritum; ergo praesupponit illam quae praeexsisebat, et per consequens non corrumpitur illa in illo instanti, - quia si sic, tunc in illo instanti non posset actus meritorius eliciti, in quo tamen quis meretur augmentum caritatis.” Ibid., 237.

²⁷⁰ Sylla, “The Science of Motion,” 263.

²⁷¹ John F. Wippel, "Godfrey of Fontaines on Intension and Remission of Accidental Forms," *Franciscan Studies* 39/17 (1979): 318. In addition to the questions discussed above in Chapter 5 (*Quodlibet* 2, q.3 and *Quodlibet* 7, q.7) Godfrey deals with the issue at length in *Quodlibet* 2, q.10 (1286) and *Disputed Question* 18 (probably after 1286). Wippel does not find an instance in Godfrey's own writings where he defends the succession of forms theory, although he was cited by Burley as one of the originators of this theory and also cited in Scotistic circles as such. “It is not impossible, of course, that he did defend the succession theory of qualities in some other discussion that has not been preserved for us. But the evidence contained in his surviving texts does not warrant our concluding that he ever did so. Ibid., 355.

compares forms to numbers, stating that any addition or subtraction from a given number will change its species, and so too with form.²⁷² In other words, if one adds or subtracts from a form, it is no longer the same form, but an entirely different form. Form is whole and exists by reason of something which is fixed and indivisible. Godfrey refers to the accidental features of qualities as their intensibility and stresses that an essence or form cannot undergo increase or decrease in its essence in terms of that which belongs to it by reason of its species, although variation can occur in a form or essence insofar as it is an individual, that is *per accidens*. In *Disputed Question* 18 Godfrey deals with the issue of how individuals that remain in the same species can admit of more or less; this occurs with variation in terms of substantial nature, that is, in terms of matter.²⁷³

²⁷² “In Quodlibet 2 he addresses himself to this question: May charity or any habit increase in its essence (*per essentiam*)? Godfrey begins his reply by likening forms to numbers. Any addition to or subtraction from a given number will change its species. So too, if one adds to or subtracts from a form taken in itself, one will change its species. This is so because a form is specifically one by reason of something that is fixed and permanent and indivisible. Whatever differs from it in this fixed and permanent and indivisible aspect by being more or less will therefore also differ from it in species and will belong to a more perfect or a less perfect species. Godfrey acknowledges that such a restriction does not apply to a generic form or follow from generic unity. In fact, he goes on to suggest that the totality of beings may be regarded as flowing from the first being just as the entire order of numbers follows from the unit. Just as two numbers that differ in species in species with the the ‘genus’ or total order of being cannot be equally distant from the first being in degree of perfection.” Wippel, 325. The rest of this paragraph is a summary of Wippel’s analysis (331-339).

²⁷³ The adjectival expressions *maius*, *minus* are proper to quantity and the

Walter Burley also rejected the addition theory of intension and remission of forms, since it assumes characteristics of qualities that he believed were really only predicable of quantities. He “espouses the position that each experienced moment of a qualitative change is guaranteed by the induction of a totally new and indivisible degree of the quality, the character of the new form being *in itself* more intense if the quality is being augmented, or more remiss than the one existing the instant before if the quality is being diminished. In either event, whether the motion in question involves intension and remission, or contrariety, the previous form must be totally destroyed in favor of the newest.”²⁷⁴ Burley explains qualitative motion by using the same arguments that were being used to describe local motion:

In local motion, the moved, in any instant of the time measuring the motion, has first one place and then another totally new place. . . . Hence, in the motion of alteration, in any instant of the time measuring the alteration, the altered has first one and then another quality, totally and numerically new.²⁷⁵

adverbial expressions *magis* and *minus* are proper to quality.

²⁷⁴ Shapiro, “Walter Burley,” 421.

²⁷⁵ Walter Burley, *De intensione et remissione formarum* (Venice, 1496), cap. iv, fol. 11ra, quoted in Shapiro, 422.

He further clarifies his position in confirming that the quality itself does not suffer the intension or remission: “no *form* is intended or remitted, but the *subject of the form* is intended or remitted with respect to the form, so that the form is that in respect of which a subject is intended or remitted.”²⁷⁶ Shapiro credits Burley with having come up with the most reasonable solution to this problem, one that avoids the contradictions and illogical presumptions of previous theories:

It is to be remarked in passing that this approach to intension and remission provides evidence for resolving an old metaphysical issue. One can now answer with assurance the question of whether qualitative variations are to be thought of as occurring *secundum esse*, or *secundum essentiam*. Since each induced qualitative grade is a new and entire form, it is not correct to hold that the form has been intended *per se*. The qualitative grade, that is, has not undergone an intrinsic intension or remission – it is an entirely new entity. The subject, on the other hand, *is* altered. It is the subject *qua* qualified, and not the quantity as such, which is correctly characterized as having been altered, owing to the fact that it alone displays, and guarantees by this display, the occurrence of a real and novel qualitative change.²⁷⁷

²⁷⁶ Burley, *De intensione et remissione formarum*, cap. iv, fol. 10va, quoted in Shapiro, 423.

²⁷⁷ This example from Shapiro may clarify for the reader how the succession theory may be understood in practical terms: “How then are we to order intension and remission? This much at least is certain: if we entertain any hope of accomplishing this end, we must completely discard the notion of qualitative formal divisibility and start fresh. Experience, as the only practicable point of departure, allows us to validate nothing more than what Aristotle has already noted: qualities vary in degree. This common fact of our experience can be accurately restated thus: Subject A, informed at time t1 by form W1, displays now, at t2, the obvious fact that it has assumed form W2. Each of these, W1 and W2, is a distinct, unique, indivisible and finite qualitative form. Let us now describe the same fact giving it the mathematical precision it warrants. Subject A, informed at t1 by heat,

Relevant to our discussion on mensural theory, it is interesting to note the comparisons that may be drawn between the controversy outlined above regarding the unity-of-form debate and the theories of intension and remission of qualities. Typically, advocates of the unity-of-form thesis are found to side with the advocates of the succession-of-forms theory; and similarly, those who supported the plurality of forms advocate the addition theory of intension and remission of form. Sylla summarizes this alignment of philosophies here:

Perhaps significantly, the ontologies behind the succession and addition theories are highly analogous to the ontologies of the two main theories of substantial change that combated each other as part of the so-called plurality of forms controversy. The succession of forms theory of intension and remission is analogous to the Thomist theory of the unity of the substantial form and of substantial change through a succession of forms. The addition theory of intension and remission, on the other hand, is analogous to the Scotist theory of substantial change according to which a succession (plurality) of substantial forms can be impressed on the same subject at the same time, with each substance acting in turn as matter to the next higher form and remaining as a “partial form” within it.²⁷⁸

grade 7, displays at t2 its information by heat, grade 8. The progressive quantitative designations ‘7’ and ‘8’ imply nothing more than the fact that subject A has undergone an intension of heat. Note that it is not necessary to predicate quantitative characteristics to qualities in order systematically to approach and explain the fact of qualitative change. When describing intensions and remissions such predications that are intrinsically ‘unlike’; while these same designations connote that quantitative meaning can be significantly attached, in a secondary sense, to make precise such observations as: ‘body A has more heat than body B’.” Shapiro, 425-426.

²⁷⁸ Edith D. Sylla, "Medieval Concepts of the Latitude of Forms," *Archive d'histoire doctrinale et littéraire du moyen âge* 40 (1973): 210.

JACOBUS ON THE UNITY OF FORM

It is my contention that these two philosophical debates provided the primary foundation for Jacobus's argument against Johannes de Muris in Book 7 of *Speculum musicae*. At times the references in Book 7 are oblique, but we are fortunate in that elsewhere in *Speculum musicae*, in other contexts, Jacobus expounds at length on just these very questions in a purely philosophical fashion. The first such passage is in Book 1, within Jacobus's chapters on *unitas* ("unity").

Chapter 30 of Book 1 is entitled "Quid sit unitas" ("What is unity?") and directly follows the discussions of time, motion and sound that I have discussed in the preceding chapter. Jacobus begins by giving the definition of unity in the treatise *De unitate et uno* (falsely attributed to Boethius): unity is that by which a thing is said to be one, whether it is simple or complex, corporeal or spiritual.²⁷⁹

He continues:

Omne enim quod est ideo est quod unum numero est. Quae unitas naturalis est unitas realis distincta contra unitatem rationis quae ab anima provenit. Quod igitur dividit unum esse, dividit esse, quod quidem esse est a forma vel actu. Sed in materialibus non est esse a forma absolute; sed, ut unitur materiae cui dat esse, vel esse totius compositi, in materialibus resultat ex unione formae ad materiam sibi aptam et dispositam. Quod igitur in materialibus dividit formam a materia, tollit esse compositi et sicut tollit unum esse, sic tollit esse. Sicut igitur res quaelibet appetit esse, sic appetit unum esse; in tantum enim res habet esse in quantum habet unum esse. Unitas enim causa est ipsius esse et conservationis et durationis ipsius esse,

²⁷⁹ Discussion of this pseudo-Boethian treatise may be found in M. Alonso, "El liber de unitate et uno," *Pensamiento* 12 (1956): 65-78, 179-202, 431-72.

sicut divisio ipsius non esse. (*SM* 1.30, 90-91)

Everything that exists is that which is one in number. Natural unity is a distinct unity in reality as opposed to the unity of reason that comes from the soul. Therefore, that which divides one being, divides existence, existence, that is, which is from form or action. But in material things things do not exist in form absolutely; but rather, as form is united to the matter to which it gives existence, or existence as it relates to this whole commixture. In material things, existence is attained from the union of matter to the form to which it is disposed. That which in material things divides form from matter, takes existence from its commixture and just as it takes one existence, thus it takes existence. Just as any thing desires existence, it desires being one; and such a thing has being inasmuch as it has one existence. Unity is the cause of its existence and the conservation and duration of its existence, just as in its division there is no existence.

Everything that exists is one in number. Existence (*esse*) is understood as resulting from form or action (“*esse est a forma vel actu*”), or better, from the union of form with the matter towards which the form is disposed. This basic philosophical position is taken straight from the Thomistic theory of form, as is Jacobus’s description of the privation of form: when there is division between form and matter there is no existence. Jacobus takes matter as pure potentiality, where being, and unity in being, emerges only after the union of matter to form.

Jacobus continues his analysis of unity in Chapter 31 (“*Unitas distinctio*”). He breaks down the concept of unity into rational unity (that by which all men are understood to be one species of man) and natural unity, which he further divides into essential and accidental. He elaborates on this distinction:

Unitas essentialis est illa quae convertitur cum ente, nihil reale addens super ens. Idem enim sunt unus homo homo et ens homo, et non differunt nisi secundum dictionem repetitam, quia eadem generatione generantur, eadem corruptione corrumpuntur et nihil aliud realiter est unum quam ens quod denominat. Haec autem est unitas transcendens de qua vivificatur id quod dictum est, quod quantum habet res de entitate, tantum habet de unitate. Haec unitas circuit omne praedicamentum (omne praedicamenti genus, tam substantiae quam IX accidentium). Etiam se extendit ad ens omnino simplex, illimitatum et infinitum, extra omne genus existens, ut est unitas divini esse. Deus enim verissime unus est, sicut suum esse est verissimum esse simplicissimum, actualissimum, omnino immutabile, omnino aeternum. Unde Boethius: Creatrix, inquit, unitas non habet principium neque finem, neque diversitatem. Sed talia accidunt unitati creatae, cum enim recedens a simplicissimo et invariabilissimo ad aliquam accedat compositionem, vel ex actu et potentia, vel ex accidente et subiecto, vel ex partibus quantitativis, vel ex materia et forma. Recedit autem omnis creatura, quasi in infinitum, a Dei simplicitate et ab eius immutabilitate. Ideo ad aliquam accedit compositionem et variationem in tantum ut, in omni quod est citra primum, differant et inter se compositionem faciant substantia, virtus et operatio. Et quanto aliquid amplius recedit a prima et simplicissima unitate quae Deus est, tanto ad minorem accedere videtur unitatem et ad materiam quae principium corruptionis est et divisionis. (*SM* 1.31, 92)

Essential unity is that which converges with being, in the realm of things, with nothing added to being. Just as man is one man and is also the entity man, and they do not differ except for the use of the same word [man], because they are generated by the same process, and destroyed by the same process, and in reality there is nothing other than the entity it names. Moreover, this unity transcends that which gives it life, and this is how we can say that whatever a thing has from its being, it has from its unity. This unity encompasses every category, every class of category (substance, rather than one of the nine accidents). So, it extends itself to every simple being, without limits and into infinity, beyond every existing class, to that unity of the divine being. God is most truly one, just as his existence is the most true and most simple existence, most actualized, everywhere unchangeable and eternal. Whence Boethius: The Creator, he says, is unity, having no beginning nor end, nor any diversity. But, such things may happen in created unity, when a thing recedes from His most simple and

invariable being towards something which is composed, either from act and potency, or from an accident and subject, or from quantitative parts, or from matter and form. Every creature recedes from the simplicity of God and from His immutability, as if into infinity. Thus, when something happens in its composition or variation, which happens to all things which are in this realm, it differs within itself to make substance, strength and deed. And the degree to which a thing recedes more from the first and most simple unity, which is God, that much less the thing seems to have unity, and extends towards matter which is the beginning of corruption and division.

Everything that exists recedes from the most simple Unity (God) to matter, which is the principle of corruption and division. Godfrey of Fontaines, in his discussion of the the perfection of species, held this same position: “. . . the essential order of all created beings is determined by their relationship to the first unity, that is, to the supreme simplicity and perfection of the divine essence. Because this supreme unity is pure act, it is the principle behind all other things, which fall short of it and thereby approach composition and multiplicity.”²⁸⁰ Jacobus affirms the view that essential unity is that which determines primary matter to become a specific essence. In other words, essential unity is that which determines the species of a being. Jacobus states that accidental unity determines substance to the category of quantity (that is, it is quantified). This accidental unity does not distinguish a thing from its genus but distinguishes a thing from other things of the same species.²⁸¹

²⁸⁰ Wippel, Godfrey of Fontaines, 150.

²⁸¹ “Man is learned or healthy in virtue of the accidental forms of learning or health that inhere in him; these may be present or absent without detriment to his

Accidental form, then, is understood to be the material principle of individuation and the principle of natural unity in individual substance.

Unitas accidentalis determinatum respicit praedicamentum quantitatis. Scilicet dicit enim indivisionem in quantitate sive quantitatem indivisam, prout dicitur aliqua linea indivisa <linea una>, vel superficies indivisa superficies una. Nec tamen haec unitas denominat solum res sui generis sed res quasdam alias, ut substantiam materialem in qua quantitas mollis reperitur. Unde et dixerunt quidam quantitatem principium esse indivisionis, individuationis et unitatis naturalis in individua substantia, quia sibi primo competit divisio et indivisio, cum sit per se indivisibilis in ea quae insunt. Non credo quod individuatō in substantia sit per quantitatem, sed per rem sui generis, quicquid sit de individuatione accidentali. Puto enim unumquodque praedicamentum individuari individuatione intrinseca et essentiali per rem sui generis. Sed exquisite loqui de hoc alterius est speculationis. Haec autem unitas accidentalis, etsi non differat realiter a rebus sui generis, differt tamen realiter a rebus alterius generis quas afficit et denominat, sicut et quantitas. (*SM* 1.31, 93)

Accidental unity is concerned with the determining category of quantity. That is to say, there may be indivisibility in quantity or indivisible quantity, just as an indivisible line is one line, or an indivisible surface is one surface. Nor does this unity name one entity of a class but it is rather what makes one entity separate from other entities, in other words, flexible quantity exists in material substance. From this, some will say a certain quantity is the principle of indivisible being, of individuation and of natural unity in individual substance, because division and indivisibility coincide within it, since a thing exists through itself as indivisible even within those elements that are part of it. I do not believe that individuation in substance happens through quantity, but rather through being one instance of a particular class, encompassing whatever accidental individuation that also exists within it. I think that any one category is individuated by intrinsic or essential individuation through being one instance of its class. But I speak carefully of this since it is really the speculation of another. This accidental unity, although it does not differ in reality from things of its own class, it

humanity.” W.A. Wallace, “Form,” *NCE*, 1014.

nevertheless differs in reality from things of another class which it affects and names, such as quantity.

In *Quodlibet* 6, q. 4 (“Utrum substantia creata possit esse immediatum principium alicuius sui actus”), Godfrey of Fontaines discusses the concept of prime matter. For Godfrey, prime matter is the passive principle of being, it is of a being’s act or perfection (“esse est actio sive actus qui immediate fluit ab essentia substantiae”).²⁸² He continues this theme in the next question of this same quodlibet (“Utrum aliquod accidens unum numero possit esse in duobus naturis”), where he argues that many accidents of the same species cannot be in the same subject and similarly one accident cannot be in two species.²⁸³ It is here that he explains his view of the relationship of quantity to the composition of matter and form: “sicut una et eadem essentia materiae est successive sub diversis formis

²⁸² Godfrey of Fontaines, *Les Quodlibets de Godefroid de Fontaines*, 115.

²⁸³ “Et hoc patet per eos qui ponunt habitus augeri vel intendi per additionem eiusdem secundum speciem. Si enim possibilis est talis additio, manifestum est quod non potest intelligi nisi sic quod additum cum eo cui additur fiat unum numero, sed intensius. Impossibile est ergo quod duo accidentia quae sunt eiusdem rationis et speciei fiant unum subiectu et quod duo maneat et distincta” (“And this is demonstrated through those things which have the characteristic of being augmented or extended through the addition of a second species. For if such addition is possible, it clearly cannot be understood unless something is added to something but makes it one in number, and just intensifies it. It is impossible therefore that two accidents, which are of the same principle and species, could make one subject and still have the two accidents remain distinct”) (Godfrey of Fontaines, *ibid.*, 123).

substantialibus, ita eadem quantitas numero haberet esse successive in duobus
subjectis non solum numero sed specie differentibus” (“just as one and the same
essence of matter exists successively under diverse substantial forms, thus the same
quantity by number will have being successively in two subjects not by number
alone but by species of different things”).²⁸⁴ Question 16 in this same quodlibet
 (“Utrum si corpus humanam resurget sine quantitate esset idem numero quod
prius”) expands further on the relationship of quantity to the composition of form
and matter:

Et quia non est nisi duplex genus partium entium actu, scilicet secundum
essentiam et formam, quia unaquaeque forma secundum se et absolute
considerate non nisi specificiter per se distinguitur ab alia, item secundum
quantitatem et extensionem, quia unumquodque extensum et quantum per
se habet partes eiusdem rationis secundum se, ut linea, tempus et huiusmodi
quae non distinguuntur formaliter et secundum speciem ab invicem, scilicet
partes lineae inter se et partes temporis et sic de aliis; ideo videtur quod
quaecumque carent quantitate oportet esse differentia sic numero quod
etiam different secundum speciem; et solum in illis, in quibus potest esse
quantitas, potest esse differentia secundum numerum absque differentia
secundum speciem.

And because there are only two classes of the parts of being by act, that is,
according to essence and form, so a form exists according to itself and may
be considered absolutely, not necessarily specifically, and through itself is
distinguished from another. Similarly it is with quantity and extensibility,
since however long something may be, or however many parts may exist
within its own rationale of being; for example: take a line, or time, and the
way they may be distinguished formally and according to their species, just
as the parts of a line may be discerned from each other, or the parts of time,

²⁸⁴ Ibid., 126.

and so it seems that whatever quantity is missing, is necessarily the difference or number that they differ according to species; and only in these things, in which we can quantify, can there be a difference according to number, absent a difference according to species.²⁸⁵

Wippel analyzes Godfrey's stance on this issue: "For Godfrey, as for Aquinas, primary matter is pure potentiality, incapable of existence without substantial form . . . He was sharply critical of the various theories of plurality of forms . . . Since substantial form serves as the principle of transcendental unity in created substances, it is also the formal principle of individuation. Since quantity, however, is the principle of numerical unity in material substances, it is also the material dispositive cause of individuation."²⁸⁶ Godfrey deals with this issue at length in *Quodlibet* 2, q. 10, but also discusses it in *Quodlibet* 2, q. 7. Wippel summarizes Godfrey's refutation of these three theories: 1) there is a substantial form in man's genus and a substantial form in his specific difference; 2) the elements in man's body are mixed to form a composite of forms; and 3) because man is in part material and in part incorruptible he is a mixture of these and therefore there is a plurality of forms in man.²⁸⁷ The first argument is dispelled

²⁸⁵ Ibid., 259.

²⁸⁶ John F. Wippel, "Godfrey of Fontaines," *NCE*, 578.

²⁸⁷ Wippel, "Godfrey of Fontaines and the Intension and Remission of Accidental Forms," 317-328.

with because it goes against the substance's essential unity. The second and third arguments contain thoughts more relevant to the discussion at hand:

A mixture comes into being when the elements involved undergo corruption both in terms of their accidental and substantial being and when an appropriate agent produces a new substance, a mixture, together with some intermediary quality which in some way falls between the qualities of the mixed elements. Thus, this new quality will differ from the former ones not in degree (by intension or remission) but in species. . . . This is not to imply, warns Godfrey, that the new intermediary quality itself consists of really distinct parts, but only of virtual parts that are logically distinct.²⁸⁸

In refuting the third argument, Godfrey states that an actuality cannot be added to another being without producing a new being. On individuation, he divides this into two concepts: he sees the formal cause of individuation as substantial form and the material cause of individuation as quantity. Godfrey distinguishes himself from Aquinas, who held that quantity was the formal principle of individuation.²⁸⁹ Duns Scotus, on the other hand, dismisses quantity altogether as the foundation for individuation (*haecceitas*).²⁹⁰

²⁸⁸ Ibid., 328.

²⁸⁹ Jacobus had also asserted his disagreement with Aquinas on this issue (see pp. 228-229 above, the section beginning: "Non credo quod individuatione in substantia sit per quantitatem").

²⁹⁰ One can compare members of a common species because they all have a common nature, but the individual possesses an intrinsic uniqueness that distinguishes it from another individual, a "thisness" or "haecceitas." So, the individual is a combination of a common nature and haecceity. On Duns Scotus's conception of the common nature, see J. R. Cresswell, "Duns Scotus on the

In addition to his definitions of essential and accidental unity, Jacobus also gives a definition of unity that relates to the division of unity, a unified whole, into parts. This section specifically concerns the notions of the continuum, multitude, and how the continuum may be divided into the parts that constitute number:

. . . quae est indivisa quantitas, actualiter dividitur in partes plures, ex qua divisione numerus causatur qui est determinata species quantitatis. Et talis unitas, antequam sit actu divisa, est principium numeri ex ea venientis, et est totus ille numerus in potentia, differens ab illo, ut continuum a discreto, et totum a partibus. Est enim quaelibet unitatum numeri causati pars totalis primae unitatis et pars numeri causati, licet differenter. Unitas igitur, ex cuius divisione numerus causatur, dicitur principium numeri, sed unitas actu divisa contra aliam dicitur pars numeri. Ex divisione igitur continui numerus causatur, idest ex divisione unius indivisae quantitatis, quia si dividatur partes in duas tantum, causatur binarius, si in tres trinarius, si in quattuor quaternarius, et sic de aliis numeri speciebus. Nec oportet ad hoc ut ex divisione alicuius unitatis numerus causetur quod illa fiat in partes aequales, sed sufficit quod fiat in partes actualiter ab invicem discretas, sive aequales sint ut inter se comparantur, sive inaequales. Semper autem ad hoc, ut sit numerus in actu, plures requiruntur unitates actu distinctae, quia sola unitas non potest facere numerum in actu. Unitas autem quae est ipsum continuum actu indivisum et ex cuius divisione numerus causatur, licet sit totus ille numerus in potentia, differt tamen realiter ab illo, primo quia sunt distinctae species realis praedicamenti, ut sunt quantitas continua et discreta, secundo quia sunt obiecta distincta potentiae realis de quibus distinctae sunt scientiae reales, ut arithmetica et geometria, tertio quia actio realis terminum habet realem. Divisio autem continui actio realis est ipsius dividendi et illa terminatur ad numeri formam. Unitas autem, licet formaliter dicat indivisionem, non dicit illud respectu numeri vel multitudinis cuius est pars et mensura, sed dicit indivisionem in ente quod denominat, et, ideo quod unitas dividatur in partes integrales, non provenit hoc ex ratione sua formali, quae est indivisio, sed ratione substracti vel sui fundamenti cuiusmodi est tale ens ut quantitas continua quae, etsi sit una et

Common Nature," *John Duns Scotus, Studies in Philosophy and the History of Philosophy* 3 (1968): 122-32.

actu indivisa, divisibilis est tamen ratione suae dimensionis. (*SM* 1.31, 94)

. . . undivided quantity, may be, in actuality, divided into many parts, and it is from this division that number, which is the determinative species of quantity, is created. This unity, before it is actually divided, is the beginning of number and where all number starts from, and it is whole number in potency, but differing from it, so that a continuum is created from discrete entities, and the whole from its parts. Any whole part of prime unity and any part of created number may be differentiated from each other as the unity of created number. Unity therefore, is created from the division of number, it is said to be the beginning of number, but this act of division produces unity, as opposed to that which is said to be a part of number. Number is caused from division of the continuum, number exists from the division of one indivisible quantity, because if it is divided into two parts, the binary number is created, if into three, the ternary, if into four, the quaternary, and so on all the way through the other species of number. It does not necessarily follow that number is created from the division of some unity because it is made into equal parts, rather, it is sufficient that it is made in actuality into discrete parts, regardless of whether, if these parts were to be compared to each other, they were equal or unequal. Related to this, there are always many distinct unities in actuality, because a single unity cannot make number in actuality. Unity, therefore is what exists through the act of this indivisible continuum, and from the division of which number is created, and while the whole of that number may exist in potency, it nonetheless differs from it in reality, because there are distinct real species predicated of this real thing: firstly, because there are continuous and discrete quantities; secondly, because there are distinct objects of real potency, which are within the realm of the real sciences, such as arithmetic and geometry, and thirdly, because a real action has a real terminus. The division, therefore, of the continuum is a real action of dividing, which terminates in the form of number. Unity, then, is formally said to be indivisibility, not said with respect to number, or multitude (which is part and measure), but is said to be the indivisibility of being, which it names, and, since unity may be divided into integral parts, this does not happen with respect to its formal principle, which is indivisibility, but rather from its substantial or fundamental principle, so that an entity such as continuous quantity, although it is one and by act indivisible, is divisible by reason of its dimensions.

This section is heavily again reliant on Thomistic philosophy and the idea of unity as convertible with being. The section on unity in number also echoes Aquinas:

Sciendum autem, quod duplex est unum; quoddam scilicet quod convertitur cum ente, quod nihil addit supra ens nisi indivisionem; et hoc unum privat multitudinem, in quantum multitudo ex divisione causatur; non quidem multitudinem extrinsecam quam unum constituit sicut pars; sed multitudinem intrinsecam quae unitati opponitur. Non enim ex hoc quod aliquid dicitur esse unum, negatur quin aliquid sit extra ipsum quod cum eo constituat multitudinem; sed negatur divisio ipsius in multa. Aliud vero unum est quod est principium numeri, quod supra rationem entis addit mensurationem; et huius unius multitudo est privatio, quia numerus fit per divisionem continui. Nec tamen multitudo privat unitatem totaliter, cum diviso toto adhuc remaneat pars indivisa; sed removet unitatem totius.

We should realize that there are two sorts of one. Namely, there is the one which is convertible with being, which adds nothing to being except being undivided; and this one is the privation of multitude, insofar as multitude is created by division. However, this is not extrinsic multitude, of which one is a part, but rather the intrinsic multitude that is the opposite of unity. For just as from this something may be said to be one, it is not negated that there may be something outside of it that may comprise a multitude with it, but what is negated is its own division into multiple entities. The other sort of one is that which is the beginning of number, and the addition to which is the notion of measurement; and the multitude of this sort is a privation of oneness, for a number is created by the division of the continuum. Nevertheless, multitude is not entirely the privation of unity, since with the division of the whole there remains an indivisible part, but it does take away the unity of the whole.²⁹¹

²⁹¹ *Quaestiones disputatae de potentia*, q. 3, a. 16, ad 3-um, quoted and translated by, Gyula Klima, "Aquinas on One and Many," available from <http://www.fordham.edu/gsas/phil/klima/ONE.HTM> (accessed February 25, 2007).

In Book 4 of *Speculum musicae*, a book that deals with the ordering of consonances in terms of perfection and imperfection (a “scale of perfection”), Jacobus again spends two more chapters discussing this metaphysical question.²⁹² I have laid out the structure of Book 4 in Table 9 to allow the reader to see the philosophical concepts that are explored in this book and the order in which they are presented.

Table 9 *Speculum musicae* Book 4 content summary

	Chapters	Content
Introduction	1	Introduction
	2	Genus (matter and form)
	3	Groupings of consonances
	4	The names of the consonances
	5	Matter (sound)
	6	Form (mixture of sound)
Important Concepts	7	Introduction
	8	Sense of hearing
	9	Intension and remission of sound
	10	Positions on the monochord
	11	Practical use of consonances
	12	Simplicity v. complexity
	13-14	Whole v. parts
	15	Intervals
16-17	Species of intervals	
Philosophy of Perfection	18	Order

²⁹² The following chapters of Book 4 are also philosophical in tone: 1 (Introductory), 2 (Genus; matter and form), 8 (Sense of hearing), 12 (Simplicity and Complexity), 13 (Whole and Parts), 18 (Order), 19-20 (Priority and Posterity).

	19-20	Priority in the order of things
	21-22	Perfection
	23	On the priority of the diapason
	24-26	Order of consonances according to three ancient systems
	27	Perfection in consonances
	28	Degrees of general essence
	29-30	Degrees of species
Concord and Discord	31	What is concord and discord
	32	What is concord
	33-37	Perfect - media – imperfect concord
	38	What is discord
	39-40	Perfect – media – imperfect discord
	41-48	Reasons for concord
	49	Location on the monochord
	50	Cadences
	51	Conclusion

Chapter 21 is entitled “*Diversae acceptiones de perfecto*” (“Diverse understandings of Perfection”) and Chapter 22 is entitled “*Unde res suam sumat perfectionem*” (“How a thing assumes its perfection”). I will focus here on Chapter 22, as it is quite difficult, and try to trace the influences in this chapter. Chapter 21 covers well-known ground, primarily from Aristotle’s *Metaphysics* on form and matter and their participation in being. Then, in Chapter 22, when Jacobus begins to discuss species and how they may be differentiated, things begin to get interesting.

He says:

Potest autem prioritas perfectionis essentialis attendi quantum ad gradus generales vel quantum ad specificos. Et species ad genus comparari possunt

vel inter se. Si ad genus, sic, cum sint coequae in naturae generis participatione, videbuntur ut sint coequae in perfectione quam trahant ex genere. Si vero inter se, quantum ad gradus específicos et distinctos quos important, conferantur, sic: in essentiali perfectione, distinctae sunt in tantum ut videatur sentire Philosophus in toto universo duas species aequalis perfectionis nullatenus reperiri. (*SM* 4.22, 54)

A priority of essential perfection can be directed toward degrees of genus or to degrees of species. And species may be considered with respect to their genus or compared to each other. If they are compared to their genus, then, since they equally participate in the nature of that genus, they may seem as if they equal with regard to the perfection that they take from the genus. If they are compared to each other (species to species), with respect to the specific and distinct degrees [of the genus] that they contain, then: in essential perfection, they are distinct inasmuch as the Philosopher intuited that, in the entire universe, two species equal in perfection could never be found.

The nature of the species is to be found in the distinct degrees of perfection contained within the particular species. He goes on:

. . . intelligi videtur illud Philosophi dictum: aequivocationes latent in generibus pro quanto genus per prius secundum viam perfectionis dicitur de specie una quantum de alia quae analogiae prioritas nasci videtur, non ex ea parte qua species genus respiciunt, quod, inquit, et univoce de qualibet patet et cuius natura tota salvatur in qualibet, sed ex ea parte qua species inter se, secundum gradus suos proprios et específicos, conferuntur. Unde altera differentiarum, qua genus dividitur et in species descendit, quantum est ex parte nominis, rationem dicit positivam, altera negativam vel privativam.

. . . Comparari autem individua sic videntur ad speciem, ut species ad genus. Species autem ad genus comparatae etsi sint aequales quantum ad perfectionem quam importat genus in quo conveniunt, in quo indistinctae sunt, ut inter se tamen conferuntur, sicut formaliter specificè distinguuntur, sic ab invicem in perfectione, quantum ad gradus específicos, separantur. (*SM* 4.22, 54-55)

. . . it seems the words of the Philosopher can be understood as follows: equivocations are present within genera, so that within a particular genus, one species is separated from another as a prior step along the path of perfection, and whose priority of analogy is known, not from that part by which the species comes from the genus, since, he says, this is shown univocally of any species, and the whole nature of a species is predicated on this relationship, but rather equivocations are present from the part by which we compare species to each other, according to their proper and specific degrees. And so he calls one of the differences, by which a genus is divided and descends into species, as much as it is from a part of its name, he calls the reason positive, and the other, negative or privative.

. . . Thus individual entities may be compared to species, just as species are to their genus. When species are compared to a genus, although they might be equal in the perfection that the genus confers upon all entities that exist under it, and in this respect indistinguishable, when they are compared to each other, they are distinguished both formally and specifically, and so they are each separated in perfection, with respect to the degrees of their species.

In this chapter, Jacobus uses the occasion to claim as erroneous the statement of Averroës, that there is one intellect placed in man (“Unde multum erravit ille commentator Averois intellectum unum in numero ponens in omnibus hominibus”), and so again, sides with Thomas on this issue.²⁹³ Jacobus also refers to the concept of “atomic species,” which may be understood as the ultimate species: a species that cannot be further subdivided into species.²⁹⁴ We get the

²⁹³ Thomas Aquinas, *Tractatus de unitate intellectus contra averroistas*, ed. L. W. Keeler, *Textus et documenta series philosophica 12* (Pontificia Universitas Gregoriana, 1957).

²⁹⁴ Jacobus also refers to the “minima vel athoma” in his discussion of the

semibreve in *SM* 7.17, 36. Kilcullen gives a useful explanation of the concept of atomic species, along with some helpful examples: “An ‘atomic’ species means an ultimate species, a species not also a genus, one that is not further sub-divided into species. Is the human race an atomic species? If you think that the various races and types of human beings differ only accidentally or inessentially, that they all share the same human nature, then you are saying that the human species is atomic. In an atomic or ultimate species, Aristotle says, comparison takes place, but not in a genus. The reference is to Aristotle *Physics* VII.4, 249 a5 ff. An example he gives there may explain the point: ‘We cannot say that one is more coloured than the other where only colour in general and not any particular colour is meant; but they are commensurable in respect of whiteness’. White, red, blue, etc., are species of colour; colour in general is the genus; you can't say that some coloured thing is more coloured (the genus), but you can say that, in comparison with another coloured (white) thing, one is more white (the species). So comparison (in the sense of ranking) as more or less can take place in the species, but not in the genus. Then Scotus argues: ‘this true unity’ (i.e. the unity an atomic species has that a genus does not have) ‘is not a unity of reason’ - i.e. a unity imposed by us, by our grouping things together under one concept, ‘since the concept of a genus is just as much one’, since we also group things into genera under a single concept. Otherwise, if the concept of a genus were in fact a collection of different concepts - for example, if the concept of animal were simply the set of the many concepts of dog, horse, human being, etc., - then when we said ‘A horse is an animal’ we would really just be saying ‘A horse is a horse’, since horse would be the applicable one of the set of concepts of animal. As Scotus says . . . ‘the same would be predicated of itself’, ‘A horse is a horse’. When Aristotle says that the unity of an atomic species permits comparisons of more and less whereas a genus does not have unity enough for that, he is not talking about unity of concept (a unity of reason) but about some sort of real unity - the real unity of a specific nature. . . . But, on the other hand, he does not mean that it is one with numerical unity - that would be too much unity: in a numerical unity there is no comparison of more and less; if two white things were in fact one numerically you could not say that one was more white than the other. So a species, such as white things, must have a certain real unity greater than the unity of a genus, yet less than numerical unity.” R.J. Kilcullen, 1996. "Scotus on Universals," available from <http://www.humanities.mq.edu.au/Ockham/z3606.html> (accessed February 26, 2007).

clearest explication so far from Jacobus on his take regarding substantial form and accidental form, and how change and alteration occurs with respect to forms::

Forsitan etiam sic tenent aliqui de individujs sub specie contentis quod ipsa scilicet, ut ad speciem conferuntur, in perfectione, quae est secundum gradum specificum, conveniunt et aequalia sunt; quantum tamen ad gradus individuales, in individuali perfectione distincta sunt et inaequalia. Si sic intelligi debeat articulus ille Parisius condemnatus quod anima Christi non sit perfectior aut nobilior anima, inde error quia, quantum ad proprietates accidentales, naturales et infusas, nulli dubium fidei est. Nec distinctio in forma, quantum ad gradus individuales, speciem variat, sed ea quae est secundum gradus específicos, et, sicut gradus specificus in specie athoma vel specialissima indivisibilis est divisione specifica, sic individualis in genere substantiae indivisibilis est divisione individuali, non iam continens in se latitudinem plurium graduum individualium. Ideo forma substantialis individualis haec signata, puta anima huius equi vel leonis, non suscipit magis et minus; non est in potentia ad perfectiorem vel minus perfectum gradum in eadem forma, sed in hoc equo vel leone manet eadem anima in numero quantum diu vivunt, et, quantum ad hoc, intelligatur illud dictum Philosophi quod proprium est substantiae non suscipere magis et minus ut exponatur sic. Proprium est substantiae quae est una numero, ut, manens una numero numerositate formae, secundum determinatum et signatum gradum individualement substantialem, non suscipiat magis et minus, sicut proprietatem maxime propriam substantiae dicit Philosophus intelligendam esse de unitate numerali: Maxime, inquit, proprium est substantiae, cum sit una numero, quod susceptibilis est contrariorum, quantum ad formas accidentales; cui tamen repugnat ut, una numero manens, secundum formam distinctos gradus suscipiat individuales substantiales. Et in hoc multum distinguitur forma substantialis ab accidentali. Ad accidentalem enim dicitur esse motus, non ad substantialem. Accidentalis dicitur suscipere magis et minus, non sic substantialis. Accidentalis enim forma, secundum opinionem multorum, cum movetur et intenditur de imperfectiore gradu ad perfectiorem, vel e contrario, remittitur et movetur de perfectiore gradu ad imperfectiorem, manet una numero et stant simul gradus illi quantum ad illud positivum quod dicunt. Sed duo gradus formales substantiales et individuales sunt duae formae. Nequeunt facere formam unam numeralem. Cum enim mutatio fit de forma una substantiali ad aliam, adveniente secunda, non manet prior, sed corrumpitur, quamvis materia, prima quae immediatum subiectum est formae substantialis, maneat una

numero sub utroque termino. (*SM* 4, 55-56)

There are some who maintain that, with respect to individual entities contained within a particular species, these entities, as they are placed in perfection under a particular species, that is, according to a specific degree, are similar and equal; but, regarding their individual degrees, they are distinct and unequal in their individual perfection. So, if that condemned Parisian article contends the soul of Christ is not a more perfect or more noble soul, that is in error, because, with respect to its accidental properties, natural and infused, there is no doubt on the part of the faithful. And neither does distinction in form by individual degrees vary the species, but these things that are according to specific degrees, just as the specific degree in the atomic species or the most specific indivisible entity is specific by division, thus the individual in the genus of substance is indivisible by individual division, as it does not contain within itself the latitude of many individual degrees. In this way, the substantial individual form is signified. Think of the soul of this particular horse, or this lion, it does not receive more and less. It is not in potency towards a more perfect or less perfect degree of the same form, but in this particular horse or this particular lion its soul remains the same in number as long as it lives. We can apply the words of the Philosopher here: that it is not proper for a substance to receive more or less, as was explained above. It is proper for a substance that is one in number, remaining one in number by numerosity of form, and according to its determined and signified individual substantial degree, to not receive more or less, just the Philosopher says that the proper property of substance is principally understood as being through numerical unity: He says “principally,” for it is a property of substance, when it is one in number, to be susceptible to contraries, such as accidental forms; it is against its nature, while it remains one in number, according to its form, to receive distinct individual degrees. And in this, a substantial form is distinguished from an accidental one. For there is said to be motion in an accidental form, not so in a substantial form. An accidental entity can receive of more and less, not so a substantial form. An accidental form, according to the opinion of many, when it is moved and is intended from an imperfect degree toward a more perfect degree, or the contrary, it is remitted and moved from the more perfect degree to a more imperfect one, it still remains one in number, and these degrees stand simultaneously. But two formal substantial and individual degrees are two forms. They cannot make one numerical form. For when one substantial form changes another,

when the second form comes to be, the previous form does not remain, it is destroyed, even though the matter, the first which was the immediate subject of the substantial form, remains one in number under the other terminus.

Jacobus argues that the individual in the genus of substance is indivisible by individual division, not already containing in itself the latitude of many individual degrees. Its substantial form does not admit of variation of degree: only in its accidental forms (of quality, and so on) may there understood to be variation or latitude. In that which makes up the essence of a being, there is no latitude of form. In this, then, Jacobus takes the side of Thomas Aquinas and Godfrey of Fontaines, and against Duns Scotus who argued that there was a plurality of forms imbued in individuals:

Thus, while according to Aquinas man is all that he is substantially (corporeal, animal, rational, Socrates) in virtue of his one soul, according to Scotus each determination (generic or specific) adds a new form to man. In this way, man would be corporeal in virtue of a corporeal form, animal in virtue of a superadded animal form, etc., until he becomes Socrates in virtue of his ultimate personal form.²⁹⁵

Dumont sees Henry of Ghent as the source for Scotus's thought: he characterizes Henry of Ghent as mounting the most sophisticated Augustinian response to the Aristotelianism of Aquinas. Henry of Ghent deals with the unity-of-form issue in a number of his quodlibetal questions. Regarding Scotus and degrees of accidental

²⁹⁵ Rosenberg, "Form," *NCE*, 1014.

perfection, he says: “white can be differentiated into degrees of shades, yet these degrees do not form a different species of colour. Yet this diversity within the form of whiteness is not one produced by specific *differentiae*, otherwise every shade of white would constitute a different species of colour. Rather, the intensive grades of a form result from *differentiae* less than specific, albeit real, because they are intrinsic to the nature of the form itself.”²⁹⁶

MENSURAL THEORY AND THE UNITY OF FORM

How, then, were these concepts applied to music theory of the early fourteenth century? Dealing first with Jacobus and Johannes de Muris, the first

²⁹⁶ Stephen Dumont, "Henry of Ghent's Philosophy," in *Medieval Philosophy*, ed. John Marenbon (London and New York: Routledge, 1998), 317. Dumont speaks to Henry's understanding of analogy here: "Henry of Ghent followed the common opinion in holding that being is predicated of God and creatures, neither univocally nor purely equivocally, but analogously. The traditional understanding of the terms was based on Aristotle. The definitions of univocity and equivocality derived from the opening chapter of the *Categories*, while the notion of analogy was taken chiefly from the treatment of being as an equivocal by reference in the *Metaphysics*. Thus, a term is univocal if it has a single meaning or concept (*ratio, intentio, intellectus, conceptus*) when applied, such as 'animal' when predicated of a horse and a human being. It is pure chance equivocal (*aequivocum in casu*) if it is applied according to completely discrete and unrelated meanings, such as the 'bark' or a dog and a tree. Analogy, however, is intermediate between these two extremes of univocity and equivocality. An analogous term has different but connected meanings, so that one is primary and the other is related to it, usually either as a cause or an effect. . . . Henry is adamant that there can be no concept of being absolutely taken apart from the concepts of God and creature, as if there were some single, simple concept of being common to them" (299-300).

question that must be asked is what exactly the ‘things’ (*res*) of mensural music theory were? It is necessary to distinguish between the definitions of the terms used by these theorists to describe the entities of mensural music, such as *vox*, *notula*, *figura*, and *tempus*. Which terms refer to the musical figures themselves (that is, those geometrical shapes drawn in black ink), which to the sounds that they signify, and which to the lengths of time taken up by the sounds represented by the shapes? Are the notational figures, as concepts, distinct entities in themselves? What are the definitions given for each of these terms, that is, what defines the essence and existence of each? Once we have clarified the definition for each of these terms, we might then understand what can be correctly predicated of them.

Johannes de Muris describes *vox* (pitch) as a natural form that is joined *per accidens* to quantity. In this passage from Chapter 2 (“De numeri ternarii perfectione”) of *Notitia*, Book 2, Muris describes quantity as secondary to the form of pitch, that is, non-essential its form:

Quoniam ergo vox tempore mensurata unionem duarum formarum, naturalis scilicet et mathematicae, comprehendit, licet quod ratione alterius fractio non cessaret, tamen propter aliam vocis divisionem necessarium est alicubi terminari. Nam sicut omnium natura constantium positus est terminus et ratio magnitudinis et augmenti sic parvitas et diminuti. Demonstrant enim naturales, quod natura ad maximum et minimum terminatur.

Vox autem est per se forma naturalis iuncta per accidens quantitati. Igitur oportet eam habere terminos fractionis, quorum latitudinem nulla vox quantacumque frangibilis valeat praeterire. Hos autem terminos volumus

comprehendere ratione. (*Notitia*, 69)

Seeing, on the other hand, that sound measured by time consists in the union of two forms, namely the natural and the mathematical, it follows that because of the one its division never ceases, while because of the other its division must necessarily stop somewhere; for just as nature limits the magnitude and increase of all material things, so it also limits their minuteness and decrease. For natural things demonstrate that nature is limited by a maximum and a minimum.

A pitch, moreover, is in itself a natural form to which is joined the accidental form of quantity; it is necessary, therefore, for there to be limits of division beyond which no sound, however fractionable, may go. These limits we wish to apprehend by reason.²⁹⁷

Muris understands pitch (*vox*), then, as an entity existent in the realm of natural things, and so makes the case that it has clearly defined *termini* (both in terms of high and low, but also in terms of long and short). Muris focuses on the physical aspects of pitch as it is perceived through the sense of hearing.

In Chapter 4 (“De Protractione Figurarum”), Muris discusses the entities of notation. He describes the musical note (*notula musicalis*) as an essential form, or as a natural form after imposition.²⁹⁸ The essential form of a note is that it is a significative figure:

²⁹⁷ Translation mine, modified from the one given by McKinnon, *Strunk’s Source Readings*, rev. ed., 153.

²⁹⁸ The term imposition is unclear in this context. Muris could simply be implying that the essential form of the note is imposed upon the material substance of the pitch. However, imposition had a particular connotation in medieval logic:

. . . in genere convenit omnis notula musicalis per eamque formis essentialibus variatam omnis modus cantus cuiuslibet explicatur, essentialibus dico, id est naturalibus figurae post impositionem, vel essentialibus, id est de forma essentiali notulae, id est figurae significativae. (*Notitia*, 75)

In it, every musical note shape converges, as if within a genus, and through it, varied in its essential forms, every mode of any song is explained. When I say “by essential,” I refer to the “natural” forms of the figure after imposition, or to the “essential” form of the note, that is, the figure that carries meaning.²⁹⁹

So, the definition of a musical note (*notula*) is a significative figure (*figura significativa*), a bearer of meaning to the musician who is reading the notes. This is the essential form of a *notula* for Muris, imparting meaning upon a natural form. In

according to Boethius, “meaning is established by an act of ‘imposition’, i.e., name-giving or reference-setting, and the influential idea that to signify (*significare*) is to “establish an understanding” (*intellectum constituere*). . . . Especially in his more elaborate second commentary on *Peri Hermeneias*, Boethius discusses at length the interrelations between the four elements of linguistic semeiosis mentioned by Aristotle, i.e., between external objects or things (*res*), mental concepts or representations (*passiones, intellectus*), spoken words (*voces*), and written words (*scripta*).” Stephan Meier-Oeser, “Medieval Semiotics,” in *The Stanford Encyclopedia of Philosophy (Winter 2003 Edition)*, ed. Edward N. Zalta, available from <http://plato.stanford.edu/archives/win2003/entries/semiotics-medieval/> (accessed March 2, 2007). The distinction of significative figures was made by Abelard: “he introduces a distinction, distinguishing between signs that simply signify (*signa significantia*) and signs that are, as significative signs (*signa significativa*), i.e., as bearers of meaning, involved in processes of intended sign-giving. Abelard *De dial.*, 1956: 111; *Log. ‘Ingredientibus’*, 1927: 336ff.” Meier-Oeser, *ibid.*

²⁹⁹ Trans. Strunk, revised by McKinnon in McKinnon, ed., *Strunk’s Source Readings*, rev. ed., 155.

the second and third conclusions of the nine conclusions, Muris further clarifies his use of the terms *notula* and *figura*:

Etiam perfectum et imperfectum figura simili designantur per doctores. Possibile est, tempus <<longum>> esse perfectum et imperfectum. Sed perfectum per brevem importatur, ergo et imperfectum. Possibile ergo est brevem esse imperfectam. Sed imperfectum per sui medietatem sibi additam transit ad perfectum. Ergo brevis imperfecta sui medietate sibi addita, quae semibrevis est, redit ad perfectam. Semibrevis ergo addita cum brevi imperfecta perficit eam, igitur imperficit et remota.

Nec obstat figurae diversitas, quia figura figuram non imperficit, cum omnis figura sit formaliter perfecta. Sed illud, quod nomine unius figurae significatur, imperficit illud, quod nomine alterius importatur. Figura autem signum est, res musicalis significatum. Signum est ens perfectum per suam formam primariam, similiter et significatum. Unumque accidit alteri, facientes ambo unum per aggregationem, quod musicalis notula nuncupatur. Est enim notula figura quadrilatera soni numerati tempore mensurati ad placitum significativa.

Notula ergo duas includit formas: figuram quadrilateram, quae primaria est, et significationem, quae secundaria est. Est autem significatio id, quod perficitur et imperficitur, non figura. Unde sicut vox ad vocem grammaticae non dependet neque causat constructionem, sed modorum significandi rerum proportio, sic figurae ad figuram nulla est proportio musicalis, sed ex proportione rerum musicalium perfectioneque et imperfectione earundem causatur consonantia musicalis. Nam figura per figuram non minuitur nec augetur, sed res figurae nomine designata.

Unum enim tempus tria tempora ponitur comprehendens et in hoc perfectum est. Dicitur imperfici tertia parte dempta et iterum perfici, si addatur. Non de figuris igitur fit quaestio, sed de rebus. Imaginandum quoque est ternarium ad binarium reduci vel econtra quantum ad eorum materiam et non formam. Haec autem sciunt mathematici sapientes. (*Notitia*, 90-92)

Teachers designate perfect and imperfect with similar figures. It is possible for *tempus* to be perfect and imperfect. But the perfect *tempus* may be continued through a breve, and is therefore imperfect. It also possible for a breve to be imperfect. It reaches a perfect breve through the addition to it of its half. In other words, it returns to perfect through the addition to it of half of it, which is a semibreve. The added semibreve along with the imperfect breve perfects it [the breve], therefore the remote part imperfects it.

The diversity of the figures does not contradict this theory because a figure does not imperfect another figure, since every figure is formally perfect. But that which is signified by the name of the figure is imperfected, and that will then take another name. Moreover, a figure is a sign - the signified musical entity. The sign is a perfect entity through its primary form, and it is similarly signified. In whatever way it is altered, perhaps by added a tail to it, that is called a musical note. A note is a quadrilateral figure of numbered sound, measured by time, and signified as convention dictates.

A musical note therefore includes two forms: a quadrilateral figure, which is primary, and a signification, which is secondary. Moreover, it is the signification that is perfected and imperfected, not the figure. So, just as the sound of the grammatical letter is not dependent upon, nor is the reason for, its particular shape, but rather signifies by way of these two entities the relationship between them, there is no musical relationship of a figure to another figure, but musical consonance is created by the relationship of musical things and by their perfection and imperfection. For one figure is not lessened or augmented through another figure, but rather the thing which is designated by the name of the figure [is lessened or augmented].

It must be understood that one *tempus* may be placed for three *tempora* and in this it is perfect. It is said to be imperfected by the removal of its third part and to revert again to perfect if it this part is added back. And so the question relates not to figures at all, but to things. The reduction of the imagined ternary to binary and its converse relates to its matter and not its form. Moreover, wise mathematicians know this to be true.

Johannes de Muris emphasizes that one note does not imperfect another (this is one of the major objections Jacobus raises with the *ars nova*), since all figurations themselves are *formally* perfect, but rather it is that *matter* (that is, sound), which has been signified by the name (*nomen*) of the figure, it is that which is imperfected.³⁰⁰ Musical notes then, contain two forms, the quadrilateral figure, which is the primary form, or essential form, and its signification, which is the secondary form. It is “that which is signified” (*significativa*) which is perfected or imperfected, or, as he clarifies with a musical example, when the length of the note

³⁰⁰ In Chapter 40 of *Speculum musicae*, Jacobus discusses the whether musical notes have the capability of action: “. . . quia quod agit in aliud naturaliter, agit per potentiam activam in ipso existentem, sicut quod ab alio patitur. Patitur per potentiam passivam in ipso manentem; agit enim agens non in quodcumque sed in patiente et disposito. Una autem notula, respectu alterius, non videtur habere potentiam activam et alia, respectu illius, passivam. Res enim mathematicae non agunt, nec sunt principium agendi, sed hoc qualitatibus debetur activis et passivis. Notulae autem musicae res important mathematicas ut quantitatem continuam vel discretam. Item una notula musica non videtur agere in aliam actione voluntaria quia actio voluntaria actio est libera quae se habet ad oppositum. Talis autem actio ad artem non pertinet” (“In the realm of natural things, when something acts upon another thing, it acts through an active potency in this existing thing, in the same way the action is undergone by another. It is undergone through the passive potency remaining in it; its “acting” may be described as acting not “in” something, but rather undergoing or being disposed to an action. In this way, it seems that one musical note, with respect to another note, has an active potency, and the other has a passive potency. For mathematical things do not act, they are not the beginning of action, but they may be said to have active and passive qualities. Musical notes do contain mathematical qualities such as continuous or discrete quantity. For it seems that a musical note does not act upon another by a voluntary action because a voluntary action is that which something is free to do, or to do the opposite. Such an action does not seem to pertain to this art”) (79).

is reduced from three to two, the note is reduced in its matter and not in its form. It should be noted that this definition contradicts or confuses the definition of *notula* given above in Chapter 4 of *Notitia* where Muris said that the signified figure is the essential form of the musical note.

In Chapters 41 to 44 of his Book 7, Jacobus responds directly to the nine conclusions laid out in the *Notitia* of Johannes de Muris. Jacobus asserts that Johannes incorrectly accords primacy to matter in his new notational theories. As we have shown above, Jacobus followed the philosophies of Aquinas and Godfrey of Fontaines in this regard, where he held that the essence of any one entity, including a musical note, is based on its form, since matter is devoid of any actuality, and correct explications of notational theory should outline only these essential forms. Any theory that accords primary importance to matter focuses on the accidental rather than essential qualities of these forms. When we read Jacobus's Book 7 in this light, we can see the influence of the unity-of-form thesis upon Jacobus's reasoning, and also the theories regarding the successive nature of the latitude of form, particularly as explicated by Godfrey of Fontaines.³⁰¹

³⁰¹ I think Tanay fundamentally misunderstands the independence of Jacobus on this issue: "The problem with this argument is that the issue at stake is the need to distinguish not between two species (say a table and a dog, each of which, according to Aristotle, is defined exclusively through its unique essential form) but between two members of the same species, (say between two men or between two longae). Now, according to Aristotle, matter does individualize one individual from another particular of the same species, not the form or essence as

Jacobus tackles Johannes de Muris's first conclusion that a perfect long may be imperfed by a breve: "Omne perfectum per tertiam sui partem amotam ad imperfectum reducit. . . . Per brevem igitur longa perfecta redditur imperfecta" ("Every perfect [long] is reduced to an imperfect [long] through its third removed part. . . . Through a breve, therefore, a perfect long is rendered imperfect") (*Notitia*, 70). Jacobus responds to this assertion by making a strongly-argued case, outlining three opposing arguments. He regards the position set forth by Muris in this first conclusion as the foundation for all of his nine conclusions and thus spills the most ink disproving this first conclusion:

. . . dicendum primo quod videtur hic "imperfecta" locutio quia perfectum proprie non reducit ad imperfectum, nec perfectum proprie nascitur ab imperfecto nec ad ipsum inclinatur, sed e contrario.

Secundo dicendum quod perfectum per amotionem tertiae suae partis, si illa sit de essentia sua, non iam imperficitur sed destruitur et corrumpitur ut domus, si fundamentum, parietes vel tectum tollatur; triangulus, si altera trium linearum vel trium angulorum; ternarius, si unitas. Similiter si a longa perfecta sui tollatur tertia pars, ipsa destruitur et in longam mutatur imperfectam.

Tertio dicendum quod, si a tempore continuo tertia pars tollatur, illud non proprie imperficitur, sed minuitur, sicut linea divisibilis in tres partes aequales, si ab ea tertia pars resecetur, non propter hoc imperficitur, sed

Jacobus mistakenly argued" (*Noting Music, Marking Culture*, 110). The point is, as I have argued above, that there was an entire medieval tradition of interpretation of Aristotle on this issue, and the individuating principle was one of the primary points of contention.

minuitur cum illud quod remanet divisibile sit in tres partes aequales (sicut prior linea) licet minores. Sic longa trium temporum aequalium, si alterum tollatur, nihilominus quod remanet, secundum Modernos, etiam secundum hunc doctorem in sua nona conclusione, ut infra patebit.

Dato etiam quod brevis potentiam habeat imperficiendi longam perfectam (quod concedendum non est), non sequitur tamen quod eam imperficiat si cum ea iungatur, quia non omnis potentia iuncta est suo actui. Non omne generabile generatur vel in futurum generabitur. Non loquor autem de actu immanente vel formali ut est albere respectu albedinis vel calere respectu caloris, sed de transeunte ut est calefacere respectu calefactibilis. (*SM* 7.41, 81)

. . . first, it must be said that this pronouncement itself seems to be imperfect, because perfect cannot properly be reduced to imperfect, and neither is perfect properly known from imperfect, nor is it inclined to it, but rather the contrary is true.

Second, it must be said that if a third part is removed from something which is perfect, it is removed from its essence, and it is not “imperfected,” but rather destroyed and corrupted, just as a dome [is destroyed], if its foundation, or its walls, are removed; or a triangle [is destroyed], if one of its three lines or three angles [are removed]; and a ternary [is destroyed], if unity [is removed]. Similarly, if a third is removed from a perfect long, it is itself destroyed and is changed into an imperfect long.

Third, it must be said that, if a third part is removed from a continuous length of time, the time is not properly imperfected, but it is lessened, just as would happen with a line that is divisible into three equal parts: accordingly, if a third part is removed from it, it is not imperfected, but rather lessened, since that which remains can still be divided into three equal parts (just like a line) albeit smaller [parts]. Thus, with a long of three equal parts, if a part is taken away, nonetheless a long still remains, according to the Moderns, and according to this teacher in his nine conclusions as will be shown here.

If I allow, for the sake of argument, that a breve might have the potential of imperfecting a perfect long (although I have not yet conceded this point), nevertheless it does not follow that it imperfects it if it is joined with it, because not every potency is joined to its action. Not everything that is capable of being generated is generated or will be generated in the future. I do not speak therefore of an imminent or formal act, such as to whiten with respect to whitening or to heat with respect to heating, but rather about the intention of making hot that which is capable of being made hot.

Jacobus's argument is a direct reference to the latitude-of-forms theory:

Jacobus states that the perfect long is not imperfected by the breve, but rather the perfect long is completely destroyed and corrupted and is replaced by the imperfect long. In Chapter 42 he discusses more fully the first conclusion and repeats again the admonition that a breve is not to be thought of as a third part of a perfect long, that it can imperfect a perfect long, but rather an imperfect long and a breve taken together make up the value of a perfect long (the breve and the long are two separate species, different in essence and having two different formal definitions). He notes that a perfect long and an imperfect long do have the same figuration, but they should be understood as equivocations:

Aequivoce enim, ut visum est supra, una figura hanc et illam repraesentat notulam statque nunc pro una illarum, nunc pro altera, et quia aequivocationes discernuntur per adiuncta, inventae sunt viae ab auctoribus per quas sciatur quando figura, quae communis est aequivoce longae perfectae et longae imperfectae, stat determinate pro hac vel pro illa. (*SM* 7.42, 82)

As was seen above, one figure represents this note and then that note equivocally, or stands now for one and then for another, and since equivocations are always known from those things which they are joined to,

authors find ways to represent what they actually mean through things that are known about particular figures, and so that which is commonly an equivocation for a perfect long or imperfect long, can stand determinatively for this or for that.

He explains that although the figures are equivocal, they are still different species, and are known from each other by their position in relation to other figures. It is within the nature of the imperfect long to need to be joined to the single breve or its equipollent semibreves. Similarly: “longa autem perfecta secundum naturam et nomen suum per se stare potest” (“a perfect long, according to its nature and name, can stand by itself”) (*SM* 7.42, 82). Jacobus uses the standard example of equivocation: just as the word dog can be taken equivocally for the barking animal, for the constellation, and for the marine animal, none of these can change into the other, and so equally the equivocal entities of the perfect long and the imperfect long cannot be changed by the adjoining notes.³⁰² This type of equivocation would fall into the first division of equivocations given by Boethius: the perfect long and

³⁰² “Nec unquam invenitur in auctoribus, saltem antiquis, ut dicant brevem solam cum longa iungi perfecta imperficiendo eam. Sed absolute dicunt quod imperficit longam cui iungitur quia ipsam ostendit esse imperfectam, idest valore duo tempora, non quod vere perfectam imperficiat et imperfectam mutet. Sicut enim haec ditio ‘canis’ aequivoce sumitur pro animali latrabili, pro sidere coelesti, pro pisce marino (non quod unquam sidus coeleste fuerit animal latrabile, vel piscis marinus, et quod unum istorum in aliud mutetur), sic eadem figura nec sumitur pro longa perfecta nec pro imperfecta, non quod una illarum unquam in aliam convertatur per cuiuscumque notulae adiunctionem” (*SM* 7.42, 83). Similarly, for medieval logicians, questions of use and context were not thought to be crucial in the determination of a term as equivocal, analogical or univocal.

the imperfect long are purely chance equivocations where despite the occurrence of the same term (“long”) within their names, they are totally unconnected.³⁰³

Jacobus had previously discussed the form and matter issue in Chapter 13 (again within a discussion of whether time may be divisible into two equal parts):

Non valet ista responsio quia, qui sic dicunt, materialiter et non formaliter tempore perfectum et imperfectum inter se distinguunt, cum tamen materia principium distinctionis non sit, quia in fundamento naturae, idest in materia, nihil est distinctum, secundum Commentatorem. Sed actus est qui distinguit et separat, ut habetur <sexto> Metaphysicae. (*SM* 7.13, 29)

I have no regard for the response of some who say that they distinguish between perfect time and imperfect time materially rather than formally, even though matter cannot be the principle of distinction between things, because in the foundation of nature, that is, in matter, there is no distinction, according to the *Commentary*. But it is the act which distinguishes and separates, as is held in the sixth book of the *Metaphysics*.

Aquinas, in his theory of the composition and distinction of essence (*essentia*) and existence (*esse*), sees their relationship as a relationship of potency to act, or matter to form. Jacobus echoes this in the above: matter is not the principle of distinction, it is only through act that it may be separated and distinguished. Therefore, perfect and imperfect times cannot be distinguished from each other on a material basis, as the moderns would have it, for only form can give this distinction between entities,

³⁰³ E. Jennifer Ashworth, "Medieval Theories of Analogy," in *The Stanford Encyclopedia of Philosophy* (Winter 2004 Edition), ed. Edward N. Zalta, available from <http://plato.stanford.edu/archives/win2003/entries/semiotics-medieval/> (accessed March 2, 2007).

entities may not be differentiated on their matter alone. Jacobus continues this theme in Chapter 16 (on the divisibility of the semibreve):

Potest autem ad illas una generalis prius tacta dari responsio: quod morulae temporis importare per semibreve competat divisio potest intelligi dupliciter; uno modo, ut talis temporis morula sumitur materialiter et absolute ut quaedam quantitas continua et ut sic sibi competit dividi; alio modo, ut significatur per semibreve, et hoc modo sibi repugnat divisio de qua loquimur. Unde non sequitur: Talis temporis morula est divisibilis; ergo semibrevis divisibilis est. (*SM* 7.13, 33)

I can give one general response to the above. The delay of time contained within a semibreve and its division can be understood in two ways: one way is that we can take such a delay of time materially and absolutely, so that it is some continuous quantity and in this way may itself be divided; or, as it is signified through the semibreve itself, which rejects the division of which we speak. Whence it does not follow that because such a delay of time is divisible, that therefore a semibreve is divisible.

If a semibreve is taken materially and absolutely as a continuous quantity, then, of course, it may be divided into as many parts as you like. However, if a semibreve is understood as that which is signified by the semibreve, then its division is not possible.³⁰⁴

Jacobus also discusses the names and the signification of the various musical notes (*notula vel figura*) in chapters 23 and 24 of book 7:

³⁰⁴ Tanay points out that Jacobus contradicts himself here since he does allow for the Petronian division of the semibreve, however, one could suggest that Petronian divisions are divisions of the breve, rather than divisions of the semibreve.

Tactae sunt notularum vel figurarum simplicium huius artis nominationes, significationes, figurationes, quas Antiqui nobis reliquerunt, qui nos in hac arte in his et aliis fundaverunt, et haec, ut firmiora essent vel durabiliora, in tractatibus suis dimiserunt, sicque tactis notulis determinatas et limitatas imposuerunt significationes ut, quantumcumque minimum a qualibet illarum tollatur vel addatur, perit illius nominatio, significatio et figuratio ut cum longa perfecta significet perfectum tempus, ut divisibile in brevem perfectam et in brevem alteram, ut in tres breves perfectas vel semibreves illis aequipollentes. Si quid ab ea de tacta ipsius significatione quantumcumque minimum tollatur aut addatur, eius nominatio, significatio tollitur atque figuratio ut dici non debeat perfecta longa. Et sic intelligendum est de ceteris tactis notulis huius artis. (*SM* 7.22, 48-49)

We have touched upon the names, significations and figurations of the notes or simple figures of this art that the Ancients handed down to us, and upon which we have based this and other things of this art. These things, more firm and durable in their treatises, they [the Moderns] dismissed. With regard to the notes we have been discussing, they imposed determined and limited significations, so that, whenever the least part of a note is taken away or added, the note loses its name, signification and figuration. A perfect long then, signifies a perfect tempus, divisible into a perfect breve and a *brevis altera*, or into three perfect breves or their equipollent semibreves. If the least part is taken away from or added to this already-discussed signification, its name, signification and figuration is also taken away and I say it no longer ought to be a perfect long. And so it is understood with respect to the already-discussed notes of this art.

The Ancients had already named and signified the perfect long, and, he says, if anything is added or taken away from this then its name, signification and figuration are no longer applicable. Godfrey, in *Quodlibet* 15, q. 3, asserts that “when a name is formally affirmed of a thing, the name must point to a form that is truly present in that thing.”³⁰⁵

³⁰⁵ Quoted in John F. Wippel, *The Metaphysical Thought of Godfrey of*

In his ninth conclusion, Johannes de Muris, moves on from the specific discussion of perfect and imperfect time to give a rather more general definition of *tempus*:

Omne continuum divisibile est in quotlibet partes eiusdem proportionis, sicut in duas vel tres vel quatuor et cetera. Tempus est de genere continuorum, ergo potest dividi in quotlibet partes aequales. (*Notitia*, 104)

Every continuum is divisible into as many parts of its proportion as you like, so into two, three or four and so on. Time is of the genus of continuities, therefore it can be divided into as many equal parts as you like.

Jacobus counters that time, when taken materially and absolutely, as a continuum, is divisible into as many parts as you like, but once time is signified through musical notes, this is no longer true (*SM* 7.44, 85). This is in agreement with Jacobus's discussion of unity and number in Book 1 and the division of the continuum. Musical notes (*notulae*) import certain determined lengths of time and are distinguished amongst themselves as are certain other temporal durations, such as years, months, days, and so on. Musical notes do not contain purely continuous time, but rather discrete and numbered time.³⁰⁶

Fontaines: A Study in Late Thirteenth-Century Philosophy (Washington, DC: Catholic University of America Press, 1980).

³⁰⁶ “Dicendum quod, licet tempus materialiter et absolute sumptum et ut continuum dividi possit in quot volueris partes aequales ut in duas, tres, quattuor, sic ceteris, non tamen ut per notulas significatur musicas, ut saepe dictum est. Aliter enim est divisibile ut per longam signatur perfectam, aliter ut per

The crux of the distinction between the material basis for Muris's theories and the formal basis for Jacobus and the Ancients is elaborated in this passage from Chapter 23:

Quaerit unus doctor modernus: Figurae quot accidunt? Respondet: Unum. - Quid? Significatio tantum.

Instare potest contra hoc, primo quia figurae musicali non videtur unum accidere, sed multa, sive sumatur accidens pro eo quod adest vel abest praeter subiecti corruptionem, sive prout superius accidit suo inferiori, sive ut distinguitur contra per se. Vel contra per se primo haec possent declarari. Sed dimitto.

Secundo, non videtur accidere figurae musicae significatio unde etiam, secundum hunc doctorem, ponitur in sua diffinitione, quia de sua ratione est importare sonum numeratum sic vel sic. Alias enim non esset notula musicae mensuralis, nisi aliquid significaret. Sed quaerit ulterius: Significationes figurarum quot sunt? Respondet: Quinque. - Quae? Maximae, longae, breves, semibreves et minimae.

Alibi vocat hic doctor tactas figurarum significationes prolationis partes ubi sic ait: <Partes prolationis> quot sunt? Quinque. - Quae? Maxima, longa, brevis, semibrevis et minima.

Membra tactarum distinctionum quantum ad aliquid videntur coincidere ut primum cum secundo, quia unum est superius ad aliud et de illo praedicatur, quia omnis maxima est longa, etsi non e converso; item quartum cum

imperfectam. Important enim notulae quaelibet determinatas temporis morulas et in hoc inter se distinguuntur, licet in hoc generaliter conveniant quod tempus important ad modum quo annus, mensis, dies, quadrans, hora, momentum, uncia, atomus. Item notulae musicae non videntur tempus pure continuum importare sed discretum et numeratum ad determinatas partes applicabile vel applicatum." *SM* 7.44, 85.

quinto, quia omnis <semibrevis> est <minima>, non e converso.

Ideo convenientior videtur illa Antiquorum notulae divisio in longam, brevem et semibreve. Ibi enim membrum unum de alio non praedicatur. (SM 7.23, 49-50)

A modern teacher asks: How many figures are there? He may respond: One. How? By Signification alone.

I must argue against this: first, because there does not seem to be just one musical figure, but many, whether its existence is taken as that which is present or absent beyond the corruption of the subject, or as an higher entity that exists with respect to a lower entity, or as it is distinguished through its contrary. Or these things could be declared as being contrary through themselves first. But I reject this.

Second: the signification of a musical figure does not seem to happen, with respect to the definition applied by this teacher, where its rationale of existence is to carry numbered sound, as here and here. Others [say] this may not refer to the note of mensural music, rather to something that it might signify. But one of them goes further and asks: How many significations of the figures are there? And responds: Five. Which are they? *Maximae*, longs, breves, semibreves and minims.

Elsewhere, this teacher calls these “significations”, which we are discussing, “parts of prolation.” Whence he says: How many parts of prolation are there? Five. Which? *Maximae*, longs, breves, semibreves and minims.

The members of these distinctions that we have touched upon might seem to coalesce at least with respect to the first and second of them, because the first is the one above something from which the second is predicated, because every *maxima* is a long, although the converse is not true. The same is true of the fourth with the fifth, because every semibreve is a minim, and not the converse. Thus the division of the notes by the ancients into long, breve, and semibreve seems more appropriate. For in this, one

member is not predicated from another.³⁰⁷

Johannes de Muris in *Notitia* stresses that times do not differ in species, they are just greater or lesser instances of the same species:

Temporis aliud maius aliud minus: maius, quod motum prolixiolem, minus, quod breviolem habet ceteris eisdem, secundum unam dimensionem metitur. Haec autem specie non differunt, nam maius et minus speciem non variant. (*Notitia*, 66)

Of time one is more and one is less: more, that more abundant motion, less, that which has a shorter [motion] than the rest, measured according to one dimension. These times do not differ according to species, for species do not change through more and less.

The reference to *tempus* being measured in one dimension becomes interesting when we think about the way in which this may have been represented in diagrammatic form by Johannes de Muris. This source of his *Libellus*, shown in Figure 4 (*I-Vnm* 85, f.11v) demonstrates this measurement along one dimension. The musical notes are presented along a horizontal line (not the usual tree presentation that may occur to us as we try to visualize mensural notation).

³⁰⁷ In this passage, Jacobus focus is Chapter 1 and Chapter 7 of Johannes de Muris's *Compendium*.

Figure 4 Johannes de Muris's chart of figures in his *Libellus* (I-Vnm 85, f.11v)

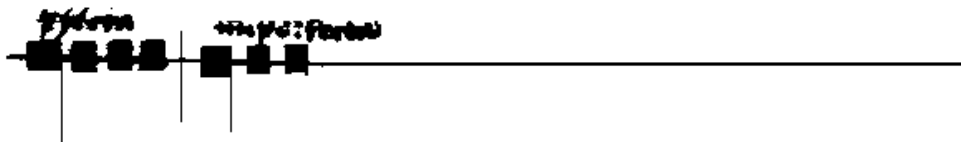
Venice, B.N.M., 85, f.11r,1



Venice, B.N.M., 85, f.11r,2



Venice, B.N.M., 85, f.11r,3



I have noted earlier how John Dumbleton discussed changes in accidental form as being analogous to distance in space.³⁰⁸ This analogy is similar to the presentation given by Johannes de Muris of the figures of the notes. Muris specifically states that the figures are measured *along one dimension*. For Muris, there is but one species of *tempus*, and within this one species there is a plurality of accidental forms. There are not different species of times, just greater and lesser times. The individual notes are individuated by the quantity of their matter, and whether parts are added or taken away from this individuating quantity of matter. Jacobus, on the other hand, holds the to the traditional explanation of the mensural system, as a tree-like conceptualization of the different species and sub-species of note values, each being distinct in their name, definition and essence, and each having an indivisible unity of form.

³⁰⁸ However, I am not sure that I agree with Tanay's discussion of Johannes de Muris theories with respect to the so-called 'Oxford Calculators.' She poses the question: "was Muris' advanced musical thought nourished by Mertonian mathematical knowledge, or conversely, should we attribute mathematical breakthroughs of the Mertonians to contemporaneous musical wisdom?" *Noting Music, Marking Culture*, 81. Rather than necessarily seeing either of these theories as dependent or outflowing from each other, I think it is more likely that Johannes de Muris's theories were a response to the unity-of-form crisis, and those philosophies put forth by Duns Scotus regarding plurality of forms and the nature of individuation of species. Tanay herself says regarding the *Quadripartitum* of de Muris: "In fact, there is no reference in the whole of the treatise to these two key concepts of fourteenth-century Mertonian mathematical physics, namely acceleration and resistance." *Ibid.*, 80.

THE CONTEXT OF MENSURAL THEORY

For Jacobus, the primary authorities on mensural music were Franco of Cologne and Magister Lambertus. How do these theorists employ the terms *figura*, *notula*, *tempus*? Do they refer at all to philosophical terms such as *species*, *forma* or *materia*, or the essential or accidental qualities of musical notes?³⁰⁹ In the

³⁰⁹ Garlandia's exposition of the mensural system is quite similar to Anonymous 4: a reliance on the traditional concept of mode, and a discussion of the figures only insofar as they relate to the modes. The species of mensural music are the modes. He does not use the term *forma* when discussing the figures and defines them as follows: "Sequitur de repraesentatione figurarum sive notularum, videlicet quomodo per huiusmodi figuras denotetur longitudo vel brevitatis. Unde figura est repraesentatio soni secundum suum modum" ("What follows is a representation of the figures or notes, and how length and brevity are denoted by these figures. Whence a figure is a representation of sound according to its mode") Johannes de Garlandia, *De mensurabili musica, kritische Edition mit Kommentar und Interpretation der Notationslehre*, 41. The discussion of Anonymous 4 also centers on mode, which he defines as follows: "modus vel maneries vel temporis consideratio est cognitio longitudinis et brevitatis meli sonique" ("the modes or *manieres* or the consideration of time is an awareness of the length and shortness of melody and sound"). Reckow, *Der Musiktraktat des Anonymus 4*, 22. The quantity of the pitches is determined by their position, that is, through qualitative relationships. Anonymous 4 first describes the modes, and then describes the 'fractioning' of the modes (*fractio*). When he moves on to describe the note-shapes, he does not discuss them with respect to their form, in fact he barely uses this term at all, but rather discusses how they are notated, and always refers to them as figures or *figurae*. However, when discussing the long and the breve, he does refer to their matter (ibid., 44). The treatise of Sowa anon. 1930; *De musica mensurata [St Emmeram anon.]* contains extensive discussion of the concepts of form and matter, however the dissemination and influence of this treatise on mensural theory is yet to be determined. It would be an interesting topic for further investigation. [Anonymous], *Ein anonymes glossierter Mensuraltraktat 1279*, ed. Heinrich Sowa, vol. 9, *Königsberger Studien zur Musikwissenschaft* (Kassel: Bärenreiter, 1930).

introductory paragraphs to his section dealing with mensural music, Magister Lambertus says he will discuss discant as it exists under a certain dimension of time or times: “de representatione formaque figurarum” (“concerning the representation and form of the figures”).³¹⁰ Lambertus defines a *figura* as “representatio soni secundum suum modum, et secundum equipollentiam sui equipollentis” (“the representation of sound according to its mode and according to the equipollence of its equipollents”).³¹¹ He says: “sex tantummodo figure sunt adinvente quarum bine et bine semper sunt affines, etiam in forma et quantitate consimiles; sed in potestate, arte, regula differunt et natura” (“Six figures are found of which two and two are always affinities, for they are similar in both form and quantity; but they differ in power, art, rule and nature”).³¹² The perfect long, which is described as the foundation and origin of this science, is defined: “trium temporum equaliter proportionata manet; seipsamque in novem partes diminuendo dupliciter partiens” (“it remains equally proportioned into three *tempora*, and may be doubly divided by diminishing it into nine parts”).³¹³ He further describes the

³¹⁰ Magister Lambertus, *Tractatus de musica*, in *CS* 1, 269.

³¹¹ *Ibid.*, 269.

³¹² *Ibid.*, 270.

³¹³ *Ibid.*, 270.

primacy of the long: “omnis cantus ab eadem procedit, et in eadem replicatur, et ipsa in numeris consistit temporibus et mensuris” (“every song proceeds from it, and is replicated in it, and it exists in number by both times and measures”); and in a similar vein “omnis cantus mensurabilis ab ipsa figura procedit et dividitur, et in eadem replicatur, et omnes figure subsequentes ad eandem propter equipollentiam retinendam recurrunt” (“every mensural song proceeds from and is divided by this figure, and is found in it, and every subsequent figure following it retains its equipollence with it”).³¹⁴ The imperfect long has affinity in form and *proprietas* to the perfect long: Lambert understands “form” as the visual representation of the note, and “*proprietas*” as the presence or absence of a notetail, since he also says that the *recta* and *altera* breve are affinities in form and *proprietas*. With regard to the smallest note values, Lambert says the following: “tres autem semibreves minores equales et indivisibiles nuncupari tenentur. Unde notandum est, quod nulla semibrevis sola reperitur, quoniam per se sola significare nequit, sed bine et bine, non equales” (“three minor semibreves are held to be equals and are called indivisible. From this it must also be noted that no semibreve is found alone, because it does not signify anything when found alone, but always two and two, and not equal”).³¹⁵ A single semibreve does not *signify* anything on its own.

³¹⁴ Ibid., 270.

³¹⁵ Ibid., 272.

Whereas Garlandia uses the term *species* to refer to the modes, Franco of Cologne uses this term to refer to the figures. When referring to the long, he says “in [longa] omnes aliae includuntur, ad eam etiam omnes aliae reducuntur” (“all other notes are included within the long, for all others are reduced to it”).³¹⁶ Franco describes the form of the figures, using this term as a noun, and also as a verb (“formatur”); he does not define the figures by saying “longa est . . .” but rather describes the visual representation of the figures and what these representations signify, almost always using the verb *significare*. The figures have species: “simplicium tres sunt species” (“of the simple [figures] there are three species”).³¹⁷ The description of the figures is contained in Chapter 4 of Franco’s treatise, and in Chapter 5 he discusses their order. We may only know the value (*cognitio valoris*) of the figures through their order. There is a brief discussion of species within Chapter 7, which deals with ligatures: “species quoque consistunt sub genere; ipsis tamen speciebus non est nomen impositum, sed eas dictae differentiae et suum genus circumloquuntur, secundum etiam quod in generalibus aliis realibus invenitur, ut corpus animatum quod circumloquitur quadam speciem, cui nomen non est impositum” (“Species is subordinate to genus. Yet to the species themselves no name is given, but the differences we have mentioned and

³¹⁶ Franco, *Ars cantus mensurabilis*, 29.

³¹⁷ *Ibid.*, 29.

the genus to which they belong define them. This agrees with what occurs in other real genera: ‘animate body,’ for example, defines a certain species to which no name is given”).³¹⁸ This chapter contains most of the metaphysical vocabulary of the treatise, dealing with such concepts as *proprietas*, *essentia* and *differentia*.

Franco stresses that ligatures with *proprietas* and without *proprietas* are essentially different, and their existence with or without *proprietas* is an essential difference.

Within the context of mapping out the species of *figura* of Franco of Cologne, the treatise of Petrus de Picardia is an interesting case, particularly if we think in terms of the so-called Porphyrian tree.³¹⁹ The treatise of Petrus, an exposition of Franco’s

³¹⁸ Ibid., 44-45. Trans. Strunk, revised by McKinnon in McKinnon, ed., *Strunk’s Source Readings*, rev. ed., 124-125.

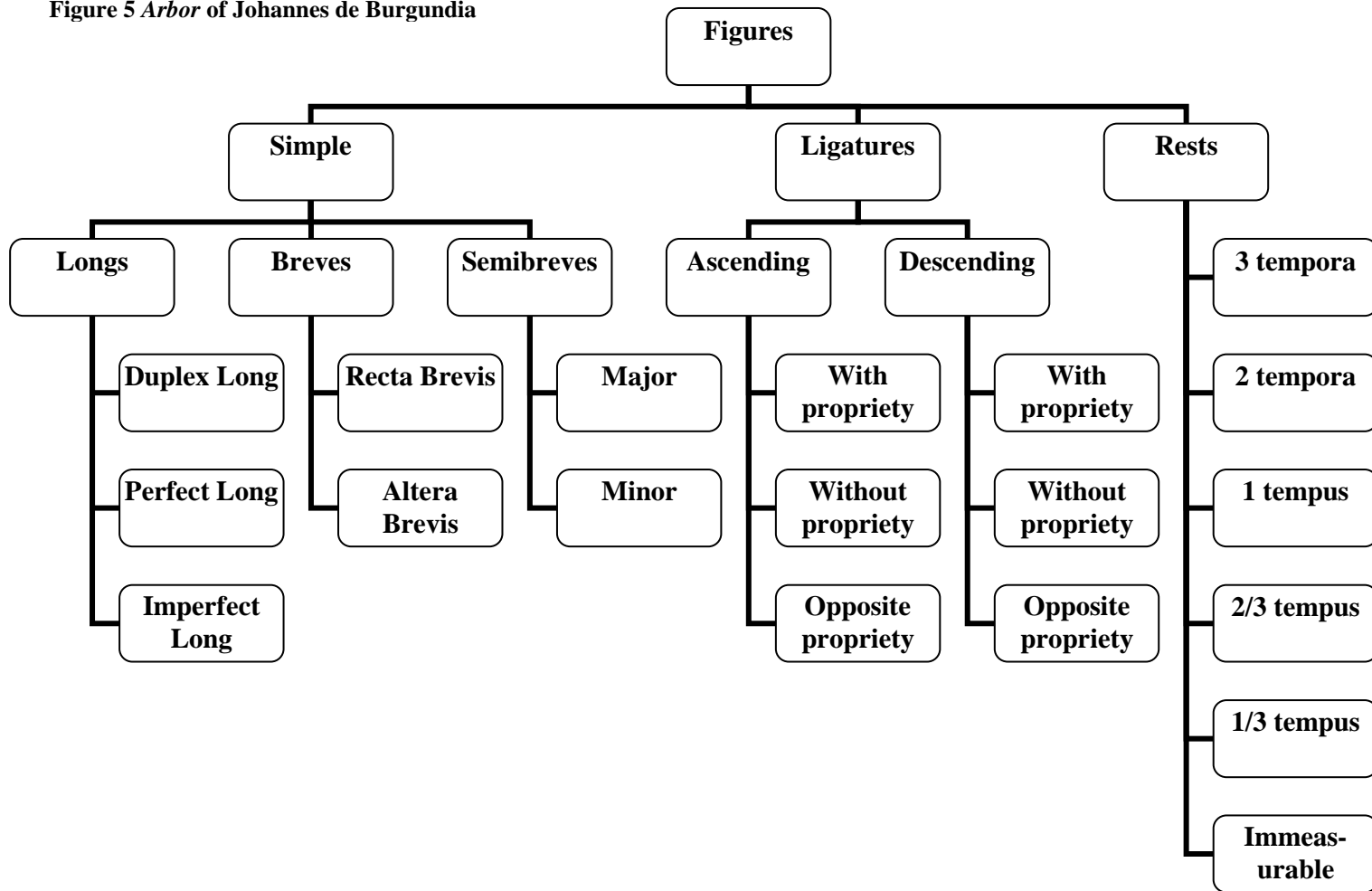
³¹⁹ The following is a useful description of the Porphyrian tree: “This process of division could be represented by a diagram, the largest class at the top, lines going down to sub-classes, more lines down to sub-sub-classes, and so on, like a family tree. If you turned the diagram upside down it would look more like a tree, with the largest class as the root and the final sub-divisions as the twigs. The Greek word for a family is *genos*, Latin *genus*, which was also the name the philosophers gave to the highest class, *genus*, in English genus; so the analogy with a family tree is appropriate. The sub-classes of a genus are called ‘species’. In the middle levels of the diagram, each class is both a genus with respect to its sub-classes and a species with respect to the higher class to which it belongs. The top of the diagram is the highest genus and at the bottom are the lowest species, and between are intermediate classes which are both genera and species. (*Genera* is the plural of *genus*, the plural of *species* is the same, *species*). The definition of a species consists of its genus and what differentiates that species from other species of the same genus. Such a definition is said to be by genus and specific difference. This sort of diagram is now called ‘Porphyry’s tree’, though it could just as well be called Plato’s tree or Aristotle’s tree. In fact Porphyry does not set out any tree fully, but one that he sometimes alludes to would look like this . . . substance at the top,

principles, is included in Hieronymus de Moravia's compilation (*F-Pn* lat. 16663), and has two other sources, *S-Uu* C453 and *I-Nn* XVI A 15. Petrus refers to the theories of Franco of Cologne and the *arbor* of Magister Johannes de Burgundia.³²⁰ Figure 5 reconstructs how the *arbor* of Magister Johannes de Burgundia may have appeared, according to the text outlined by Petrus de Picardia.

divided into corporeal substance and incorporeal substance; corporeal substance divided into animate and inanimate; animate (i.e. living) divided into plant and animal; animal divided into rational and irrational; man is the only species in the 'rational' division of animal. So the definition of man by genus and specific difference is 'rational animal' – 'rational' being the character that differentiates man from other species of the genus animal, or so the ancients believed." R.J. Kilcullen, "Boethius on Porphyry," available from <http://www.humanities.mq.edu/Ockham/x52t02.html> (accessed February, 2007).

³²⁰ *Petrus Picardus, Ars motetorum compilata breviter. Anonymus, Ars musicae mensurabilis secundum Franconem* (Mss. Paris, Bibl. Nat., lat. 15129; Uppsala, Universiteitsbibl., C 55). *Anonymus, Compendium musicae mensurabilis artis antiquae* (Ms. Faenza, Biblioteca Comunale 117), ed. F. Alberto Gallo, Gilbert Reaney, and André Gilles, vol. 15, *Corpus scriptorum de musica* ([Dallas, Texas]: American Institute of Musicology, 1971). On the *arbor* of Johannes de Burgundia see Christian Berktold, "Die 'Arbor' des Johannes de Burgundia," *Cantus planus VI: Éger 1993 2* (1993): 653-4.

Figure 5 *Arbor* of Johannes de Burgundia



Petrus's treatise is essentially a pared-down version of Franco, first treating the simple figures: "figurarum simplicium tres sunt species, que tres ramos perficiunt in Johannis arbore supradicti" ("there are three species of simple figures, which comprise the three branches in the tree of Johannes that we mentioned above").³²¹ These three species are the long, breve and semibreve - understood as three completely different forms, with different definitions and different essences. Each of these species is then further subdivided, the long into three species (duplex long, perfect long, imperfect long), the breve into two species (*recta* and *altera*) and the semibreve into two species (major and minor). Johannes de Burgundia follows Franco in the division of the semibreve: "sed intelligendum est, semibrevium plures quam tres pro recta brevi non posse accipi" ("but it is understood that more than three semibreves must never be placed for a *recta* breve").³²² All figures may be plicated, except for the semibreve, which cannot be plicated on account of its figuration.³²³ Petrus's discussion of ligatures is preceded by a brief philosophical comment on their essence, using Franco as an authority:

³²¹ Petrus Picardus, *Ars motetorum compilata breviter*, 16.

³²² *Ibid.*, 18.

³²³ ". . . omnes simplices figure plicari possunt, excepta semibreui cui repugnat plica propter eius figurationem." *Ibid.*, 19.

Item ligaturarum tam ascendentium quam descendentium alia cum proprietate, alia sine proprietate, alia cum opposita proprietate. His tribus differentiis differunt essentialiter ab invicem omnia principia ligaturarum, ut in magna arte magistri Franconis prius dicti declaratur; sed a fine duabus tantum differentiis differunt ab invicem ligature, scilicet perfectione et imperfectione.

Media vero ligaturarum nullas habent differentias essentielles, quia omnia media idem dicuntur significare . . .

It is the same with ligatures either ascending or descending: some are with propriety, some without propriety, some with opposite propriety. With these three differences all the beginnings of the ligatures differ in turn, as was stated previously from the great art of Magister Franco, and ligatures differ at their end at the end by two differences, that is, perfect and imperfect.

Truly, in the middle of the ligatures there are no essential differences, because all middle notes are said to signify in the same way . . .³²⁴

It is their figuration, either in the beginning or the end of the ligature, that affects the essence of the notes: the middle notes of ligatures have no *essential* differences. Concluding his discussion of ligatures, Petrus says: “et hec quinque differentie in arbore dicti Johannis subtiliter declarantur” (“and these five differences are subtly declared in the tree of Johannes that we have mentioned”).³²⁵ There are six species of rests; Petrus again here maintains this

³²⁴ Ibid., 20.

³²⁵ Ibid., 23.

vocabulary of “species.” He concludes this short treatise outlining, in the simplest possible terms, the five modes of Franco. Like Franco, he no longer uses the term *species* to refer to the modes, but rather simply mentions that there are five modes.

In treatises that are believed to be contemporaneous with Johannes de Muris and Jacobus, few even mention the concepts of *forma* or *materia*, so perhaps this particular philosophical debate may have had a fairly limited influence on the realm of music theory until it was taken up by Johannes de Muris and Jacobus. Of the authors that mention these specific terms we do find Marchettus da Padova with the following:

9. Quantum ad primum, est sciendum quod, secundum omnes phylosophos et doctores in istis materialibus, numerus causatur ex divisione continui;

10. et in tot partes in quot potest dividi continuum, et eo modo quo potest dividi, tot possunt esse numeri, et eodem modo etiam augmentari . . .

9. As to the first, it is known that, according to all philosophers and teachers in these matters, that number is caused through the division of the continuum.

10. And in all the parts in which the continuum may be divided, and in the way in which it can be divided, there are as many numbers as there can be, and in this way to be augmented.³²⁶

³²⁶ Jan W. Herlinger, *The Lucidarium of Marchetto of Padua: A Critical Edition, Translation and Commentary* (Chicago and London: Chicago

And also here:

Sed quia tempus, ut tempus est abstractum ab omni materia, esset divisibile in infinitum, sicut linea separata esset divisibilis in infinitum; ideo cum nostra consideratio non sit de tali tempore, quia sic non esset dare primum tempus, sed sit de tempore, prout in musica accipitur, ideo dicimus, quod non omne minimum tempus est perfectio et prima mensura cantus, sed tempus musicum. Id ergo, quod est minimum tempus musicum, est prima mensura et ratio mensurandi totum ipsum cantum. Hoc autem est id minimum tempus, in quo potest formari plenitudo vocis: propter quod Magister Franco postquam dixit, tempus musicum est minimum, addit statim: non quodcumque minimum tempus, sed quod est minimum in plenitudine vocis; quia illud tempus minimum, in quo potest formari plenitudo vocis, est ipsum primum tempus et ratio mensurandi omnia, quae in musica continentur.

But because time, as it is abstracted from all matter, is divisible into infinity, just as a line may be divisible into infinity, thus it is our opinion that it is not this type of time, because there cannot be a “first” of this time, but rather it is from the time that we say as it is taken in music, and not every smallest time is a perfection and the first measure of song, but only a musical time (*tempus*). Therefore, this, which is the smallest musical time, is the first measure and the proportion of measurement of the whole of this song. This, then, is the smallest time (*minimum tempus*), in which the fullness of voice can be formed, according to that which Franco has already stated, and the *tempus* of music is the least, he adds next: not any least time, but that which is the least in the fullness of voice, this is this first time and the proportion of measuring all things which are contained in music.³²⁷

University Press, 1985), 112.

³²⁷ Marchettus da Padova, *Pomerium arte musicae mensuratae*, ed. Giuseppe Vecchi, vol. 6, *Corpus scriptorum de musica* (Rome: American Institute of Musicology, 1961).

Marchettus's definitions of time are more closely aligned with those of Johannes de Muris, but in terms of his division of the note values, and also in their graphical representation in his treatise (that is, as *trees*) he more closely follows a Franconian approach of understanding the note values as species and sub-species ordered in a Porphyrian-type tree. The main difference is that he considers the *tempus minimum* to be the least time, that by which all song is measured (in opposition to Franco, for whom the long was the primary measurement).

Finally, Anonymous OP also briefly discusses *forma* and *materia* and in his understanding of these terms seems to be most closely aligned with the theories of Johannes de Muris:

Nunc nota bene, quod licet sicut totum ad totum ita pars ad partem intelligendo de materia, tamen totum habet aliquid, quod non partes formaliter. Nam virtus omnium hominum trahit navem totam et tamen partes virtutis non trahunt partes navis, sicut unus homo non trahit unam partem navis, nec significari potest illa pars, sed tota virtus trahit totam navem.

Now it is well noted, that the way in which the whole relates to the whole and the part to the part must be understood in terms of matter, nevertheless it possesses some formal aspect, which is not of its parts. For the strength of all men pulls the whole ship, nevertheless the parts of that strength do not pull the various parts of the ship, just as one man does not pull one part of a ship, this part cannot be signified, but rather the whole strength pulls the whole ship.³²⁸

³²⁸ Michels, "Der Musiktraktat des Anonymus OP," 58.

And here again:

Item notandum est, quod perfectum et imperfectum eadem figura significantur, et materialiter sunt idem, sed formaliter differunt, scilicet per situm vel punctum.

Item notula duas habet formas: primam, quae est figura geometrica, quae solum dicitur signum, secundam, quae est sonus numero mensuratus, qui dicitur significatum.

It must be noted that perfect and imperfect are signified by the same figure, and are materially the same, but formally they differ, either through their position or through a dot.

Thus a note has two forms: the first, which is a geometrical figure, which alone is called a sign, second, which is sound measured by number, which is called the signification.³²⁹

So can the divergences in the various fourteenth-century notational systems be explained by the differences between systems that relied heavily upon the Franconian traditional Porphyrian-tree representation and categorizations of the note-types, as opposed to those favored in the “French” realm who dispensed with species of notes and rather ordered all the accidental forms of the one species along a single dimension? It is an interesting way to look at both the development of mensural theory, and also the differences in the musical styles. Scholars have remarked in other contexts on the essentially additive nature of French *ars nova* music, and the arguments outlined in this

³²⁹ Ibid., 62.

chapter provide a philosophical basis for the organization of the theoretical system as such, as a linear layering of time values measured along a single dimension of time. It also provides grounds for the heated debate between proponents of the two systems, based as they were on two very different worldviews.

CHAPTER 7

MUSICA CAELESTIS AND THE BEATIFIC VISION

In Book 1 of *Speculum musicae*, Jacobus describes a type of music he terms *musica caelestis* (heavenly music), adding this category to the traditional Boethian division of *musica* into *mundana*, *humana* and *instrumentalis* (*SM*, 1.11-12, 37-45).³³⁰ He defines three species of *musica caelestis*: (1) a harmony between the heavenly spheres and the angels that move them; (2) the incessant praise of God sung by the saints and angels; and (3) a kind of music possessed *subjectively* by all the citizens of heaven. His examination of this music goes beyond the generic descriptions of music in heaven found sporadically in medieval music theory, through his focus on that which links *musica caelestis* with the experience of the beatific vision - that supernatural act by which the beatified angels and souls are united to God in a direct, intuitive knowledge of God as He is in Himself. Jacobus describes this heavenly encounter as a non-sonorous musical experience, where there will finally exist a perfect, proportionate, and consonant connection with the Divine.

³³⁰ These two chapters are part of Jacobus's introductory remarks on the divisions of music. These remarks, presented within twelve chapters of Book 1 (Chapters 8-19) elaborate extensively on the traditional doctrine presented by Boethius, and include a detailed analysis of the Boethian divisions, and a discussion of various types of *musica instrumentalis*. For the Boethian threefold division of music, see A.M.S. Boethius, *Porphyrii Isagoge*, ed. L. Minio-Paluello, vol. 1.6-7, *Aristoteles Latinus* (Brugge, Paris: 1966), 1.2, 187.

In this chapter I will evaluate the musico-theoretical concept of *musica caelestis*, which I carry out through an examination of medieval music theory, medieval commentaries on Aristotle and on Scripture, commentaries on Peter Lombard's *Sentences* and other theological *summae*. Jacobus's extensive comments on *musica caelestis* is one of the few forays of the music theorist into the realm of theology, with its pursuit of the theological implications of the existence of *musica caelestis*.³³¹ I will examine briefly the first two species of *musica caelestis* outlined by Jacobus, prefacing this discussion with some comments on Jacobus's divisions of music. I wish to focus on Jacobus's third species of heavenly music - his unique conception of this subjective, internal and intuitive music. Jacobus's concentration on this species of *musica caelestis*, a completely intellectual conception of music, and one which has no existence as a natural sonic reality, presents an extreme example of his willingness to pursue entirely theoretical and speculative abstractions. At the same time his representation of *musica caelestis* as the most perfect species of music in itself provides the ultimate justification for his speculative pursuit: the inner harmony that will only be attained through the clarity of cognition possessed at that

³³¹ Jacobus's concept of *musica caelestis* has been presented, in a very general way in Reinhold Hammerstein, *Die Musik der Engel, Untersuchungen zur Musikanschauung des Mittelalters* (Bern and Munich: Francke Verlag, 1962), 131-36. There is also a superficial discussion in Kay Brainerd Slocum, "Musica coelestis: A 14th Century Image of Cosmic Music," *Studia mystica* 14 (1990-1): 3-12.

moment of the beatific vision, is now possessed, if yet imperfectly, by Jacobus, through his contemplative occupation as a music theorist.

THE DIVISIONS OF *MUSICA*

Jacobus's expanded divisions of music must be understood within the context of medieval divisions of *philosophia*.³³² By the end of the thirteenth century, with the assimilation of the new translations of Aristotle, the well-known division of speculative philosophy into metaphysics, physics and mathematics now corresponded to actual texts being studied in the new university curricula.³³³ Jacobus's divisions of music attempt to synthesize the traditional scope of the subject of music (that is as a quadrivial science

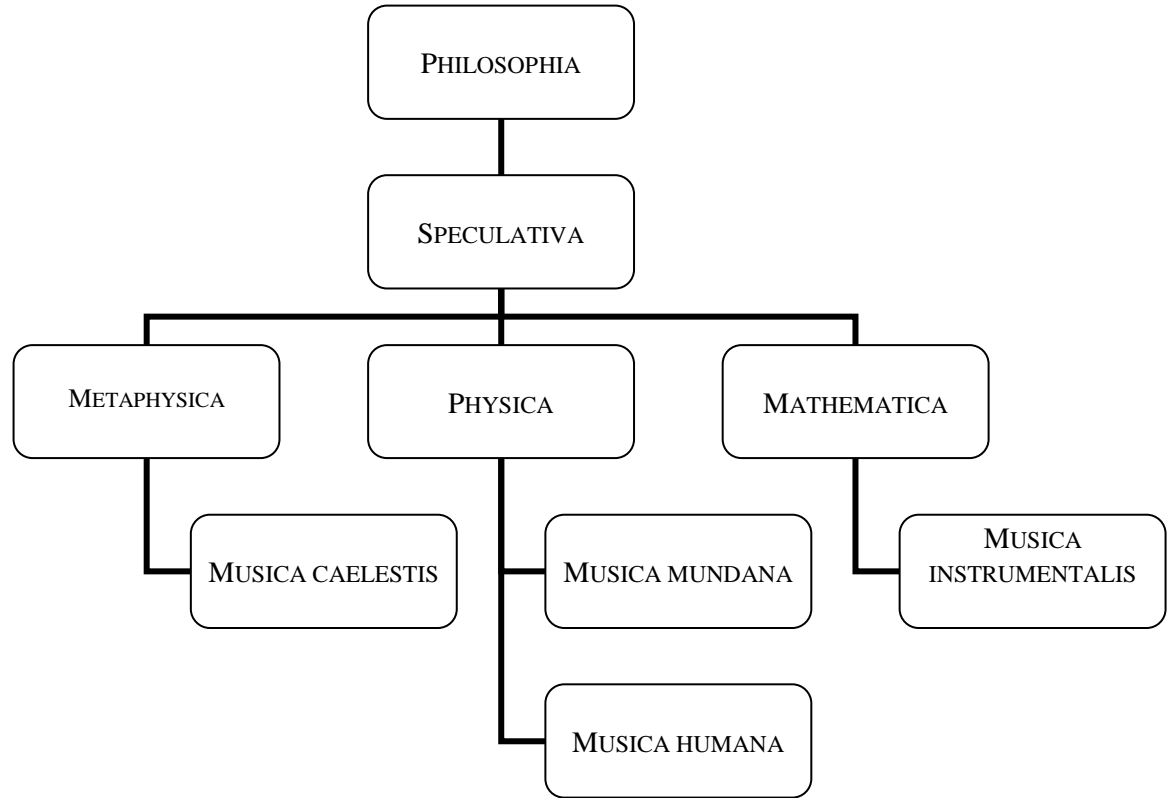
³³² On the history of the divisions of the sciences in the Middle Ages, see James A. Weisheipl, "Classification of the Sciences in Medieval Thought," *Mediaeval Studies* 27 (1965): 54-90. For a detailed history of the place of music in medieval classifications of knowledge, see Gerhard Pietzsch, *Die Klassifikation der Musik von Boetius bis Ugolino von Orvieto* (Halle: Max Niemeyer Verlag, 1929). Joseph Dyer, "The Place of *Musica* in Medieval Classifications of Knowledge," *Journal of Musicology* 24/1 (2007): 3-71.

³³³ The threefold division of the speculative sciences stems from Aristotle (*Metaphysics* 5) and was transmitted to the Middle Ages by Boethius in his *De trinitate*. The best-known twelfth-century discussion of the scientific divisions was Hugh of St. Victor's *Didascalion*. These earlier classification schemes included many or all of the various subjects that are found in the thirteenth-century schemes: however, as Weisheipl emphasizes, without the works of Aristotle, these divisions were essentially meaningless. Textbooks available before the translations of Aristotle covered only the subjects of the seven liberal arts, which included music as one of the four mathematical sciences - the *quadrivium*.

conceptualized within the scope of the seven liberal arts) with the new practical applications of these classification schemes. In Book 1, Chapter 8, Jacobus discusses the placement of music under *philosophia*, using the classification scheme outlined in Robert Kilwardby's *De ortu scientiarum*, where Kilwardby locates music under the usual hierarchical scheme: *theologia - philosophia - speculativa - mathematica – musica* (*SM* 1.8, 28-32).³³⁴ What is different in *Speculum musicae* is that Jacobus proposes that music is not only a mathematical science, but that the species of *musica mundana* and *musica humana* can be placed under the subject of physics (natural science), and the species of *musica caelestis* can be placed under metaphysics (see Figure 6) (*SM* 1.10, 36-37).

³³⁴ In Chapter 18, “De ortu musicae et subiecto et fine proprio ac definitione” of Robert Kilwardby, *De ortu et divisione philosophiae*, ed. A. G. Judy, vol. 4 (Toronto: The British Academy and The Pontifical Institute of Mediaeval Studies, 1976).

Figure 6 The correspondence of *musica* to each of the speculative sciences, Jacobus, *Speculum musicae*



Thomas Aquinas, in his commentary on Boethius's *De trinitate*, describes the hierarchical arrangement of the sciences as follows:

. . . aliqua scientia continetur sub alia dupliciter, uno modo ut pars ipsius, quia scilicet subiectum eius est pars aliqua subiecti illius . . . Alio modo continetur una scientia sub alia ut ei subalternata, quando scilicet in superiori scientia assignatur propter quid eorum, de quibus scitur in scientia inferiori solum quia, sicut musica ponitur sub arithmetica.

. . . any science is contained under another science in two ways, the first, as a part of it, since its subject is some part of the subject of the other . . . In another way, one science is contained under another so that it is its subalternate, so that certain elements in the inferior science are known only from whatever has already been assigned in the superior science, just as music is placed under arithmetic.³³⁵

Aquinas's second way describes how instrumental music is contained under mathematics. Instrumental music takes the principles demonstrated by mathematics as givens: it is not for the subject of music to prove these principles, but merely to apply them to the specific matter of sound. But in his division of *musica* into *caelestis*, *mundana*, *humana*, and *instrumentalis*, Jacobus places these musics directly under each of the speculative sciences according to the first way mentioned by Aquinas: their subject is part of the subject of that other science.

³³⁵ Thomas Aquinas, *Expositio super Boetium De trinitate et De hebdomadibus*, ed. R. A. Verardo, R. M. Spiazzi, and M. Calcaterra, *Opuscula theologica* (Turin: Marietti, 1954), 5.1, 170-71. Trans. in Thomas Aquinas, *The Division and Method of the Sciences: Questions V and VI of his Commentary on the De Trinitate of Boethius translated with Introduction and Notes* (Toronto: Pontifical Institute of Mediaeval Studies, 1986), 21.

In the same passage quoted above, Aquinas gives the following example: the science of plants studies plants, which are natural bodies, and therefore the science of plants is contained under that subject which considers natural bodies, that is, physics.³³⁶ So, for Jacobus, it logically follows that *musica instrumentalis* is contained under mathematics insofar as it studies numbers, *musica mundana* and *musica humana* are contained under physics, or natural science, insofar as they treat the things of the natural world, and *musica caelestis* is contained under metaphysics or divine science insofar as it considers God, the angels, and other transcendentals (*SM* 1.10, 37).³³⁷

THE MUSIC OF THE CELESTIAL MOVERS

Jacobus opens his discussion of *musica caelestis* with a description of what he terms the music of the celestial movers:

Adhuc, ut videtur, non debet harmonica modulatio musicam generaliter respiciens ad solas arctari res naturales et corporales, quae mundanam et humanam musicam respiciunt, sonos et voces, quae instrumentalem, sed ad intelligentias orbium motrices, etiam ad primum motorem, quia

³³⁶ Ibid., 170.

³³⁷ Of course, the problem of identifying the subject of metaphysics was tackled by many philosophers of the later Middle Ages, dealing with the questions of whether God was the subject of metaphysics, thus corresponding to Aristotle's divine science of *Metaphysics* 6, or whether the subject of metaphysics was the more universal study of being as being (Aristotle, *Metaphysics* 4). See John F. Wippel, "Essence and Existence," in *Cambridge History of Later Medieval Philosophy*, ed. Norman Kretzmann, Anthony Kenny, and Jan Pinborg (Cambridge: Cambridge University Press, 1982), 385-92.

mundana musica de orbibus tractat coelestibus, qui a motoribus moventur separatis, idest ab intelligentiis, quae, secundum Philosophum, motrices dicuntur orbium. (*SM* 1.11, 38)

So, it seems that the genus of harmonic modulation ought to apply not only to the music of natural and corporeal things (which are dealt with in cosmic and human music), or to sounds and pitches (which are dealt with instrumental music), but also to the movers of the spheres, the intelligences, and even to the Prime Mover. Cosmic music treats the heavenly spheres themselves, which are moved by separated movers, that is, the intelligences, who, according to the Philosopher, are said to be the movers of the spheres.

As he explains, it was within the realm of *musica mundana* to consider the heavenly spheres, and the music produced by their movement. The ancient tradition of *musica mundana*, transmitted to the Middle Ages by Boethius, held that this was a sonorous music: “Qui enim fieri potest, ut tam velox caeli machina tacito silentique cursu moveatur” (“For how can it happen that so swift a heavenly machine moves on a mute and silent course?”).³³⁸ By the thirteenth century, however, medieval philosophers (and music theorists) found that this theory was specifically contradicted by Aristotle in the second book of his *De caelo*.³³⁹ And for many of these thinkers, including Albertus Magnus, Roger

³³⁸ Boethius, *De institutione musicae*, ed. Freidlein, 1.2, 187. Trans. Bower in Boethius, *Fundamentals of Music*, 9.

³³⁹ *De caelo* 2.9. For the Latin translation of *De caelo*, since this volume of *Aristotelis Latinus* has not yet been published, the reader may refer to the commentary in Thomas Aquinas, *Sententia de caelo et mundo*, Vol. 3, *Opera omnia*. (Rome: Leonine Commission, Vatican Polyglot Press, 1886), 1-257. Aquinas used William of Moerbeke’s translation of Aristotle. For an overview

Bacon, Aquinas, and the music theorists Hieronymus de Moravia and Johannes de Grocheio, the discovery of this new information in *De caelo* resulted in their rejection of a sonorous *musica mundana*.³⁴⁰

But the incorporation of Aristotelian cosmology renewed interest in many other questions concerning the movement of the heavenly spheres, including questions concerning the nature and identity of the celestial movers.³⁴¹

of the concept of *musica mundana* in the Middle Ages and the Renaissance see James Haar, "Musica mundana: Variations on a Pythagorean Theme" (Ph.D. diss., Harvard University, 1960). Ilnitchi's recent study concentrates on the treatise of anonymous Bishop found in *I-Rvat* lat. 283 (fols. 37r–42v) that she dates to the thirteenth century. Gabriela Ilnitchi, "Musica mundana, Aristotelian Natural Philosophy and Ptolemaic Astronomy," *Early Music History* 21 (2002): 37-74. This author juxtaposes a thoroughly Neoplatonic understanding of cosmic motion, alongside Aristotelian rationales for the mechanics of sound production.

³⁴⁰ Albertus Magnus, *De caelo et de mundo*, ed. Paul Hossfeld, vol. 5/1, *Opera omnia* (Cologne: Aschendorff, 1971), 2.3.10, 163-65; Roger Bacon, *De celestibus* (Paris: 1913), 408-10, 4.9. Thomas Aquinas, *Sententia de caelo et mundo*. 2.10.14, 173-77. Much of Aquinas's discussion is directly quoted by the music theorist, and fellow Dominican, Jerome of Moravia, *Tractatus de musica*, 26-35; Johannes de Grocheio, *De musica*, 46. Incidentally, Jacobus, fully aware of this controversy, attempts to synthesize Boethius's theory of *musica mundana* with Aristotle's opinion: he asserts that Boethius did not understand *musica mundana* to be a sonorous and sensible symphony, but rather it was believed that it is the connection, order, proportion, concord and common quality that exists between each of the heavenly bodies. *SM* 1.13, 46-47.

³⁴¹ For the series of questions that dealt with the movers of the spheres see Appendix 1 of Edward Grant, *Planets, Stars and Orbs* (Cambridge: Cambridge University Press, 1994), 713-16. Of particular importance to this topic are the questions that Grant groups under q. 195, "Whether the heavens or planets are moved by intelligences or intrinsically by a proper form or nature"

The planets themselves were thought to be inanimate, and incapable of movement, being carried around in gigantic orbs in which they were embedded. But if the spheres moved the planets, then who moved the spheres? The most common solution was to conceive of the celestial movers - the separated substances described in Aristotle's *Metaphysics* - as angels (*Metaphysics* 12.7-8). The equation of the nine orders of angels with the nine spheres of the cosmos was a frequent assertion - and indeed it is reiterated by Jacobus in *Speculum musicae* - although it was also common to associate one particular angel with each sphere (*SM* 1.12, 41).³⁴²

Some medieval illuminations depict a more literal interpretation of the heavens' movement: for example, the illumination in Ermengaud's *Breviari d'amor* (*GB-Lbl* Royal 19.C.1, f. 34v) depicts two angels moving the universe in its circular motion using two mechanical cranks.³⁴³ This reflected a controversial question: exactly how were the angels said to move the spheres?

(713) and under q. 211, "Whether the stars are self-moved or are moved only by the motions of their orbs" (715).

³⁴² Many medieval illuminations depict this Dionysian vision of the celestial hierarchy, such as the illumination found in *Vie et miracles de St. Denis* (*F-Pn* fr. 2090, f. 107v), which shows the nine orders of angels, some of whom are depicted playing musical instruments, each order contained within each of the nine spheres.

³⁴³ This illustration is discussed in Murdoch, *Album of Science: Antiquity and Middle Ages*, 336-37. A similar illustration is given in Grant, *Planets*, 530.

Edward Grant has shown how article 212 of the 1277 Condemnation at Paris, which condemned Aquinas's opinion "quod intelligentia sola voluntate movet caelum" ("that an intelligence moves a heaven by its will alone"), shaped the theories of celestial movement being developed in the late thirteenth and early fourteenth centuries.³⁴⁴ The bishop of Paris found this article to be objectionable, Grant suggests, because it implied that angels moved the orbs through their own free will (for only God can move anything at all without limit), and that the orbs were, in some sense, alive.³⁴⁵ The solution arrived at by Godfrey of Fontaines was further refined by the Dominican theologian Hervaeus Natalis (c1260-1323), who upheld Aquinas's opinion, but extricated it from the condemned passage by stressing that the intelligences (or angels) do not move the heavens solely by their will and with complete freedom of choice. The angel's desire to move the sphere actualizes an inherent power, or potency, a motive force, termed *virtus motiva*. They do not have an unlimited capacity to move *any* body, but their power, this *virtus motiva*, is finite and proportional to

³⁴⁴ Grant, *Planets*, 528-533. On the arguments on this topic which led up to the condemnation, see James A. Weisheipl, "The Celestial Movers in Medieval Physics," *Thomist* 24 (1961): 286-326. He discusses the theories of Albertus the Great, Aquinas and Robert Kilwardby.

³⁴⁵ *Planets*, 531. See the question "Utrum luminaria caeli sint animate" in Thomas Aquinas, *ST* 5:1a.70.3. See also the question "Utrum motus caeli sit ab intelligentia" in Thomas Aquinas, *Scriptum super libros sententiarum*, ed. P. Mandonnet, vol. 1-2, *Opuscula omnia* (Paris: Léthiellieux, 1929), 1:2.14.1.3, 164.

the particular body which they move. Hervaeus Natalis, in his commentary on Book 2 of Lombard's *Sentences*, says:

Nam sicut anima se habet ad corpus coniunctum ita Angelus ad corpus coniunctum. Anima autem per suum velle aliquam motionem facit in corpore coniuncto . . . praeter velle quod est ex parte Angeli, requiritur determinata proportio inter corpus mobile et ipsum velle moventis: secundum quod velle moventis, est virtus motiva finita.

For just as the soul is joined to the body so is the Angel joined to a body [a sphere]. The soul through its desire makes some motion in its conjoined body . . . beyond this desire [to move the spheres] that belongs to the Angel, a determined proportion is required between the mobile body and this desire of the mover: accordingly, this desire of the mover is a finite motive power.³⁴⁶

In his description of the music of the heavenly movers, Jacobus, aware of this controversy, uses a vocabulary similar to that of Hervaeus:

Etiam inter movens et motum seu mobile requiratur quaedam proportio, saltem si movens finitae sit virtutis et moveat motum naturaliter, quod dico propter primum movens omnino immobile, quod infinitae virtutis existens per liberam suam movet voluntatem. Insuper, si proportio sive coaptatio animae humanae ad corpus suum, quod movet, ut movens coniunctum, quaedam dicitur harmonica modulatio, quare non poterit coaptatio illa vel proportio, quae est inter motores separatos ad orbes, quos movent, harmonica vocari modulatio? (*SM* 1.11, 38)

Between the mover, and the thing moved, or the mobile, a certain proportion is required, at least if the mover is of finite power and moves the moved thing naturally. I say that the Prime Mover is necessarily completely immobile, and, existing in infinite power, he moves by his own free will. Following from this, if there is a proportion or a joining

³⁴⁶ Hervaeus Natalis, *In quatuor libros sententiarum commentaria* (Farnborough: Gregg, 1966), 2.14.1.4, 246.

of the human soul to its body, which it moves, just as the mover moves that which is joined to it, and this is said to be a harmonic modulation, then why not also call the joining or proportion, that exists between the separated movers and the spheres that they move, a harmonic modulation?

In making the analogy between the relationship of the human soul to its body, and of the intelligence to its orb, Jacobus proposes that if we call the proportion that exists between the human soul and its body a species of music, that is, *musica humana*, then why not classify the proportion that exists between the spheres and their movers as a species of music? Additionally, this use of the concept of proportion to describe the relationship between the sphere and its mover - Aquinas, Bonaventure, Giles of Rome and Duns Scotus all describe this relationship as a *proportion* - has prompted Jacobus, I believe, to view this relationship or connection as a musical phenomenon.³⁴⁷ His representation of this species of celestial music problematizes issues traditionally reserved for the discussion of *musica mundana*, possibly in response to the scholastic or

³⁴⁷ Aquinas, *Scriptum super libros Sententiarum*, ed. Mandonnet, 2.14.1.3, 164; Bonaventure, *Commentaria in quatuor libros sententiarum*, 2.14.1.3.1, 345; Giles of Rome, *Quodlibets* (Frankfurt am Main: Minerva, 1966), 1.13, f. 8ra; John Duns Scotus, *Lectura in librum secundum sententiarum a distinctione septima ad quadragesimam quarta*, ed. Carl Balić *et al.*, vol. 19, *Opera omnia* (Rome: Vatican Scotistic Commission, 1993), 2.14.2, 122. Of course, the concept of proportion was multi-layered, and the use of the term *proportio* does not just signify specific relationships between abstract numbers, but can also refer to an organic proportion, or relationship, a connection that links or unites two entities. I will return to this idea presently.

Aristotelian lens through which Boethius's theory of a sonorous cosmic music was viewed, and he introduces the question of the celestial movers into this discussion. In any event, Jacobus developed his theories of celestial music with knowledge of the contemporary controversies regarding the nature of this movement, and formulated his theory of the music of the celestial movers accordingly.

THE INCESSANT PRAISE OF GOD

Jacobus does not expand or elaborate further on the music of the celestial movers. Within one paragraph he moves on to describe a more familiar species of heavenly music: the incessant songs of praise sung by the angels, the saints and the blessed in God's dwelling place. He states:

. . . in Ecclesia hac Militante, Deus in se et in Sanctis suis collaudetur . . . in Ecclesia igitur illa coelesti, musica locum suum tenet, qua Deus a civibus illis incessanter collaudetur . . . et haec musicae species tanto ceteris excellentior est atque perfectior. (*SM* 1.11, 39)

. . . in this Church Militant, God Himself and His saints are extolled . . . in the heavenly Church, music also holds its place, through which God is incessantly praised by these citizens of heaven . . . this species of music is more excellent and more perfect than the other species of music.

The presence of music in heaven was known to the medieval mind through the many references to it in Scripture, and in his two chapters on *musica caelestis*, Jacobus peppers the text with these scriptural references. These include general

references to heavenly music and its purpose in heaven: for example, he quotes from Psalm 18, “the heavens declare the glory of God” and from Psalm 149 “sing unto the Lord a new song.” The two most widely-used descriptions of heavenly music - Isaiah’s vision of the seraphim (Isaiah 6.3), and the related passage from Apocalypse 4.8 - are not quoted by Jacobus in Chapters 11 or 12, but are included in his chapter on the uses and functions of music (*SM* 1.5, 22).³⁴⁸ The ultimate purpose of all music aspires to this most excellent and most perfect of musics, whose final cause is the praise of God (*SM* 1.5, 23).

To this extent, Jacobus’s discussion echoes, in part, the discussion of heavenly music by other medieval music theorists. A number of medieval theorists mention the species of heavenly music: the descriptions of *musica caelestis* found in medieval theory of the thirteenth through the fifteenth centuries are summarized in Table 10.³⁴⁹

³⁴⁸ The full quotations from Scripture are: Isaiah 6.3: “Et clamabant alter ad alterum, et dicebant: sanctus, sanctus, sanctus Dominus exercituum; plena est omnis terra gloria eius” (“and one cried unto another, and said, Holy, holy, holy is the Lord of Hosts; the whole earth is full of His glory”); Revelations 4.8: “et requiem non habebant die ac nocte dicentia: sanctus, sanctus, sanctus Dominus Deus omnipotens, qui erat, et qui est, et qui venturus est” (“and they rest not day and night saying Holy, holy, holy Lord God Almighty, which was and is, and is to come”). Even both these quotations use the verb “to say” rather than “to sing.”

³⁴⁹ Table 10 includes summary descriptions of heavenly music taken from late medieval music theory (before c.1500). *Ameri Practica artis musicae*, 19-21. Johannes Ciconia, *Nova musica*, ed. Oliver B. Ellsworth, vol. 9, *Nova musica and De proportionibus* (Lincoln: University of Nebraska Press, 1993),

Table 10 Descriptions of *musica caelestis* in music theory

<i>Theorist, Treatise (Date)</i>	<i>Term used to designate music</i>	<i>Summary</i>
Amerus, <i>Practice musice</i> (1271)	-	music is the most excellent queen of all the liberal arts . . . she alone is before the tribunal of the all powerful . . . she is the most high lady who sweetly serves God in the triumphal Church Militant
Elias Salomo, <i>Scientia artis musicae</i> (1274)	-	it is right for the angels to praise God . . . before the coming of God it is said: Praise Him with the sound of the trumpet, etc. . .

1.1.54. For the treatise of Egidius Carlerius, see: J. Donald Cullington and Reinhard Strohm, eds., *On the Dignity and the Effects of Music: Two Fifteenth-century Treatises, Study texts (Institute of Advanced Musical Studies)*, no. 2 (London: Institute of Advanced Musical Studies, King's College London, 1996). Elias Salomo, *Scientia artis musica*, CS 3, 16-64. Adam de Fulda, *Musica*, CS 3, 339-40. Gaffurius, *Theorica musice*, 1, f.iiii' -f.av. *Johannes Boens Musica und seine Konsonanzenlehre*, 44. Marchettus da Padova, *Pomerium arte musicae mensuratae*, 35-36. Nicolas of Capua, *Compendium musicale*, ed. Adrien de la Fage, *Essais de diphthérogaphie musicale* (Paris: Legoux, 1864), 311. Ugolino of Orvieto, *Declaratio musicae disciplinae*, 1.1, 15-16. This listing does not claim to be fully inclusive, but I have included here any descriptions that go beyond quoting Isaiah 6.3. In Table 10 I have also included the various terms that the theorists used to designate this type of music, including *armonia caelestis*, *musica divina*, and *musica angelica*. It is interesting to note that these descriptions multiply, or at least are more extensive, in music theory from the thirteenth century and later. David Keck has found that depictions of angels carrying musical instruments appear more frequently in medieval art beginning in the thirteenth century. David Keck, *Angels and Angelology in the Middle Ages* (Oxford: Oxford University Press, 1998), 31.

		and Sing to the Lord a new song . . . similarly at Christ's birth, the angels sang Glory to God in the Highest . . . and on the assumption of the Blessed Virgin Mary, the angels rejoice, and all in heaven praise the daughter of God
Anonymous, <i>Speculum cantancium</i> (13 th c.)	-	the supercelestial and celestial chorus incessantly and ineffably praise the Lord Jesus Christ . . . in the supercelestial hierarchies they praise the Lord God Almighty . . . with one voice we praise God just as the angels are said to praise Him with one continuous voice saying Holy Holy Holy
Marchettus, <i>Pomerium</i> (1318-1326)	-	among all the hierarchies, the heavenly and militant army in choirs before the throne of the deity, with sweet voice, produce an invariable harmony (<i>invariabilem armoniam</i>), and with modulating voices, they do not cease to sing the hymn of divine glory, Holy, holy, holy
Ciconia, <i>Nova musica</i> (c1400)	armonia celestis	the Fathers of the Church say that the heavenly harmony is the noise of the angels (<i>concentum angelorum</i>), they sing without end in the heavenly kingdom in praise of creation . . . in their seeing of God they rejoice with Him in eternity . . . this heavenly harmony seems to be more sweet than earthly music, insofar as heaven is more excellent than the earth
Ugolino of Orvieto,	caelestis	in the heavenly hierarchy, separated substances [intelligences] of divine majesty,

<i>Declaratio</i> (1430-5)	musica	understanding His majesty and comprehending the infinity of His knowledge, without end sweetly proclaim Holy holy holy, through sweet and incredible heavenly music, music composed with marvellous sweetness . . . heavenly music is the beginning and origin of all music, cosmic, human and instrumental, the beginning of all melodic proportion, of all concord, and of all consonance . . . all things exist in a similitude with this most high heavenly praise
Egidius Carlerius, <i>De cantu</i> (c1450)	-	the image of heavenly of joys . . . sweet and well composed is the music of the angels and the saints, they do not cease their praise of the name of the Lord
Nicolas of Capua, <i>Compendium</i> (1460)	musica angelica	music is the first among the liberal arts . . . angelic music is that which is continuously performed by the Angels before the face of God
Adam of Fulda, <i>Musica</i> (15 th c.)	-	the angels' song is ordained to the praise of God . . . before the throne of God, the saints and the elect sing the praise of God, where the Cherubim and Seraphim incessantly with one voice proclaim Holy holy holy and the twenty four elders are before God . . . Sing to the Lord a new song, etc.
Gaffurius, <i>Theorica musica</i> (1492)	harmonia celestis, angelica et divina	nothing is greater or more dignified than this heavenly, angelic and divine harmony of the angels when they sing Holy holy holy . . . thus to our mind nothing is more sweet than this heavenly conversion . . . we desire

nothing more joyful than that moment when
all chains to the human flesh are dissolved
and we become as celestial spirits

If we briefly scan these descriptions, we can see that they closely adhere to the traditional generic descriptions of angelic song, and they rely heavily on the aforementioned quotations from Scripture. They are very brief in nature, and are often relegated to the dedicatory letter at the front of the treatise, and not given a place in the music treatise proper. They describe *musica caelestis* as a sweet and soft song employed in the service of God, sung without end: its sweetness and its continuity are important themes stressed by all these theorists. Ciconia describes the heavenly harmony (*armonia caelestis*) as the noise of the angels, sung without end in praise of creation.³⁵⁰ Ugolino of Orvieto speaks of the separated substances - the intelligences - proclaiming, without end: Holy, holy, holy, through sweet and incredible heavenly music.³⁵¹ For Nicolas of Capua, angelic music, or *musica angelica*, is that which is continuously performed by the Angels before the gaze of God (*ante conspectum Dei*).³⁵² And Gaffurius, in his description of what he terms *harmonia celestis, angelica et divina*, states that we desire nothing more joyful than this moment of unending

³⁵⁰ Ciconia, *Nova musica* 1.1, 54.

³⁵¹ *Declaratio musicae* 1.1, 16.

³⁵² Nicolas of Capua, *Compendium*, 311.

praise, when all that binds us to this human flesh is dissolved and we become as spirits of heaven.³⁵³

All these descriptions are limited to an extremely literal interpretation of Scripture, and most music theorists were content to leave the discussion at this level. Indeed, Johannes de Grocheio insists that it is not for the musician to treat the songs of the angels, unless he is both a theologian and a prophet, and has experienced a divine revelation.³⁵⁴ Jacobus goes beyond the literal interpretation of these scriptural references, understanding the “song” of the angels as a mere metaphor for a more profound and complex spiritual experience. He raises the concept of *musica caelestis* beyond the realm of the literal to what might be termed an analogical interpretation - reflecting that level

³⁵³ Gaffurius, *Theorica musica*, f.iiii’-f.av. It must be noted that these descriptions would have evoked, to a medieval audience, the liturgical subtext of the *Sanctus* - that religious act that brought together humans and angels in a fellowship of praise. In the Middle Ages, the congregation often participated in the singing of the *Sanctus*. The identification of earthly praise with that of the angels was commonly understood in the Middle Ages, not only with reference to the *Sanctus* but also applied to other parts of the liturgy, for example, the *Alleluia*. On this link between the heavenly and earthly liturgy, see Chapter 2 of Hammerstein, *Die Musik der Engel*, ‘Himmlische und irdische Liturgie’; for the *Sanctus* specifically, see Gunilla Iversen. “On the Iconography of Praise in the Sanctus and its Tropes,” in *De musica et cantu. Studien zur Geschichte der Kirchenmusik und der Oper (Festschrift Helmut Hucke zum 60. Geburtstag)*, edited by Peter Cahn and Ann-Katrin Heimer (Zürich and New York: Hildesheim, 1993).

³⁵⁴ Johannes de Grocheio, *De musica*, 47.

of scriptural exegesis where Scripture was interpreted to signify life in heaven, the final victory of the Church Triumphant.³⁵⁵

MUSIC AND THE BEATIFIC VISION

So, we know that there is music in heaven through Scriptural revelation, but Jacobus implies that we can begin to understand the true nature of this heavenly music through theological inquiry and interpretation of Scripture. For Jacobus, it is not just that there *is* music in heaven, but that existence in heaven *is* music. He goes beyond the literal interpretation of this concept, as found sporadically in music theory, and focuses on that which links *musica caelestis* with the experience of the beatific vision. There are two particular quotations from Scripture which, through their presence in these two chapters of *Speculum musicae*, provide the key to Jacobus's understanding of *musica caelestis*. The

³⁵⁵ On the four senses of Scripture - the literal, and the spiritual (encompassing the moral, the allegorical, and the anagogical), see Henri de Lubac, *Exégèse médiévale, les quatre sens de l'Écriture* (Paris: Aubier, 1959-64); Beryl Smalley, *The Study of the Bible in the Middle Ages*, 3rd ed. (Oxford: Oxford University Press, 1983), 197-219. Aquinas describes the four senses of Scripture in his *Quaestiones de quodlibet*, ed. S. E. Fretté and Paul Maré Vivès, 34 vols., vol. 15, *Opera omnia* (Paris: Apud Ludovicum Vivès, 1874-1889), 7.6, 145-48. In his definition of the spiritual sense, he says: "Alio modo secundum quod res sunt figurae aliarum rerum; et in hoc consistit sensus spiritualis" ("in another way, things are figures of other things, and this is how we understand the spiritual sense") (146). Anagogical exegesis interprets Scripture as it signifies life in heaven, so, for example, Aquinas states that anagogically in "Christ" there is demonstrated to us the final path to glory (148).

first is from 1 Cor. 13.12: “videmus nunc per speculum in aenigmate, tunc autem facie ad faciem” (“now we see through a glass darkly, but then face to face”). The second is from 2 Cor. 12.2-4, describing how Paul was enraptured into the third heaven:

Scio hominem in Christo ante annos quatuordecim, sive in corpore, sive extra corpus, nescio, Deus scit, raptum huiusmodi usque ad tertium coelem . . . quoniam raptus est in paradysum et audivit archana verba, quae non licet homini loqui.

I knew a man in Christ above fourteen years ago (whether in body, I cannot tell; or whether out of body, I cannot tell, God knoweth) such a one caught up to the third heaven . . . How that he was caught into paradise, and heard unspeakable words, which it is not lawful for a man to utter.

Both these verses were traditionally invoked in theological elaborations on the beatific vision, and consequently their use would have brought the concept of the beatific vision directly to the mind of the medieval reader.

The experience of the beatific vision is often described, especially in scholastic writings, as an intellectual experience: our souls, once they have been separated through death from our corporeal matter, will exist as purely spiritual and intellectual forms, capable of beholding the true nature of the divine. In 2 Cor. 12. 2-4, Paul describes how he was caught up into the third heaven - the *empyreum* - and how he was caught up into paradise, where he heard unspeakable words. Aquinas’s commentary on Paul expands on this theme:

. . . sublimaretur ad illam altissimam claritatem cognitionis, et hoc

significat cum dicit ad tertium caelum, et ut sentiret suavitatem divinae dulcedinis, unde dicit in paradisum.

. . . he was sublimated to the highest clarity of thought, and he signifies this when he says “to the third heaven,” and when he sensed the softness of divine sweetness, for this he says “in paradise.”³⁵⁶

Upon being taken up into the heavens, our souls will have immediate and intuitive comprehension of the nature of all things: this is the “highest clarity of thought” referred to by Aquinas. Here is Jacobus’s own elaboration on this passage:

Et quid mirum, si rapti sunt, qui audiunt quae non licet homini loqui, vident quae non possunt ad plenum effari, divinarum scilicet personarum inter se concordiam et societatem inseparabilem et earumdem in essentia una simplicissima, et omnibus perfectionibus absolutis summam unionem, qualiter Filius est in Patre. (*SM* 1.12, 42)

And behold, if they are enraptured, they hear that which men cannot speak, they see what cannot be fully described, between them and the inseparable society of the divine persons there is concord in one most simple essence, the highest union through the absolute perfection of all things, as the Son is in the Father.

Indeed, this moment is the ultimate end of all intellectual activity, and its final purpose (in terms of Aristotle’s four causes of being – material, formal, efficient and final – this moment represents the final cause). This principle is understood from the famous statement that opens Aristotle’s *Metaphysics*: “All human

³⁵⁶ Thomas Aquinas, *Expositio et lectura super Epistolas Pauli Apostoli*, ed. P. Raphaelis Cai OP, 8th rev. ed. (Turin, Rome: Marietti, 1953), 1, 542.

beings by nature desire to know” and quoted by Jacobus in the first chapter of *Speculum musicae*: “naturaliter omnes homines scire desiderant” (*SM* 1.1, 7). The essence of being human is this desire to know. Aquinas, in his commentary on *Metaphysics*, explains that each thing desires to be united with its source, and it is by means of the intellect that human beings will be united with the principle of their beginning, that is, God.³⁵⁷ The ultimate end of all human beings consists in their union with God, and their perfect happiness will finally exist in this apprehension of His essence.³⁵⁸

But why does Jacobus describe this experience as a type of music? We find that the relationship between the enraptured soul and the Divine was often described in the theological literature as a proportionate relationship. *Proportio* was a multi-layered concept in the Middle Ages, ranging from the concrete relationships between abstract numbers to any kind of relationship or comparison.³⁵⁹ For example, in his definition of *proportio*, Aquinas says:

. . . proportio dicitur *dupliciter*. Uno modo certa habitudo unius quantitatis ad alteram, secundum quod duplum, triplum, et aequale sunt species

³⁵⁷ Thomas Aquinas, *In duodecim libros Metaphysicorum Aristotelis expositio*, ed. M. R. Cathala and R. M. Spiazzi (Rome: Marietti, 1971), 1.4.

³⁵⁸ Jan A. Aertsen, "Aquinas's Philosophy in its Historical Setting," in *The Cambridge Companion to Aquinas*, ed. Norman Kretzman and Eleonore Stump (Cambridge: Cambridge University Press, 1993), 30-25.

³⁵⁹ Umberto Eco, *Art and Beauty in the Middle Ages*, trans. Hugh Bredin (New Haven: Yale University Press, 1986), 41-42.

proportionis. Alio modo quaelibet habitudo unius ad alterum proportio dicitur. Et sic potest esse proportio creaturae ad Deum, in quantum se habet ad ipsum ut effectus ad causam, et ut potentia ad actum: et secundum hoc intellectus creatus proportionatus esse potest ad cognoscendum Deum.

There are said to be two types of proportion. When we say one thing is in proportion to another we can either mean that they are quantitatively related - in this sense double, thrice and equal are kinds of proportion - or else we can mean just any kind of relation that one thing may have to another. It is in this latter sense that we speak of a proportion between creatures and God, in that they are related to him as effects to cause and as the partially realized to the absolutely real; in that sense the created intellect is proportioned so that it can know God.³⁶⁰

Proportion, like being, was not expressible in a single definition, but could be realized on diverse and multiple levels. Just as there were infinite ways of being, so there were infinite ways of making things in accordance with proportion - the concept of proportion was able to sustain more complex determinations.

Beyond this, each soul was thought to experience the divine essence as proportioned to the mode of being of that particular soul: in other words, the knowledge of God, according to Thomistic philosophy, is arranged in hierarchical fashion, whereby those beings more blessed will experience a more perfect vision of God (*ST* 1a.12.6-7, 4:125-8). In this same question of his

³⁶⁰ Thomas Aquinas, *Summa theologiae*, vol. 4-12 (Rome: Leonine Commission, Vatican Polyglot Press, 1888-1906), 1a.12.1, vol. 4, 122. Translation in Thomas Aquinas, *Summa theologiae*, 60 vols. (New York: Blackfriars, McGraw-Hill, 1964-76), vol. 3, 6.

Summa theologiae, Aquinas concluded that the soul that participates more in the light of glory will have a fuller experience of the beatific vision (“... unde intellectus plus participans de lumine gloriae, perfectius Deum videbit”) (*ST* 1a.12.6, 4: 126). He elaborates further: the intellect will understand God more or less perfectly according to the degree of the light of glory that floods it (“intantum enim intellectus creatus divinam essentiam perfectius vel minus perfecte cognoscit, inquantum maiori vel minori lumine gloriae perfunditur”) (*ST* 1a.12.7, 4:127). The participation in the divine essence is proportioned to the power of knowing possessed by the knower, and this power is directly related to the soul’s state of blessedness. This association of the concept of “proportion” and “relation” would have brought *musica* to the mind of the medieval reader - *musica* being the subject which considers things as they are in proportion to one another.

And unlike instrumental music, which considers proportions as related to the specific matter of sound, Jacobus intends this celestial harmony, this *music*, to be thought of as non-sonorous. Although it was common for authors writing on the beatific vision to speak of it, symbolically, as a visual experience, as the previous paragraph shows, the fact is that once in heaven we will be separated from our senses – and this beatific vision is a purely intellectual experience. There is an association constantly present in these texts of this experience with very “visual” images, encouraging quite a literal interpretation of this difficult

concept: in heaven there will be perfect clarity, perspicuity: we will be flooded with the light of glory, indeed, we will gaze upon the face of God. The biblical quotes that were often interwoven into scholastic commentaries on the beatific vision all emphasize the symbolic importance of sight in this experience:

“blessed are the pure in heart for they shall *see* God” (Matthew 5.8); “we shall *see* Him as He is” (1 John 3.2); “and they shall *see* His face,” (Rev. 22.4); and, perhaps the most pervasive quote in all of this literature: “*videmus nunc per speculum in aenigmate, tunc autem facie ad faciem*” (“now we *see* through a glass darkly, but then face to face”) (1 Cor. 13.12).

Sight, hearing, touch, all of these abilities are related to our corporeal bodies, the matter of our earthly existence, but we will exist in heaven as purely intellectual forms, not needing the mediation of our senses. Aquinas, again commenting on Paul’s enrapturement states:

Dicit autem audivit pro vidit, quia illa consideratio fuit secundum interiorem actum animae, in quo idem est auditus et visus, secundum quod dicitur Num. 12. 8: Ore ad os loquitur ei et palam, etc. Dicitur autem illa consideratio visio, inquantum Deus videtur et hoc, et locutio, inquantum homo in ipsa instruitur de divinis.

. . . he says heard instead of saw, because this experience was according to an interior act of the soul, in which hearing and seeing are the same, according to what it says in Num. 12.8: with him I will speak mouth to mouth, even apparently, etc. This contemplation may be said to be vision, inasmuch as God is seen, and speech, inasmuch as man in this is

instructed in divine things.³⁶¹

The experience, being completely intellectual, has no need for any faculty that requires the use of the sensory organs. Indeed, in discussions of whether or not angels speak to each other in heaven, Aquinas concluded that angels communicate without the use of language, but rather through a certain kind of illumination and signification.³⁶² They have an interior locution, and when Paul speaks of the “tongues of the angels” (1 Cor. 13.1), he does so metaphorically (“. . . et sic lingua angelorum metaphorice dicitur”) (*ST* 1a.107.1, 5:489). In response to Isaiah 6.3, “et clamabant alter ad alterum, et dicebant: sanctus, sanctus, sanctus” (quoted in full above), Aquinas says: “clamor ille non est vocis corporeae . . . sed significat magnitudinem rei quae dicebatur, vel magnitudinem affectus” (*ST* 1a.107.4, 5:492). Their song also must be considered metaphorically.

³⁶¹ Aquinas, *Super secundum epistolam ad Corinthios* (ed. Cai), 544.

³⁶² Aquinas deals with this question in the following: *Super Primam Epistolam ad Corinthios* 13.1 (ed. Cai), 379-380; *Super Sententiam* 2.2.2.3; and *ST* 1a.107 (Leonine ed.), vol. 5, 488-494. See, Barbara Faes de Mottoni, “Enuntiatores divini silentii: Tommaso d'Aquino e il linguaggio degli angeli,” *Medioevo*, *Rivista di storia della filosofia medievale* 12 (1986): 197-228; Idem, “Thomas von Aquin und die Sprache der Engel,” in *Thomas von Aquin. Werk und Wirkung im licht neuerer Forschungen*, ed. Albert Zimmermann, *Miscellanea mediaevalia. Veröffentlichungen des Thomas - Instituts der Universität zu Köln*, 19 (Berlin: de Gruyter, 1988), 140-55.

So it better suits Jacobus's purpose, then, rather than relying merely on visual symbols, to use a vocabulary primarily derived from musical experiences to describe this connection with the Divine. Aquinas, in his commentary on *Psalm 32*, describes the use of music and its effect on man thus: "affectus enim hominis per instrumenta et consonantias musicas dirigitur, quantum ad tria: quia quandoque instituitur in quadam rectitudine et animi firmitate quandoque rapitur in celestudinem" ("The effect on man through instruments and musical consonances may be described in three ways: and insasmuch as it is practiced with righteousness and firmness of spirit, man is enraptured into the heavens").³⁶³ In his exegesis of this psalm, Aquinas elaborates on the word "cantata" understanding it two senses: in the literal sense it signifies the exhortation "sing!" - either a simple chant or polyphony ("organizando") - but in the spiritual sense, "cantata" expresses the ineffable joys experienced by the soul upon its enrapturement to the heavenly abode.³⁶⁴ This use of musical imagery to describe this experience of enrapturement was also employed by medieval mystics: Richard Rastall, in his study of the medieval repertory of music that deals with "heavenly subjects" quotes from the English mystics, Richard Rolle

³⁶³ Thomas Aquinas, *Postilla super Psalmos*, ed. S. E. Fretté and Paul Maré Vivès, vol. 18, *Opera omnia* (Parma: Ad Ludovicum Vivès, 1874-1889), 409.

³⁶⁴ *Ibid.*, 410.

and Walter Hilton, who in turn describe the mystical experience as a type of music, a melodious harmony, a symphony, and as the song of good angels.³⁶⁵

Jacobus goes beyond the literal description of hearing the angels' songs to describe this union, and particularly this "face-to-face" experience, as a species of music:

Adhuc ab illis coeli civibus haec musicae species coelestis nuncupatur . . . sed quia in eis est subiective; ipsi enim perfectissime hanc habent musicam, qui iam non in speculo et in aenigmate . . . Deum contemplantur, sed immediate facie ad faciem Deum intuentur. (*SM* 1.12, 41)

. . . this species of music is named for these citizens of heaven . . . because it exists in them subjectively. They most perfectly possess this music, who do not contemplate it in a mirror or in darkness, but who immediately marvel at God, face to face.

He describes it as a connection and stable concord:

Vident ordinem absque priore et posteriore, ipsarum aequalitatem et similitudinem. Formas vident ideales, exemplares, et alia nobis inenarrabilia in speculo illo contemplantur . . . inter se connexionem et stabilem concordiam et ad Deum. (*SM* 1.12, 42)

. . . they see the order of things . . . their equality and similitude. They see the ideal forms, the exemplars, and other things, indescribable to us, are contemplated in this mirror . . . between them is a connection and stable concord to God .

³⁶⁵ Richard Rastall, "The Musical Repetory," in *The Iconography of Heaven*, ed. Clifford Davidson, *Early Drama, Art, and Music Monograph Series 21* (Kalamazoo: Medieval Institute Publications, 1994).

Describing the union of the human and the divine as a concord calls to mind one of the commonly known definitions of consonance, found in Boethius:

“consonantia est dissimilium inter se vocum in unum redacta Concordia”

(“consonance is the concord of mutually dissimilar pitches brought together into one”).³⁶⁶ The two dissimilar natures, human and divine, are united as one.

Finally, linking this experience to the concept of harmonic modulation, Jacobus says:

In quibus omnibus debito modo comparatis . . . inveniunt excellentissimam modulationem harmonicam, sic et perfectissimam musicam. Unde optimi sunt musici, qui intuitive librum illum aeternum conspiciunt. Nam ibi patet et relucet omnis proportio, omnis concordia, omnis consonantia, omnis melodia, et, quaecumque ad musicam requiruntur, sunt ibi conscripta. (*SM* 1.12, 43)

In all things compared in the proper way . . . they find the most excellent harmonic modulation and thus the most perfect music. And so they are the best musicians, who intuitively perceive this eternal book. For there all proportion is shown and shines out, all concord, all consonance, all melody, and, whatever might be required for music, are there composed.

This sentiment is echoed a century later by Ugolino of Orvieto when he describes heavenly music as the beginning and origin of all music: “ecce caelestis musica omnis mundanae principium, omnis humanae ac instrumentalis initium et origo a qua omnium melodiarum proportio, omnium consonantiarum coniunctio, omnis vocum concordia, omnis vocum concordia . . . omnium est

³⁶⁶ *De institutione musicae* in *De institutione arithmetica libri duo, De institutione musicae libri quinque*, 1.3, 191. Trans. Bower, 12.

caelestis musicae ad ipsius conditoris laudationem similitudinis” (“Behold, heavenly music is the beginning of all cosmic music, and the origin of all human and instrumental music, and the fount of all melodic proportion, of the joining of all consonance, of all concordance of pitches . . . all things exist in a similitude with this most high heavenly praise”).³⁶⁷ The theologian Henry of Ghent describes the existence of the Blessed in the empyreum as a musical phenomenon: the Blessed will be at one with the substance of the empyreum, and through the *harmonic* contact between the Blessed and the parts of the empyreum, the whole body of the empyreum will resound in the highest melody.³⁶⁸

* * * * *

In conclusion then, this last species of *musica caelestis*, the music possessed *subjectively* by the all citizens of heaven, illustrates Jacobus’s conception of heavenly music, and demonstrates his original contribution to the theology of the Beatific vision. His placement of *musica caelestis* under the realm of metaphysics allows him to treat all species of music that consider transcendental entities: the music of the celestial movers, the angels, their incessant hymns of praise, and the music that expresses the transcendental

³⁶⁷ *Declaratio musicae* 1.1, 16.

³⁶⁸ Henry of Ghent, *Quodlibet* 7, ed. G. A. Wilson, vol. 11, *Opera omnia* (Leiden: Leuven University Press, E. J. Brill, 1991), q. 7, 46-47.

experience of complete intuitive cognition. This state of perfect understanding, this complete and instantaneous knowledge of all things, and the final cause of existence for all human beings, will only be fully realized upon our arrival in heaven, but Jacobus suggests (and this is of course a commonplace in scholastic writings) that we might approach this perfect state in the pursuit of a contemplative life. In his definition of beauty, Aquinas writes:

. . . pulchritudo . . . consistit in quadam claritate et debita proportione. Utrumque autem horum radicaliter in ratione invenitur, ad quam pertinet et lumen manifestans et proportionem debitam in aliis ordinare. Et ideo in vita contemplativa, quae consistit in actu rationis, per se et essentialiter invenitur pulchritudo. (*ST 2a2ae 180.2, 10: 426*)

. . . beauty consists in a certain clarity and due proportion. Each of these is rooted in reason, and it is the function of reason to shine the light in which beauty is seen and to order things in proportion. Therefore, in the contemplative life, which consists in an activity of reason, beauty is found.³⁶⁹

In relation to the Beatific vision, he says:

Principaliter quidem ad vitam contemplativam pertinet contemplatio divinae veritatis, quia huiusmodi contemplatio est finis totius humane vitae . . . Quae quidem in futura vita erit perfecta, quando videbimus eum facie ad faciem, unde et perfecte beatos faciet. Nunc autem contemplatio divinae veritatis competit nobis imperfecte, videlicet per speculum et in aenigmate: unde per eam fit nobis quaedam inchoatio beatitudinis, quae hic incipit ut in futuro terminetur. (*ST 2a2ae 180.4, 10: 427-428*)

The contemplation of divine truth belongs to the contemplative life primarily because this contemplation is the goal of the whole human life

³⁶⁹ Trans. in Blackwell edn., 46: 19.

. . . This contemplation will be perfect in the next life when we shall see God face to face, hence it will make us utterly happy. Now, however, the contemplation of divine truth can be ours only imperfectly, through a glass darkly. Consequently it gives us a certain dawning happiness which begins here so as to be fulfilled in the life to come.³⁷⁰

This attainment of what Jacobus terms *musica caelestis* is therefore possible in this life, however imperfectly, in the pursuit of knowledge, and so the contemplative occupation of Jacobus, as a music theorist, is vindicated. In fulfillment of the purpose of his treatise outlined in the first chapter of *Speculum musicae*, through his commentary on the opening statement of Aristotle's *Metaphysics* ("naturaliter omnes homines scire desiderant") and his interpretation that the highest occupation of man is to live through his intellect, Jacobus's seven-volume, half-a-million word encyclopaedic work on music, brings him closer to the perfect attainment of *musica caelestis*. He concludes:

Hanc autem . . . musicae speciem, etsi cives illi coelestes perfecte habeant, nos tamen viatores aliquantulum imperfecte habere possumus . . . per doctrinam sanam, per philosophiam. (*SM* 1.12, 43)

This species of music . . . is possessed perfectly by these citizens of heaven, but we wayfarers of this world can possess it imperfectly . . . through sound doctrine, and through philosophy.

³⁷⁰ Trans. in Blackwell edn., 43: 26.

CONCLUSION

In a brief conclusion, I would like to return to the question regarding the purpose of Jacobus's treatise, and who the audience for such a work may have been.

While I have alluded to this question obliquely within the course of these chapters, I would like now to explicitly consider certain aspects. As mentioned in Chapter 3, Jacobus makes a specific reference as to how much of the Boethian material of *Speculum musicae* emerged.³⁷¹ In the passage I quoted, Jacobus discusses how he was afraid he might forget the material from Boethius's *De institutione musica* that he had learned while a student in Paris, and so he made his own compilation, in places excerpting the Boethian text word-for-word, and at other places abbreviating it, or adding more text and figures (*SM* 2.56, 136).³⁷² This passage gives an accounting of the impetus behind Books 2, 3 and 5 of *Speculum musicae*, which are essentially extensively detailed glosses on Boethius's *De institutione musica*. It also implies that there was, at first, a very personal audience for these books: Jacobus himself. These

³⁷¹ For the full quote and translation, see Chapter 3 of this dissertation, 98.

³⁷² For a discussion of the use of Boethius in the curriculum of the University of Paris, see the article by Haas, "Studien zur mittelalterlichen Musiklehre I: Eine Übersicht über die Musiklehre im Kontext der Philosophie des 13. und frühen 14. Jahrhunderts." Haas analyzes the curriculum list found in the manuscript *Bar* 109, which dates from the mid-thirteenth century.

books of *Speculum musicae*, although later formalized and expanded, were at first compiled to aid him in his own internalization of Boethius's teachings.

But was Jacobus the only audience for these books? This seems unlikely. Interesting work is now being done on the importance of centers of learning outside of the great universities, arguing that the work being done in these smaller centers was more advanced than has often been thought. In her work on the Dominican houses of the late thirteenth and early fourteenth centuries, Mulchahey found that the course of study being undertaken at each house included lectures on Lombard's *Sentences* and Aristotle, and frequent disputations were also scheduled.³⁷³ This level of study used to be commonly associated only with the universities, but while there were only a handful of universities, there were hundreds of sites of higher education in the Dominican houses across Europe. It was common for teachers to train at the university and then to return to the local houses where they might then comment on Lombard's *Sentences* for a second time. We also know that the Dominican friars taught not only in their schools but also in those of the other ecclesiastical groups: there are records of more than a hundred friars teaching in episcopal schools and abbeys,

³⁷³ M. Michèle Mulchahey, "First the Bow is Bent in Study..." *Dominican Education before 1350*, vol. 132, *Studies and Texts* (Toronto: Pontifical Institute of Medieval Studies, 1998), 134-6.

and particularly in cathedral schools.³⁷⁴ I have already noted the primacy of the Dominican house in Liège as the center for theological studies in the region, and the ritual and liturgical reforms instituted at the Benedictine abbey of St. Jacques under Dominican influence.³⁷⁵ And as the seat of a powerful bishop, Liège was one of the most important cities in the region, especially prior to the rise of the

³⁷⁴ Hinnebusch, *The History of the Dominican Order*, Volume 2, 12.

³⁷⁵ Chapter 2 of this dissertation, 47-50. In his review of Mulchahey's book, Inglis draws attention to a new focus in the study of Aquinas, placing it within the Dominican intellectual context, beginning with Boyle's 1982 study of the *Summa theologiae*: "With a focus on the moral component of Aquinas's *Summa theologiae*, Boyle establishes that Aquinas did not converse alone with Aristotle and Averroës in some philosophical ivory tower as historians often imply, but that he wrote and disputed in light of Dominican goals." John Inglis, "Review: *First the Bow is Bent in Study... Dominican Education before 1350* by M. Michèle Mulchahey," *Journal of the History of Philosophy* 37/2 (1999), 361. O.P. Leonard E. Boyle, *The Setting of the Summa Theologiae of Saint Thomas*, vol. 5, *The Etienne Gilson Series* (Toronto: Pontifical Institute of Medieval Studies, 1982). As indicated throughout this dissertation, Jacobus seems to write and dispute in light of the philosophy of Aquinas and (to a greater extent) Godfrey of Fontaines. Inglis discusses the previously popular argument that Aquinas's *Summa theologiae* was too dense for local consumption: "This Dominican context helps to provide a response to an objection that John Jenkins raises to Boyle's view of the audience of Aquinas's *Summa theologiae*--an issue that has important implications for how to read this work. Boyle argued that the *Summa* arose out of the pastoral needs of ordinary Dominicans and reflects this institutional purpose. Jenkins "rejects" this claim, arguing that Aquinas's text is so dense and conceptually difficult that it could only have been written for those who were prepared to study the *Sentences* of Peter the Lombard at the University of Paris. (See John I. Jenkins, *Knowledge and faith in Thomas Aquinas* [Cambridge: Cambridge University Press, 1997], 81, 89-90.) Mulchahey provides important support for Boyle's view by establishing that it was the policy of the order to prepare ordinary Dominicans to study the *Sentences* of Peter the Lombard at the local houses." Inglis, 362.

great commercial cities of Ghent and Bruges, and was primarily a city of clerics, with its cathedral, seven collegiate churches and two monasteries.³⁷⁶ It seems likely that in this active environment there was an audience and outlet for the scholastic and discursive treatment of the subject of music of the sort found in Jacobus's *Speculum musicae*.

Although not a member of the Dominican clergy, but *magister scholarum* of the collegiate church of St. Paul, as I have hypothesized, Jacobus would have enjoyed a certain stature within the clerical society of Liège, and particular influence over the educational curriculum.³⁷⁷ For an earlier period (1260-1280), it has been suggested that, with the combined treatises of Johannes de Garlandia on plainchant and mensural music (*De plana musica* and *De mensurabili musica*), and Boethius's *De institutione musica*, the university student in Paris would have had all the written music theory he needed to earn

³⁷⁶ See Martha C. Howell, "Review: *Réseaux de pouvoir et solidarités de parti à Liège au moyen âge (1250-1468)* by Geneviève Xhayet," *Speculum* 75/2 (2000), 525-7. On the Dominican activity in Liège, see: Paul Bertrand, *Commerce avec dame Pauvreté: Structures et fonctions des couvents mendiants à Liège, XIIIe – XIVe siècles* (Geneva: Librairie Droz, 2004). This extensive study, based on archival sources, concentrates on the Dominicans' economic integration and their legal activity in the city during this period.

³⁷⁷ In his study of an earlier time, Pedersen discusses how the *magister scholarum* of a twelfth-century cathedral school had a monopoly on public education in a town. Olaf Pedersen, *The First Universities: Studium generale and the Origins of University Education in Europe*, trans. Richard North (Cambridge: Cambridge University Press, 1997), 105. It is interesting that several music theorists are known to have held the position of *magister scholarum*: Elias Salomo, Amerus, Johannes de Muris.

the title *musicus*.³⁷⁸ Would the first five speculative books of *Speculum musicae* (an alternate Boethius), along with the practical books 6 and 7 on plainchant and mensural music, have provided the liégeois student with his music curriculum? This may well be the case, and hand-in-hand with the provision of a complete and rounded education in music theory, Jacobus also conveys an evident concern with very practical matters, particularly in the instruction of chant. At the end of a long chapter on Guido's concept of *motus*, Jacobus gives this aside on the teaching of plainchant:

Hae igitur et aliae multae sunt non modo vocum, sed consonantiarum inter se coniunctiones quibus utuntur cantores et cantuum compositores. Qui igitur musicus vult esse practicus, qui cantare non iam tantum per usum, sed per artem desiderat, in variis prius tactis vocum et consonantiarum coniunctionibus apte proferendis se habiliter et specialiter in iuventute, quia qui nimis expectat, rudis et quasi inhabilis efficitur in cantu, quidquid sit de musica theoricā.

Diligenter igitur cantando, saepe et saepius proferat quis tactas varias vocum simplicium et mixtarum secundum artem et thesim modulationes, nec ignoret voces repercussas seu unisonantes suis in locis convenienter decantare et primitus in manus iuncturis in quibus pueri primo instruuntur.

Ut enim aliqui cantare sciant, primo suum gamma debent adiscere et notas suas et voces et cantus in manus iuncturis proferre, ibi suas solfationes multiplicare. Sicque sit illis pro monochordo varia vocum in gammate dispositio, varia coniunctio, varia decantatio; noscat ibi cantandi modos, vocum mutationes, litteras, vocum distantias et alia

³⁷⁸ Rebecca Baltzer, "Johannes de Garlandia," *GroveMO* (accessed April 10, 2009).

quae ibi continentur prius tacta.

Et cum in manu fuerit aliquis convenienter instructus et cantare sciverit et assignare in suo gammate ubi voces sui cantus locum habent, ad cantus in libris notatos accedat, ibi saepe et saepius se informet, cantus varios et distinctos <addiscat>, primo notas cantuum ruminando et solfaciendo sine littera, postea applicando ad litteram cantus.

Inde cum fuerit magis instructus, cantet sine solfatione et cantando cantus litteram proferat per se et sine notis, ac si notas illius diceret, nec hunc dimittat laborem donec indifferenter cantus specialiter ecclesiasticos invisos et inauditos, quasi ex improvise et sine magistro, secure decantare sciat ut sit musicus practicus vel cantor dici mereatur.

Videtur autem finis principalior musicae practicae vel de principalioribus cantus, vel scire cantare. Non enim qui varias vocum novit mixtiones, consonantiarum naturas, ipsarum proprietates, convenientias, differentias, naturales proportiones, etiam cantuum regulas, musicus dici debet practicus nisi cantare sciat. Unde dicit Guido quod longe aliud est memoriter, id est speculative, sapere quam memoriter canere. Sunt enim aliqui sapientes qui multa sciunt et forte musicam theoreticam, et tamen parum aut nihil cantare noverunt. Etiam de Boethio dicit Guido quod liber eius non cantoribus, sed solis philosophis, utilis est, quia principalius de musica tractat theoretica, vel, si tangat practicam, theoretice tangit illam. (SM 6.69, 198-199)

All of the above, both in terms of pitch, but also with respect to the conjunctions of the consonances, are used by singers and composers of chants. He who wishes to become a practical musician, and who desires to sing, not just for utility's sake, but also artfully, should become acquainted with the various topics we have discussed, regarding the pitches and how to produce the joinings of the consonances with skill. He should do this as a youth, for he who has high expectations with respect to the purview of music theory in this regard, will produce rough and unwieldy chants.

By singing diligently, he who practices more and more often the various

aspects of the simple pitches and their commixture through modulation (both *arsis* and *thesis*) that I have discussed above, will know how to sing repeated pitches with consistency, and how to place the unisons correctly, and also the junctions on the hand, which boys are taught first.

He who wishes to know how to sing, should first learn the gamut, and be able to replicate its notes, pitches and songs through the junctions on the hand, and multiply them there through solmization. He may also know various aspects of the disposition of the monochord, the various conjunctions, the various decantations; he should know the modes, the mutations of the pitches, the letter names, the distances of the pitches, and other things that are contained therein, that we have discussed already.

And when he has been instructed in the hand consistently, and knows how to sing and also assign the pitches of a chant their correct place in his gamut, then he may proceed to chant in notated books. He will return to these books more and more often to learn the various chants and the distinctions between them, first ruminating on the notes of the chant then solmizing them without letters, afterwards applying them to the letter of the chant.

Then, when he has been taught a great deal on all the above, he will sing without solmization syllables, and by singing will bring forth the letter of the chant by himself and without the notes in front of him. If he does need to review the notes of another chant, he not take this work lightly, and will internalize these invisible and inaudible aspects of the chant, as if from improvisation and without the master, and now knowing how to descant securely will earn the title of practical musician or cantor.

It seems the goal of *musica practica* is principally, or more principally, the chant itself, or knowing how to sing. For he who knows the various mixtures of the pitches, the nature of the consonances, their properties, their conjunctions, differences, natural proportions, and even the rules of chant, cannot be called a practical musician unless he knows how to sing. Whence Guido remarks: the longer you try to commit something to memory, that is, speculatively, then you will also be able to sing it by memory. There are many knowledgeable men who know many things

about music theory and in great detail, and yet nevertheless this is worth little to nothing if they do not know how to sing. With respect to Boethius, Guido says, his book is not useful to singers, but only to philosophers, because it deals principally with theoretical music, or if it touches on practical music, it touches on it only in a theoretical way.

There are a number of such personal asides in *Speculum musicae* (particularly in books 6 and 7), which decry the incompetence of some singers, and their lascivious and corrupt style in the declamation of plainchant, expanding on the Boethian *topos* that contrasts simple music with lascivious music.³⁷⁹ The above passage gives a very detailed description of how best to teach someone to how to sing from a young age, outlining the necessary steps along the way. It is interesting that Jacobus singles out those who may demonstrate a vast knowledge of the theoretical aspects of music, but do not know to sing, and so are not worthy of the title *musicus practicus*. So, it seems likely that drafts of certain sections of *Speculum musicae* were first written earlier in Jacobus's career, namely those that function as "straight" glosses or commentary on Boethius (Books 2, 5, and sections of the other books). It is possible that Book 3 also existed separately at one point, as a philosophical disputation on the nature of the whole tone, backed up by copious mathematical proofs. But there

³⁷⁹ The similarity of this language to the papal bull of 1324 and the Cistercian statutes has been discussed above (Chapter 1, pp. 15-17). See also: *SM* 1.18, 59-61; *SM* 6.41, 12, 16, 18; *SM* 6.46, 10; *SM* 6.74, 8-13; *SM* 6.78, 12; *SM* 7.1, 4-5; *SM* 7.9, 23; *SM* 7.27, 49; *SM* 47, 94.

may have been other practical impetuses behind certain of the other books, such as particular liturgical reforms affecting the tonary of Book 6, the completion of which may have been encouraged by a commissioner.³⁸⁰

Returning to the issue of comprehensive post-elementary education in centres outside of Paris, Jacobus does seem to have had a wider audience in mind for *Speculum musicae*, and not just one concerned with the intricacies of practical music-making. At the end of Book 2, Jacobus addresses the reader directly and explains that he wrote this very long treatise because he saw a niche in the market. Jacobus states that all the other sciences have many long treatises dedicated to their study, but in his experience, books of music theory were modest in scope, and dealt with specific and confined theoretical questions, rather than addressing the grand scope of music theory:

Sed hic, circa finem huius libri secundi, lectorem rogo: Parcat mihi si longus nimis fui. Excuset me amor huius scientiae desideriumque assumptae explanationis eius theoriae, insuper insufficientia mea, operis difficultas et abundantia materiae. Siquidem consona non videntur ut ibi dicantur pauca ubi dicendorum offert se copia, sitque sermo rarus atque parcus ubi potest esse largus. Sane musicae doctores de consonantiis aliquibus bona multa nobis reliquerunt. . . .

Repugnatne musico illarum ignorare naturas? Non enim hoc minus videtur quam de generibus illis ad musicam pertinere. Non minus hoc quam illud est speculabile. In quo enim magis viget musicae theoria, in

³⁸⁰ He mentions a work of his youth that dealt with the tone, which probably was the basis for *Speculum musicae* Book 3, as discussed in Chapter 3 above.

quo magis matri suae arithmeticae conformis est musica quam in consonantiarum inquirendis naturis, partibus earum notabilioribus, ipsarumque per partes proportionibus specificis in primis vel minimis numeris? Ubi amplius quam inibi locum habent musicae mathematicae demonstrationes? Et, si de tactis consonantiis musica non tractaverit, quaenam alia scientia disseret de illis?

. . . Haec autem et consimilia amatori musicae theoricae fastidium non generent. In ceteris scientiis libri multi sunt et inter illos aliqui magni. In musica, etsi multi tractatus sunt, illi tamen sunt modici et specialiter de ipsius theoria breviter se expediunt tractatores, cum tamen magnitudini scientiae magni possint vel debeant respondere libri. Igitur benivolus lector, amator musicae, mihi condescendat, excusatum me habeat. Sumat opus gratis in quo non modicum laboravi. (*SM* 2.126, 308-9)

But here at the end of this second book, I would like to say this to the reader. Excuse me if I went on excessively long. Let my love of this science and my desire to fully explain these theories be my excuse, and along with my own inadequacies, consider also the difficulty of the work and the abundance of the material. If indeed, the consonances seem only to offer but a few things to be said, then a rare sermon on them can afford to be long. Teachers of music have left out many details concerning some consonances. . . .

Does the musician refuse to deal with the nature of these? No issue would seem to pertain more to music than a consideration of the *genera*. It is not worth speculating on music without consideration of such issues. In what does the theory of music flourish more, in what does its mother arithmetic flourish more than the inquiry into the nature of consonances, the more notable parts of them, and the parts of their specific ratios? Where more fully than here do the mathematical demonstrations of music apply? And if we do not discuss the consonances within the realm of music, within which science should we discuss them? . . .

These and similar things will not turn off the lover of music theory. In other sciences there are many books, and among those some great ones. Although there are many treatises in music, they are nevertheless modest in scope and they deal specifically with their theory briefly, despite the

fact that the great magnitude of this science should or ought to be reflected in the number of books about it. Therefore induldge me, benevolent reader, lover of music, excuse me this. This work, which I have worked very hard on, has taken up grace.

Other sciences had benefited greatly from the infusion of texts newly translated from their Greek or Arabic originals. From one twelfth-century translator alone (Gerard of Cremona, ca. 1114-87), we have translations of at least a dozen astronomical texts, including Ptolemy's *Almagest*, seventeen works on mathematics and optics, including Euclid's *Elements* and al-Khwarizmi's *Algebra*, fourteen works on logic and natural philosophy, including those of Aristotle (*Physics*, *De caelo* and others), and twenty-four medical works.³⁸¹ William of Moerbeke (fl. 1260-86) sought to provide a complete and reliable version of all Aristotle's works. It is a commonplace to note that the advent of scholasticism in Europe (and the rise of the universities) was propelled by the newly-available works of Aristotle in translation. The subjects of logic, moral philosophy, natural philosophy and metaphysics all had the new texts of Aristotle with which to grapple, and as I noted above in Chapter 3, the mathematical subjects (with the exception of music) benefited from the new translations of Euclid, al-Khwarizmi and Ptolemy.

³⁸¹ Lindberg, *The Beginnings of Western Science*, 205.

There were no such new, dense intellectual tomes for the student of music, who had to be content with the works of Boethius that had been available to him since the sixth century. Jacobus sees himself as capable of taking on this task of producing a grand *opus* on the subject of music – both a *summa* of all previous work, but also an analysis and synthesis of this material within the context of the other subjects of higher learning, in particular, arithmetic, metaphysics, natural philosophy and theology. He knows his Aristotle well, is conversant with the theological and philosophical debates on major issues that were current at least up to the first decade of the fourteenth century (Aquinas, Godfrey of Fontaines, Duns Scotus), and was possibly aware of later developments.³⁸² This is not a cosmetic Aristotelianism (to use Christopher Page’s phrase), or of a dilettant in the area.³⁸³ Rather we see a scholar fully versed in the language of Aristotle, and capable of applying it in appropriate and novel ways, in particular in the arguments he traces within Book 7 of *Speculum musicae*. At times during the treatise, we can almost catch a glimpse of him at

³⁸² I suggested above Jacobus may have been aware of Walter Burley’s work on physics (c1320) (see chapter 5) and possibly of the innovative mathematics of Muris (1330s/1340s) (see chapter 3).

³⁸³ Christopher Page, *Discarding Images*, 121. On the use of Aristotle within thirteenth-century music theory, and in particular his description of Franco’s dilettantish application of terminology, see Haines and DeWitt, “Johannes de Grocheio,” 73.

work on this research project, combing through the libraries of St. Jacques in Liège, or the Sorbonne in Paris, or through those works that he has retained in memory, seeking out more authorities and examples for the particular topic he is at work on, whether it be the many definitions of the phenomenon of motion, or the various practices employed in joining the antiphons to their verses (he will often pepper his text with phrases such as “I have found one teacher who. . .” or “I have not been able to find. . .”).³⁸⁴ Jacobus assumes his book would have a wide circulation alongside those of other disciplines. His work is intended to be ambitious in scope - truly a compilation of the “greats” of music theory - with the masters of the *ars antiqua* standing as the heirs to this continuous achievement of excellence in the discipline of music.

One tradition that may best describe the entirety of *Speculum musicae* is that of the medieval encyclopedia, with Jacobus’s careful organization, citation, analysis and commentary on all the known sources of music theory at the time. An interesting, but somewhat later example of a medieval encyclopedia from Liège has recently been discovered: a fifteenth-century text known as the *Macrologus* of Liège, an enormous dictionary and grammar, written in the Benedictine monastery of St. Laurent (the same monastery that produced the

³⁸⁴ For example: “Inveni autem unum doctorem qui tertii toni super antiphonas sex tangit differentias” (“Moreover, I found one teacher who discussed six *differentia* for antiphons in the third mode”) (*SM* 6.91, 265).

manuscript *B-Br* 10162, discussed in Chapter 2 of this dissertation), which combines passages from the classics such as Cicero and Ovid with others from earlier medieval encyclopedists such as Isidore of Seville and Vincent of Beauvais.³⁸⁵ While there was a flourishing tradition of large, encyclopedic treatises during the twelfth and thirteenth centuries for subjects other than music (such as the one by Bartholomaeus Anglicus), there were no comparable encyclopedic treatises on music from this time period.³⁸⁶ The *Speculum musicae* could be viewed as one such example of a late medieval *summa*, but it is, in Jacobus's own words, a work of philosophy, in which Jacobus endeavored to treat every aspect of music, both practical and theoretical, from a scientific standpoint, and quite possibly as an element of the post-elementary curriculum in the schools of the city of Liège.³⁸⁷

³⁸⁵ Van den Abeele, "The *Macrologus* of Liège: An Encyclopedic Lexicon at the Dawn of Humanism."

³⁸⁶ "The history of encyclopedism in the fourteenth and fifteenth centuries has yet to be written, and it is still too early for this. Nearly all of the works remain unedited, and the manuscript collections still have to be searched through systematically." Van den Abeele, "The *Macrologus* of Liège: An Encyclopedic Lexicon at the Dawn of Humanism," 43.

³⁸⁷ "Horum igitur consideratione, ego, etsi minimus inter alios, ut, etiam cum vacat, aliquam operam darem philosophiae" ("Therefore, with these considerations, I, although the least among men, since it is lacking, offer this work of philosophy"). *SM* 1.1, 10.

Jacobus's definition of his treatise as a work of philosophy draws our attention back to two tensions that pervade the text. The first is the tension between the Neoplatonic inheritance of music theory (and Jacobus's own Neoplatonic philosophical tendencies) and the Aristotelian bent of the treatise – the vocabulary, the thirteenth-century authorities, some of the topics covered, the incorporation of natural philosophy, and even the organization of content at some level (in particular, the *disputatio* structure of the last book). Other than, the huge reliance of Jacobus on Boethius as a primary authority, and his belief in the primacy of the discipline of arithmetic and of abstract numbers, this neoplatonism comes to the fore in Jacobus's conception of *musica caelestis* (even to the point where he mentions that when in heaven we will see the ideal forms).³⁸⁸ It is only within the scope of book 7 (and perhaps book 3), where we have the greatest amount of original material in the treatise, and where there was no pre-thirteenth-century primary authority to which Jacobus could be beholden, that we find the purest expression of Jacobus's scholasticism, and its most original application.

The other tension is between science (in particular, natural science, which relies on observation as its primary authority) and philosophy. There is

³⁸⁸ *SM* 1.11, 42. This concept of divine illumination was one of the oldest and most influential alternatives to naturalism, and found one of its last defenders in Thomas Aquinas.

evidence of this throughout the treatise, but one particular example is the protracted discussion of sensory *versus* intellectual cognition in the perception of consonance (Book 4, chapters 1-8).³⁸⁹ Within his classification of the subject of *musica*, Jacobus places it under the speculative sciences (*per* Kilwardby's *De ortu scientiarum*), and in his discussion of the subalternation of music to the other sciences, he asserts the primacy of mathematics over physics.³⁹⁰ The

³⁸⁹ The sense of hearing is not the efficient cause of concord, although it may perceive it. For Jacobus, as others before him, the essential quality (the quiddity) of discord and concord is dependent upon numerical proportion: “Quamvis autem sensus iudicet aliquos sonos concordare, aliquos non, et, quantum ad concordantes, aliquos magis, aliquos minus concordare dicat, et similiter in discordantibus, non tamen sensus causa concordiae in concordantibus, nec discordiae in discordantibus, sed provenit hoc naturali ex proportione miscibilium vocum vel in proportione ex partibus principalibus talium consonantiarum, seu causis aliis essentialibus vel accidentalibus, quas etsi non noscat sensus, percipere potest eas intellectus” (“The sense [of hearing] may be able to judge that some sounds are concordant, and some are not, and can judge which are more concordant and which are less concordant, similarly too with the dissonances. However, it is not the sense of hearing that is the cause of concord in the consonances, nor of discord in the dissonances, but it comes from the natural proportion of these combined pitches, or from the proportion between the principal parts of the consonance, and whether it is with respect to the essential causes or the accidental causes, this the sense of hearing cannot know and can only be perceived by the intellect”) (*SM* 4.31, 93). For an excellent discussion of the understanding of the sense of vision in the later Middle Ages, see: Katherine H. Tachau, *Vision and Certitude in the Age of Ockham: Optics, Epistemology and the Foundation of Semantics. 1250-1345* (E.J. Brill: Leiden, New York, 1988). An analysis of Jacobus's discussion of the perception of sound (particularly the above-mentioned chapters of book 4, but also book 1, chapter 22-29) in the light of the developments in optics at this time would be an interesting study.

³⁹⁰ “Scientia enim subalternata a subalternante multa sumit. Et cum musica principalius arithmeticae quam physicae subponatur, plura de

distance between his outlook and that of Johannes de Muris is best exemplified with this quote from Muris: “vox autem est per se forma naturalis iuncta per accidens quantitati” “sound, moreover, is in itself a natural form which is joined to quantity accidentally” (*Notitia*, 70). The late thirteenth century and early fourteenth century saw an explosive growth in the experiential sciences, and Johannes de Muris was at the forefront of these developments in his musical and non-musical treatises. Jacobus, for his part, resisted this trend. At the end of Book 3, he addresses his readers directly, referring to them as “subtle clerics,” and suggests that they, as lovers of music, and experts in numbers, will delight in the play of numerical proportions, in the various and stupendous numerical comparisons, and will revel in the marvelous fruits of this noble science.

Haec sint dicta ad expositionem qualemcumque verborum Boethii, in quibus si defeci, ruditati deputetur meae, quia non sufficio ad plene capiendam tam arduam materiam quae multas requirit cogitationes, multas numerorum collationes. Sed accedant, ad tantum perscrutandam materiam, subtiles clerici, in numeris experti, clarum et profundum habentes ingenium in talibus. Si amatores musicae sint theoriae, delectentur. Ludant hi in numerorum proportionibus, in variis et stupendis numerorum comparationibus. Ingrediantur et egrediantur, et pascua invenient. Ibi ruminent, pulsent et fodiant, et proportionum

arithmetica quam de physica subponatur, plura de arithmetica quam de physica sunt scientia, nec est perfectus musicus theoreticus qui in arithmetica non est sufficienter instructus” (“A subalternate science takes many things from that to which it is subalternate. And since music is more principally subalternate to arithmetic than to physics, it will take more things from arithmetic than physics. A musician will not be perfect in music theory unless he is sufficiently instructed in arithmetic”) (*SM* 1.21, 67).

naturas penetrent, et thesauros huius nobilis scientiae non modicos fructusque mirabiles reperient. (*SM* 3.56, 163)

These words are intended to elaborate on those of Boethius, and insomuch as they are deficient in this goal, let that clumsiness be my fault, since perhaps I did not fully conquer this difficult material, which required a lot of hard thinking, and many numerical operations. But let them succeed, subtle clerics, expert in numbers, and having a clear and profound talent in such things, with this almost inscrutable content. If they are lovers of theory, they will delight in this. They will have fun with the numerical proportions, and in the various and stupendous comparisons of numbers. They will enter here and exit and find pasture. Here they will ruminare, they will frolic, and be nourished, and they will penetrate the nature of proportion, and in these treasures they will discover the not modest but rather marvelous fruits of this noble science.

APPENDICES

Appendix 1 Account books and charters, St. Paul³⁹¹

Terrier de la collégiale S. Paul à Liège, Ms. C I 2, Archives de l'Évêché, Liège.

(1) anno vii apud wonc (f. 1r) [1307]

item pro minuta deciam feodorum terris terracialibus de wonc et pro deciam deniches debent iohannes wafelars et humbeleis filius le pelon 15 modios spelte a 2 ans.

(2) anno x apud wonc (f. 17r) [1310]

. . . dominus h. de wonc pro deciam deniche 16 modios spelte et 2 sextarios.

(3) anno xxi apud wonc (f. 47r) [1321]

item pro deciam deniche debent iohannes li pessarias li drapiers et rigaldus inniltor de wonc 23 modios spelte.

. . . item iohannes wafflars et colinus fratres 6 modios spelte.

. . . item nicolaus wafflars pro terra preciosa 1 modium [spelte].

(4) anno xxi expense ecclesie sancti pauli (f. 65v) [1321]

³⁹¹ In this transcription, I retain the spelling, capitalization and punctuation of the source.

magister iacobus de montibus habet per h. in denariis ut patet per computum in papiro pro sua rata cere 14 solidos 3 denarios et obolum turonenses valentes 1 libra et 3 sextarios cere 7 obolos turonenses. item habet per h. in denariis ut patet per suum dictum computum³⁹² in papiro pro sua rata piperis 10 solidos 2 denarios et obolum turonenses valentes 1 libra piperis desunt 3 denarios et obolum turonenses. item habet per dictum h. per eandem computum in papiro in denariis pro [*number no longer visible*] fagottis 17 solidos 2 denarios turonenses pro sua rata fagottarum.

(5) anno xxii apud wonc (f. 67r) [1322]

item pro deciam deniche iohannes li pessarias li drapiers et rigaldus inniltor de wonc 23 modios spelte.

. . . item iohannes wafflars et colinus frater eius 6 sextarios spelte.

. . . item nicholaus wafflars pro terra preciosa 1 modium spelte.

(6) anno xxii expense ecclesie sancti pauli (f. 87r) [1322]

³⁹² Ms: “per suam dictam computam”; the scribe always treats “computus” as a feminine noun, I have corrected that in these transcriptions.

magister iacobus habet per dominam hochettam in camera 4 libra cere. item habet in domo dicte domine hochette 2 libra piperis. item habet per h. in denariis ut patet per computum suum in papiro 8 libra cere. item habet per eandem h. in denariis ut patet per eundem computum in papiro 4 libra piperis. item habet per eandem h. ut patet ibidem 25 capones in denariis. item habet per hugonem granatarium 17 capones et gallinam, gallinam sic nimis habet 1 gallinam. item habet per donam mariam de gimes domine dicte mulieris 18 libra amigdalarum. item habet per h. in denariis ut patet per computum suum in papiro 22 libra amigdalarum. item habet per h. in denariis ut patet per computum suum in papiro 15. item habet per eandem h. in denariis ut patet per suum dictum computum in papiro 1500 fagottos.

(7) anno xxii distributio siliginis ordei avene et pisonis (f. 87v) [1322]

magister iacobus habet per h. in denariis ut patet per computum suum in papiro 1 modium siliginis. item habet per eandem h. in denariis ut patet per eundem computum in papiro 3 modios avene de hannay. item habet per eandem h. in denariis ut patet per dictum computum in papiro 2 sextarios pisonis. item habet per hugonem granatarium 4 sextarios ordei de wonc. item habet per h. 4 denarios ut patet per suum computum in papiro 4 sextarios ordei. item habet per eandem h. 4 denarios ut patet per suum dictum computum in papiro 1 modios cere avene de wonc.

(8) anno xxxvi apud wonc (f. 90r) [1336]

item nicolaus wafflars 3 sextarios spelte. item idem pro terra preciosa 1 modium spelte. item iohannes wafflars 3 [modios spelte].

(9) anno xxxvi sequitur domus claustralis (f. 99r) [1336]

item domus magistri iacobi de montibus 10 modios spelte.

(10) anno xxxvi distributio cere piperis caponis amigdalarum siliginis ordei avene pisonis fagottarum (f. 128r) [1336]

magister iacobus habet per iohannem hochettam 2 libra et dimidiam cere, 1 libra et dimidiam piperis. item habet per h. in denariis 9 libra et dimidiam cere et 4 libra et dimidiam piperis. item habet per granatarium 17 capones et 2 gallinam. item habet per h. in denariis 32 capones et 1 gallinam. item habet 5 libra amigdalarum decime de lavoit. item habet per h. in denariis 41 libra amigdalarum. item habet per granatarium 11 sextarios siliginis. item habet per h. in denariis 21 sextarios siliginis. item habet per granatarium 1 modum ordei. item habet per h. in denariis 4 sextarios ordei. item habet per h. 3 denariis 3 modios avene de hannay. item habet per granatarium 2 sextarios pisonis. item habet per h. in denariis 3 sextarios

psonis. item habet per h. in denariis pro 3000 fagottis 9 libra turonenses. Item habet per h. in denariis 1 modum avene de wonc.

(11) redditus ecclesie sancti pauli pro anno lx (f. 130r) [1360]

item domicella katherina wafflarde 3 sextarios spelte mensura leodiensis.

item eadem pro acquisitione magistri iacobi de montibus 1 modium spelte. item colit 31 vigiliis magister de montibus de altari beate agnete in ecclesia beati pauli de quibus debet supra sancta antiqua debita 2 modios spelte mensura leodiensis non sunt de redditibus.

. . . item nicholaus wafflar pro terra preciosa 1 modium spelte leodiensis.

item idem 3 sextarios spelte mensura leodiensis.

item idem pro acquisitione magistri de montibus 3 modios spelte leodiensis.

summa 4 modios 3 sextarios spelte.

(12) anno lx in anniversariis modios spelte (f. 167v) [1360]

pro die ydus februarii anniversarum magistri iacobi de montibus et renardi de besechon valentes pro 30 modios 2 sextarios 1 tercerios et dimidiam granarium spelte 60 libra 12 solidos 3 denarios obolum turonenses exeunt pro candelis pro una libra et dimidiam 33 solidos turonenses pro campanis pro 2 denarios spelte 8 denarios turonenses presbyteris et clericis pro septima parte 8 libra 8 solidos 4

denarios obolum turonenses bone remanent et 50 libra 10 sextarios 3 denarios
turonenses perdit nemo habent 22 canonici residentes quilibet 45 solidos 11
denarios turonenses census 1 turonenses

(13) anno xlv apud wonc (f. 171r) [1344]

item sorores iohannis wafflart 3 sextarios spelte.

. . . item domicella katherina soror dicti iohannis pro acquisitione magistri iacobi de
montibus 1 modium spelte.

item nicolaus wafflars [*badly worn, the rest of this entry is illegible*].

(14) distributiones anniversarum pro anno xlvii (f. 208v) [1347]

ydus februarii anniversarum magistri iacobi de montibus et r. de biscontio valentes
pro 39 modios 2 sextarios in granarium et dimidiam et 2 tercerios spelte 48 libra 9
solidos 2 denarios obolum turonenses exeunt pro candelis 16 solidos 6 denarios
turonenses capones 4 denarios valentes 8 denarios turonenses presbyteris et clericis
pro septima parte 6 libra 16 solidos turonenses remanent 40 libra 16 solidos 1
obolum turonenses perdit nemo habent 29 residentes quilibet 43 solidos turonenses
census 11 denarios obolum turonenses.

(15) distributiones anniversarum pro anno xlviii (f. 212r) [1348]

tertio ydus februaryi anniversarum magistri iacobi de montibus et renardi de bescohon valentes pro 29 modios 2 sextarios in granariam et dimidiam et 1 tercerium spelte 54 libra 6 solidos 8 denarios turonenses exeunt pro candelis 17 solidos 6 denarios turonenses campanis pro 2 denarios cere pro 7 denarios turonenses presbyteris et clericis pro septima parte 7 libra 12 solidos 8 denarios turonenses remanent 45 libra 41 solidos 11 denarios turonenses perdit iohanni delle scure habent 21 residentes turonenses quilibet 43 solidos 7 denarios turonenses census 8 denarios turonenses.

(16) distributiones anniversarum pro anno xlix (f. 216r) [1349]

quarto ydus februaryi anniversarum magistri iacobi de montibus et renardi bisontio valentes pro 29 modios 2 sextarios 2 quartarios et dimidiam et 2 tercerios spelte 45 libra 10 solidos 4 denarios obolum turonenses exeunt pro candelis pro una libra et dimidiam cere 34 solidos turonenses pro campanis pro 2 denarios bone 7 denarios turonenses presbyteris et clericis pro septima parte 6 libra 4 solidos 10 denarios remanent 31 libra 8 denarios turonenses perdit nemo habent 22 residentes quilibet 34 solidos census 11 denarios obolum turonenses.

(17) anno xlvi redditus ecclesie sancti pauli (f. 219r) [1346]

item domicella katherina soror dicti iohannis pro [acquistione] iacobus de
montibus 1 modium spelte.

. . . item nicolaus wafflars pro terra preciosa 1 modium spelte. item idem pro
acquistione magistri de montibus 3 modios spelte. item idem nicolaus 3
sextarios spelte.

(18) anno xlvii redditus de wonc (f. 257v) [1347]

item domicella katherina soror iohannis wafflar 3 sextarios spelte.

. . . item eadem pro acquisitione condicione magistri de montibus 1 modium
spelte.

item nicolaus wafflars pro terra preciosa 1 modium spelte.

item idem pro acquisitione condicione magistri de montibus 3 modios spelte.

item idem 3 sextarios spelte.

*Charte No. 160, Collégiale St. Paul, Archives de l'Évêché, Liège. Purchase of
land by Jakeme de Mons, dated 21 September, 1334 (This charter is not edited
by Thimister)*

a tous cheaus qui ces presentes lettres veront et oront, li maires et li eschevins de
wonc salut et conissance de veriteit. sacent tuit ke par devant nos si com par
devant curt et iustiche. conirent en leurs propres persones pour chu faire ke chi

apres sensiet. thiriars fis thirar deniche dunepart, et hons discreis sires pires de hanayyes, cappelains de saint paul, en Liège, stipulans et partie faisans por home discreis mon singnor jakeme de mons canone de saint paul pour lui et en nom de lui dautrepart. et lui requist li dis thiriars, a johani le tyes, maior mis en fealteit de par betran de vileir maior et est henri de wonc. qui somonist nos les eschevins ke nos raporte sus sil estont si lui binfaitement avestis et a hireteis et en teile possecion com par lui deshireteir et atruit a hireteir. de ovoit verges grandes et dois et deniet petites de terre eroule por plus ou por moins gisans en terroir de wonc, deleis lis terres saint paul vers froimont dunepart, et les terres saint gile decosteit vers gere dautrepart. item, de sept verges grandes et dys petites en tel mersines terroir en dois piches lume joindant del autre en lue dist al estagir entre le terres dame ysabeaus feme conoir desore et desos. item don jornal en sol moisures terroir por le trege detreit. deleis les terres saint gile dunepart, et le terre giles de moins dautrepart. li quos maires nos en somont et raportans par plaine siete. ke li dis thiriars estoit de tout hiretage desordit si bin a hireteis et en teile posention quilh en poist bin faire se lige volenteit lui deshireteir et atruit a hireteir. et chu ensi raporteit. li dis thiriars fut si conselhies quilh reportat sus en le main de dit maior en aioes de dit mon singnor jakeme toute le terre entirement desordite. qui teroir de mon ditte curt le bonir pour mi dis denirs et malhe et en denir ligois de polage. de cens par an a pourament dicte curt a teis

termes. a savoir al saint denys quatre denirs a le terre quatre denirs al saint jehan baptiste doit denirs le malh et le donir de polage a on de ces termes et le report li dis thiriars sens rins eus a rettenir par quos li dis maires a l'ensegnement de nos les eschevins par mi teil cens et a teis jours apponir com dit est. sist a dit singnor piron en aioes le dit mon singnor jakeme. de tout hiretage desordit don et vesture et eus le commandat empais si anant. ke lilois et li costume de pays portent et enseignement et chu fait li dis sires pires pour le dit mon singnor jakeme. et en se nom rendit a tenir de li hiretavlement a trescens, a dit thiriar, tout hiretage desordit par mi teil cens com dit est et par mi encors. dois muys despeatte. ke li dis thiriars en doit a dit mon singnor jakeme rendit et parer caston au hiretavlement al feste saint andrir lapostle bim parens et loians al mesure de Liège a dois denirs pres delle melhome de muy de Liège et de dehireir a Liège sor le grenir, le dit mon singnor jakeme. a cost frons et despens le dit thiriar et par mi teil cens rentes ensi et a teis jours apponir com dit est li dis sires pires por le dit mon singnor jakeme fist a dit thiriar del yretage desordit don et vesture et ens le commandat empais si anant com lois porte par teile condition. se li dis mon sires jakemes mestoit bin sens et ponis del saint andrir justes a le quasimode apres. quilh tantost sens mi determine bin autrement faire portit valen a hiretage desordit si qua ast bin yretage les queles onires et toutes les cases desordites. li dis maires mist en le wonc de nos les

eskevins ki nos drois en ewimes et li dis maires le sins drois asavoir. sont
johans wafflars, libiers pinteneas, humbeles wairat, rigas li munirs, watirs le
blans et betran de vilier. et par tant ke ce soit ferme coise et estable ju bertrans
por mi por le maior a se requeste, ju johans wafflars par mi, ju libiers por mi por
rigol, ju humbeles por mi wateoreol a lur requeste avens pendus a ces letres nos
propres saious dequeis nos li eschevins usons a ceste fois. che fut por lan del
nativiteit mon singnor jhesu christe m. ccc. et trente quatre le jor le saint mathies
lapostle.

Appendix 2 Structure of tonary in Book 6³⁹³

<i>Mode</i>	<i>Chant</i>	<i>Source</i>	<i>Jacobus's citation</i>
I	6 <i>principiae</i> (C, D, E, F, G, a)		“Guido et Antiqui”
	4 <i>principiae</i> (C, D, F, a)		“moderni”
	6 <i>differentiae</i>	Johannes Cotto	“Quidam antiquus doctor”
	7 <i>differentiae</i>	Liège	“sunt aliqui moderniores... nunc utuntur saeculares ecclesiae leodienses”

³⁹³ If Jacobus is not specific in his citation reference, in the “Source” column I note either the theorist’s name, or the treatise name, or the tradition (such as Dominican, etc.). In the “Citation” column, I either give the full phrase Jacobus uses to refer to his source, or a short English paraphrase if it is more illustrative.

8 <i>differentiae</i>	<i>Tr. inton.</i> ³⁹⁴	“in multis observantur ecclesiis...gallicanis et ... romanis” “secundum doctrinam quam nunc sequor” Gives four commonly used and then four more that are less used
2 <i>differentiae</i>	Cistercian ³⁹⁵	Some religious orders have reduced all the <i>differentiae</i> to just two
1 <i>differentia</i>		Some add one irregular <i>differentia</i>
Psalm tone intonation	<i>Tr. inton.</i>	
Psalm tone intonation		“aliquae ecclesiae”
Psalm tone intonation with median inflexion	Dominican	“aliqui religiosi”

³⁹⁴ I have noted in this column when there are concurrences between Jacobus’s tonary in Book 6 of *Speculum musicae* and the tonary found in the treatise known as *Tractatus in tonatione tonorum* (referred to in this table as *Tr. inton.*), which is transmitted in the fifteenth-century manuscript *B-Br 10162/66*. This treatise is edited here: *Jacobi Leodiensis Tractatus de consonantiis musicalibus. Tractatus de in tonatione tonorum. Compendium de musica.*

³⁹⁵ Huglo, *Les tonaires*, 433.

	Intonation of Benedictus and Magnificat, the <i>cauda</i>	<i>Tr. inton.</i>	
	Intonation of Benedictus and Magnificat	<i>Tr. inton.</i>	
	Intonation of Benedictus and Magnificat		
	4 introit <i>differentiae</i> and GP, Responsory GP, and the invitatory psalm with its Venite	<i>Tr. inton.</i>	
	Responsory Alleluia		
II	5 <i>principiae</i> (G, A, C, D, F)	<i>Tr. inton.</i>	“secundum Modernos”
	1 <i>differentia</i>	<i>Tr. inton.</i>	Most commonly just one <i>differentia</i> for the second mode
	2 <i>differentiae</i>	<i>Tr. inton.</i>	Some churches use these
	Psalm tone intonation, Benedictus,	<i>Tr. inton.</i>	

Magnificat, *cauda*

Introit *differentiae* *Tr. inton.*
and GP,
responsory GP,
and the invitatory
psalm with its
*Venite*³⁹⁶

Responsory
Alleluia

III³⁹⁷ 4 *principiae* (E, *Tr. inton.* “secundum
G, a, c) Modernos”

2 *differentiae*

3 *differentiae*

3 *differentiae* *Tr. inton.*

³⁹⁶ Jacobus give two *Venite* in his example, but only one is in *Tr. inton.*

³⁹⁷ “In differentiis tertii toni, magna reperitur diversitas quantum ad numerum, quantum ad cantum, quantum ad distinctionem ipsorum” (“In the *differentiae* of the third tone, a great diversity is found with respect to the number, the melody and the distinction of each”) (*SM* 6.91, 262); “Inveni autem unum doctorem qui tertii toni super antiphonas sex tangit differentias, sed dimitto illas, quia aliquae illarum tactae sunt, aliae ab usu recesserunt” (“I found one teacher who gave six *differentiae* for the third tone above the antiphons, but I do not take these into account here, since some of them were touched on above, and the others have receded from use”) (*SM* 6.91, 265).

	Psalm tone intonation	<i>Tr. inton.</i>	
	Psalm tone intonation with an inflexion	Dominican	
	Benedictus, Magnificat, cauda	<i>Tr. inton.</i>	
	3 or 4 introit <i>differentiae</i> and GP, responsory GP, and the invitatory psalm with its Venite	<i>Tr. inton.</i>	Gives one additional introit <i>differentia</i> not in <i>Tr. inton.</i> Also gives a version of the responsory GP (“secundum aliquas ecclesias”)
	Responsory Alleluia		
IV	5 <i>principiae</i> (C, D, E, F, G)	<i>Tr. inton.</i>	
	2 <i>differentiae</i>		“Aliqui”
	5 <i>differentiae</i>		“Aliqui” (Also gives a variant for the third one of these given by the “ancients”)
	6 <i>differentiae</i>	<i>Tr. inton.</i>	“Sunt alii” (“there are others”); “secundum istos” (“according to these”)

	Psalm tone intonation	<i>Tr. inton.</i>	
	Psalm tone intonation with inflexion		
	Benedictus, Magnificat, <i>cauda</i>	<i>Tr. inton.</i>	
	2 introit <i>differentiae</i>		“habet duas quartus tonus” “Aliqui autem sola prima differentia utentes indifferenter” (“there are some how use just one <i>differentia</i> indiscriminately”)
	Responsory GP	Dominican	
	Responsory		“Aliquas ecclesias”
	Responsory Alleluia		
V	4 <i>principiae</i>		
	1 <i>differentia</i>		
	4 <i>differentiae</i>	<i>Tr. inton.</i>	In <i>Tr. inton.</i> there are just 3 <i>differentiae</i>

	Benedictus, Magnificat, <i>cauda</i> , 3 introit <i>differentiae</i> and GP	<i>Tr. inton.</i>	Discusses a dispute about the <i>finalis</i> here ("irrationabile")
	2 Responsory GP		
	Venite	<i>Tr. inton.</i>	
	Responsory Alleluia		
VI	5 <i>principiae</i> (C, D, E, F, a)	<i>Tr. inton.</i>	
	1 <i>differentia</i>		
	1 <i>differentia</i>		"Antiqui"
	Psalm tone intonation	<i>Tr. inton.</i>	
	Psalm tone intonation with inflexion	Dominican	
	Benedictus, Magnificat, <i>cauda</i>	<i>Tr. inton.</i>	Slight variant on that in given in <i>Tr. inton.</i>

	1 introit <i>differentia</i>	<i>Tr. inton.</i>	
	Introit GP		
	Responsory GP		
	3 Venite	<i>Tr. inton.</i>	One of these is given in <i>Tr. inton.</i>
	Responsory Alleluia		
VII	Five <i>principiae</i> (d, c, b[^{sqb}], a, G)		Ancients and Moderns
	2 <i>differentiae</i>		“Aliqui”
	7 <i>differentiae</i>		Ancients, but I disregard these (“sed dimitto illas”). There are actually nine examples (seems to be three variants on the first one)
	4 <i>differentiae</i>	<i>Tr. inton.</i>	“communius”
	Psalm tone intonation		

	Psalm tone intonation with inflexion	<i>Tr. inton.</i>	Long discussion of this inflexion ³⁹⁸
	Benedictus, Magnificat, <i>cauda</i>	<i>Tr. inton.</i>	The ending of the Benedictus differs somewhat from that given in <i>Tr. inton.</i>
	1 introit <i>differentia</i> and GP, Responsory and GP	<i>Tr. inton.</i>	Jacobus also gives a variant for the introit <i>differentia</i>
	Responsory Alleluia		
	Invitatory with Venite	<i>Tr. inton.</i>	
VIII	6 <i>principiae</i> (c, a, G, F, D, C)		
	2 <i>differentiae</i>		“Aliqui”
	8 <i>differentiae</i>		“Quidam Antiquus” (he does not give the examples because he says “recesserunt ab usu”)

³⁹⁸ SM 6, 286.

5 <i>differentiae</i>	<i>Tr. inton.</i>	“Alii” (only 4 of the 5 given in <i>Tr. inton.</i>)
1 <i>differentia</i>		“barbaram et extraordinem” “convenientius vel minus irregulariter aptatur antiphonis primi toni quam octavi”
Psalm tone intonation	<i>Tr. inton.</i>	
Psalm tone inflexion	Dominican	
Benedictus, Magnificat, <i>cauda</i>	<i>Tr. inton.</i>	
1 introit <i>differentia</i> and GP, responsory and GP	<i>Tr. inton.</i>	
1 introit <i>differentia</i>		“Quidam Antiqui”
Invitatory and Venite, Responsory Alleluia		

Appendix 3a Codicological examination of *B-Br 10162/66*

<i>Gath.</i> (<i>paper-</i> <i>type</i>)	<i>Scribe</i>	<i>Ruling</i>	<i>RISM</i>	<i>Folio</i>	<i>Contents</i>	<i>Comments</i>
-	-			i-vi	[Blank]	Paper flyleaves (modern)
-	A			vii	[Parchment flyeaf]	On vii verso in red ink is written "Ecclesie laurentii liber." There is also some writing on the recto but it has been pasted over, so it is illegible.
1	-	-	<i>I-Iv</i>	1-1v	[Blank]	

(A,B)			2	2	“Guido monachus, et Berno abbas Augiensis, ordinis sancti Benedicti de musica, cum aliis etiam modernorum de eadem re opusculib’, que curiosa sunt, que et melius oculis intuentium patebunt”	Later hand (16 th /17 th century)
			2v- 12v	2v- 12v	[Blank]	
2 (C)	A	2 cols 1 col (f.18- 24v)	1-3v	13- 15v	<i>Tractatus de consonantiis</i>	Red leather square approx 5mm square stuck about three quarters way down the outer edge of the first page of this treatise (presumably the remains of a tab marking the start of a section of text). Black/brown ink. Certain initials in red, and others touched with red.

	<i>A</i>		3v- 10v	15v- 22v	<i>Tractatus de intonatione tonorum</i>	Chapter titles in red ink and larger hand. Musical examples in square notation
			11- 12v	23- 24v	[Blank]	
3 (D)	<i>B</i>	2 cols (f. 36v 1 col)	13- 20v	25- 32v	<i>Micrologus</i> , Guido	5mm red leather square again stuck about three quarters way down the first page of the gathering. Hand is more spaced out, slightly larger using different ink. Red ink used for chapter titles.
			20v- 23	32v- 35	<i>Regule rithmice</i> , Guido	“GUIDO” acrostic pointed out in red ink
			23v- 24v	35v- 36v	<i>Prologus in antiphonarium</i> , Guido	Musical examples on f.24v look like messine notation

4 (A)	<i>B</i>	2 cols	25r- 28v	37- 40v	<i>Epistola ad Michaelem, Guido</i>	5mm red tab three quarters way down page. Different ink, different pen (perhaps thicker nib) but definitely same scribe. Musical examples again in <i>hufnagel</i> .
			28v- 34	40v- 46	<i>Dialogus</i>	Staves are drawn for musical examples but only a few notes drawn in here and there. Scribe a appears to have returned to this text and made various corrections (darker ink and a smaller hand)
			34v	46v	<i>[Blank]</i>	
5 (A)	<i>a</i>	1 col	35- 35v	47- 47v	<i>[Blank]</i>	

			36- 42v	48- 54v	<i>Compendium de musica</i> (Incipit: "C. 1. Dispendiosa sub compendio tradere facile quoniam non est")	5mm red tab three quarters way down f. 48r (the first page of this treatise).
6 (A)	<i>a</i>	-	43- 43v	55- 55v	[Blank]	
		1 col	44- 49v	56- 61v	<i>Prologus Bernonis in Tonarium</i>	5mm red tab three quarters way down page.
		2 cols	50- 51v	62- 63v	Initia of the eight modes	
		-	52- 52v	64- 64v	[Blank]	
		-	53- 53v	65- 65v	[Blank]	

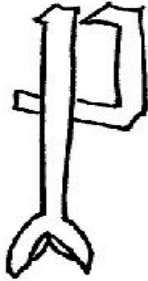
7,8 (C,A,B)	<i>a</i>	2 cols (f.76 1 col and from f.88 1 col)	54- 79v	66- 91v	<i>Quaestiones in musica</i>	The presentation of this treatise is less consistent than the other gatherings, size of hand and ink changes, some figures are drawn but accompanying text not filled in or figures are unfinished, and ruling also changes throughout. The codicological structure is also less consistent in terms of three paper types used, pages cut or missing and uneven or odd numbers of bifolia per gathering. See Appendix 3b and fn. 46 for details.
			80- 80v	92- 92v	[Blank]	

9 (A,C)	<i>a</i>	1 col	81- 84	93- 96	<i>Musica</i> , Aribo (fragment) (Incipit: “Est quaedam quadripartite figura modernis adeo venerabili”)	
			84v	96v	[Blank]	
			85- 86v	97- 98v	<i>De ratione proportione et divisione semitonii</i>	
	<i>c</i>		87	99	Table of Roman Numbers and Weights	Later addition
			87v	99v	[Blank]	
			88- 88v	100- 100v	Table of the interval proportions	Later addition
			89- 92v	101- 104v	[Blank]	

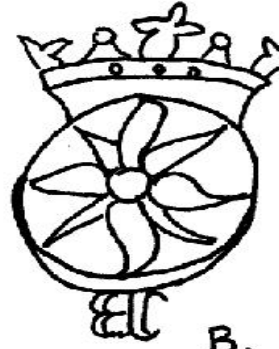
10 (A)	<i>a</i>	1 col	93- 93v	105- 105v	Extracts from various music treatises including Boethius, Martianus Capella (Incipit: "Cum sint quattuor disciplinae mathematicae")	5mm red tab.
		2 cols	94- 95	106- 107	<i>Tractatus de motu</i>	
		1 col	95v	107v	[Blank]	
	<i>d</i>		96- 96v	108- 108v	<i>Musica</i> , Aribo (fragment) (Incipit: "Et aliae voces ab aliis morulum duplo longiorem")	Later addition. The pattern of watermarks in this gathering implies that a folio is missing between f.107 and f.108.
			97- 99v	109- 115v	[Blank]	
11 (B)	-	1 col	-	116- 119v	[Blank]	

-	-	-	-	120- 129v	[Blank]	Parchment flyleaves. Possibly were used to cover separate treatises within this manuscript originally before they were all bound together
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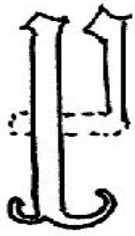
Appendix 3b Watermarks in *B-Br 10162/66*



A.



B.

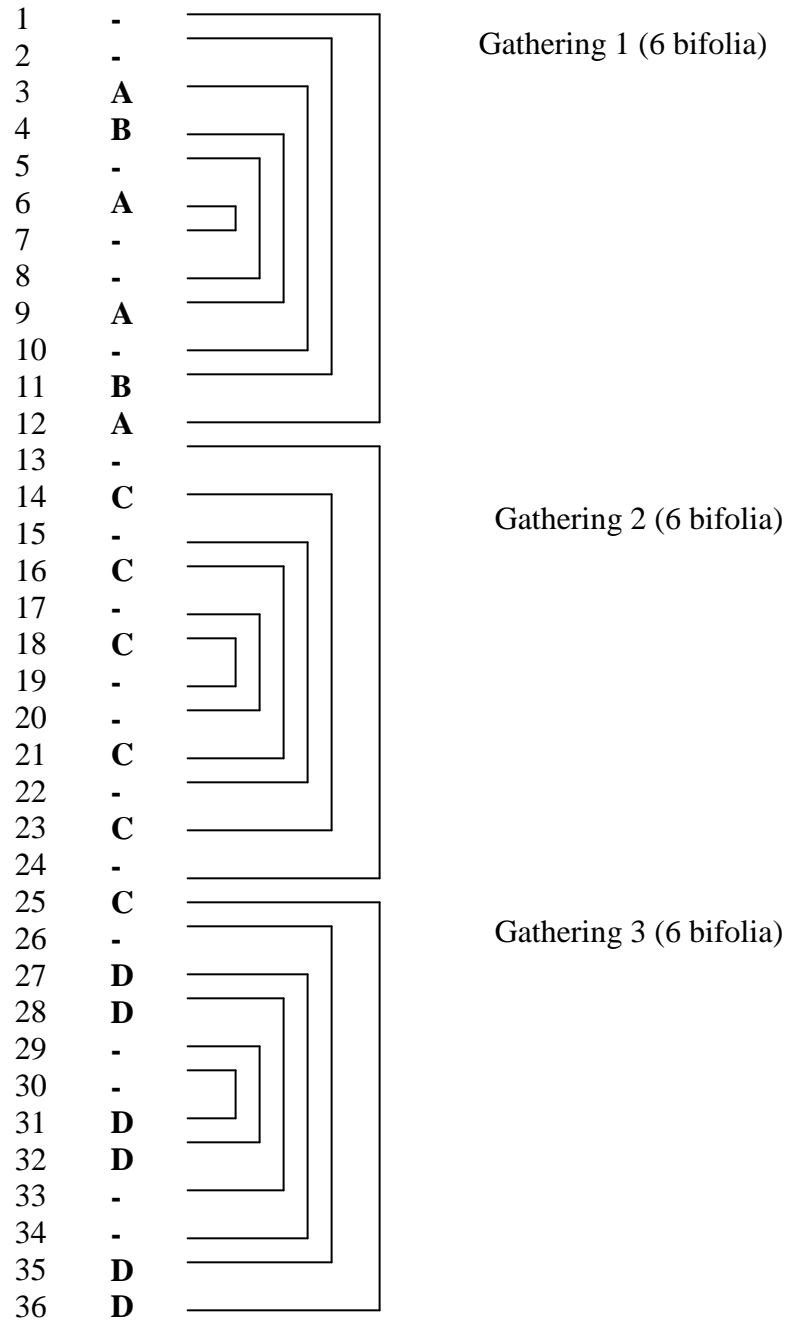


C.

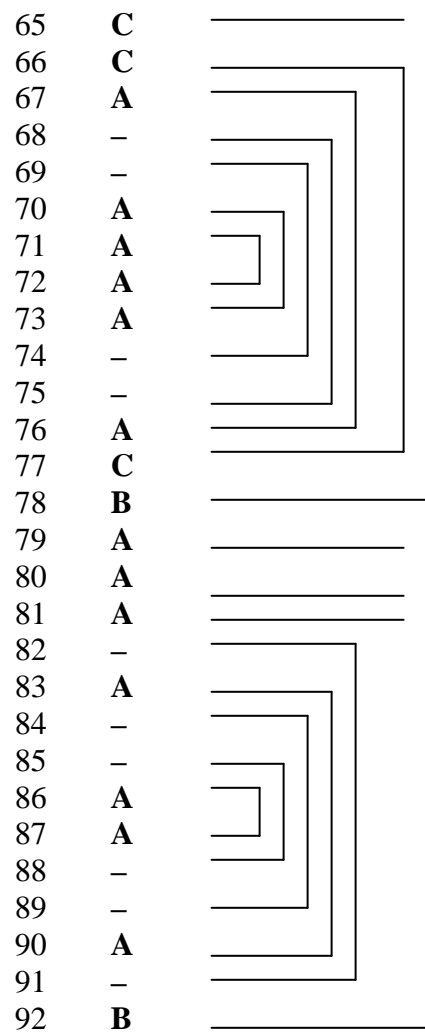


D.

Appendix 3c Gathering Structure in *B-Br* 10162-66



37	-		Gathering 4 (5 bifolia)
38	A		
39	-		
40	A		
41	-		
42	-		
43	A		
44	-		
45	A		
46	-		
47	-		Gathering 5 (4 bifolia)
48	A		
49	-		
50	A		
51	A		
52	-		
53	A		
54	-		
55	A		Gathering 6 (5 bifolia)
56	A		
57	-		
58	A		
59	-		
60	-		
61	A		
62	-		
63	A		
64	A		



Gathering 7 (6 bifolia and 1 folio)

Gathering 8 (6 bifolia and 3 folia)

93	A		Gathering 9 (6 bifolia)
94	-		
95	A		
96	-		
97	-		
98	C		
99	C		
100	-		
101	-		
102	A		
103	-		Gathering 10 (5 bifolia and 1 folio)
104	A		
105	-		
106	A		
107	-		
108	A		
109	-		
110	-		
111	A		
112	A		
113	-		Gathering 11 (2 bifolia)
114	A		
115	-		
116	-		
117	B		
118	B		
119	-		

Appendix 4 Comparison of *D-Ds* 1988 and *B-Br* 10162/66

<i>D-Ds</i> 1988		<i>B-Br</i> 10162/66	
<i>Folios</i>	<i>Title</i>	<i>Folios</i>	<i>Title</i>
1-67	Alchemy treatises		
		1-1v	Blank
		2	Notations in a later hand
		2v-12v	Blank
		13-15v	<i>CS 1, Anon. 1; Tractatus de consonantiis musicalibus</i>
		15v-22v	Anonymous, <i>Tractatus de intonatione tonorum</i>
		23-24v	Blank
71-87v	<i>Micrologus</i> , Guido of Arezzo	25-32v	<i>Micrologus</i> , Guido of Arezzo
87v-92v	<i>Regule rithmice</i> , Guido of Arezzo	32v-35	<i>Regule rithmice</i> , Guido of Arezzo
93-95	<i>Prologus in antiphonarium</i> , Guido of Arezzo	35v-36v	<i>Prologus in antiphonarium</i> , Guido of Arezzo

95-101v	<i>Epistola ad Michahalem, Guido of Arezzo</i>	37-40v	<i>Epistola ad Michahalem, Guido of Arezzo</i>
101v-110	Anonymous (Pseudo-Odo), <i>Dialogus</i>	40v-46	Anonymous (Pseudo-Odo), <i>Dialogus</i>
		46v	Blank
		47-47v	Blank
		48-54v	Anonymous, <i>Compendium de musica</i> (“Dispendiosa sub compendio tradere facile quoniam non est”)
		65-65v	Blank
110v-143v	<i>Quaestiones in musica</i> [Pseudo-Rodulfus of St Trond] ³⁹⁹	66-91v	<i>Quaestiones in musica</i> [Pseudo-Rodulfus of St Trond]
144-146v	<i>Catholicon et vers</i> , Balbi de Junua		
		92-92v	Blank

³⁹⁹ Steglich, ed., *Die Quaestiones in musica: ein Choraltraktat des zentralen Mittelalters und ihr mutmasslicher Verfasser Rudolf von St. Trond.*

		55-55v	Blank
147-167	<i>Tonary</i> , Berno of Reichenau	56-61v	<i>Tonary</i> , Berno of Reichenau
		62-63v	Initia of the eight modes
		64-64v	Blank
		93-96v	<i>De musica</i> , Aribo (fragment) (Incipit: “Est quaedam quadripartite figura modernis adeo venerabili”)
168v-169v	<i>De ratione proportione et divisione semitonii</i>	97-98v	<i>De ratione proportione et divisione semitonii</i>
		99	Table of roman numbers and weights
		99v	Table of the interval proportions
		100-100v	Blank
169v-170v	Extracts from various music treatises including Boethius, Martianus Capella (Incipit: “Cum sint quattuor	101-104v	Extracts from various music treatises including Boethius, Martianus Capella (Incipit: “Cum sint quattuor disciplinae mathematicae”)

	disciplinae mathematicae”)		
170v- 178v	<i>De musica</i> , Aribo (fragment) (Incipit: “De perversa tetrachordum collectione”)		
179	<i>Prima species diapason</i>		
179v- 180v	Computation table		
181-181v	<i>Tractatus de motu</i> (Incipit: “Musica est motus vocum et est in quantitate”) ⁴⁰⁰	105-105v	<i>Tractatus de motu</i> (Incipit: “Musica est motus vocum et est in quantitate”)
182-189v	<i>Wolf anon. 1893a</i> (Incipit: “Quindecim chorde habentur in monocordo secundum Boetium”) ⁴⁰¹		

⁴⁰⁰ Smits van Waesberghe, *Musiekgeschiedenis der Middeleeuwen*, 154-71.

⁴⁰¹ Johannes Wolf, "Ein anonymer Musiktraktat des elfen bis zwölften

108-108v *De musica*, Aribo (fragment)
(Incipit: "Et aliae voces ab aliis
morulum duplo longiorem")

109-129v Blank

Jahrhunderts," *Vierteljahrsschrift für Musikwissenschaft* 9 (1893): 186-234.

Appendix 5 Transcriptions of Ste-Croix Tonaries

Tonary, L'église Sainte-Croix, Ms. 1, Antiphonaire Ste-Croix, 14th century

De primo thono [f. 257]

Pri - mum__ que - ri - te__ reg - num__ de - i

Ant.
Sal - ve Stel - la__ Glo - ri - a E u o u a e

Ant.
Do - mi - ne In - cli - na - vit Glo - ri - a E u o u a e__

Ant.
Vi - di - mus Ec - ce ve - re Glo - ri - a E u o u a e__

Ant.
An - ge - lus__ Ger - mi__ na - vit Glo - ri - a E u o u a e

Ant.
Pec - ca ta__ O__ quam Glo - ri - a E u o u a e

Spe - ci - o - sus__ X - pis - ti__ vir - go

Glo - ri - a E u o u a__ e

Bi - du - o vi - vens Glo - ri - a Se - cu - lo - rem A - - - men
Ant.

O - quan - tus O be - a - tum Glo - ri - a E u o u a - - - e
Ant.

Fac - ti su - mus - Spe - ret - Glo - ri - a E u o u a e
Ant.

Se - de Di - xit Do - mi - nus do - mi - no me - o se - de a dex - tris me - is
[f. 257v] Cant.

Ec - ce - no - men Mag - ni - fi - cat - a - ni - ma me a do - mi - num

Tra - - - di - - - tor
Cant.

Be ne - dic tus do mi nus de - us is ra - hel - qui a iu si ta vit et fe - cit re dempti o nem ple bis - sue
Introitus

Gau - de - a - mus - Glo - ri - a Sae - cu - lor - um a - men -

Ec - ce - ap - pa - re - bit -

V.

Ap - pa - re - bit

Glo - ri - a pat - ri et fi - li - o et spi - ri - tu - i sanc - to

De i i thono

Se - cun - dum au - tem si - mi - le est huic

O sa - pi - en - ti - a Scu - to Glo - ri - a

E - u - o - u - a - - e

Ant.

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - i

Mag - ni - fi - cat a - ni - ma me - a Do - mi - num

Be ne dic tus do mi nus de us is - ra hel qui ain si ta vitet fe - citre demp ti o nemple bis su - ae

Introitus *[f.258]*

Sal - ve Glo - ri - a E - u - o - u - a - - e

Resp. V.
Ihe - ru - sa - lem _____ Le - va

Glo-ri - a pa-tri et fi - li - o et spi - ri - tu sanc - to _____

De iii thono
Ter-ti - a di - es est quod haec fac - ta _____ sunt _____

Ac - ci - pi - ens _____ Glo - ri - a E - u - o - u - a - e

Qua - si u - nus _____ Glo - ri - a E - u - o - u - a - e

Quan - do _____ na - tus _____ est Glo - ri - a E - u - o - u - a - e

Om - ni - a _____ Glo - ri - a E - u - o - u - a - e _____

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

Can.
Mag - ni - fi - cat

[f. 259]



Be - ne - dic tus do mi nus de us is ra hel qui a ius ta vit et fe cit re demp ti o nem ple bis su ae__

Introitus



Con - fes - si - o Glo - ri - a _____ E - u - o - u - a - e

Resp.



Dum ste - ter - - ri - tis _____

V.

[f. 293v]



Non e - nim

De quarto tono



Quar - ta vi - gi - li - a ve - nit ad__ e - os



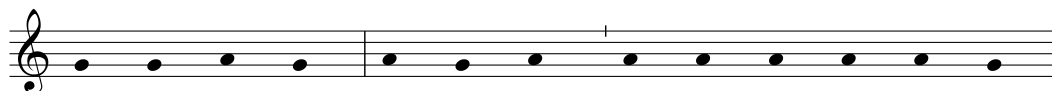
To - ta__ pul - chra__ es Ru - bum Glo - ri - a E - u - o - u - a - e



Be - ne - dic - ta__ tu Glo - ri - a E - u - o - u - a - e__




Ex eg - yp - to Glo - ri - a E - u - o - u - a - e__



In man - da - tis__ Glo - ri - a E - u - o - u - a - e



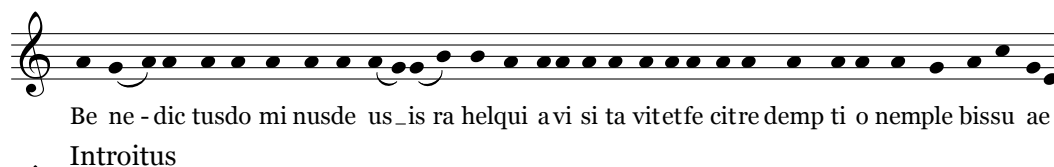
Is sub - iec - tis Glo - ri - a E - u - o - u - a - e



Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

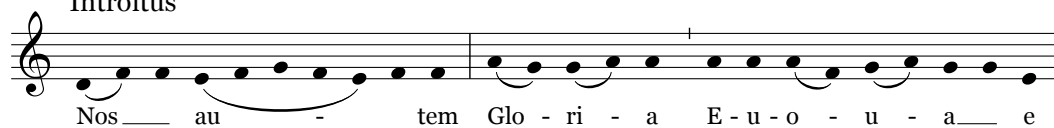


Mag - ni - fi - cat a - ni - ma me - a do - mi - num



Be ne - dic tus do mi nus de us is ra hel qui a vi si ta vit et fe cit re demp ti o n em ple bis su ae

Introitus



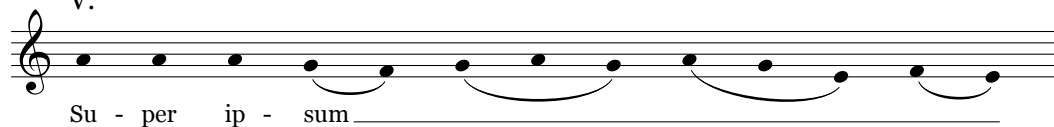
Nos au - tem Glo - ri - a E - u - o - u - a e

Resp.

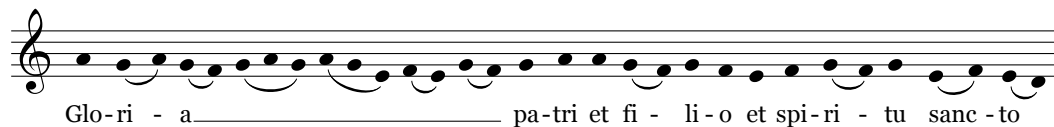


Rex no - ster

V.

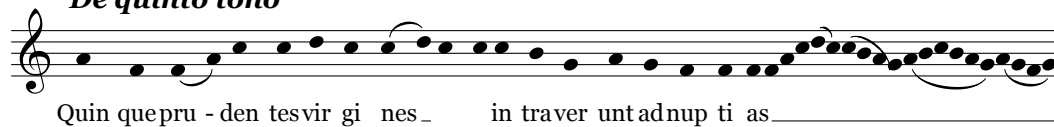


Su - per ip - sum



Glo - ri - a pa - tri et fi - li - o et spi - ri - tu sanc - to

De quinto tono



Quin que pru - den tes vir gi nes in traver unt ad nup ti as

Om-nis val-lis Le-va-mi - ni Glo-ri - a E - u - o - u - a - e

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

Cant.

Mag - ni - fi - cat a - ni - ma me - a do - mi - num

Be ne dic tus do mi nus de us is ra hel qui a vi si ta vit et fe cit re demp ti-o nem ple bis su ae

Introitus

Le - ta - re Glo - ri - a E - u - o - u - a - e

Resp. [*f. 259'*]

V.

Qua - dra - gin - ta In ar - ti - cu - lo

Glo-ri - a pa-tri et fi - li - o et spi-ri - tu - i sanc-to

De sexto tono

Sex - ta ho-ra se - dit su - per pu-te- um

O ad mi - ra - bi - le Be - ne - dic - tus

Glo - ri - a E - u - o - u - a - e

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is
Can.

Mag - ni - fi - cat a - ni - ma me - a do - mi - num

Be ne - dic tus do mi nus de - us is ra - hel qui ai u si ta vit et fe cit re demp ti o nem ple bis su ae
Introitus

Os jus - ti Glo - ri - a E - u - o - u - a - e
Resp. V.

In - cli - vit me Tra - di - dit

Glo - ri - a pa - tri et fi - li - o et spi - ri - tu - i sanc - to

De septimo tono

Sep - tum sunt spi - ri - tus an - te thro - num de - i

[f. 260]

Ho - mo Do - mi - ne Glo - ri - a E - u - o - u - a - e

Ve - te - rem Sur - ge Glo - ri - a E - u - o - u - a - e

Stel - la is - ta Glo - ri - a E - u - o - u - a - e

Re - demp - ti - o nem O - ran - te Glo - ri - a E - u - o - u - a - e

Ve - ni Do - mi - ne Glo - ri - a E - u - o - u - a - e

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris meis

Can.

Mag - ni - fi - cat a - ni - ma me - a do - mi - num

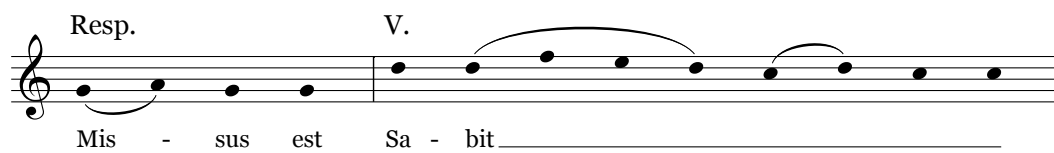
Can.

Be ne dict us do mi nus de - us is ra - hel qui a vi si ta vit et fe cit re demp ti o nem ple bis su ae

Introitus

Po - pu - lus Sy - on Glo - ri - a

Resp. V.



Mis - sus est Sa - bit



Glo-ri - a pa - tri et spi-ri - tu sanc-to

De octavo thono



Oc-to sunt be-a - ti - tu - di - nes



Nup-ti - e Glo-ri - a E - u - o - u - a - e

[f. 260']



In il - la dei Be - a - te de - i Glo-ri - a E - u - o - u - a - e

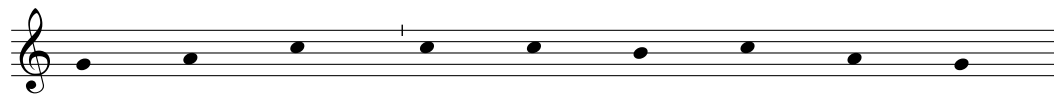
[f. 295v]



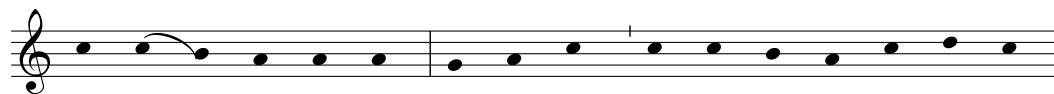
Sub thro - no Ve - ri - tas Glo-ri - a E - u - o - u - a - e



Om - nis plebs Hoc est pre - cep - tum me - um



Glo - ri - a E - u - o - u - a - e



In e - ter - num Glo - ri - a E - u - o - u - a - e

Nos qui vi - vi - mus An - ge - li Glo - ri - a___ E - u - o - u - a - e___

Di - xit do - mi - nus do - mi - no me - o se - de a___ dex - tris meis

Mag - ni - fi - cat a - ni - ma me - a do - mi - num

Be ne dic tus do mi ne de us is - ra hel qui a vi si ta vit et fe - cit re demp ti o nem ple bis su ae

Ad te le - va - vi Glo - ri - a___ E - u - o - u - a - e

Resp.

Ec - ce di - es In di - e - bus

Glo - ri a___ pa - tri et fi - li - o___ et spi - ri - tu - i sanc - to___

Tonary, Musée d'art religieux, MS 2, Antiphonaire Ste-Croix, 14th century

De primo thono [f. 292]

Pri - mum que - ri - te reg - num de - i

Ant.

Sal - ve Stel - la Glo - ri - a E u o u a e

Ant.

Do - mi - ne In - cli - na - vit Glo - ri - a E u o u a e

Ant.

So - lo pa - ter Ec - ce ve - re Glo - ri - a E u o u a e

Ant.

An - ge - lus Ger - mi - na - vit Glo - ri - a E u o u a e

Ant.

Mag - na vox O - quam Glo - ri - a E u o u a e

Spe - ci - o - sus X - pis - ti - vir - go

Glo - ri - a E u o u a e

Bi - du - o vi - vens Glo - ri - a Se - cu - lo - rem A - - men
Ant.

O quan - tus O be - a - tum Glo - ri - a E u o u a _____ e
Ant.

Fac - ti su - mus _____ Spe - ret _____ Glo - ri - a E u o u a e
Ant.

Se _____ de Di - xit Do - mi - nus do - mi - no me - o se - de a dex - tris me - is
Ant. Cant. [f. 292']

Lo - que - re _____ do - mi - ne _____ Mag - ni _____ fi - cat _____ a - ni - ma me a do - mi - num
Ant.

Pre - cep - - - - - tor _____
Cant.

Be ne . dic tus do mi nus de - us is ra - hel . qui a iu si ta vi tet fe - cit re demp ti o nem ple bis . sue
Introitus

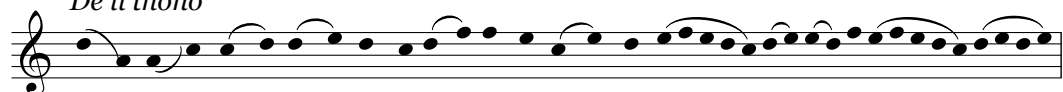
Gau - de - a - - mus _____ Glo - ri - a Sae - cu - lor - um a - - men _____
Resp. V.

Ex - pur - ga - - te _____ Non _____ in - fer - men - to _____



Glo - ri - a pat - ri et fi - li - o et spi - ri - tu - i sanc - to

De i thono



Se - cun - dum au - tem si - mi - le est huic

Ant.

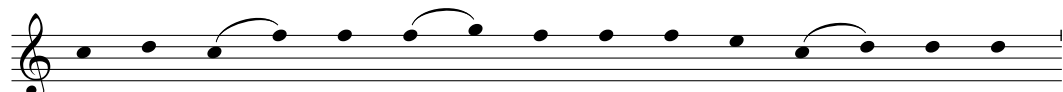


O rex glo - ri - ae Scu - to E - u - o - u - a - e

Ant.



Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - i



Mag - ni - fi - cat a - ni - ma me - a Do - mi - num



Be ne dic tus do mi nus de us is - ra hel qui a in si ta vit et fe - cit re demp ti o nem ple bis su - ae

Introitus

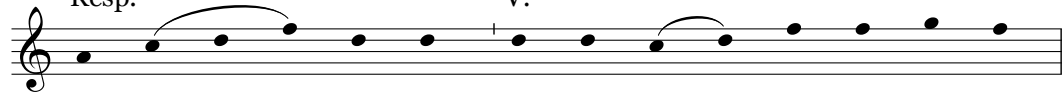
[f.293]



Sal - ve Glo - ri - a E - u - o - u - a - e

Resp.

V.

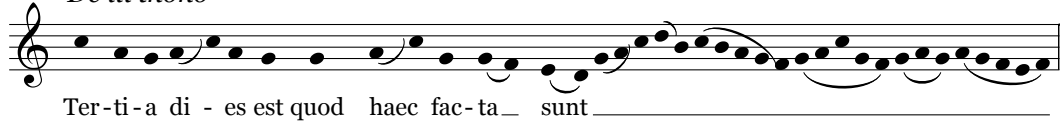


Re - ful - sit sol E - rat e - nim



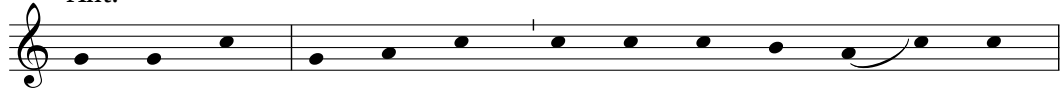
Glo - ri - a pa - tri et fi - li - o et spi - ri - tu sanc - to

De iii thono

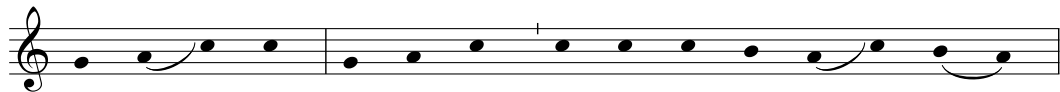


Ter-ti-a di - es est quod haec fac-ta_ sunt_

Ant.



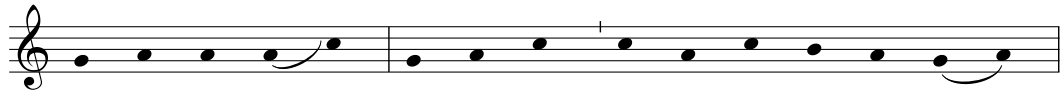
Ni - gra sum Glo - ri - a E - u - o - u - a - e



Sal - va___ nos Glo - ri - a E - u - o - u - a - e



Fa - vus___ dis - till - ans Glo - ri - a E - u - o - u - a - e



Om - ni - a_____ Glo - ri - a E - u - o - u - a - e___

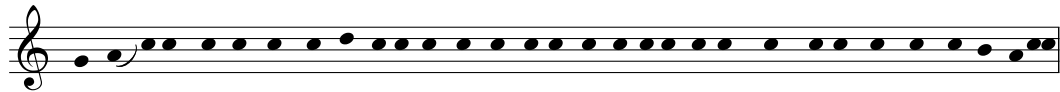


Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

Can.



Mag - ni - fi - cat



Be ne - dic tus do mi nus de usis ra helqui a ius ta vit ete citre demp ti o nemple bissu ae_

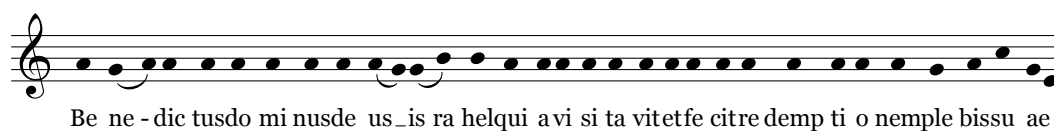
Introitus



Con - fes - si - o Glo - ri - a_____ E - u - o - u - a - e

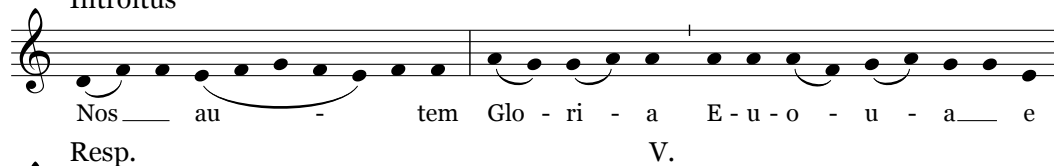


Mag - ni - fi - cat a - ni - ma me - a do - mi - num



Be ne - dic tus do mi nus de us is ra hel qui a vi si ta vit et fe cit re demp ti o nem ple bis su ae

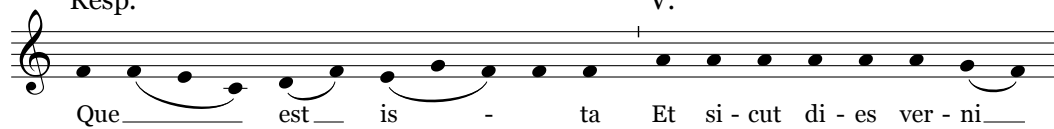
Introitus



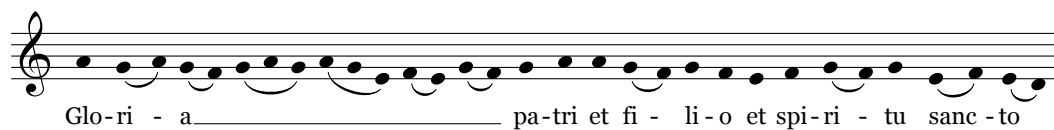
Nos au - tem Glo - ri - a E - u - o - u - a e

Resp.

V.

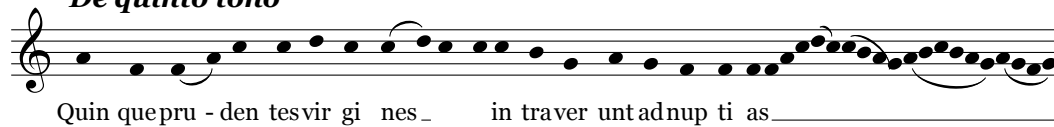


Que est is - ta Et si - cut di - es ver - ni



Glo - ri - a pa - tri et fi - li - o et spi - ri - tu sanc - to

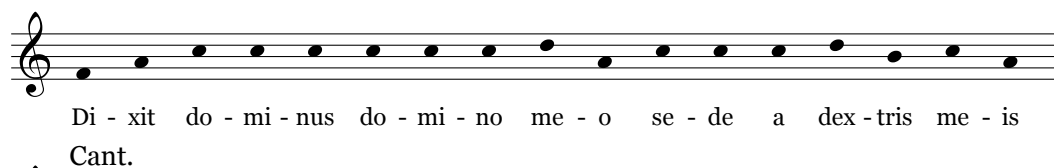
De quinto tono



Quin que pru - den tes vir gi nes in traver unt ad nup ti as



Ec - ce fac - tus est Fons or - to - rum Glo - ri - a E - u - o - u - a - e

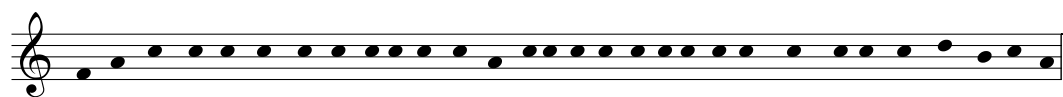


Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

Cant.



Mag - ni - fi - cat a - ni - ma me - a do - mi - num



Be ne dic tus do mi nus de us is ra hel qui a vi si ta vit et fe cit re demp ti-o nem ple bis su ae

Introitus



Le - ta - - re Glo - ri - a E - u - o - u - a - e

Resp.

V.



In cir- cui - tu - o Mag- nus do - mi - nus



Glo-ri - a pa-tri et fi - li - o et spi-ri - tu - i sanc-to

De sexto tono



Sex - ta ho-ra se - dit su - per pu-te- um

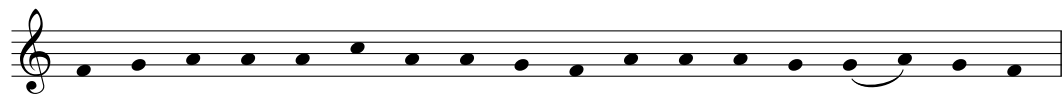
[f. 294v]



A - ve re - gi - na Be - ne - dic - tus



Glo - ri - a E - u - o - u - a - e




Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris me - is

Can.




Mag - ni - fi - cat a - ni - ma me - a do - mi - num



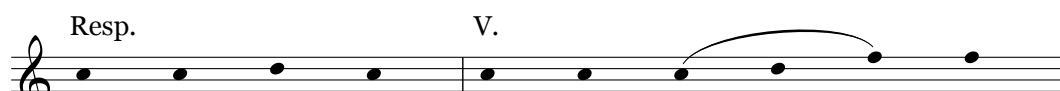
Be ne - dic tus do mi nus de - us is ra - hel qui a iu si ta vit et fe cit redemp ti o nem ple bis su - ae

Introitus

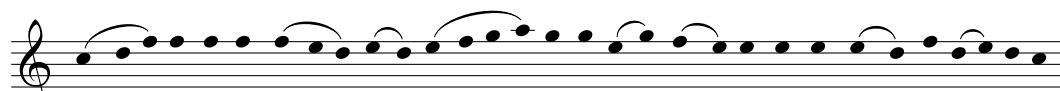


Os jus - ti Glo - ri - a E - u - o - u - a - e

Resp. V.




Tu - am A - do - re - mus te




Glo - ri - a pa - tri et fi - li - o et spi - ri - tu - i sanc - to

De septimo tono



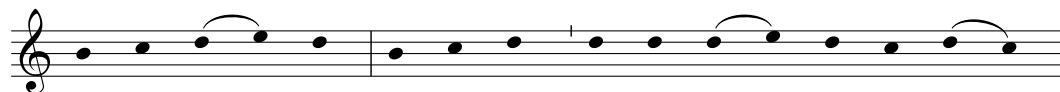
Sep - tum sunt spi - ri - tus an - te thro - num de - i



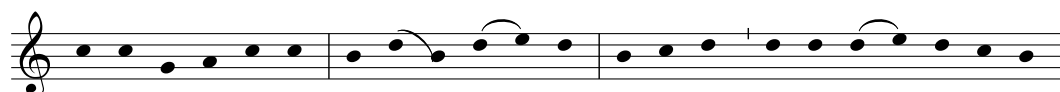
Spe - ci - e tu Do - mi - ne Glo - ri - a E - u - o - u - a - e



Ve - ni in ut - rum Sur - ge Glo - ri - a E - u - o - u - a - e



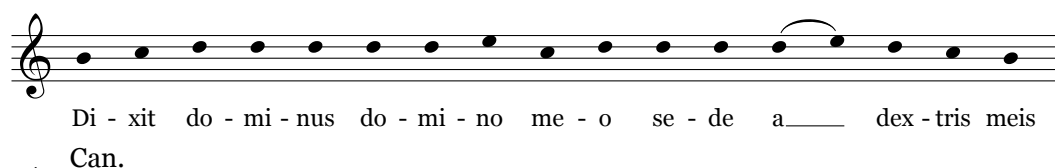
Al - le - lu - ya Glo - ri - a E - u - o - u - a - e



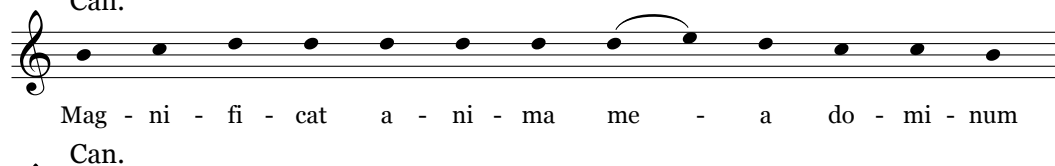
Ip - se pre i - bit O - ran - te Glo - ri - a E - u - o - u - a - e



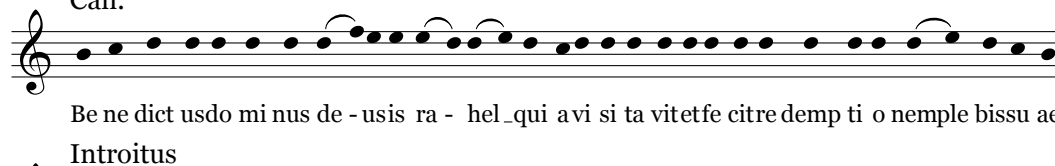
Hic ac - ci - pi - et Glo - ri - a E - u - o - u - a - e



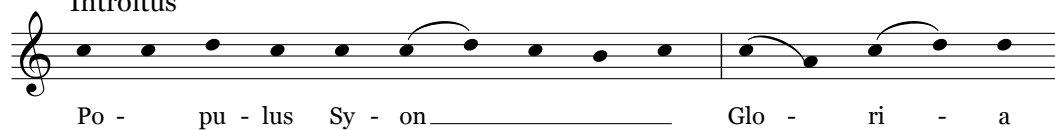
Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris meis
Can.



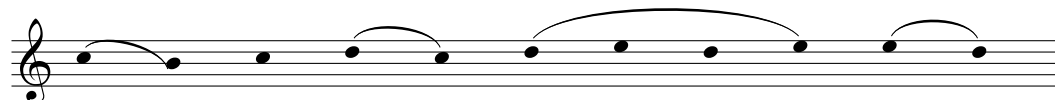
Mag - ni - fi - cat a - ni - ma me - a do - mi - num
Can.



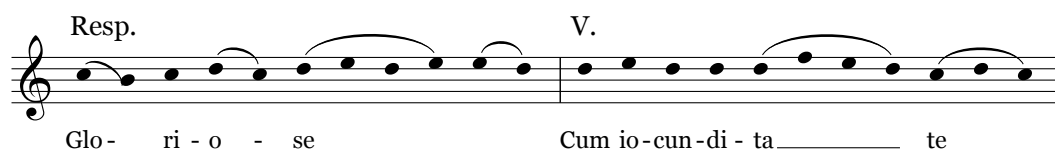
Be ne dict us do mi nus de - us is ra - hel qui a vi si ta vit et fe cit re demp ti o nem ple bis su ae
Introitus



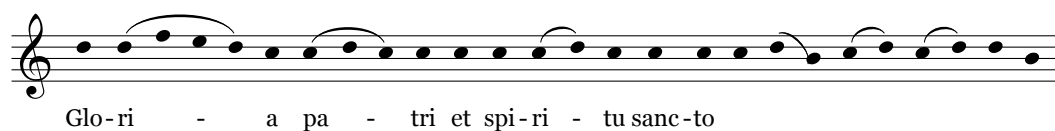
Po - pu - lus Sy - on Glo - ri - a



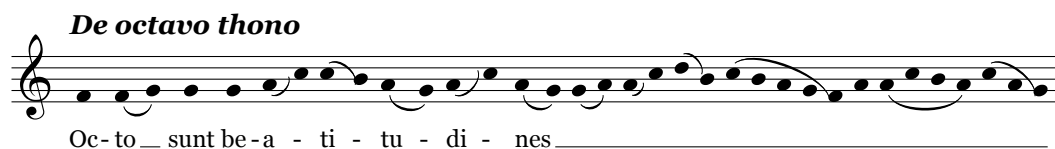
Glo - ri - o - se



Cum io - cun - di - ta te



Glo - ri - a pa - tri et spi - ri - tu sanc - to



De octavo thono
Oc - to sunt be - a - ti - tu - di - nes

Nup-ti - e Glo-ri - a E - u - o - u - a - e

Tu-am cru - cem Be - a - te de - i Glo-ri - a E - u - o - u - a - e

[f. 295v]

Sub thro - no Ve - ri - tas Glo-ri - a E - u - o - u - a - e

Om - nis plebs Hoc est pre - cep - tum me - um

Glo - ri - a E - u - o - u - a - e

In e - ter - num Glo - ri - a E - u - o - u - a - e

Nos qui vi - vi - mus An - ge - li Glo - ri - a E - u - o - u - a - e

Di - xit do - mi - nus do - mi - no me - o se - de a dex - tris meis

Mag - ni - fi - cat a - ni - ma me - a do - mi - num



Be ne dic tus do mi ne de us is - ra hel qui a vi si ta vit et fe - cit re demp ti o nem ple bis su ae



Ad te le - va - vi Glo - ri - a E - u - o - u - a - e



Cor - de et a - ni - mo Om - nes pa - ri - ter



Glo - ri - a pa - tri et fi - li - o et spi - ri - tu - i sanc - to

Appendix 6 Variants of the antiphon *differentiae* found in *Speculum musicae* and other late-medieval tonaries

MODE 1

- 1.1 GGGDFEd
- 1.2 AAAAAA
- 1.3 AAGFGG
- 1.4 AAGFGfD
- 1.5 AAGFGfed
- 1.6 AAGFGGfed
- 1.7 AAGFGGfedf
- 1.8 AAGFGGfedg
- 1.9 AAGFGA
- 1.10 AAGFGGa
- 1.11 AAAGfGa
- 1.12 AAAGfGA
- 1.13 AAAGfGGa
- 1.14 AAGFGaG
- 1.15 AAGFGGag
- 1.16 AAAGfGGag
- 1.17 AAGFGaGf
- 1.18 AAAGfGaGfed
- 1.19 AAGFAGfed
- 1.20 AAAGAG
- 1.21 AAcaGFGA
- 1.22 AAcaGFFFFD

MODE 2

- 2.1 FFDECD
- 2.2 FFFECD
- 2.3 FFEeFeCD
- 2.4 FGfDFEcDed

MODE 3

- 3.1 CCCAbAG
- 3.2 CCCAcAG
- 3.3 CCCACB
- 3.4 CCCACBa
- 3.5 CCCbAbAGa
- 3.6 CCCBAcC

- 3.7 CCCBAcAg
- 3.8 CCCBAcBa
- 3.9 CCCAGABGa

MODE 4

- 4.1 AAAAAg
- 4.2 AGABGE
- 4.3 AGABGEg
- 4.4 AGABGA
- 4.5 AGABGGa
- 4.6 AGABaGfEd
- 4.7 AGACaGfE
- 4.8 AGACaGfEd
- 4.9 AGACbaGfE
- 4.10 AABAGA
- 4.11 AAFGaGE
- 4.12 DCDECB

MODE 5

- 5.1 CCABAGF
- 5.2 CCABAGF
- 5.3 CCDBCA
- 5.4 CCDBCAG
- 5.5 CCDBCAC

MODE 6

- 6.1 AAFGaGF
- 6.2 AAFGaGfFg

MODE 7

- 7.1 DDEDCB
- 7.2 DDEDCBa
- 7.3 DDEDCBc
- 7.4 DDEDCBd
- 7.5 DDEDCD
- 7.6 DDEDCCd
- 7.7 DDEDCDc
- 7.8 DDEDCdC
- 7.9 DDeFeDCCCbAg

MODE 8

- 8.1 CCACDC
- 8.2 CCBACCD
- 8.3 CCBCAG
- 8.4 CCBCAGa
- 8.5 CCBCAGag
- 8.6 DDACBa
- 8.7 CCCbGaCbAG

Appendix 7 Late-medieval treatises on mensural music⁴⁰²

<i>Treatise</i>	<i>Date</i>	<i>TML</i>	<i>Source</i>
<i>Amerus; Practica artis musicae.</i>	1271	AMEPRA	<i>D-Baa</i> lit. 115; <i>GB-Ob</i> Bodley 77; <i>D-TRs</i> 44
<i>Anglès anon. 1929.</i>	late 14th / early 15 th c	AGANONT	<i>E-Sc</i> 5.2.25

⁴⁰² In this table I follow, for the most part, the convention outlined Balensuela’s article on anonymous theoretical works in *GroveMO* (that is, each anonymous work is listed by its *first* editor), the exception being the citation of the Vitry *Ars nova* treatises published in *CSM* 8 (which, along with any other attributed treatises were not included in Balensuela’s list). Matthew Balensuela, “Anonymous Theoretical Writings,” *GroveMO* (accessed November 27, 2006). Although the abbreviation should suffice for identification (and in some cases, for clarity, I have included in square brackets a reference to the edition given in the Bibliography, please refer to the Balensuela article for complete lists of editions for each treatise. The date ranges given here follow the general ranges given in either *GroveMO* (in Balensuela’s article or that given under the attributed theorist’s name) or the most recent secondary literature or edition of the treatise in question. A TML reference is also given for each treatise, and the manuscript source or sources, unless they are too numerous to list within the confines of the page and column.

<i>Anglès anon. 1958; De cantu organico.</i>	c1350	AGANOCO	<i>E-Bbc</i>
<i>Cousse-makerH, Anon.3 (Document 3); Discantus vulgaris positio.</i>	13 th century	DISPOVU	<i>F-Pn lat. 16663</i>
<i>Cousse-makerH, Anon.5 (Document 5); De arte discantandi.</i>	late 13th century	ARTDIS	<i>F-Pn lat.15139</i>
<i>Cousse-makerH, Anon.6 (Document 6); Quaedam de arte discantandi.</i>	Late 13th century	ANOFIG	<i>F-Pn lat. 15129, S-Uu C55</i>
<i>CS 1, Anon.2; Tractatus de discantu.</i>	late 13th century	ANOTDD	<i>F-SDI 42</i>
<i>CS 1, Anon.3; De cantu mensurabili.</i>	late 13th century	ANOCMM	<i>F-SDI 42</i>
<i>CS 1, Anon.4; De mensuris et</i>	c1270-	ANO4MUS	

<i>discantu.</i>	1280		
<i>CS 1, Anon.5; De discantu.</i>	14 th century	ANO5DED	<i>GB-Lbl</i> Roy.12.C vi
<i>CS 1, Anon.6; Tractatus de figuris sive de notis.</i>	mid 14th century	TRADEF	<i>GB-Lbl</i> Add. 4909 (18 th -century copy of <i>GB-Lbl</i> Cotton Tiberius B. IX); <i>GB-Lbl</i> Royal 12. C. VI
<i>CS 1, Anon.7; De musica libellus.</i>	c1270- 1280	ANODML	<i>F-Pn</i> lat.6286
<i>CS 3, Anon.1; De musica antique et nova.</i>	14 th century	ANO1DEM	<i>GB-Ob</i> Digby 90
<i>CS 3, Anon.2; De valore notularum tam veteris quam novae artis.</i>	early 14th century	ANO2DEV	<i>F-Pn</i> lat. 15128
<i>CS 3, Anon.3; Compendiolum artis veteris ac novae.</i>	early 14th century	ANOART	<i>F-Pn</i> lat. 15128

<i>CS 3, Anon.4; Compendium musicae mensurabilis tam veteris quam novae.</i>	early 14th century	ANO4CMM	<i>F-Pn</i> lat. 15128
<i>CS 3, Anon.5; Ars cantus mensurabilis mensurata per modos iuris.</i>	late 14th century	ANO5ACM	<i>I-Bc</i> A.49, <i>I-Fl</i> Plut.29.48, <i>I-Fr</i> 734, <i>F-Pn</i> 7369
<i>CS 3, Anon.6; De musica mensurabili.</i>	c1321	PSDTRA	<i>US-Cn</i> 54
<i>CS 3, Anon.7; De diversis maneriebus [manieribus] in musica mensurabili.</i>	mid-14th century	ANO7DDM	<i>F-SDI</i> 42
<i>CS 3, Anon.10; De minimis notulis.</i>	late 14th century	ANO10DEM	<i>F-SM</i> 222
<i>CS 3, Johannes de Muris Ars discantus [incipit Quedam notabilia utilia Quocumque sola brevis]</i>	15 th century	MURARSD	<i>Ghent</i> 70(71)

<i>CS 3, Philippe de Vitry Ars perfecta in musica [incipit: Omni desideranti notitiam artis mensurabilis musice]</i>	late 14 th century	VITARSP	<i>US-Cn 54</i>
<i>Ellsworth anonymi.</i>	before 1375	BERMAN	<i>US-BEm 744</i>
<i>Franco of Cologne; Ars cantus mensurabilis</i>	1260/1280	FRAACM	<i>F-Pn lat.11267, ff.1–7v (13th-century French MS); F-Pn lat.16663, ff.152–65 (13th-century Parisian MS); F-Pn lat.16667, ff.152–65; F-SDI 42, ff.43–53v (14th-century German MS); GB-Ob 842, ff.49–59 (14th-century English MS); I-Ma D.5.inf., ff.110–18 (15th-century Italian MS); TRE [MS without no.], ff.3–14 (MS written by Gaffurius); S-Uu C 55, ff.20–43 (15th-century Swedish MS)</i>
<i>Gallo anon. 1966a; Capitulum de semibrevibus.</i>	14th century	ANOSEMI	<i>I-PAVu Aldini 361</i>
<i>Gallo anon. 1966b; Fragmentum de mensuris.</i>	14th century	ANOFRAM	<i>F-SDI 42</i>

<i>Gallo anon. 1966c; Fragmentum de proportionibus.</i>	14th century	ANOFRAP	<i>I-PAVu</i> Aldini 361
<i>Gallo anon. 1966d; Capitulum de modo accipiendo.</i>	14th century	ANOCAPM	<i>I-CATc</i> D39
<i>Gallo anon. 1966e; Musice compilation.</i>	14th century	ANOMUSC	<i>I-Ma</i> M.28 sup.
<i>Gallo anon. 1966f; Tractatulus de figuris et temporibus.</i>	14th century	ANOFIT	<i>E-Sc</i> 5.2.25
<i>Gallo anon. 1971a; Compendium musicae mensurabilis artis antiquae [Faenza anon.].</i>	late 13th century	ANOCOM	<i>I-FZac</i> 117
<i>Gallo anon. 1971b; Tractatulus de cantu mensurali seu figurativo</i>	Mid-14th century	ANOTRA	<i>A-M</i> 950

musice artis [Melk anon.].

Hieronimus de Moravia;
Tractatus de musica, CS 1, 1–
155.

c1272

IERTDM

F-Pn lat.16663

Johannes de Garlandia, De
musica mensurabili position
(CS 1, 97-117).

C1270-
1300

GARDMPP

F-Pn lat. 16663

Johannes de Garlandia; De
mensurabili musica, (CS 1,
175-182 [probably
anonymous]).

c1240-
c1260

GARDMM

I-Rvat 5325; B-BRs 528

Johannes de Muris;
Compendium musicae
practicae.

c1322

MURCOM

B-Gu 70(71); F-Pn lat. 14741; I-Rvat
Regin.lat. 1146; St. Paul, Archiv des
Benediktinerstiftes 135/1; St. Paul, Archiv des
Benediktinerstiftes 264/4

Johannes de Muris; Libellus

c1340

47 manuscript sources⁴⁰³

⁴⁰³ See D. Katz, *The Earliest Sources for the ‘Libellus cantus mensurabilis secundum Johannem de Muris’*

*cantus mensurabilis secundum
Johannes de Muris*

<i>Johannes de Muris; Notitia artis musicae.</i>	1319/1321	MURNOT	<i>I-Rvat</i> 307; <i>GB-Ctc</i> R.14.26; <i>US-Cn</i> 54; <i>B-Gu</i> 70(71); <i>I-Ma</i> H 165 Inf; <i>GB-Ob</i> Bodley 300; <i>GB-Ob</i> Bodley 77; <i>F-Pn</i> lat. 14741; <i>F-Pn</i> lat. 7378 A; St. Paul, Archiv des Benediktinerstiftes 264/4; <i>US-Wc</i> ML 171 J 6
<i>Johannes Vetulus de Anagnia; Liber de musica.</i>	Mid-14th century	VERLDM	<i>I-Rvat</i> 307
<i>John of Tewkesbury; Quatour Principalia.</i>	14th century	QUAPRIB1- 4	<i>GB-Lbl</i> Add. 4909 (18 th -century copy of <i>GB-Lbl</i> Ms. Cotton Tiberius B. IX)
<i>John Torkesey; Trianguli et scuti declaratio de proportionibus musicae mensurabilis.</i>	1330s	TORTRI	<i>GB-Ctc</i> 1441; <i>GB-Lbl</i> Landsdowne 763; <i>GB-Lbl</i> Royal 12.C vi; <i>I-Rvat</i> Regin.lat. 1146

(Ph.D. diss., Duke University, 1989).

<i>Kellner anon. [Brieg (Brzeg) anon., Kremsmünster anon.].</i>	c1400	ANOBRI	A-KR 312
<i>Magister Lambertus; Tractatus de musica (CS I, 251–81).</i>	before 1279	ARITRA	GB-Lbl Harley 281; F-Pn lat. 11266; F-Pn lat. 6755/2
<i>M.L. Göllner anon. a; Practica musicae artis mensurabilis magistri franconis.</i>	13th century	ANOPRA	D-Mbs Clm 5539
<i>Marchetto da Padova; Brevis compilation [ed. Vecchi].</i>	after 1318	MARBREV	B-Br II 4144
<i>Marchetto da Padova; Pomerium.</i>	c1318	MARPOME	US-Cn Ms. 54.1; I-Ma D.5.inf.
<i>Michels anon. [OP anon., Anon. OP].</i>	c1320	ANOPTRA	GB-Ob Bodley 77; F-Pn lat. 14741
<i>Moberg anon.; Tractatus brevis de musica mensurata.</i>	13th-14th century	ANOUPS3	S-Uu C.55

<i>Müller anon. 1886; Regulae super discantum et ad discernendum ipsas notas discantus [Müller Anon.2, Karlsruhe anon.].</i>	c1270-1280	DIEREG	<i>D-KA St.Peter pergamen.29a</i>
<i>Petrus de Amalfia; Compendium artis motectorum Marcheti (ed. Gallo 1966).</i>	14th century	PAMCOM	<i>E-Sc 5.2.25</i>
<i>Petrus de Picardia; Ars motetorum compilata breviter.</i>	c1250	PETARS	<i>I-Na XIV A 15; F-Pn lat. 16663; S-Uu C453</i>
<i>Reaney anon. 1983; De origine et effectu musicae.</i>	Early 15th century	ANOOREF	<i>GB-Lbl Lansdowne 763; GB-Ob Bodley 515</i>
<i>Ristory anon. 1987a; Compendium musicae mensurabilis artis antiquae.</i>	c1400	ANOCOMM	<i>A-Wn Cod. Vind. 5003</i>
<i>Ristory anonymi 1987b;</i>	late 13th	ANOTAA	<i>A-Wn Cod. Vind. 5003</i>

<i>Tractatus artis antiquae cum explicatione mensurae binariae.</i>	century		
<i>Seay anon. 1964; Libellus musicae adiscendae valde utilis et est dialogues [edn. Ex codice Vaticano 5129].</i>	c1400	ANOLIB	<i>I-Rvat lat.5129</i>
<i>Sowa anon. 1930; De musica mensurata [St Emmeram anon.].</i>	1279	ANO1279	<i>D-Mbs Clm 14523</i>
<i>Sweeney anon.; De semibrevibus caudatis.</i>	late 14th century	ANOSEM	<i>F-Psg 1257</i>
<i>Sweeney anon.; De musica mensurabili [formerly attributed to Theodoricus de Campo]</i>	late 14th century	ANODEM	<i>I-Rvat 307</i>
<i>Thomas Walsingham; Regulae Magistri Thomae Walsingham</i>	late 14th century	WALREG	<i>GB-Lbl Lansdowne 763</i>

*de figuris compositis et non
compositis, et de cantu
perfecto et imperfecto, et de
modis incipiunt.*

*Vecchi anon.; Rubrice breves
[ed. Vecchi 1969].*

14th
century

ANORUB

F-SDI 42

*Vitry anon. 1964a (I-Rvat
307); Sex minimae possunt
poni pro tempore imperfecto
(incipit)*

c1320

VITARNO

I-Rvat 307

*Vitry anon. 1964b (F-Pn
14741) [incipit: Cum de signis
temporis variationem
demonstrantibus]*

c1320

ANOQUAE

F-Pn 14741

*Vitry anon. 1964c (F-Pn
7378A); Sex sunt species
principales sive
concordantiae discantus
(incipit)*

c1320

ANOARS

F-Pn 7378A

<i>Vitry anon. 1964d (GB-Lbl 21455); [incipit: Cum de mensurabili musica sit nostro]</i>	c1320	REGDEM	<i>GB-Lbl 21455</i>
<i>Vitry anon. 1964e (I-Su L.V.30) [incipit: Sub brevissimo compendio Philippo de Vitriaco in musica]</i>	c1320	ANOOMD	<i>I-Su L.V.30</i>
<i>Willelmus, Breviarium regulare musicae.</i>	before 1372	WILBRE	<i>GB-Ob Bodley 842</i>
<i>Wolf anon. 1908; Compendium totius artis motetorum [Wolf Anon.3].</i>	c1340	WFANON3	<i>D-EF Arupl. 8°94</i>
<i>Wolf anon. 1918–19; Tractatus de musica mensurabili [Wolf Anon.4, Breslau].</i>	c1400	WFANON4	<i>PL-WRu cart.IV.Qu.16</i>

Appendix 8 Translation of Jacobus's chapters on the semibreves

Jacobus, *Speculum musicae* 7.33

“A short prologue touching on the intention and also the order of things to be said”

We now come to the semibreves. The Moderns have invested a great deal of effort in their teachings on these notes.

They have labored much in the distinction, signification, value and naming of them. More time should to be devoted to those notes that are more central to this art, that is, longs and breves, but of these the Moderns have spoken less and less. In fact, they do the opposite and focus on semibreves, which seem to pertain less to this art. Many processes, many chapters, they devote to these notes.

They use them a lot and through them they have extended the new art, in their way of singing and notating songs. They give them many more names, and they decorate them with plicas and manifold strokes. But while properties and passions should follow the form and species of a thing, they ascribe to them many properties that seem inappropriate, and which apply more to longs and breves, if we can trace their original and primary signification. If nothing acts beyond its own species, why do they attribute to duplex and simple longs the ability to imperfect breves one to another?

These are among the things they say, the properties that they ascribe to the semibreve, and which, as will be seen, they ponder upon to a great extent:

First, that the semibreve is divisible by a division of its integral whole;

Second, that a tail can be added to the semibreve;

Third, that the semibreve can be placed alone, without another semibreve joined to it;

Fourth, that the semibreve can imperfect longs, breves and one to another.

None of these teachings was held by the Ancients. But since they did not touch upon them specifically, they did not explicitly forbid these things.

First we will speak of the second point, because we discussed the first point elsewhere.

With respect to the second point, we will proceed as follows:

First, it is against the nature of the semibreve to have a tail or plica added to it;

Second, if a tail is added, it should be done less to the *semibreve minima* than to other notes;

Third, if a tail is added, it ought to be done at a lateral angle, rather above than below.

Jacobus, *Speculum musicae* 7.34

“That the Moderns irrationally put caudas on semibreves”

Moderns, as is now often said, put tails on some semibreves (I say “some” meaning minims and semibreves).

They put tails on them in various ways. The tail on the semibreve not only goes against its nature, but its figuration. And we declare this according to what is permitted by its matter. The words of the Ancients relied on these fundamentals.

It is argued like this: these notes repudiate being caudated or plicated because they repudiate division of their integral whole. The tail or plica is a sign of division or inflexion of the sound of the note to which it is joined, ascending or descending, as was seen above. Since the sign and the signified ought to correspond, the cauda or the plica, since it is a sign of division, should not be added to something unless it is divisible. The semibreve repudiates division, as was proven above.

Beyond this, there is much confusion in the distinction of the value of the notes and the difficulty in figuring them, and where there is not utility, there is corruption. It is similar with the plication of semibreves, as the done by the Moderns.

One of them says it thus:

“It could be said that if a person was to place any of these noteshapes of whatever genus or species (duplex and simple longs, perfect and imperfect, breves, or altered breves, of imperfectly perfect time, major and minor semibreves, and minims – if one may be permitted to name them such), then there would be no need for any new signs, figures or strokes, or superfluous *plicas*, and the value of the all the notes in any measurable song (performed slowly or quickly) could be deciphered without the need for *plicas* or strokes. Indeed, the confusion of these diverse strokes proves an impediment to the singer, for some marks seem to be missing, and some invisible on the page, and the singer, preoccupied by the various strokes and *plicas*, prolongs the pitches awkwardly. For it is only with this prolonging of some notes and then the continuation of the song in a balanced manner that the ear is seduced, and this is why the figuration of the notes was finally invented. The figuration of the notes was invented for this precision, so that the singer, instead of hesitating about the value of the notes, can use the prenotated figuration to remove any doubts about how to perform the song, without any uncertainty about the length of the notes interfering with the performance.”

These are the words of the author who says next:

“What might I respond to this? I find that I do not agree with this for the most part, since by imitating the Ancients, the power of this practice is constrained.”

But saving the grace of this teacher, this is not a sufficient excuse. Nothing irrational ought to be placed under this art, and no irrational use ought to be sustained in this art. Tyranny, it seems, is an irrational power; bad practice must be abolished, and at no time should a bad and irrational use cause a proscription against the proper use.

Those who are pleased by these novelties would seem to imitate the vain Athenians. This use must not be praised or approved on account of its novelty, which obfuscates the fundamentals of this art, and which those of us observing this art protest against, asking why such reasons should color and sustain this use.

Franco, they say, forbade semibreves to be plicated because he divided the perfect breve into three equal semibreves, beyond which it is indivisible, or into two unequal parts. Not so the moderns, who state that that third into which the perfect breve is divided is further divisible into three. According to Franco, it is not appropriate to plicate it because its value does not contain a lesser number, and it should only be placed without plicas.

First, it must be said that this is not the reason why Franco prohibited the plication of semibreves, but I have already touched upon this. Second, it must be

added that, as was seen above, in this new art more than three semibreves are placed for a *recta* breve, while we also saw this done by some of the Ancients following the art of Franco, it does not follow from this fact that semibreves can be plicated, and the Ancients who placed more than three semibreves for a perfect tempus never plicated them.

And according to this argument, those which are more likely plicated are those which can be divided, and according to this, minims and semiminims ought not be plicated, or at least not not as often as certain semibreves, but they do the opposite.

To this they say: it was not necessary for the Ancients to plicate semibreves, since according to custom, when two unequal semibreves are found, the first is less the second greater, imitating nature by which the stronger is at the end rather than the beginning.

The Moderns say this is not necessary since the contrary is also found, where the first semibreve could be held longer than the second, just as they now observe. And they indicate the distinction of this by plicating the other one. They say that it is not always necessary for art to imitate nature.

It must be said that it is true that two unequal semibreves can be made where the first is longer than the second, and the contrary. But nevertheless it is more appropriate that that the smaller semibreve is placed first, and then the

greater, as the Ancients did, because, although art cannot imitate nature, it nevertheless should attempt to imitate it as much as possible. It does not follow that the first would be indicated as longer than the second by plicating the other one. This is committing a fallacy of the consequent from many indeterminate causes to one because through one way or another it could be discerned.

The use of the Ancients distinguished these semibreves without the use of caudas, so why cannot the Moderns through their own contrary use not also distinguish them and add marks which are not appropriate?

To this we can add that the Ancients created this delay of time which is carried through the major semibreve, which the Moderns call the minor semibreve in the fast measure, and for the major semibreve the Ancients placed the imperfect long, for the minor breve, the perfect long, as is in the following hocket [*A l'entrade*].

The first section of this song seems to be a song made from two unequal semibreves, where the minor semibreve precedes the majore semibreve; the second of which is reversed in the following notation of this song [*Plaignant*].

Since in this song there are four species of notes, that is, the perfect long, the imperfect long, the *recta* breve and the semibreve, if someone wanted to notate this according to the Modern way of notating, for the perfect long, they would place a semibreve which is called *parva*, for the imperfect long they would place a

semibreve which is called *minor*, for the recta breve a semibreve minima, for the semibreve a semiminim. These notes, with respect to their entities, whatever their names may be, seem similar in value in their measure. And if this is indeed so, the Moderns ought not to rejoice that they invented minims and semiminims; since more is involved in things than finding names for them.

And this name of miniminity does not seem to be rational insofar since it is possible to place two semiminims for a minim. But there ought not be less than the least. Thus the ancient names of the notes given by the Ancients seem more rational than the Moderns.

It must also be added that it seems to go against its nature to plicate a single semibreve, not only by reason of its signification, but also by reason of its figure, since it is figured as a lozenge. Such a figure, if a tail is added to it, should either be at the most acute point (above or below), or at the obtuse point (at the sides). It does not seem rational to add it at the acute point, because the notes are balanced at the middle of the obtuse or lateral side (a figure ought not be tailed in the middle). Similarly this figure ought not to be tailed at the points because we cannot distinguish between the left and right side at the points. And so it does not fit to put the tails either at the obtuse or acute points.

It seems that it is not possible to put tails on semibreves placed by themselves. I say “themselves” because it follows that if they are joined to another, it might be a different story.

Jacobus, *Speculum musicae* 7.35

“That if tails are added to semibreves, it is less appropriate for a *semibreve minima* than other notes”

Some may say that if a tail is added to a single semibreve, just as is done by the Moderns, this is less irrational with a major or minor semibreve than with a minim.

First, because the major and minor semibreves more closely approach certain plicable notes in value. According to the Moderns, the major semibreve is divisible into three and the minor into two, and in those having this symbol the leap is easier. The note having the name of *minima* seems to be indivisible.

Second, because the delay of time of the major semibreve is greater, the stroke or the plica is a sign of this slowness.

Third, because the way is greater in lesser things: a smaller number of major semibreves are placed for a perfect tempus than minor semibreves or minims.

Fourth, because penalty for notators ought to be avoided when possible, and it is a lesser penalty to put strokes on three or two, than on six or nine.

Fifth, when making a distinction between things, it is a hindrance to distinguish many where few could suffice. If anyone wants to distinguish one from a herd of animals, only this one ought to be marked, and not all the remaining ones.

From these points it seems that the *semibreve minima* is both not caudible and less caudible than the major and minor semibreve.

This should not distract on account of confusion but for those reasons and others that were touched on. I say, “on account of confusion” because there is less confusion, and less penalty, if the major and minor are tailed and not the minim, rather than the opposite, whether there are tailed above or below. The *semibreve minima* ought not to be tailed above since it could be confused with the ligature of opposite propriety which applies to semibreves rather than minims. This really ought to be notated using quadrangular notes, rather than lozenge-shaped notes.

To this, it does not suffice to say that minims are tailed above because a tail can be more quickly distinguished than a point, because, whatever distinction is quicker, is not necessarily more rational.

Jacobus, *Speculum musicae* 7.36

“That if a single semibreve is tailed, it is more appropriate to do this on the obtuse angles rather than on the acute”

Although a single semibreve ought not to be tailed, it is more appropriate to tail it on the obtuse angles rather than the acute.

First, because the extremities of this figure are at the obtuse angles, and the acute angles, which is to say the top or the bottom, sustain the reason of the middle and are prior with the respect to the place and the direct aspect of this figure. The figures ought not be tailed in the middle but at their extremities, we can see this clearly in the quadrangular and rectangular figures.

Second, because the plica or cauda ought to be placed on these notes on the on the angles which could be termed right or left, thus in the obtuse angles of the semibreve figures, not the acute.

Third, because the larger angle seems to be more appropriate than the lesser, since the greater angle makes more sense with respect to divisibility than the minor, the plica is a sign of the division, and the obtuse angle is greater angle than the acute.

Fourth, because any figure, if it has a tail, it should have a tail at the angle from which it is named rather than the other; the figure of the semibreve is named from the obtuse angles, and not from the acute.

Fifth, because the figure of the semibreve is more rationally tailed in these angles, or, less irrationally, more distinctions are found among the semibreves and the tailing of them. And so it is from the tailing of semibreves at their obtuse angles, like the tails in quadrangular rectangular figures, such as longs and breves. This can be said of the major semibreve, which is tailed at the right side above or below; and the minor semibreve, which is tailed in the left below or above in this way; and this will be called a minim, which lacks a tail.

I speak hypothetically or from a supposition, I do not approve of this practice, as you can imagine. I reject the tailing of semibreves at the acute sides and at the obtuse, and I spoke of this previously.

Jacobus, *Speculum musicae* 7.37

“That a semibreve is not placed alone without being joined to one or another semibreves”

The Moderns place solitary semibreves, that is, one semibreve not joined to one other semibreve or more. This seems irrational, because it is against the nature of part to be placed by itself without the completion of its whole. The whole, since it is greater than the part, necessarily requires more parts to constitute the whole. It is impossible for a single part to render the whole. The semibreve, as was proven above, has the rationale of a part, not a whole, with respect to proper or perfect time. Thus, no part through itself renders the whole, but requires one or another joined to it to render the whole.

Similarly it goes against the nature of an imperfection to be placed by itself. Whence the commentator Eustratius, on the book of Ethics, “Imperfects,” he says, “do not stand alone.”

No semibreve carries a perfection, as was touched on above, for it does not have the reason of the whole, but of the part. The whole is perfect.

A perfection, according to mensural music, consists in the ternary. It was proven above that it is against the nature of the semibreve to be divided into three equal parts. In relation to this, it must be asked if it is appropriate for a long or a breve to be placed by themselves, and not joined to another. From this we can see the irrationality of the imperfect breve, which the Moderns use, to be given the form of a breve. It is congruous for breves and longs, by reason of

their form and figure, to be placed by themselves while their figure is a quadrilateral rectangle comprising both the upper plane and lower plane. Not so the form of the semibreve, which begins with an acute angle above, and is similarly terminated below, and does not thus include the firmness or stability of the figure of the long or breve, nor the perfection.

For a right angle seems more perfect than an acute or obtuse angle. Accordingly, the figures of the notes, which are used in mensural music, are taken from plainchant, and as such, mensural music in its properties imitates plainchant, as much as it can. In plainchant, among those who know how to notate it well, a single semibreve is never found, but the figure of a long or a breve is often found on its own.

But, the Moderns say, the semibreve, either according to us, or according to the Ancients, is never found alone, but is always found with a long, or with a breve or with another semibreve.

I submit that the semibreve taken together with another semibreve or other for the rendering and completing of its whole, this semibreve note will render a whole with a breve, but this is only when it is with another semibreve or semibreves, as the Ancients held.

Although a semibreve must not be joined to a breve, it is worse to join it to a long, either simple or duplex. The Ancients did not state that a semibreve could perfect or imperfect a breve or a long. So now we must deal with imperfections.

Appendix 9 Discussions of discrete and continuous time in late-medieval philosophy

<i>Theologian</i>	<i>Work</i>	<i>Section</i>
Robert Grosseteste	<i>Commentary on the Physics</i>	Book 4
Albertus Magnus	<i>De quatuor coaequaevis</i>	“Quid sit tempus” (Treatise 2, q. 5, art. 2) “Utrum motus Angelorum sit in tempus, vel non?” (Treatise 4, q. 59, art. 3)
	<i>Summa theologiae I</i>	“An tempus sit unum vel plura” (Treatise 5, q. 23, c. 3, art. 2)
	<i>Commentary on the Categories</i>	“Qualiter numerus et oratio sunt quantitates discretæ” (Treatise 3, c. 2) “Qualiter tempus est quantitas continua” (Treatise 3, c. 4)
Bonaventure	<i>Commentary on the Sentences</i>	“Utrum Angelus pertranseat medium moto subito, vel successivo” (I, dist. 37, pars 2, a. 2, q. 3) “De mensurae angelicae in se” (II, dist. 2, pars 1, a. 1, q. 1-3) “De mensura angelicae naturae in comparatione ad mensuram rei corporalis” (II, dist. 2, pars 1, a. 2, q. 1-2)
Thomas Aquinas	<i>Commentary on the Physics</i>	Book 4, lectures 15-23
Henry of Ghent	<i>Commentary on Liber de causis</i>	“Utrum inter aeternitatem et tempus sit ponere aliqua mensuram mediam” (q. 15)
	<i>Quodlibet 2</i>	“Utrum angelis secundum substantiam suam sine operatione est in loco” (q. 9)

	<i>Quodlibet 9</i>	“Utrum aevum sit substantia vel accidens” (q. 7)
	<i>Quodlibet 12</i>	“Utrum cogitationis substantiae separatae mensuretur mensura composite ex indivisibilibus” (q. 8)
	<i>Quodlibet 13</i>	“Quod duobus nunc existentibus in tempore angeli respondeat unicum existens in tempore nostro” (q. 7)
	<i>Summa</i>	“Utrum aeternitas possit dici mensura dei” (art. 31, q. 2)
John Duns Scotus	<i>Commentary on the Physics</i>	“Utrum omen ens sit in tempora” (q. 17)
	<i>Ordinatio II</i>	“Utrum operatio angeli mensuretur aevo?” (dist. 2, pars 1, q. 4)
	<i>Ordinatio II</i>	“Utrum angelus possit moveri de loco ad locum motu continuo” (dist. 2, pars 2, q. 5)
Giles of Rome	<i>Quaestiones de motu angelorum</i>	

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