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HUMANISM IN ITALIAN RENAISSANCE MUSICAL THOUGHT

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ONE

Introduction: An Italian Renaissance in Music?

istorians generally view the Renaissance as a movement that began in Italy and spread northward. Music historians, however, have habitually begun the study of music in the Renaissance with composers associated with France and the Low Countries. Gustave Reese organized his book *Music in the Renaissance* on the premise that a central musical language arose in the fifteenth and sixteenth centuries in France, the Low Countries, and Italy, and spread to Spain, Portugal, Germany, England, and eastern Europe. In the first part of the book he defines this language in terms of the music of Dufay, Busnois, and Ockeghem, who were active principally in the north.[1]

Similarly Howard Mayer Brown takes the view that music in the Renaissance "is a northern art, or at least an art by northerners. All of the great composers of the fifteenth and early sixteenth centuries were born in what is today northern France, Belgium, and Holland."[2]

Thus, while the impetus for the Renaissance in the visual arts, literature, and philosophy is generally recognized to have come from Italy and moved across the Alps, we are confronted in music history with the thesis that music, of all artistic expressions, moved in the opposite direction. Now contrary motion may be a praiseworthy polyphonic practice, but it is disconcerting when applied to cultural historiography. If history in general has a proverbial "problem of the Renaissance," how much more acute it is in music history!

Heinrich Besseler, reflecting on his own work in Renaissance studies since

1. Gustave Reese, *Music in the Renaissance* (New York, 1954), Pt. I.

2. Howard Mayer Brown, *Music in the Renaissance* (Englewood Cliffs, 1976), p. 4. Leo Schrade, in "Renaissance: the Historical Conception of an Epoch," *Kongress-Bericht der Internationale Gesellschaft für Musikwissenschhaft, Utrecht 1952* (Amsterdam, 1953), pp. 19–32, took a similar view: "In contrast to the bonae litterae and to the visual arts as well, the rebirth of music came to pass as an achievement of northern composers . . . " (p. 30).

his *Die Musik des Mittelalters und der Renaissance* of 1931,[3] admitted in 1966 that he did not in that work look closely at the word or its meaning and now felt that "Renaissance" is "certainly the most problematic epoch-designation in the history of culture."[4] Besseler recalled that the word itself was not Italian but French and was first applied to historical periodization by a French historian, Jules Michelet, in 1855 in the subtitle of the seventh volume of his *Histoire de France*. In the introduction Michelet spoke of the rediscovery of the things of this world, of man.[5] Anticlerical in his leanings, Michelet celebrated what he saw as the triumph of the secular spirit. Five years later Jacob Burckhardt adopted the term in *Die Kultur der Renaissance in Italien* (Basel, 1860), which by 1919 had gone through twelve editions.

Although Besseler appreciated the book's enormous influence, he found a major fault in Burckhardt's failure to link the Renaissance with the Middle Ages. Burckhardt also failed to give sufficient credit to the religious component of the movement. Besseler reviews the corrective efforts of Henry Thode,[6] Paul Sabatier,[7] Konrad Burdach,[8] and Ernst Troeltsch.[9] August Wilhelm Ambros, Besseler notes, adopted the term "Renaissance" in the title of the third volume of his history of music.[10] Hugo Riemann used a similar designation for the period up to 1600[11] and extended the period back to the fourteenth century, incorporating a *Frührenaissance*. For Besseler, Riemann identified two points of particular significance to the Renaissance problem, that the Italian music of the trecento was "free, self-sufficient, and therefore autonomous," and that composers' names appear in such manuscripts as the Squarcialupi codex;[12] both points illustrate the individualism that Burckhardt isolated as one of the principal marks of the culture. Riemann, Besseler points out, did not know the French *ars nova,* whereas Besseler could show that Philippe de Vitry not only names himself but departs from reigning formal types. This led Besseler to annex the ars nova to the Renaissance, mocking any who disagreed, for example, Leo Schrade[13] and Friedrich Blume.[14]

3. Heinrich Besseler, *Die Musik des Mittelalters und der Renaissance* (Potsdam, 1931).
4. "Das Renaissanceproblem in der Musik," *Archiv für Musikwissenschaft* 22 (1966):1–10.
5. Jules Michelet, *Histoire de France* (Paris, 1855), VII, 1–133.
6. Henry Thode, *Franz von Assisi und die Kunst der Renaissance* (Berlin, 1885).
7. Paul Sabatier, *La vie de Saint François d'Assise* (Paris, 1893).
8. Konrad Burdach, *Von Mittelalter zur Reformation,* 11 vols. (Leipzig, 1893–1937).
9. Ernst Troeltsch, "Renaissance und Reformation," *Historische Zeitschrift* 110 (1913):519–56.
10. August Wilhelm Ambros, *Geschichte der Musik im Zeitalter der Renaissance bis zu Palestrina,* Geschichte der Musik, III (Breslau, 1868).
11. Hugo Riemann, *Das Zeitalter der Renaissance (bis 1600),* Handbuch der Musikgeschichte, II/1 (Leipzig, 1907).
12. Besseler, "Das Renaissanceproblem," p. 4.
13. Schrade, "Renaissance."
14. Friedrich Blume, "Renaissance," in *Die Musik in Geschichte und Gegenwart,* XI (Kassel, 1963), 224–80; trans. M. D. Herter Norton, in Blume, *Renaissance and Baroque Music* (New York, 1967), pp. 3–80.

In seizing upon individualism as the touchstone of the Renaissance, Besseler picked the characteristic that Burckhardt had made the centerpiece of his book, in the chapter "The Development of the Individual." Whereas medieval man was conscious of himself only as part of a group, individual personality being veiled in faith, illusion, and childish prejudices, Burckhardt observed that in the Italian cities of the Renaissance individuals who had an objective view of themselves as independent spirits emerged. Dante was the prophet of this spiritual resource and independence; his *virtù* remained with him even in exile. Renaissance man needed neither family, church, nor lord. Pietro Aretino, self-exiled from Rome, could extract pensions from both Charles V and Francis I simply by promising to spare them the barbs of his pen.

Individualism was not the only characteristic brought out by Burckhardt. The patronage of the tyrants who ruled the city-states was crucial to the flourishing of the arts, and Burckhardt celebrated them in the chapter "The State as a Work of Art." The arts bolstered these uncrowned rulers through eloquent orations and dedications, portraits and motets, which conferred on them the magnificence and legitimacy that their thrones lacked. What gave the Renaissance in Italy substance and won it worldwide dominance was the "Revival of Antiquity," the subject of another chapter. Here Burckhardt considers the adoration of the ruins of Rome, the revival of the literary classics and textual criticism, led by Petrarch, the cultivation of learning in the universities and schools for patricians. In the next chapter he traces the rediscovery of the world of nature, of geographical exploration and the renewed respect for human nature in all its fullness and richness. The final chapters describe the brilliant society and its festivals, the moral decadence and fainthearted religion. All these ingredients, not only individualism, need to be considered in defining a musical Renaissance.

Since publication of Burckhardt's book, the picture painted there has been undergoing correction and completion. The canvas has been extended to the northern countries and the religious character of this phase of the movement under the leadership of Erasmus, and the reaction against the abuses and luxuries of the church in the Reformation has been fitted into the panorama.[15]

15. For an account of various interpretations of the Renaissance through the centuries, see W. K. Ferguson, *The Renaissance in Historical Thought, Five Centuries of Interpretation* (Boston, 1948), and for reinterpretations since Burckhardt, see Ferguson's "The Reinterpretation of the Renaissance," in *Facets of the Renaissance* (New York, 1959), pp. 1–18, also reprinted in his *Renaissance Studies* (New York, 1963), pp. 17–29. For an excellent survey of scholarship and an overview of Renaissance humanism, see William J. Bouwsma, *The Culture of Renaissance*

Particularly important in the reassessment of the period has been the effort to identify the causes of the movement and the conditions for its taking root in Italy. Ferguson suggested that the landholding agrarian economy of the feudal system was replaced in Italy by the beginning of the fourteenth century by an urban society with large scale commerce and industry and developing capitalist institutions. The massing of population in the cities, the growth of private fortunes, concentration of wealth and political power in princes and leading families encouraged the spread of lay education and lay patronage of art, learning, and letters. In the royal courts of the north, such as those of the dukes of Burgundy, a money economy also grew, as did learning, vernacular literature, and art, but they "retained the forms of feudal and chivalrous society. . . . Literary reflections of these forms had by the fifteenth century lost the vitality that had inspired the feudal literature of the twelfth and thirteenth centuries."[16]

In Italy writers and artists had to cater to the taste of men not bound by ecclesiastical traditions. Classical culture was perfectly designed to fulfill the needs of educated, urban laymen. Since there was nothing in the immediate past to satisfy them or to draw from, the classics became the natural models for artists and founts for secular knowledge, particularly in matters of human and civic interest. Hans Baron has shown that Leonardo Bruni's *laudatio,* which helped to save Florence from succumbing to Duke Giangaleazzo Visconti of Milan, was modeled on a panegyric, *Panathenaicus* (Praise of Athens), by the orator Aelius Aristides.[17]

Bruni imitated not only the rhetorical form but the general sequence of arguments, though the content, giving a portrait of the political constitution of Florence, was original and crucial to arousing the commitment of the citizenry to resist the Milanese campaign. Thus classical rhetoric could serve to defend both tyranny and republicanism. Classical models were found fruitful also on other civic occasions, such as when one wanted to construct a splendid and stout palace or to honor a statesman with a Roman-style bust or equestrian statue.

The conditions that led to the reanimation of literature, the visual arts, and learning also deeply affected music in Italy throughout the period of the Renaissance. Music historians generally have overlooked many of these manifestations because their stated objective has been a history of musical style. But style is only the audible surface of a musical culture, the essence

Humanism, American Historical Association, pamphlet no. 401 (The American Historical Association, 1973).

16. Ferguson, *Renaissance Studies,* p. 131.

17. Hans Baron, *The Crisis of the Early Italian Renaissance* (Princeton, 1955; revised 1966).

of which must be sought beneath. Style as a criterion is particularly misleading in the Italian Renaissance, because some of the most characteristic music of the period is not preserved in writing, and much of the written music exhibits style elements of undeniably transalpine origin. But this should not lead us to the conclusion that the Renaissance was a northern phenomenon. *Renaissance music,* that is, music imbued with the spirit of the Renaissance— as opposed to the *music of the Renaissance*—that is, of a particular chronological period, received its first impetus in Italy just as did the other arts and literature. Every impulse of the Italian Renaissance that affected the other arts and literature can be shown to have operated also in music. The movement changed the face of European music as surely as it did other facets of thought and culture.

It has become ever more evident with recent archival work that nearly every important composer of the Renaissance, whatever his native country, benefited from the patronage of the Italian courts and princes of the church. The most sumptuous manuscripts, some containing, to be sure, chiefly French music, were produced under the same sponsorship. The best musicians from everywhere were recruited to perform. There was also much music created by native musicians and poets, amateurs and professionals, a lot of it not preserved in writing. A constant demand for instruments stimulated local makers to produce them in quantity and to develop new varieties and designs. Chamber music, particularly for instrumental ensembles, received unprecedented impetus from the patronage of the Italian courts.[18] And to supply printed parts for all this music making, Venice became the music publishing capital of the world.

Because much of the momentum of the Renaissance was translated into performance rather than original creation, to seek its essence in a style is unproductive. There were many coexistent styles, appealing to different elements of the population and operative in different spheres, and some contained more native components than others. The Renaissance musical scene in Italy cannot adequately be characterized in stylistic terms. It is best defined in cultural terms. Renaissance music is not a set of compositional techniques but a complex of social conditions, intellectual states of mind, attitudes, aspirations, habits of performers, artistic support systems, intracultural communication, and many other such ingredients, which add up

18. Concerning these last points, see Lewis Lockwood, "Jean Mouton and Jean Michel: New Evidence on French Music and Musicians in Italy, 1505–1520," *Journal of the American Musicological Society* 32 (1979):191–246; Anne-Marie Bragard, "Les musiciens ultramontains des chapelles du pape Médicis Leon X (1513–1521), *Bulletin de l'Institut historique belge de Rome,* fasc. 50 (1980):187–215; Lawrence F. Bernstein, "Notes on the Origin of the Parisian Chanson," *Journal of Musicology* 1 (1982):275–326; Dietrich Kämper, *Studien zur instrumentalen Ensemblemusik des 16. Jahrhunderts in Italien* (Rome, 1970).

to a thriving matrix of musical energy. Eventually many of these impulses were translated into musical style, but this was a gradual process.

Perhaps the most problematic component of this scene is the revival of antiquity. It is frequently stated, and quite rightly, that Renaissance musicians had no ancient Greek or Roman exemplars to emulate, as the artists, sculptors, and architects had. Eventually some specimens of notated Greek music were discovered—and this already in the fifteenth century—but until the 1580's the notation was too much of an obstacle. It is naive, however, to be too literal (or strictly aural) about the imitation of ancient music. In the absence of the ancient sounds, composers could still imitate ancient categories and schemes, and this they did. There were countless consciously contrived imitations of odes, elegeia, epikedeia, epinikia, epithalamia, paeans, orphic songs, nomoi, and antistrophic choruses in the sixteenth century, and even some in the fifteenth and fourteenth. Many of the dramatic performances involving music, both solo and choral, were deliberately imitative of ancient practices. These are not restricted to Italy, of course, but such practices were most intensively cultivated and widespread there.

Schrade once denied that the Renaissance in music had anything to do with the imitation of antiquity. He argued that historians should recognize a Renaissance, rather, because men of the fifteenth and sixteenth centuries saw their own epoch as one of rebirth, a renewal that was independent of any revival of antiquity.[19]

It is the object of this book, however, to show that the revival of ancient learning and of certain ancient artistic and musical practices that it revealed was a potent force in the development of music in the Renaissance. Much more fundamental than any practical musical revival of antiquity was the transformation of musical thought brought about by the renewed pursuit of ancient learning.

Paul Oskar Kristeller has repeatedly emphasized that "classical humanism was, if not the only, certainly the most characteristic and pervasive intellectual current of that period."[20] As Kristeller has never tired of pointing out, the *studia humanitatis* strictly speaking were grammar, rhetoric, poetry, history, and moral philosophy, but he has recently affirmed that the renewal of learning that was first in evidence in these fields soon spread to the other branches of philosophy, to mathematics, natural science, and music.[21] Because music did not belong to the traditional humanistic studies, the earliest

19. In "Renaissance," p. 32, Schrade writes: "Renaissance means the act of rebirth effected spontaneously; in the minds of the musicians it also means an epoch well defined within the history as a whole. It does not mean the imitation of antiquity; nor does it mean the renaissance of antiquity. It means the renaissance of standards of culture in music."

20. Kristeller, *Studies in Renaissance Thought and Letters* (Rome, 1956), p. 12.

21. Kristeller, *Renaissance Thought* (New York, 1961), p. 19.

phase of humanism, in the fourteenth century, paid scant attention to it. Petrarch, Boccaccio, and Guarino Veronese, for example, give no evidence in their writings that they considered music a field ripe for any kind of humanist revival, though it should be added that the leader of the Paduan school, Pietro d'Abano, did. Music first had to be recognized as a discipline worthy of scholarly attention. The next generations of humanists were decidedly inclined toward giving music this status: Vittorino da Feltre, Ficino, Poliziano, and Giorgio Valla were all deeply interested in music, not only as a practical art but as an intellectual discipline.

An event that marks the coming of age of music as a humanistic subject is its inclusion in the curriculum of the school founded by Vittorino da Feltre at the court of Gianfrancesco Gonzaga in Mantua in 1424.[22] Vittorino's fifteenth-century biographer Bartolomeo Platina said of him, "He affirmed an education which rendered a man able, according to the time and the needs, to treat of nature, of morals, of the movements of the stars, of geometry, of harmony and music, of numbering and measuring."[23]

The core of the program at the school was Latin and Greek grammar and literature taught in these languages, but the subjects just named were not neglected. We know of musical studies at the school through Johannes [Legrense] Gallicus de Namur (c. 1415–73), who was a product of the University of Padua and a teacher in the Mantuan school. Under Vittorino, Gallicus acknowledged, he "diligently heard the Music of Boethius" and thereby "attained the true practice of this art."[24]

Gallicus recognized that the theory of Boethius was concerned not with the music of his time but with that of the ancient Greeks, and that the music of the Greeks was not subject to the modes (*tropi*) of the church but could be distinguished by octave species or by height and lowness of pitch that resulted from placing the identical constitution of notes higher or lower. Gallicus was the first Western writer to appreciate that the Greek modes and those of plainchant were different and independent systems. Thus the fresh rereading of Boethius becomes not simply a continuation of medieval Boethian studies but a vital component of the reexamination of antiquity.

Other centers of study in the fifteenth century also gave music a place.

22. Schrade and Kristeller early recognized the importance of Vittorino in the renewal of music theory. But in "Renaissance" pp. 26–27, Schrade may have gone too far in viewing him as the center of a group that included Gaffurio, Ramos de Pareja, and Spataro, as well as Gallicus and Burzio.

23. Quoted by Paul Lawrence Rose in *The Italian Renaissance of Mathematics* (Geneva, 1975), p. 16.

24. Johannes Legrense (Gallicus) de Namur, *Ritus canendi vetustissimus et novus*, I, i, in Charles-Edmond-Henri de Coussemaker, *Scriptorum de musica medii aevi* (Paris, 1864–76; Hildesheim, 1963), IV, 345a. Coussemaker dated the treatise 1458–64, ibid., IV, xiii.

From 1412, when the studio of Parma reopened, there is evidence that Giorgio Anselmi taught in the faculty of arts and medicine. Himself a product of Pavia, Anselmi completed in 1434 a set of three dialogues on music that has the character of a university textbook. It is likely that in addition to mathematics, astronomy, and medicine, Anselmi taught music as a liberal art. In 1450 Pope Nicholas V established an endowed chair in music at Bologna, to which Bartolomé Ramos de Pareja aspired when he settled there in 1472. Although he lectured publicly in Bologna for a number of years, neither he nor anyone else was ever appointed to the chair. It is likely that music was taught as part of the mathematical arts in Padua, where Prosdocimo de' Beldomandi was active from 1409.[25] From 1492 Franchino Gaffurio taught music in an academy established by Lodovico Sforza (il Moro) in Milan.[26] These facts, though meager, indicate that music early earned a place alongside the disciplines of the humanist curriculum in the main Italian centers of learning.

Music was also a subject for serious study outside formal academic circles. The best evidence is the number of treatises on musical practice and theory written and published during the fifteenth and sixteenth centuries in Italy, which by far outnumber those written and published elsewhere. Knud Jeppesen speaks of a "music-theoretical madness" that "seized Italy at the time" (the last quarter of the fifteenth century).[27]

Why should there have been such an outpouring of musical theorizing in Italy during these two centuries, both before and after the advent of printing? We cannot delve into all the causes. But certainly a principal one is the example set by the classical authors, who confided to their treatises the secrets of their art, whether architecture (Vitruvius), oratory (Cicero, Quintilian), medicine (Galen), surgery (Paulus Aeginita), education (Plutarch), geography (Ptolemy, Strabo), poetics (Horace, Aristotle), geometry (Euclid), or military arts (Vegetius). Not only did the treatise as a genre receive a spur through humanism, but the forms these treatises took often betrayed classical models. Some were based on Euclid's method of definitions, propositions, and corollaries (Erasmus of Höritz, Zarlino, *Dimostrationi*), but many more were in dialogue form.

25. Prosdocimo de' Beldomandi (d. 1428), author of several treatises on music, undoubtedly included music in his teaching of mathematics from around 1409, when he received the doctorate *in artibus* at Padua.

26. A letter of 1 September 1479 from Jacopo Antiquario to Lodovico Maria Sforza, pleading for a benefice for Gaffurio, begins: "Pre[sbi]te[r] Franchino Gaffuro: quale insegna la musica qua" (Father Franchino Gaffuro, who teaches music here). In a similar application of 10 December 1493 Antiquario gives Gaffurio's qualifications for another benefice: "Pre[sbi]t[er] Franchino Gafforo Rectore qui de la chiesa de S[an] Marcellino: quale per benignita de la ex[cellen]tia V[ostra] como quella sa: lege publicamente musica in questa Inclyta Cita. . . ." (Father Franchino Gafforo, Rector here of S. Marcellino, who through the kindess of Your Excellency, as you know, lectures publicly on music in this illustrious city. . . .) Milan, Archivio di Stato, Autografi, no. 94, busta 33. For further information concerning Gaffurio's academic positions see Kristeller, "Music and Learning in the Early Italian Renaissance," *Journal of Renaissance and Baroque Music* 1 (1947):255–74.

27. ". . . der sozusagen musiktheoretischen Wut, die damals ganz Italien ergriffen hatte." From K. Jeppesen, "Eine musiktheoretische Korrespondenz des früheren Cinquecento" *Acta musicologica* 13 (1941):3.

The most familiar model for the didactic dialogue was Cicero's *De oratore,* in which Lucius Crassus and Marcus Antonius discuss the art of oratory in three books or discussions. Cicero himself had adopted the dialogue form in imitation of Greek authors, the most famous of whom was Plato. The format had the advantage of airing both sides of a controversial subject, and this was particularly advantageous in introducing novel methods or indirectly attacking previous authors or the opinions or deeds of the powerful. Among the early humanists, Poggio Bracciolini, writing on greed, Lorenzo Valla on pleasure, Alberti on the family, Bembo on vernacular literature, and Sadoleto and Vergerio on education, all employed the dialogue form. Among the musical treatises in dialogue are those of Anselmi, Artusi, Morley, Pontio, Zarlino (*Dimostrationi*), and several by Bottrigari.

The encouragement of patrons was an important factor in stimulating the production of treatises. Some treatises were directly commissioned by secular and religious leaders, for example, the *Liber musices* of around 1495–96 of Florentius de Faxolis by Cardinal Ascanio Maria Sforza (1455–1505).[28] Another is the *Complexus effectuum musices* of Tinctoris for Beatrice of Aragon.[29] These treatises were not printed, though they were carefully scripted and illuminated. With printing, the need for patrons was even more acute; it was too costly a process to be paid for solely by the few copies sold. Gaffurio offered beautifully illuminated manuscript copies on parchment of his *De harmonia musicorum instrumentorum opus* (1518) to four potential patrons in succession before he found one who would sponsor the printing. The shifting personnel and allegiances in the unstable political environment of Milan hindered his first three tries and caused a lag of eighteen years between completion and publication. The availability of patrons in the main centers of learning—Naples, Florence, Bologna, Rome, and Venice—greatly contributed to the boom in theoretical publications. Not only did patrons help with the expense of printing, but often they were the buyers and readers of the treatises, for noble amateurs who did not have the benefits of choir

28. Milan, Biblioteca Trivulziana, MS 2146; see Albert Seay, "The 'Liber Musices' of Florentius de Faxolis," in *Musik und Geschichte—Music and History: Leo Schrade zum sechszigsten Geburtstag* (Cologne, 1963), pp. 71–95.

29. Ed. Albert Seay, in Johannes Tinctoris, *Theoretical Works* (American Institute of Musicology, 1975) 2, 159–77.

schools or apprenticeships were eager to acquire the secrets of the musical profession.

The efflorescence of treatise writing embraced several aspects of music. That which was most obviously influenced by the classical past in content was, naturally, *musica theorica,* or speculative music. But more and more during the Renaissance, practical theory was penetrated by this influence through the desire to rationalize practice and make it conform to the precepts of musica theorica. This is especially true of the theory of composition. Least affected by classical models but still part of the vogue of treatise writing are the tutors for various instruments and singing.

Most surprising is the centrality of counterpoint theory in a nation that has been branded, at least since the late eighteenth century, as anticontrapuntal. It is habitual to think of counterpoint in the Renaissance as a Netherlandish or at least Franco-Flemish phenomenon. Yet there is no significant treatise on counterpoint, whether manuscript or printed, emanating from the Franco-Flemish or Netherlands region in the first century of the Renaissance. The authors are preponderantly Italians; a minority is made up of northerners and Spaniards who settled in Italy. Before printing became common, the principal authors include Antonio de Leno, Prosdocimo de' Beldomandi, Ugolino of Orvieto, Johannes Gallicus, John Hothby, Johannes Tinctoris, Guilelmus Monachus, and Florentius de Faxolis.[30] Among the authors of printed treatises are Ramos de Pareja, Burzio, Gaffurio, Aron, Lanfranco, Del Lago, Vanneo, Vicentino, Zarlino, Artusi, Pontio, and Tigrini. The other center of counterpoint codification was Germany, though much of the writing there derived from the Italian authors.

To reconcile these facts with the myth that counterpoint was primarily a Netherlandish phenomenon, one would need to assume that polyphonic writing was developed in the north but codified in Italy. There were two important counterpoint teachers who can be adduced as links between north and south in support of such a hypothesis: Tinctoris and Willaert.

Tinctoris wrote his counterpoint treatise in Naples in 1477 several years, perhaps five, after settling there. In the dedication to King Ferrante I, he names as composers Ockeghem, Regis, Busnois, Caron, and Faugues. He does not say they are his models; indeed, in the body of the book he is critical of some of their habits. Tinctoris learned composition in France, perhaps at Cambrai. But the motivation to write a method for the art of counterpoint must have come from his Neapolitan patron or the circle around him. The very process of devising rules would have led him to

30. See Klaus-Jürgen Sachs, *Der Contrapunctus im 14. und 15. Jahrhundert: Untersuchungen zum Terminus, zur Lehre und zu den Quellen* (Wiesbaden, 1974), and "Counterpoint" in *New Grove Dictionary of Music and Musicians,* ed. Stanley Sadie (London, 1980) IV, 833–45.

rationalize and purify the art of various barbarisms that he found in works then in circulation. It is inevitable that this process was affected by his reading of the many classical treatises in his prince's library, which he liberally cited in several of his works on music.

The other teacher who is thought to have transmitted northern polyphonic art to Italy, the great composer Adrian Willaert, makes an even poorer case for such transmission than Tinctoris. Although he must have gained a basic competence in counterpoint in France, particularly in his studies with Jean Mouton, latest evidence has him working for Cardinal Ippolito I d'Este at a very early age in 1515.[31] The precepts that he communicated orally to Zarlino and Vicentino must have been developed during his long experience in Ferrara, Rome, and Venice.

Through Tinctoris and Willaert and their pupils, counterpoint was progressively purged of uncontrolled dissonance, linear angularities, and other irregularities and mannerisms (particularly fauxbourdon) characteristic of the northern composers. It becomes a suave, refined, polished art that was taught essentially by the Italian and Italianized masters. The extensive correspondence among a group of northern Italian composer-teachers, including Giovanni del Lago, Spataro, Aron, Giovanni Maria Lanfranco, and others in the 1520's and 1530's, testifies to the intense theoretical activity that accompanied the forging of these rules.[32]

Other aspects of composition, besides counterpoint, figured in the revival of theoretical activity. One of the most important was modality. The theory of the modes was traditionally a part of plainchant theory; the subject rarely came up in the early treatises on counterpoint. Sebald Heyden asks: "Why is it necessary to pursue religiously the ranges of authentic and plagal tones, as they are called, and the *differentiae* added to them, when we know that they have almost no meaning in figural [that is, measured] music?"[33] Yet about this time Glarean completed his famous book celebrating the twelve modes, in which he claimed to have restored the ancient Greek system. Glarean may have been inspired partly by Gaffurio, who dedicated the first twelve chapters of Book IV of his *De harmonia* (1518) to the modes. It is this section of Glarean's own copy of Gaffurio's book that is most heavily annotated in his hand.[34] Gaffurio's treatment is pseudo-historical; he purports to be discussing the ancient modes, but he does so with almost de-

31. Lewis Lockwood, "Willaert," in *New Grove Dictionary,* XX, 421.

32. Biblioteca Apostolica Vaticana, MS Vat. lat. 5318; see Jeppesen "Eine musiktheoretische Korrespondenz,"and the forthcoming edition of the correspondence by Edward E. Lowinsky and Clement Miller.

33. Sebald Heyden, *De arte canendi* (Nuremberg, 1540), trans. Clement Miller, p. 113, quoted in Harold Powers, "Mode," in *New Grove Dictionary,* XII, 397.

34. Munich, Universitäts Bibliothek, MS 2° Art 239.

liberate ambiguity: the attributes assigned by various ancient authors to the Greek tonoi and harmoniae Gaffurio associates with a system of modes that are identifiable as those of plainchant. Without realizing it, he badly misinterpreted Ptolemy, Boethius, and Bryennius. Glarean, lacking access to the ancient authors, followed him into the same misunderstandings. Glarean also copied Gaffurio's ordering and structure of the octave species, dividing them either harmonically or arithmetically to produce the authentic and plagal forms respectively. However mistaken both Gaffurio and Glarean were about the ancient modes, their ostentatiously documented association of the modern modes with those of the Greeks and Romans enhanced the prestige and vigor of these systems in the minds of many, and consequently both composers and theorists paid more attention to them. Whereas the modes do not figure at all in Gaffurio's own eight contrapuntal rules,[35] and only one of Tinctoris's eight rules has to do with modality,[36] by contrast, Aron wrote a separate treatise on the modes in polyphony, and Zarlino dedicated all of Book IV of his *Le Istitutioni harmoniche* to them. Composers in the mid-sixteenth century likewise seem to regard them as important constructive and expressive means.

The modes were fascinating to Renaissance musicians not simply because they were a link to a noble ancient past but because they were thought to unlock the powers of music over human feelings and morals.[37] Plato in the *Republic* and *Laws,* Aristotle in the *Politics,* works previously unknown except to a very few, could now be read in printed Latin translations, and they spoke eloquently of the emotional and moral or ethical effects that could be wrought by a musician through the proper choice of mode. Gaffurio, and those who, like Glarean, followed him, by equating the modern and ancient modes, associating the effects of the latter with the former, thereby transferred these powers, theoretically at least, to the modern modes.

Gaffurio identified particular modes as appropriate to certain general feelings of the text to which melodic lines are set:

> Let the composer of a vocal piece [*cantilena*] strive to make the melody agree in sweetness with its words, so that when these are about love or a plea for death or some lament let him set and dispose mournful sounds so far as he

35. Franchino Gaffurio, *Practica musice* (Milan, 1496), III, 3.

36. Johannes Tinctoris, *Liber de arte contrapuncti* III, 5. Tinctoris did write a treatise on the modes, *Liber de natura et proprietate tonorum,* ed. Albert Seay, in Tinctoris, *Theoretical Works* I, 59–104. But apart from a few applications to polyphonic problems, it is based on medieval plainchant theory and is indebted particularly to Marchetto of Padua.

37. D. P. Walker dealt at length with the fascination with this power in his serialized article "Musical Humanism in the 16th and Early 17th Centuries," in *The Music Review* 2 (1941): 1–13, 111–21, 220–27, 288–308; 3 (1943):55–71; German translation as *Der musikalische Humanismus* (Kassel, 1949).

> can, as the Venetians do. What I believe will most contribute to this is to order the piece in the Fourth, Sixth, or even Second Tone, since these Tones are more relaxed and are known to produce this kind of effect easily. But when the words speak of indignation and rebuke, it is fitting to utter harsh and harder sounds, which are ascribed most often to the Third and Seventh Tones. To be sure, words of praise and modesty seek somehow intermediate sounds, which are properly ascribed to the First and Eighth Tones.[38]

Although Gaffurio fails to cite a source for the correspondences between modes and affections, a classical link is implied by his sending the reader to the chapters in his *De harmonia,* Book IV, which are purportedly about the Greek modes. Also, his qualification of groups of modes (*toni*) as *remissiores* (relaxed) and *medii* (intermediate) utilize expressions that fit the Greek tonoi much better than the modern modes.

A layman steeped in the classics, Matteo Nardo, goes beyond the coupling of general mood and mode to express the belief that the first thing a composer does is to consider the affection to which he wishes to move the listener; then he chooses a suitable mode.[39] Nardo may have read Aron's characterization of the diverse effects of the modes and of the desirability of choosing a mode according to the feeling that the composer wants to awaken.[40] The chapter in which Aron took up the affective nature of each mode seems to be almost an afterthought, however, lacking integration with the more technical descriptions. Aron was evidently not much concerned with giving instruction in composition in this book, as opposed to determining the mode of polyphonic works already written, for he rarely mentioned the composer's role.[41] Nardo thus articulates something Aron left unsaid, that a choice of mode according to the affection to be expressed is a primary step in the act of composition, that musicians, indeed, start out with the aim of moving listeners to particular feelings.

It is common to link humanism with the increasing attention given to the faithful rendering of the natural spoken rhythm of the text and its

38. Gaffurio, *Practica musice,* III, 15. Gaffurio refers the reader to his *De harmonia* but gives there no affective qualities for the Hypermixolydian, if that is what he meant by the Eighth Mode. Nicolo Burzio, in *Musices opusculum,* II, 5, fol. 36v, in describing how to compose a polyphonic work, names the choice of mode as the third step in the process and characterizes the modes according to their affections, but his list of qualities differs from that of Gaffurio.

39. This statement is made in a letter to a certain Hieronymo that is partly preserved in a manuscript containing, in the same hand, an Italian translation of Carlo Valgulio's preface to his Latin translation of pseudo-Plutarch's *De musica:* Biblioteca Apostolica Vaticana, MS Vat. lat. 5385, fol. 57v. See ch. 5 below.

40. Pietro Aron, *Trattato della natura et cognitione di tutti gli tuoni di canto figurato* (Venice, 1525; Bologna, 1970), ch. 25, fol. e4v.

41. The composer's task is referred to in ch. 1, fol. e1v; ch. 4, fol. b1r; ch. 6, fol. c2r; ch. 21, fol. e2v; and ch. 25, fol. e4v.

affective content in musical settings. But actually it is quite difficult to find early documentary evidence for this link. The earliest that I have found invoked the famous dictum of Plato (*Republic* 3.399–400) that of the three components of song—words, rhythm, and melody—"the words are by far the most important of the three, being the very basis and foundation of the rest" is in Bishop (later Cardinal) Jacopo Sadoleto's *De pueris recte instituendis* (Venice, 1533).[42] To propose as Sadoleto did that in a song the words should dominate and rule the rest was a radical departure. It was one thing to say that the music should be suited to the text, as by the choice of mode, which would assure at most a general and consistent mood; it was quite another to suggest that the music should be subject and subservient to the text. Sadoleto introduces Plato's definition into the context of a critique of contemporary music by Jacopus, who is conversing with his son Paulus about Aristotle's *Ethics*. Jacopus complains that even when the text of a musical composition is moral and worthwhile, which in itself is rare, it is obscured by "abruptly cutting and jerking the sounds in the throat—as though music were designed not to soothe and control the spirit, but merely to afford a base pleasure to the ears, mimicking the cries of birds and beasts, which we should be sorry to resemble."[43] If he were to teach his son about music, he would say nothing of the "common and trivial harmony, which is entirely a pandering caress of the ear with sweetness and which consists of hardly anything but variation and running of notes."[44]

It was around this time that another bishop, according to his own later confession, was thinking about these matters. This was Bishop Bernardino Cirillo Franco, who did not write his thoughts down until twenty years later in 1549 in a letter to Ugolino Gualteruzzi. There he recalls that the ancients "created powerful effects that we nowadays cannot produce either

42. Fol. 42v, "cum constet chorus ex tribus, sententia, rhythmo (hic enim numerus nobis est) & uoce. primum quidem omnium et potissimum sententiam esse, utpote quae si sedes & fundamentum reliquorum." This passage from Plato was later quoted by Johannes Ott, *Missae tredecim,* (Nuremberg, 1539), Zarlino (*Istitutioni,* 1558, IV, 32); Giovanni Bardi, *Discorso mandato a Caccini sopra la musica e 'l cantar bene,* in Giovanni Battista Doni, *Lyra Barberina* (Florence, 1763), II, 234, 244; Giulio Caccini, in the foreword to *Le nuove musiche,* trans. in Oliver Strunk, *Source Readings in Music History* (New York, 1950), p. 378; and Giulio Cesare Monteverdi in the preface to Claudio Monteverdi's *Scherzi musicali* (Venice, 1607), trans. in Strunk, *Source Readings,* p. 407.

43. Sadoleto, *De pueris,* trans. by E. T. Campagnac and K. Forbes in *Sadoleto on Education* (London, 1916), p. 117. This passage was quoted by Galilei in *Discorso intorno all'uso delle dissonanze,* ed. Frieder Rempp in *Die Kontrapunkttraktate Vincenzo Galileis* (Cologne, 1980), fol. 194v, p. 158.

44. "Sed ego non ea dicam quae huius uulgatae, & triuialis symphoniae sint, cuius auribus tantum suauitate demulcendis omne est lenocinium, & quae in sola penè uocum flexione ac modulatione ipsa consistunt " [Sadoleto, *De pueris* (Basel, 1538 ed.), p. 130], my translation.

with rhetoric or with oratory in moving the passions and affections of the soul."[45] The only music he has heard that produces such effects is that of the pavane and galliard. He would have the music of the church "framed to the fundamental meaning of the words, in certain intervals and numbers apt to move our affections to religion and pity." Musicians should rediscover the power of the modes and the enharmonic, chromatic, and diatonic genera. Like the sculptors, painters, architects, and writers, they should seek to recover the art of the ancients, who were able with music to make the lazy active, the angry calm, the dissolute temperate, to console the afflicted and to make happy the miserable.[46]

The idea that music should move the affections, as oratory and rhetoric were intended to do, was a new goal for composers. It was different from exhorting them to imitate the divine harmony of the heavens or to propitiate the influence of a planet by synthesizing its music in man-made song. Both Sadoleto and Cirillo Franco quoted Plato, the Plato not of the *Timaeus,* but of the *Republic* and *Laws,* in which the ethical effects of music were under consideration.

Cirillo Franco's remarks point to another important source of the new ideology, the revival of rhetoric. One of the achievements of humanism was to restore the balance among the components of the old trivium. Medieval scholasticism had emphasized logic and tended to diminish the value of rhetoric, because it was through logic that the intelligence, which should govern belief and action was persuaded, whereas rhetoric held sway over the emotions. With the early humanists, and here again Petrarch led the way, this tendency began to be reversed. Disillusioned with the capacity of abstract reason to lead people to reform their lives, churchmen sought to move them by oratory, to induce an act of will through religious fervor rather than doctrinal conviction. Rhetoric was also more effective in the daily encounters of the tribunal, marketplace, and political forum, not to mention in diplomatic and personal correspondence. Artful communication that could sway people through their feelings, whether to anger at a tyrant or transgressor, sorrow for a deceased notable, joy upon victory, or enthusiasm for a cause, became a prime instrument for gaining or maintaining power. It is characteristic that Bishop Cirillo should seize upon the underutilized language of music for this purpose, a language that in the hands of

45. Palestrina, *Pope Marcellus Mass,* ed. and trans. by Lewis Lockwood (New York, 1975), p. 11. Franco says that he has wanted to set down these thoughts about music for twenty years. According to Oscar Mischiati the addressee of this letter really was Ugolino Guastanezzi, who was employed by Ludovico Beccadelli, secretary of Cardinal Ranuccio Farnese. See his review of Lewis Lockwood, *The Counter Reformation and the Masses of V. Ruffo,* in *Rivista italiana di musicologia* 9 (1974):304.

46. Ibid., pp. 12–13.

the ancients, or so he believed, had even greater force than verbal rhetoric. If one could unleash the powers of musical rhetoric, what wonders could be worked, particularly in the church. Thus the crusade against scholasticism has its counterpart in the campaign against abstract polyphony. Both scholasticism and polyphony were refined systems that appealed to intellectual elites—on the one hand theologians, on the other highly trained musicians—but which left the common herd of Christians and listeners unmoved and indifferent.

Such thoughts had been circulating in the Roman court for several generations. Sadoleto, with Pietro Bembo, had served as secretary to Pope Leo X. Carlo Valgulio, secretary to Cardinal Cesare Borgia (cardinal 1493–98, son of Pope Alexander VI, reigned 1492–1503) was another humanist critic of the current musical scene at the end of the fifteenth century. In an essay addressed to the musician Titus Pyrrhinus, apparently a singer, Valgulio urges him to use the translation of Plutarch's *De musica* that accompanies the essay and his own ingenuity and study to raise music to its former dignity, for music was not a science infused in the minds of ancient men by the stars but an invention of human genius, of which Titus too possesses a sufficiency for the purpose.

Valgulio pronounces the music of his time dead:

Neminem autem esse puto tam stupidum tamque plumbeum, qui cantu non moueatur. Praeclarè Theophrastus in secundo Musicae inquit naturam musicae esse animae inuecta à perturbationibus mala ab ea depellentem: quod ni musica efficeret, ut uidelicet et animum quo uellet pertraheret, naturam ipsius omnino nullam futuram. Hoc loco nostri musicam temporis lamentarer: ni iampridem complorata foret. . . . Eorum ars & scientia omnis in paucis quibusdam est syllabis, cantus nulli ferè sunt sine conspecto libro, in quo nihil est descriptum praeter certas notas & characteres: quod si uerba

I believe that there is no one in the world so insensitive, so leaden, that he is not moved by song. Theophrastus rightly said in the second book concerning music that the essence of music is the movement of the soul, driving away the evils and troubles that have invaded it. If music did not have this effect, that is, to draw the soul where it wants, it would become in essence nothing. I would lament here the music of our time, if it had not already been mourned as dead. . . . Their whole art and science consists in certain few syllables and they sing almost nothing without reading from a book. In it you see nothing written except certain notes and characters, and if sometimes

cantilenarum quandoque proferuntur, de medio ea uulgo pleraque accepta dices.[47]

they pronounce some words of songs, you may say that most of them are taken from the vernacular.

Valgulio, Sadoleto, and Cirillo are witnesses to the mounting resistance among humanists to the elaborate polyphony that dominated the repertory of the principal chapels in the first decades of the sixteenth century. The dissatisfaction must have been abundantly felt in the commission of cardinals set up to reform the church, which included Sadoleto. It found its way, as everyone knows, to the Council of Trent.[48]

Whereas on the subject of the modes and the ethical effects of music, Platonic and Aristotelian writings reinforced each other, in the matter of universal harmony, the Pythagorean-Platonic and Aristotelian spheres of influence bent the prevailing theory in opposite directions. *Harmonia est discordia concors* (Harmony is the concord wrought out of discord). This motto, which appears in a scroll over Gaffurio's head—like the bubble of a modern cartoon—in a famous woodcut in the *De harmonia,* where he is shown in a *cathedra* lecturing to students at his feet (see Figure 8.1), sums up a philosophy embraced by many musical writers up to around 1500, one that remains strong in the first decades of the sixteenth century. In the practical domain the motto symbolizes the union of diverse voices, pitches, rhythms, tempos, and instruments in polyphonic music. But of greater significance is that it epitomizes the harmony that reigns in the universe, that exists, optimally, between man and cosmos, between the faculties of the human soul and the parts of the body, and between the body and soul. Heard music is but a reflection of this harmony, which, grasped by the musician in a state of furor or enthusiasm, inspires him to give it audible form. Almost all the early Renaissance writers accepted the assumptions of this musica mundana and humana. Under the influence of humanism, the idea was transformed and elaborated and gained momentum through the Platonic revival led by Marsilio Ficino. But by the beginning of the fifteenth century a Christian mysticism had altered the concept of world harmony. Musica mundana and humana were then believed to emanate from the

47. Carlo Valgulio, *In Plutarchi Musicam, ad Titum Pyrrhinum,* in *Plutarchi Chaeronei . . . Opuscula (quae quidem extant) omnia* (Basel, 1580), fol. 244v. The Plutarch translation and preface were first published in 1507 by Angelo Britannico of Brescia.

48. We do not know whether Pietro Bembo shared Sadoleto's dissatisfaction with the current musical scene, but there is evidence that he too was interested in Greek music in his borrowing on 4 February 1518 the famous manuscript Vat. gr. 191 (return undated) containing treatises by Gaudentius, Euclid, Aristoxenus, Alypius, Ptolemy, and Cleonides. This manuscript was also borrowed by Pietro Aretino 7 July 1522 (returned 8 August), and for Cardinal Ridolfi, 25 August 1529: Maria Bertola, *I due primi registri di prestito della Biblioteca apostolica vaticana* (Vatican City, 1942), pp. 50, 55, 108.

higher harmony of celestial hosts of angels sweetly singing "Sanctus." Ugolino of Orvieto, Giorgio Anselmi, Nicolo Burzio, all unfolded with various degrees of intricacy this angelic hierarchy. The most complete and concrete picture was given by Giorgio Anselmi in the first of his dialogues on music of 1434, in which the angels of the theologians were ranged in orders to coordinate with the homocentric spheres of the astronomers. As a musician he felt some embarrassment about the prospect of nine hosts of angels all singing together without any rule of counterpoint, yet producing the fabled harmony of the spheres. Unlike his predecessors, who were content to leave the proposition literally up in the air, Anselmi sought to establish some polyphonic marching order.

Neque modo harmoniam unam	A single sphere does not in
sphera unica continuo profert,	any way continually pour forth
sed pluriformes phtongos et	one harmony but manifold tones
limmata et dieses et commata,	and limmas and dieses and commas,
ut spiritus illi felices modo	so that those happy spirits, with
cum sonitu sue sphere, modo	the sound of their spheres, now
cum eis qui proximis insident	seem to precede, then to follow,
nunc cantu precedere, nunc	now again to pursue,
sequi, nunc insequi, nunc	then to concur with
concurrere videantur atque	those situated nearby, and
mirando harmonie ludo semper	with a wonderful play of harmony
dulcius concertare credantur.[49]	are believed to concert sweetly.

Thus the spirits that dwell in the spheres sing a diversity of song; yet they make consonance: again, *in discordia concors*.

Gaffurio in his early treatises of 1480 and 1492 assimilated Anselmi's model, but in his last speculative work, *De harmonia,* he leaves behind the Christian overlay and adopts a Neoplatonic cosmology based on Ficino's *Compendium in Timaeum,* Ficino's translation of Plato's *Timaeus,* and the Latin translation by Francesco Burana of the *De musica* of Aristides Quintilianus. In his final work Gaffurio omits mention of the angels and restores the Muses as coordinators of planetary and earthly harmony. With the help of Aristides Quintilianus and Ptolemy, Gaffurio expands the conception of cosmic harmony beyond planetary to human concerns. Music or consonance controls the periodicity of the seasons, of births, and fevers. It mediates between public bodies and between individual people, making possible civic peace and well-being and personal friendship. Although Gaffurio was not able really to digest either Aristides or Ptolemy, who were even more opaque in the Latin translations of Burana and Leoniceno than they were

49. Georgius Anselmus Parmensis, *De musica,* ed. Giuseppe Massera (Florence, 1961), p. 101.

to readers of Greek, he was carried away by their ideas. He wanted to believe that the cosmos was a harmony and that this was the ultimate source of the music created by men and their enjoyment of it.

> If we believe Plato, who said that the world soul consists of musical melody, I surely do not see why it should be doubted that any other living thing possessing a soul, which, it is clear, is a gift of heaven, is also affected by and rejoices at harmonies congruent with its own nature, since it is well known that one is inclined toward something like oneself.[50]

Meanwhile Johannes Tinctoris, Gaffurio's associate for a while at the Neapolitan court, denied the existence of world harmony:

> I cannot pass over in silence the many philosophers such as Plato, Pythagoras and their successors, Cicero, Macrobius, Boethius and our own Isidore, who believe that the spheres of the stars revolve under the rules of harmonic modulation, that is by the concord of different consonances. . . . I unshakeably agree with Aristotle and his commentator, together with our more recent philosophers, who most clearly prove that there is neither real nor potential sound in the heavens. For this reason I can never be persuaded that musical consonances, which cannot be produced without sound, are made by the motion of heavenly bodies.[51]

The Florentine humanist, mathematician, astronomer, organist, and music theorist Fra Mauro—in a manuscript treatise of 1541 in which he shows that he had read Tinctoris' work—took up the question of universal harmony and denied that any audible harmony results from it.[52] But as late as Zarlino's *Istitutioni harmoniche,* 1558, the harmony of the cosmos and of the elements and body are accepted. The first published musical writer who emphatically refutes these theories is Francisco de Salinas (1577).[53] Besides the reasons given by Aristotle, which he did not repeat because they were too far afield for a music book, he argued that the creator would not have made anything so superfluous as unheard music. Moreover, the combinations of the elements

50. Gaffurio, *Practica musice* (Milan, 1496), dedication to Ludovico Maria Sforza.

51. Johannes Tinctoris, *The Art of Counterpoint,* trans. A. Seay (American Institute of Musicology, 1961), p. 13–14.

52. Fra Mauro, in *Utriusque musices epitome (Dell'una et l'altra musica)*, ed. Frank A. D'Accone (Stuttgart, 1984), Prologo, p. 28, writes: "La mondana musica o vero (per dir meglio) harmonia è una debita dispositione delle parti col suo tutto, o naturali o artificiali che le sieno, considerata secondo la sostanza, quantità o qualità di qualunche cosa si vogli. Et questa è quell'armonia la quale pone il philosopho et li altri sapienti in cielo et nell'anima nostra, cioè harmonia physica et di corpi et potentie naturali, et non di suoni, come falsamente s'impone a Platone et Pythagora da questi moderni scioletti." See D'Accone, "The Florentine Fra Mauros, A Dynasty of Musical Friars," *Musica Disciplina* 33 (1979):89ff.

53. Francisco de Salinas, *De musica libri septem* (Salamanca, 1577; repr., ed. Macario Santiago Kastner, Kassel, 1958), I, 1, p. 2.

and of the parts of the soul may be based on certain ratios, but these proportions are contemplated by the reason and not the sense of hearing. Throughout his book Salinas was very scrupulous about assigning to the senses and the reason respectively what truly belongs to each of them.[54]

More important in the long run for Renaissance musical thought than the views on cosmic and human music was the changing outlook toward consonance and dissonance. The Pythagorean tradition that persisted throughout the Middle Ages and early Renaissance defined consonance in numerical terms. The intervals that were products of string-length ratios expressible by the numbers from one to four were consonances; the rest were dissonances. Eventually another category of consonance was recognized in compositional practice, the so-called imperfect consonances, but their ratios were thought to be unstable and not subject to numerical definition. Indeed, whereas there was agreement from antiquity concerning the ratios of the octave, fifth, fourth, double octave, and octave-plus-fifth, yet thirds and sixths—the imperfect consonances—were not assigned specific ratios by the authors who paid any attention to them (for example, Ptolemy) because they could come in various sizes. The first theorist to make a complete break with the Pythagorean tradition was Lodovico Fogliano in 1529. Of the musical writers he was the most learned Aristotelian. In his book he consistently follows the logic of the *Posterior Analytics* and principles drawn from Aristotle's *Metaphysics, De anima,* and *Physics*. His dual competence was unique: he read Greek well enough to contemplate an Italian translation of the works of Aristotle; at the same time he worked as a professional singer and composer. Fogliano challenged the Pythagorean position with every possible weapon—epistemology, psychology, logic, and physics. He defined consonance and dissonance not according to ratio but in terms of how they struck his ear:

Consonantia est duorum sonorum secundum acutum & graue distantium: auribus amica commixtio: . . . dissonantia contraria: est duorum sonorum secundum acutum & graue distantium auribus inimica commixto.[55]	Consonance is a mixture of two sounds distant in highness and lowness that is pleasing to the ears; dissonance, its contrary, is a mixture of two sounds distant in highness and lowness that is displeasing to the ears.

To justify these unmathematical definitions,[56] Fogliano proves by means of

54. The acceptance and rejection of the doctrine of the music of the spheres is surveyed in greater detail in ch. 8 below.

55. Lodovico Fogliano, *Musica theorica* (Venice, 1529; facs. ed. Giuseppe Massera, Bologna, 1970), II, 2.

56. Fogliano's definitions are actually very similar to those of Boethius in *De institutione musica* 1.8, with the difference, however, that Boethius in previous chapters, 1.5–7, limited the sphere of consonance to intervals determined by multiple and superparticular ratios using the numbers from one to four.

Aristotelian categories and logic that sound is an affective quality (*passibilis qualitas*) that exists only in the ear, and therefore the ear is the final judge of sonorous matters. Experience similarly tells us the difference between perfect and imperfect consonances. The perfect consonances leave the ear perfectly satisfied, whereas the imperfect do not fulfill the potential and desire of the ear completely.[57] Eventually Fogliano uses both numerical ratios and Euclidean geometry to define a tuning system that optimizes both perfect and imperfect consonances. He sets out a method of dividing the monochord that he describes as "a new almost materialist way, according to the sense," a method that aims to "join art and science."[58] The basic diatonic division, laid out on the C-c octave, is identical to that proposed by Zarlino thirty years later, which Zarlino identified as Ptolemy's syntonic diatonic.[59] Fogliano did not attribute it to any previous author, perhaps because he modified it by alternate solutions for some of the poorer consonances, such as Bb-D, for which he used a Euclidean construction to find the geometric mean of the 81:80 comma. (Zarlino did not credit Fogliano for his innovation either, until after Galilei pointed out his indebtedness.)

Fogliano's break with the Pythagorean tradition was a bold and important step. In treatises of musica practica, to be sure, it had been on the way for fifty years already and may be traced in Ramos de Pareja, his pupil Giovanni Spataro, and Spataro's friend Pietro Aron. But Fogliano's book is plainly entitled *Musica theorica,* and in it the author deliberately set out to establish a new scientific basis for musical theorizing. Zarlino was torn between this new approach and the attraction of Neoplatonic theories of harmonic numbers. Although Zarlino's practical theories of counterpoint and the modes had great success, his carefully erected Neoplatonic theoretical basis, truly an anachronism after Fogliano's work, was demolished by Vincenzo Galilei and other critics.[60] Galilei then proceeded to the logical next step by proclaiming that there was no natural physical difference between a consonance and a dissonance, that there was an infinity of both kinds of intervals, and that it was altogether up to practitioners to decide how to use them according to their own purposes. This emancipation of harmony from numerical theory was one of the hard fought conquests of the Renaissance. And it is one of the achievements that can be traced directly to the revival of ancient learning.

Humanism did not stop affecting the course of music history with the

57. Fogliano, *Musica theorica,* II, 5.

58. Ibid., III, 1.

59. Compare the diagram in Fogliano, III, 1, with Zarlino, *Istitutioni,* II, 39, p. 122.

60. A fuller account of this controversy is given in ch. 7 below.

chronological terminus usually assigned to the Renaissance.[61] Indeed, the momentum of investigation into the ancient sources in the period between 1560 and 1580 was such that some of its effects were to be felt into the 1590's and the early years of the seventeenth century. The most obvious example is the spirit and work of the group around Giovanni Bardi known as the Camerata, most active in the 1570's. The research of Girolamo Mei into Greek music and theater fueled the practical experiments of Florentine musicians and dramaturgists for the rest of the century and beyond.

In this book I aim to show that with music, as with the other arts and letters and learning in general, the movement we call the Renaissance began in Italy, and that its chief source of inspiration was the revival of antiquity. Fundamental changes during this period in both musical thought and style issued from the ferment of ideas and activity that we celebrate as the Renaissance. The renewal of learning in Italy led to a rethinking of some fundamental issues in music theory and aesthetics that directly affected practice. Questions such as the nature of the modes, the control of dissonance, melody, and rhythm in counterpoint, the relation between text and music, and the degree to which the aural sense or mathematics should determine the rules of composition, were argued in letters, discourses, and treatises written in Italy by philosophers, humanists, musical theorists, and musicians. Their thinking was intertwined at many points with the general intellectual strands that constituted the very core of the Renaissance spirit.

61. Karl Gustav Fellerer gave an outline history of the revival of ancient learning from the late fifteenth to the eighteenth centuries in "Zur Erforschung der antiken Musik im 16.–18. Jahrhundert," *Jahrbuch der Musikbibliothek Peters für 1935* 42 (1936):84–95.

TWO

The Rediscovery of the Ancient Sources

It has often been stated that humanism reached music tardily. This is in effect true, but the lag was not as great as it has been thought. Almost the entire corpus of ancient writings on music as well as some of the notated examples had been recovered in Italy by the middle of the fifteenth century, and almost all of it had been read and commented upon by the end of that century, if not always with much understanding. There are even some isolated examples in the fourteenth century of the rediscovery of and commentary upon Greek music theory.

The momentum for a musical revival was decidedly sluggish until the end of the fifteenth century, which contrasts with the feverish activity of editing, translating, commenting, and synthesizing Greek sources that took place in the areas of literature, rhetoric, history, medicine, philosophy, and to some extent natural science. There were reasons for this lag.

Music is not preserved in verbal form, although its theory is. This it has in common with mathematics, which also lagged in the humanist movement. Because of its nonverbal nature music did not flow with the mainstream of early humanism, which was preoccupied with the study of the Greek language and Latin eloquence. If a large quantity of music in Greek notation had been found, it undoubtedly would have excited the interest of those among the early humanists who were musically inclined—and there were some—and stimulated them to try to decipher it. But this was not the case. The examples in Greek notation were few. There was a better chance of hearing vestiges of ancient Greek music in the performances of living musicians and singers in the Greek islands and surrounding territories than of ferreting them out of manuscripts. But the humanists were ill equipped to deal with oral tradition; nor would they have grasped the relationship of this music to that of ancient Greece without previously having studied the written documents.

Early humanists had a passion for old manuscripts, both Greek and Latin,

multifidijs, ut
nemo unus Olympi modum posset
imitari, & qui in multinerui,
multitudineque uersabantur
posteriores essent.[43]

and multistringed that
not one could rival the manner of
Olympus, and even those who worked
with many strings and multiplicity
are his inferiors.

43. *De musica* 1137A.18, in Plutarch *Opuscula,* fol. 28r. Cf. MS Galilei 7, fol. 36r–v.

SIX

The Early Translators: Burana, Leoniceno, Augio

To those who saw some of the manuscripts of Greek theoretical writings or even read lists of them it was evident that the resources in Latin were meager compared to what existed in the Greek language. The number of trained musicians who could read the treatises in their original language was very small, however. Indeed, during the entire Renaissance there were only three who figure significantly in the history of theory in Italy who could: Lodovico Fogliano, Francisco de Salinas, and Ercole Bottrigari. Others had to depend on translations. Franchino Gaffurio, Gioseffo Zarlino, and Vincenzo Galilei were among those who commissioned or stimulated translations of Greek musical treatises. Among the translators, two, though not musicians, wrote original works about music, Giorgio Valla and Carlo Valgulio. Two other humanists expert in the Greek language who wrote competently about music should be mentioned, although they too were not musicians: Girolamo Mei and Francesco Patrizi. With so few professional music theorists and musicians able to read Greek, then, translation was an essential bridge between the Greek theoretical heritage and late Renaissance musical thought.

Giovanni Francesco Burana

Of the translators who worked at the request of, or on commission from, Franchino Gaffurio, Giovanni Francesco Burana was the most productive. He completed three or four translations from the Greek: Aristides Quintilianus, *De musica,* a group of three anonymous treatises formerly known as Bellermann's anonymous, Manuel Bryennius, *Harmonics,* and probably, Bacchius Senior, *Introductio musica,* which has not survived.

Burana was born in the last quarter of the fifteenth century in Verona. The translations for Gaffurio were among his earliest works, completed between 1494 and 1497. He later studied at the university in Padua and

received the doctorate in arts in 1500. He taught logic there in 1501, but there are no documents indicating a continuation of his teaching beyond 1502.[1]

Gaffurio's own compilation of Burana's translations of the three musical treatises, a paper codex that he gave to the Church of the Incoronata of Lodi in 1518, is now in the Biblioteca Capitolare of Verona, MS CCXL (201).[2] The Verona manuscript may be autograph and probably contains the treatises in the order in which they were completed. The Aristides is dated in a colophon in Gaffurio's hand 15 April 1494; the others are not dated. The contents of the manuscript are as follows:

Aristides Quintilianus, *De musica*
- Lib. 1, fol. 1r
- Lib. 2, fol. 13v
- Lib. 3, fol. 25v

Anonymi:[3]
- 1, fol. 37v
- 2, fol. 38r
- 3, fols. 39r–44v

Bacchius Senior, compendium in Greek of his *Introductio musica,* fol. 44v

Bryennius, *Harmonics:*
- Lib. 1, fol. 48r
- Lib. 2, fol. 63v
- Lib. 3, fols. 99r–119r

The manuscript, written by one hand, is of uneven legibility; much of the Bryennius is damaged, apparently by water, so that often only a part of a page is visible. On nearly every page are marginal and some interlinear notes, in both Greek and Latin, the main purpose of which seems to be to

1. See G. Stabile, "Burana," in *Dizionario biografico degli Italiani,* XV (1972), 386–89. The evidence for Burana's teaching at Padua is in Elda Martellozzo Forin, ed., *Acta graduum academicorum ab anno 1501 ad annum 1525* (Padua, 1969). She reports two documents mentioning him: Item 59, I, 24, dated 6 August 1501, in which he is named witness in an examination and is designated "art[is] doctor," and Item 60, ibid., same date, where he is described as "d[ominus] mag[ister] Franciscus Burana ordinarius logice." Also attributed to Burana is a translation of Hero's *De spiraminibus* (Rome, Biblioteca Lancisiana, MS 321; see Kristeller, *Iter italicum,* II, 118).

2. For a description of the manuscript, see F. Alberto Gallo, "Le traduzioni dal Greco per Franchino Gaffurio," *Acta Musicologica* 35 (1963):172–74; and Gallo, "Musici scriptores graeci," in *Catalogus translationum et commentariorum: Mediaeval and Renaissance Translations and Commentaries,* ed. Edward Cranz and Paul O. Kristeller, III (Washington, 1976), 67–68. Of the Bryennius there is a second copy on parchment in Lodi, Biblioteca Comunale, MS XXVIII.A.8, to which Gaffurio added a colophon and date 21 January 1497.

3. These are numbered according to Najock, *Drei anonyme.*

give the reader an idea of the original Greek terminology. The manuscript was evidently tailored to Gaffurio's requirements, for although he would not have been able to translate the prose himself, he could read the Greek alphabet.

Since the translations of Burana were for the exclusive use of Gaffurio, the significance of their content for the development of musical thought is best considered in connection with Gaffurio's utilization of them in his treatises. In the present chapter I shall limit myself to general problems of translation and transmission.

Unlike Valla, Burana replaces Greek technical terms with native Latin words. For example, translating the Aristides treatise, he renders *proslambanomenos* as "assumpta" and *hypate hypaton* as "suprema supremarum." This has the double drawback of obscuring the original names familiar to readers of Boethius and other medieval authors and falsely suggesting height of pitch with the nomenclature of tetrachordal location. So *hypate hypaton* may really mean "the principal of the principals" or the "supreme of the supremes," for which *suprema supremarum* is correct, but in effect the pitch is "the lowest of the low." Less objectionable are such neologisms as "tertia coniunctae" for *trite synemmenon* or "acuta disiunctarum" for *nete diezeugmenon"* (fol. 2v). Similarly *pyknon, barypyknon, oxypyknon,* and *apyknon* become "densi," "grauis densitatis," "acutae densitatis," and "non densi" (3r). For the fixed notes of the tetrachord Burana chooses "stantes," while for the movable "ferens," cognates of the Greek *hestōtes* and *pheromenoi* (3r). Burana occasionally preserves the Greek word. Whereas in 1.8 he translates *synecheis* as "continuati," for its opposite, *hyperbaton* (gapped), he retreats to "hyperbaton." The terms for the genera are transliterated "harmonia," "diatonon," and "chroma." Of the melopoetic terms (1.12) he leaves some partly in Greek, such as *melopoeia and pettia,* others he translates, such as the three types of *agoge:* "recta," "inflexa," and "circularis." *Ploke* becomes "connexio," and *chresis* "usus." Each of these terms is defined by Aristides, so that the unfamiliar words acquire concreteness without further explanation by the translator.

One of the most difficult passages of the technical first book of Aristides Quintilianus is that describing Aristoxenus' system of tonoi (1.10; fol. 5v).[4] Aristides explains that Aristoxenus recognized thirteen tonoi, and he gives their names. To these, he says, some new theorists added two more, so that for each name there would be a low, medial, and high-pitched tonos,

4. I shall use the book and section designations in R. P. Winnington-Ingram's edition of the treatise, *Aristidis Quintiliani De musica libri tres* (Leipzig, 1963). An indispensable aid in studying Burana's translation has been the translation by Thomas J. Mathiesen, *Aristides Quintilianus, On Music in Three Books,* translation, with introduction, commentary, and annotations (New Haven, 1983).

producing triads of tonoi, such as Hypodoriann, Dorian, and Hyperdorian. He then describes how they were related to each other in pitch:

Quodammodo autem unusquisque grauissimi horum precedentem per acutum unumquisque per ipsorum semitonio superabit precedentem si à grauissimo initium sumam uolemus semitonio aut minor erit/ ab acutissimo inchoabimus. continent igitur ut dixi ipsorum assumpti sub diapason et tono: assumi quoque possent hac causa per symphonias, nam si coepi à grauissimo resoluero quod intendere ac rursus remittere per uarias distantias omnino unum alique ipsorum assumptum tangam. horum alij cantantur in totum/ alij non. dorius igitur totus cantatur quoad duodecim usque tonos uocem nobis suppeditat et quod eius medius assumptus sub diapason est hypodorio. Ceterorum uero qui grauiori toni sunt sub dorio consonantur/ usque ad sonus, consonantia similem limitem nete extrema hyperboleon. Sic igitur cantus uel member constituemus, si profundissimi omnium constitutionis sonorum uni assumptorum subtituimus: ac quae post hunc sequunt ad grauiorum modulemus nam si ulterius remittere non ualabimus dorius erit. per sonus primus audibilis dorij assumpto definitur: si uero audiatur consyderare certabimus quanto dorij assumpto

In a certain way every one of these will exceed every preceding one of those in height of pitch by a semitone, if we choose to begin on the lowest; or if we wish to begin on the highest, it will be smaller [lower] by a semitone. As I said, the assumed notes [proslambanomenoi] add up therefore, to a diapason-plus-tone. For this reason, they can be joined to make consonances. Now, if I choose to begin with the lowest note and raise, and then lower, the pitch through various intervals, I shall surely reach one of the other proslambanomenoi. Of these [tonoi] some are sung in their entirety, some not. Thus the entire Dorian is sung, up to as far as twelve whole tones which the voice supplies us, because its proslambanomenos is the median in the Hypodorian diapason. Of the remaining, those tones that are lower than the Dorian are sung up to the sound that is consonant with the extreme limit, nete hyperbolaeon. So now, therefore, we shall construe the song or phrase: if we substitute for the lowest of all the sounds of the constitution [i.e., scale] one of the assumed notes [proslambanomenoi] and after this direct the song toward the lower pitches, then if we do not have the capacity to descend any farther, it will be Dorian, for the first audible sound of the Dorian is defined by the proslambanomenos. If, however, it [a lower note] is heard, we shall strive to consider by how much it

tanto quanto et intus profundissimum natura profundissimo maior consyderetur/ sin autem grauissimus cantus sonus superando dorij diapason quae sit acutus/ assumimus diapason ad grauitate supradicto usi sciremus artificio/ harmoniam ipsam facile assequeremus.[5]

exceeds the proslambanomenos of the Dorian, as much, that is, as the deepest note of the song is considered greater [higher] than the deepest by nature. But if the lowest note of the song is higher than the Dorian, in the upper diapason, we assume the diapason below. We shall know to make use of the method stated above and shall determine easily the harmonia itself.

Each tonos, Burana's translation tells us, is a semitone higher or lower than the next. According to the new theorists, the proslambanomenoi, when stacked one on top of another, fill the compass of an octave-plus-tone. Proslambanomenoi may, therefore, be related to each other as consonances, for example by fourth, fifth, or octave. (This fact will be important later, when Aristides speaks of modulation.) Only one of the tonoi fits fully within the vocal range, the Dorian, because its proslambanomenos is the bottom note of the central octave of the Hypodorian, effectively the lowest note of the average male voice; let us say modern F. So in the case of the Dorian, one can sing all the way from F up to f', or from proslambanomenos to nete hyperbolaeon—in other words, the entire fifteen notes of the perfect system. But with other tonoi, which have their proslambanomenoi lower than this, the note disappears below the singable range and must be recouped in an upper octave. If we wish to determine the tonos of a song, we are told to take its lowest note and sing from it down the proslambanomenoi. If we find ourselves at the limit of the voice, we are on the Dorian's proslambanomenos, and the tonos is Dorian. If we do not reach the limit of the voice, then the tonos is higher than the Dorian by whatever interval the note reached is higher than the Dorian's proslambanomenos. However, if we need to go below this natural limit of the voice to reach the proper proslambanomenos for the given melody, then the tonos is lower than the Dorian, and the note equivalent to the "excessive" proslambanomenos will be heard in a higher octave, above the Dorian's range. For example, the proslambanomenos of the Hypophrygian (D by analogy to the modern gamut), a minor third below the natural limit, can be said to occur in the octave above the Dorian (d", a major sixth above its nete hyperbolaeon) and an octave higher than the Hypophrygian's nete hyperbolaeon (see Figure 6.1).

5. Aristides Quintilianus *De musica* 1.10, Burana trans., fol. 5v.

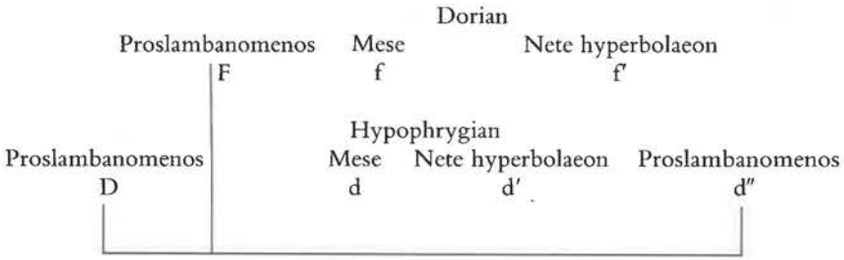

Figure 6.1:
Comparison of the locations of Dorian and Hypophrygian

Burana's translation of this passage is adequate enough; Aristides' conception and his manner of expressing it are difficult and far from transparent in any language. If Gaffurio, the destinee of this translation, failed to grasp the sense of this passage, he surely may be forgiven. On the other hand, what prevented him from understanding it were probably his preconceptions about the Greek tonal system rather than the intrinsic difficulty of Aristides' thought or Burana's translation.

In both the Aristides and the anonymous treatises Burana encountered material that was beyond the competence of a classical rhetorician, in the form of notational diagrams and tables in which there were signs that were not part of the usual Greek alphabet. Burana had no way of knowing whether his manuscript was correct and whether he was copying a sign faithfully. As a result, his transmission of the signs for pitch were full of corrupt characters. He would have had to study the exposition of the notational system in Alypius to get a grounding in the system, and then to make allowances for the disparity in dates of his various sources before he could correct one by the other. He was obviously not prepared for this task, nor did he regard it as essential to his role as translator.

A different problem is encountered in the tables, such as those of the modes in the Bryennius treatise. Many of the manuscripts, and especially the one that Burana used, labeled the modal octaves incorrectly. Burana's translation of the text and the figure itself, so far as it can be read, appear to be correct. Interestingly enough, by the time of the Bryennius translation, Burana had changed his approach to the string names and now used the more usual transliterations, such as "hypate hypaton" rather than "suprema supremarum." Gaffurio may have urged him to do this for clarity's sake. Bryennius in the chapter (2.3) in which the tonal system is described, uses the terms *hypate, mese,* and *nete* in two ways, not unlike the thetic and dynamic nomenclature of Ptolemy, but in a less precise manner. He conceives the eight tonoi as identical octaves at different pitch levels. Each of these octaves is made up of two conjunct tetrachords and a note added below, and each has a bottom (*hypate*) note, a middle (*mese*) note, a top (*nete*) note, and an added (*proslambanomenos*) note a whole tone under the hypate. The hypate note is the lowest of the lower tetrachord; the middle note is common to the two tetrachords; and the nete is the top note of the upper tetrachord. Thus the top note of the Hypodorian—its nete—is the string mese of the fifteen-string system, and it is the middle note of the Dorian octave. Similarly the mese of the Hypophrygian is the hypate of the Phrygian, and both sit on the string parhypate hypaton. The Hypodorian's nete coincides with the Hypermixolydian's proslambanomenos on the string mese. Burana's translation would have been clearer had he used Latin words, such as "gravissima," "media," "acutissima," and "assumpta" for the relative pitch positions within the tonos, confining the Greek nomenclature to the string locations.

In the next chapter (2.4) Bryennius establishes the relative pitch of the tonoi by stating how much higher or lower each one is than the others. For example, the second of the eight tonoi, the Hypophrygian, is higher than the first, the Hypodorian, by a tone, but lower than the Hypolydian by a tone, lower than the Dorian by a trihemitone, lower than the Phrygian by a fourth, and so on. The distances between the eight tonoi in rising pitch order is: tone, tone, semitone, tone, tone, semitone, tone. This too is indicated on the chart as translated by Burana, but it is missing in the chart transcribed by Jonker in his edition-translation of Bryennius (pp. 156–57).[6]

Nicolò Leoniceno

Leoniceno completed his translation of the *Harmonics* of Ptolemy in 1499 at the advanced age of seventy-two. But he was to go on to publish in subsequent years translations of eleven treatises of Galen, on which his reputation greatly rests, for he lived until the age of ninety-six. Born in Vicenza in 1428, son of a physician, Francesco, and Madalena, daughter of Antonio Loschi, humanist and secretary to Pope Alexander V, he received lessons in Latin and Greek from Ognibene de' Bonisoli and went on to study medicine and philosophy at Padua, completing the doctorate around 1453. In 1464 he was called to teach at the *studio* of Ferrara and remained there for the rest of his life except the year 1508–09, when he taught in Bologna. At Ferrara he taught mathematics, later Greek philosophy, then medicine. His most important contribution was the restoration of the teachings of Galen from the original Greek sources, as opposed to the Arabic

6. Among the manuscripts, Venice, Biblioteca Marciana, MS gr. 322 (711) has the same format as Burana, with the tonoi mislabeled and the distances indicated by *tonos* and *hemito[nos]*.

interpretations. He became involved in a controversy after questioning the dependability of Pliny on medical matters, particularly the identification of herbs. His main work in this polemic was *De Plinii, et aliorum in medicina erroribus* (Ferrara, 1482). Poliziano, Ermolao Barbaro, Pandolfo Collenuccio, and Alessandro Benedetti defended Pliny. Among Leoniceno's correspondents were Poliziano, Pico della Mirandola, Giorgio Valla, Ermolao Barbaro, and Erasmus.[7]

Leoniceno's only connection with music was his translation of Ptolemy's *Harmonics*. It was apparently done at the request of Gaffurio but with the support of Bishop Petro Barozzi of Padua. The letter of transmission of a copy of the translation presented to Barozzi, dated "K[a]l[endae]. Martii 1499," refers to two manuscripts of the Ptolemy work that he was returning to him. Gallo believes that Gaffurio, knowing that Barozzi owned some copies of Ptolemy's *Harmonics,* asked to have the work translated. Barozzi then may have gone to Leoniceno without mentioning Gaffurio's request, since, in the letter to the bishop, Leoniceno did not name Gaffurio. When Gaffurio received a copy of this translation with the letter to Barozzi, he made corrections in the letter to indicate that it was he as well as Barozzi who had requested the translation. In a copy of this manuscript in his own hand Gaffurio made further revisions of the letter and added at the end a colophon: "Claudii Ptolomei Harmonicon interprete Nicolao Leoniceno artium et medicine Ferarie professore adhortatione et opera celeberrimi viri Petri Barotii episcopi patavini ac Franchini Gafuri musicam profitentis explicit foeliciter."[8] There may have been direct contact, however, between Leoniceno and Gaffurio, for Leoniceno possessed an early draft of Gaffurio's *De harmonia,* which is now in Paris.[9]

The whereabouts of the Ptolemy manuscripts that Leoniceno used and

7. The best short biography is by Jerome J. Bylebyl, in *Dictionary of Scientific Biography* (New York, 1973), VIII, 248–50, from which most of the above facts were taken. See also Domenico Vitaliani, *Della vita e delle opere di Nicolò Leoniceno Vicentino* (Verona, 1892), and F. A. Gallo and G. Mantese, "Nuove notizie sulla famiglia e sull'opera di Nicolò Leoniceno," *Archivio veneto* 72 (1963):5–22.

8. The copy by an unknown scribe with corrections in the dedicatory letter in Gaffurio's hand is what I used for this study: Biblioteca Apostolica Vaticana, MS Vat. lat. 4570, a paper codex from the fifteenth century consisting of 58 folios. Gaffurio's copy is now in London, British Library, MS Harl. 3306, fols. 1–46. It was written by Gaffurio between 26 June and 3 August 1499. The dedicatory letter is reproduced by Gallo, "Musici scriptores graeci," III, 70–71. See R. Nares, *A Catalogue of the Harleian Mss. in the British Museum* (London, 1808), III, 15. There is a third copy, which Giovanni Giorgio Trissino, once a pupil of Leoniceno, presented to Pope Paul III in 1541: Biblioteca Apostolica Vaticana, MS Vat. lat. 3744, fols. 1–64.

9. Bibliothèque Nationale, MS lat. 7208. It contains Leoniceno's name and some annotations in Greek, but there is no dedication to him. It has an explicit signed by Gaffurio and dated 27 March 1500. See ch. 9 below.

that once belonged to Barozzi are unknown. Leoniceno in his letter to him apologizes for his lateness in delivering the translation and returning the books (codices), pleading that the first exemplar he used was full of faults, and the second only "somewhat corrected."[10]

Leoniceno had hoped for broader circulation of his translation according to Giovanni Giorgio Trissino, who in a letter to Pope Paul III stated that the translator planned to dedicate it to Pope Leo X so that it might reach scholars of music generally, because "the music of our times preserved only a third part of the force of that of the ancients," and he considered Ptolemy's treatise "the most perfect of all."[11] There is no evidence, however, that anyone besides Trissino and Gaffurio studied it. Trissino, who dedicated his *Sophonisba* to Pope Leo X in 1524, was the author of an important treatise on poetics.[12] He does not speak in it of music, which he says is not the business of the poet but should be left to singers. Nevertheless he shows in the letter that he understood the importance of Ptolemy's treatise for the theory of the tetrachords and the "shades":

Quantum autem musicae hujus nostri temporis desit, non modi tibi omnium doctissimo notum esse arbitror, sed cuivis etiam mediocris eruditionis non ignotum esse censeo. Nam praeter enharmonicam, et chromaticum, quae duo genera haec aetas non nouit, ipsum quoque diatonicum, quo solo genere utitur, non ita exquisitum et perfectum habet, ut antiqui habuere[nt]. Boethius enim a quo Guitto aretinus, et nostri deinde omnes hanc scientiam acceperunt, cum tetrachorda, in quibus ratio totius musicae continetur, Architae, et Aristoxeni exposuisset, ac ea verbis Ptolemei

How much is lacking in the music of our present time, I think, is known not only to you, who are the most learned of all men, but is also, I consider, not unknown to anyone of moderate erudition. For, apart from the enharmonic and chromatic—two genera that our age does not know—it does not even possess in so exquisite a form as had the ancients even the diatonic, the sole genus of which it makes use. Boethius (from whom Guitto Aretinus and all our [writers] received this science), when he had set forth the tetrachords—in which the logic of all music is contained—of Archytas and Aristoxenus and rejected them with the words

10. "I sent you the translation of the Music of Ptolemy with the remaining books which I conveniently used to finish it rather tardily because with the first exemplar I was able to complete only a small part of what I desired to do on account of the many faults contained in it. The second exemplar, however, somewhat corrected, I received from you around the beginning of studies, in which I was so busy that I had to wait until the vacation that occurred before Lent." Latin text in Gallo, "Musici scriptores graeci," III, 70–71.

11. Ibid., III, 71.

12. Trissino, *La Poetica* (Parts I to IV: Vicenza, 1529; Parts V and VI: Venice, 1562).

reprehendisset, deinde tetrachordorum divisionem, quemadmodum Ptolemeus fieri dicat oportere, se explicaturum pollicetur, quae tamen malignitate temporum, ut ipse arbitror, non extant. Quare necessario ab ipso Ptolemeo, aut Briennio, qui eadem graece a Ptolomeo acceperat, petenda sunt: nunc vero latini musici, et graecorum litterarum ignari, ea omnia cum laboribus Leoniceni, tum consilio meo, et benignitate sanctitatis tuae facile sibi poterunt comparare.[13]

of Ptolemy, promised to explain how Ptolemy said the division of the tetrachords ought to be done. But because of the ravages of time, as I judge, they do not survive. For this reason, it is necessary to resort to Ptolemy himself or to Bryennius, who received the same in Greek from Ptolemy. Latin musicians and those unacquainted with Greek letters will now be able easily to compare all the tetrachords for themselves through the work of Leoniceno, with my advice and the blessing of your Holiness.

Leoniceno faced in Ptolemy's *Harmonics* a text that was more scientific, original, and profound than those Burana had translated; it was also full of unfamiliar concepts and turns of thought. Had Leoniceno first translated Bryennius or even known Burana's translation of it, he would have been prepared for some of the complexities of Ptolemy's work, which Bryennius succeeded in simplifying, though not without sacrificing some of its logical consistency. Leoniceno hesitated to depart from the smallest detail of the original, possibly because he barely understood it. For entire pages he followed the Greek text word for word, producing a syntax that was unlike Latin and yielding no ready meaning. It is not surprising that when Gaffurio utilized passages from this translation he almost always rewrote them, departing from his normal method, which was to quote nearly verbatim. A sample of Leoniceno's translation may be taken from the crucial chapter 5 of Book 2 in which Ptolemy introduces his concepts of thetic and dynamic nomenclature of the steps of the scale. In the following English translation I have maintained as far as possible the Latin word order, with a certain loss of idiomatic quality, suggestive, I hope, of the awkwardness of Leoniceno's Latin.

Quomodo uocum appelationes et ad situm capiuntur et ad potentiam. C[aput] 5.

How the names of the steps are acquired according to both position and function. Chapter 5.

13. Letter, 13 August 1541, in Biblioteca Apostolica Vaticana, MS Vat. lat. 3744, fol. 1. This letter is printed in the appendix to the article by Gallo and Mantese, "Nuove notizie," pp. 21–22, which varies slightly in its reading in unimportant details.

Vnde igitur et diapason et diatessaron Constitutio coniuncta sit Consonantiae bisdiapason in sequentibus nobis oculis subjicietur. Priora autem perfectas et bisdiapason uoces quindecim constituentes: quia una communis fit: et grauiore et acutiore diapason constitutis: et media omnium: aliquando quidem iuxta ipsum situm: et acutius simpliciter uel grauius nominamus mesen quidem id est mediam, quae dicta est inter duas diapason, proslambanomenon autem grauissimam et neten hyperboleon acutissimam: deinde eas quae sunt post proslambanomenon ad acutum usque ad mediam hypaten hypaton et parhypaton et lichanon hypaton: et hypaten meson et parhypaten meson et lichanon meson: et quae sunt post mesen. Similiter usque ad neten hyperboleon paramesen et triten diezeugmenon, et paraneten diezeugmenon: et neten diezeugmenon: et triten hyperboleon et paraneten hyperboleon. Aliquando uero et secundum potentiam ipsam quod ad aliquid aliquomodo se habet cui iam prius adaptantes sitibus eas quae secundum uocatam impermutabilem constitutionem potentias bisdiapason: deinde communes in ipsa facientes praedicationes situum et potentiarum transumamus ipsas in alijs. alteram enim quae est in bis diapason duorum tonorum ab ea quae est situ media capientes: et apponentes

Whence also the constitution of the diapason-plus-diatessaron is connected with the consonance of the double diapason will be put before our eyes. But first come the fifteen steps constituting the perfect double diapason. Because there is a common [step] joining the lower and higher diapasons that likewise is the middle of all, sometimes by its position, simply in respect to being higher or lower, we call it mese, that is "middle note," so named because it is between two diapasons. We call proslambanomenos the lowest note and nete hyperbolaeon the highest. Then we name those following the proslambanomenos up as far as the middle note: hypate hypaton, parhypate hypaton, and lichanos hypaton, and hypate meson, parhypate meson, and lichanos meson. And those that come after mese, similarly, up to nete hyperbolaeon: paramese, and trite diezeugmenon, and paranete diezeugmenon, and nete diezeugmenon, and trite hyperbolaeon and paranete hyperbolaeon. Sometimes, however, [we name them] according to their function—how they behave in some way or other towards something—adapting to it, by their positions the functions which [they had] according to the so called immutable system of the double octave. Then, establishing these common terms of positions and functions in it we transfer them to others, that is, taking one of the two [disjunctive] tones lying in the double diapason from its middle position and putting

ipsi secundum
utranque partem duo tetrachorda
copulata ex quattuor
quae sunt in toto.
Deinde alterum tonum
reliquo et grauissimo
interuallorum assignantes
mediam quidem potentia
uocamus ab ea quae tunc
erat consistentia grauissimam
acutioris disiunctionis
et paramesen
acutiorem.
proslambanomenon autem
et neten hyperboleon grauissimam
grauioris disiunctionis: et
hypaten hypaton,
acutiorem.[14]

beside it two tetrachords,
[one] on either side,
coupled together out of the four
that there are in all;
then, assigning another tone to the
remaining lowest of the
[disjunctive] intervals, we call
the middle note according to
function after that
which was consistently the lowest
[note] of the higher disjunction
[i.e., mese] and "paramese" the
higher [step of the disjunction];
"proslambanomenos" and
"nete hyperbolaeon" the lowest of
the lower disjunction, and
"hypate hypaton" the higher
[of the two disjunctive steps].

Leoniceno did not commit any inaccuracy in this passage; indeed he followed the original scrupulously. However, by adhering doggedly to the Greek word order, cases, verb forms, and other details, he has made inherently dense matter even more obscure. The participial clauses beginning or ending with "capientes," "apponentes," and "assignantes" (which have purposely been preserved in the English), more characteristic of Greek than Latin, unnecessarily complicate the train of thought.

In the foregoing passage Ptolemy explains how the middle note of the double octave acquires the name *mese* either by virtue of its position joining the two octaves or by its function of being the lower boundary in the disjunction between two tetrachords. In the latter guise it may be moved from its normal position to another, always maintaining its medial function. Similarly the other notes preserve their relative positions or functions after being transported to another location.

When Leoniceno is more at home with the content, the translation manifests some freedom, as in favoring Latin word order with the relocation of a word or two, but syntactical changes are still avoided. An example may be found below.[15]

Giovanni Battista Augio

In 1545 Giovanni Battista Augio completed a translation into Latin of Ptolemy's *Harmonics*. His Greek source must have stopped at Book 3, chapter 14,

14. Leoniceno trans., fol. 26r–v, of Ptolemy *Harmonics* 2. 5 (Düring ed., 51.17–52.10).
15. P. 291.

for that is as far as his translation goes. Another characteristic of his source must have been that it lacked chapter headings or subdivision after Book 3, chapter 9. A large number of manuscripts have these characteristics, including the early and important codex, Marciana VI.10 from the thirteenth century. However, this codex also lacks chapter headings from the second chapter of Book 2 until the end of that book,[16] whereas Augio's translation lacks a heading only for chapter 16. This it has in common with Bologna, Biblioteca Universitaria, MS graecus 2280, dated 1528, which belongs to Düring's V-branch (deriving from Vat. gr. 192) of his m-class.[17] The fact that Augio did his translation in Bologna heightens the probability that this was his source, but more positive identification must await close study of the idiosyncracies of the translation and features of other manuscripts as well as this one that would give rise to them.

Nothing is known of Augio other than what we learn from the explicit to the translation, in a hand different from the text: "Versum est opus istud Bononiae Anno 1545 Mens Augusti, Jo: Bapt.ª Augio Turris brutianae calabro Interprete, Rogatu D. Nicolai Mantuani Musici et Amicorum." (This work was translated in Bologna in the year 1545, month of August, by Johannes Baptista Augius Calabrese of Brutiana Castle, Translator, at the request of Dominus Nicola Mantuanus, musician, and friends). The sole manuscript, Milan, Biblioteca Ambrosiana, P.133 sup., of the sixteenth century, cannot be autograph, as it contains errors a copyist rather than a translator would make. Besides, it is incomplete in that the tables of 2.14–15 are blocked out but the data are not filled in.

The dedicatee, Nicolo Mantovano, or Nicolo Cavallari, was maestro di canto—equivalent to director of the chapel music—of San Petronio in Bologna between 1551 and 1558 (he died on 28 November of that year). He had been a singer at San Petronio between 1527 and 1531, but his whereabouts between 1531 and 1551 are unknown; he is not mentioned in the records of that church during those years. He left no musical compositions, either printed or manuscript. Spataro said of him in a letter that he was a "homo da bene et molto perito in practica et in theoria" (a gentleman and very expert in practice and in theory).[18]

Augio's is a much more modern translation than Leoniceno's. He avoids translating terms, such as the names of the steps of the double-octave perfect

16. Düring, *Die Harmonielehre*, p. xl.
17. Ibid., p. x.
18. Gaetano Gaspari, "Memorie risguardanti la storia dell'arte musicale in Bologna al xvi secolo raccolte ed esposte dal Prof. Gaetano Gaspari," reprinted from *Atti e memorie della R. Deputazione di Storia Patria per le provincie di Romagna*, Anno 9, in *Musici e musicisti a Bologna, Ricerche, Documenti e memorie riguardanti la storia dell'arte musicale in Bologna* (Bologna, 1969), pp. 157–58; Elvidio Surian, "Bologna," in *New Grove Dictionary*, III, 3.

be connected with Bardi's circle. These are Lorenzo Giacomini's translation of pseudo-Aristotle's *Problems* and Giorgio Bartoli's translation of Boethius' *De institutione musica*. Giacomini left several unpublished translations from the Greek: an incomplete one of pseudo-Aristotle's *Oeconomica*, one of the Epistle to Philip, and one of the *Nicomachean Ethics*. Some of these are extant in copies made by Giorgio Bartoli, who served as Giacomini's amanuensis.[56] The translation of the *Problems*, also in the hand of Bartoli, probably dates from around 1582.[57] It was Bartoli who copied the letters to Galilei and Bardi from Girolamo Mei that survive in the Biblioteca Apostolica Vaticana, MS Regina latinus 2021. These cover the period from May 1572 to around September 1581. The emendations in Problem 48 (numbered 49 in the older sources) made by Mei in the translation he sent to Galilei around September 1581 are adopted by Giacomini.[58] Indeed, the translations are identical. Giacomini may have had Mei's assistance also on other points in the *Problems*, which abound with linguistic and technical difficulties. Giacomini's translation is done with scholarly acumen and sensitivity to what was known of Greek musical practice and would merit greater attention than can be given to it here.

Giorgio Bartoli's translation of Boethius is dated 17 March 1579 and survives in Bartoli's autograph.[59] It is on the whole an excellent translation, in fluent and proper Tuscan,[60] yet scrupulously faithful to the original. The choice of technical vocabulary is particularly cognizant of the nuances of Boethius' Latin and reveals a scholar who must have been trained in music theory. Bartoli's translation, were it published with suitable annotation, could benefit Italian-speaking readers today.

56. Florence, Biblioteca Riccardiana, MSS 1599 and 1612. See Bernard Weinberg, "Nuove attribuzioni di manoscritti di critica letteraria del cinquecento," *Rinascimento* 3 (1952):245–59. However, not all the writing in MS 1599 identified by Weinberg as in Bartoli's hand was copied by him, in my judgment.

57. Biblioteca Riccardiana, MS 1612, fols. 86r–100r. The single watermark that runs throughout this codex is identical to that in letters from Bartoli to Giacomini of 4 March and 23 September 1582 in Biblioteca Riccardiana, MS 2438.

58. See Palisca, *Girolamo Mei*, pp. 178–79 and (2d ed.), Appendix, p. 207. The copy of selected letters by Mei in the Regina manuscript may have been made for Giacomini, who is known to have owned at least one letter of Mei. See ibid., p. 208.

59. Florence, Biblioteca Nazionale Centrale, MS Magl. XIX.75. On fol. 1r appears in Bartoli's hand the title: "De la musica di Boethio libro primo." The translation ends on fol. 156v with Book V, chapter 18, and the annotation "Finito à di 17 di Marzo 1579."

60. Bartoli is best known for his treatise *Degli elementi del parlar toscano* (Florence: Ne le case de' Giunti, 1584).

EIGHT

Harmonies and Disharmonies of the Spheres

Harmonia est discordia concors. So is inscribed the scroll placed beside the figure of the author in the illuminated manuscripts of Gaffurio's *De harmonia*, as he sits in his cathedra lecturing to the students at his feet (see Figure 8.1).[1] At his right are three organ pipes, measuring three, four, and six lengths, on the left three strings with the same measurements, and beside them a pair of dividers. Thus the octave is divided through the harmonic mean with the fifth below and the fourth above. Also on his desk is an hour glass, perhaps to remind this preceptor that if he does not keep an eye on it, however important his message, the bright looks on his pupils' faces will soon fade.

"Harmony is concord [wrought] out of discord"—a fitting motto for Gaffurio's book, indeed for his time. Harmony in practical terms was a union created out of diversity—of voices, of pitches, of rhythms, of tempos, of instruments. But harmony was also thought to prevail in the universe, between man and universe, among the faculties of the human soul, among the parts of the body, and between the body and soul. The scroll says nothing about music, because Gaffurio's timely lesson is that harmony is universal, and audible music is only one of its manifestations.

Is this something Gaffurio believed, or is it, like so much of the treatise, ancient erudition addressed to Greekless musicians? Is the harmony of the universe and man a nice allegory, or is it a doctrine that underlies an aesthetic position? Is universal and human harmony relevant to musical practice and creativity in the early Renaissance? The answers to these questions are by no means easily arrived at.

The tradition of musica mundana and humana goes back to the ancient Pythagoreans and to Plato. Partly rejected by Aristotle, it was revived by

1. The same figure occurs as a vignette on the title page of the printed edition of 1518.

Figure 8.1.
The first page of text of Gaffurio's *De harmonia musicorum instrumentorum opus,* in the manuscript Vienna, Österreichische Nationalbibliothek, MS Ser. nov. 12745, fol. 4r. Gaffurio is shown in a *cathedra* lecturing to his disciples: "Harmony is concord [wrought] out of discord." In the border is inscribed "Franchino Gaffurio of Lodi carefully wrote three books concerning music: the theory, the practice, and the harmony of instruments." Courtesy of Bild-Archiv der Österreichischen Nationalbibliothek, Vienna.

Cicero and his commentators, by Nicomachus and Boethius, and elaborated by a number of medieval authors.[2]

Boethius presented two contrasting versions of the cosmic harmony. One was based on Nicomachus, and is in the image of a lyre in which hypate meson is Saturn, parhypate meson Jupiter, lichanos meson Mars, mese the sun, trite synemmenon Venus, paranete synemmenon Mercury, and nete synemmenon the moon.[3] Boethius' other version is that of Cicero as revealed in Scipio's dream, to which we may go for the classic account of the celestial order:

> "What is this large and agreeable sound that fills my ears?" "That is produced," he replied, "by the onward rush and motion of the spheres themselves; the intervals between them, though unequal, being exactly arranged in a fixed proportion; by an agreeable blending of high and low tones various harmonies are produced; for such mighty motions cannot be carried on so swiftly in silence; and Nature has provided that one extreme shall produce low tones while the other gives forth high. Therefore this uppermost sphere of heaven, which bears the stars, as it revolves more rapidly, produces a high, shrill tone, whereas the lowest revolving sphere, that of the moon, gives forth the lowest tone; for the earthly sphere, the ninth, remains ever motionless and stationary in its position in the centre of the universe. But the other eight spheres, two of which move with the same velocity, produce seven different sounds—a number which is the key of almost everything."[4]

Ugolino of Orvieto

As with every other sphere of thought, ideas about cosmic and human harmony were transformed by humanism. This process will be evident if we consider the status of the concept at the beginning of the fifteenth century. The ancient idea of world harmony was permeated at this time with Christian mysticism and beatitude. Ugolino of Orvieto (c. 1380–1457) provides a sample in his *Declaratio musicae disciplinae,* probably completed in Ferrara between 1430 and 1435.[5] Instead of being itself the font of all harmony, musica mundana is seen as an offshoot of a higher harmony, the

2. See the concise survey in Giuseppe Massera, *Severino Boezio e la scienza armonica tra l'antichità e il medio evo* (Parma, 1976), pp. 27–50. For a detailed history, see James Haar, *"Musica mundana:* Variations on a Pythagorean Theme," (Ph.D. diss., Harvard University, 1960).

3. Boethius *De institutione musica* 1.27; Nicomachus *Manual of Harmony* 3. The text of Nicomachus may be faulty, because Mercury is placed between Venus and the sun instead of between Venus and the moon.

4. Cicero *De Re Publica* 6.8, trans. Clinton Walker Keyes.

5. Albert Seay, "Ugolino of Orvieto," in *New Grove Dictionary,* XIX, 320.

ineffably sweet song of the celestial hierarchy of angels proclaiming without end, "Sanctus, Sanctus, Sanctus." This, says Ugolino, is the beginning and origin of all cosmic, human, and instrumental music; from it flows the proportion of all melodies, the conjunction of all consonances, the concord of all notes, the smooth and uniform mixture of all grave and acute sounds, that agreeable union (*coaptatio*) in which there is no discord or asperity, no break in smoothness, no disproportion or awkward distance. All this harmony, moreover, imitates the celestial music that exists to praise the creator.[6] Human music harmonizes the parts of the soul, the sense's capacity to feel with the intellect's to perceive, and bridges the infinite gulf between the material and mortal body and the immaterial and immortal soul. It also permits the elements and parts of the body to be harmonized within itself.

Giorgio Anselmi

Giorgio Anselmi (before 1386–c.1440–43) is much more concrete in spiritualizing the music of the spheres in a treatise of 1434, consisting of three dialogues: on *harmonia celestis, harmonia instrumentalis,* and *harmonia cantabilis*. Aside from the apparent originality of his approach, Anselmi's treatment of the topic is important because of Gaffurio's absorption of parts of his doctrine in his early works. Those spirits that Socrates in Plato's *Republic* (10.617b) called sirens are regarded by "our theologians"[7] as angels ranged in nine orders. Anselmi seems to invoke here a system of concentric spheres, or orbs, for he uses the terms *sphera* and *orbus* as well as *ordines*. His naming of Socrates recalls the myth of Er, related by Socrates in the tenth book of the *Republic*. Here Necessity, helped by the three Fates—Lachesis, Clotho, and Atropos—turns the cosmic spindle around which whirl the planets and stars, each in its own rim. Each rim holds a siren, who sings her particular note. The earth is imagined to be in the center, and the whirling mass around it a cylinder. In place of the sirens, Anselmi has assigned to each sphere angels of various ranks, who sing forth not from rims but spheres, in keeping with the geocentric universe of concentric globes that was then the accepted view. An outer sphere, or shell, of stars contained the spheres of the planets, the sun, the moon, and, at the center, the earth.

On the innermost sphere, the earth, Anselmi places the Angels who proclaim to humanity the divine will. In the second or lunar orb are the special messengers, the Archangels; in the third, that of Mercury, are the

6. Ugolino of Orvieto, *Declaratio musicae disciplinae,* ed. Albert Seay, I, 1, pp. 15–16.

7. Giorgio Anselmi, *De musica,* ed. Giuseppe Massera (Florence, 1961), p. 103. Anselmi does not say who these "theologians" were, and his modern editor has not supplied the information. However, see n. 9 below.

angels called the Virtues, through whom God reveals great miracles and portents; on the fourth, that of Venus, are the Powers (*Potestates*), who restrain the malignant spirits that threaten man and are capable of injuring him. The fifth, the sphere of the sun, holds the Principalities (*Principatus*), who serve God in governing his kingdom. The sixth, of Mars, hosts the Dominations (*Dominationes*), the army of militant angels, defenders of the righteous and opponents of the unjust on earth. The seventh is the order of the Thrones (*Throni*), who have their seat in the orb of Jove, and whose function is to transmit the decrees and laws of God. The eighth order, the Cherubim, reside in the sphere of Saturn, and, because of their proximity to the Supreme Wisdom, interpret it for the masses. The ninth host of angels are in the sphere of Uranus; they, the Seraphim, excel all others in wisdom, authority, and happiness and participate most intensely in the divine flame and love of God.

Gaffurio repeated this exposition of the angel hosts almost verbatim in his *Theorica musice,*[8] citing Anselmi and probably not realizing there was a venerable tradition behind him.[9] In the introduction to his edition of Anselmi, Massera shows that Gaffurio cannot have come into possession of Anselmi's treatise before 1484; in fact the citations of Anselmi are not found in the 1480 *Theoricum opus,* only in the *Theorica musice* of 1492 and later works. The passages taken from Anselmi are among the insertions made in the 1480 text. In his edition of Anselmi, Massera has identified Gaffurio's borrowings in notes to the text.

Anselmi was not content to leave the concept of cosmic harmony in the mystic realm. He sought to explain how the diversity of motions could produce a music sweet and satisfying to the ear. There was, after all, a

8. Gaffurio, *Theorica musice,* I, 1, fol. a4r–v.

9. Anselmi, *De musica,* pp. 103–06. The hierarchy of the angels that Anselmi describes goes back to an ancient tradition; in a Jewish-Christian document transmitted in Arabic and Ethiopian, the *Adam Apocalypse,* it is stated that the first day God created heaven and earth, water, air, and fire, and the angels—namely the Thrones, Dominations, Principalities, Powers, Cherubim, and Seraphim; on the second day he created the lower heaven, called the firmament. See Kathi Meyer-Baer, *Music of the Spheres and the Dance of Death* (Princeton, 1970), pp. 23–26. The Greek tract *The Celestial Hierarchy,* attributed to the first-century church father Dionysius the Areopagite, but actually a fifth- or sixth-century forgery—a fact not known to the Renaissance—divided the nine angel hosts into three groups of three each: the Counsellors—Seraphim, Cherubim, and Thrones; the Rulers—Dominations, Virtues, and Powers; and the Servants—Principalities, Archangels, and Angels. The work was known in the Middle Ages in the Latin translations of John Scotus Erigena (c.810–880) and Robert Grosseteste (c.1168–1253) and through commentaries by Jean Gerson. See Meyer-Baer, *Music of the Spheres,* p. 38. Also see L. D. Reynolds and N. G. Wilson, *Scribes and Scholars, A Guide to the Transmission of Greek & Latin Literature,* 2d ed. (Oxford, 1974), p. 105; and Jacques Handschin, "Ein mittelalterlichen Beitrag zur Lehre von Sphärenharmonie," *Zeitschrift für Musikwissenschaft* 9 (1927):193–208.

harmony in the sounds produced by the several kinds of motion. The diurnal motion, by which one assumes Anselmi meant the rotation of the outer sphere of fixed stars around the earth in twenty-four hours, emits a very high pitch, while, consonant with it, the self-moved sphere (the empyreum of Aristotle's prime mover?) produces a very low sound. In between, the seven errant spheres, in which the planets, sun, and moon move independently and in complex patterns against the stars, make sounds of intermediate pitch. The epicycles produce semitones. Here Anselmi seems to refer to the Ptolemaic model in which a planet revolved in a small circle the center of which was on the sphere of that planet. As these epicycles run through the stars the collisions produce dieses and commas. The movement of the heavens gives rise to three genera of music: diatonic, chromatic, and enharmonic. The revolution of the spheres themselves, that is their velocities, produce diatonic sounds. Between Saturn and Jupiter there is a diapason-plus-diapente, for, whereas the former takes nearly thirty years to make its circuit, Jupiter takes approximately twelve. (The ratio 30:12, or 5:2, fits the octave-plus-fifth, 3:1, only approximately.) Jupiter to Mars is a double diapason; between Mars and the sun, the sun and Venus, and Venus and Mercury are a diapason-plus-diapente. (The period, in each case, which Anselmi does not mention, is considered to be one year. The ratio 1:1, however, does not yield an octave-plus-fifth.)[10]

Anselmi is torn between the Christian model of angels perched on their spheres singing "Sanctus" and the traditional explanation of spheres emitting musical sounds because of their rapid movement. He adds to these a third source of music, the collisions, or rubbing, of planets in their epicycles against the fixed stars. There is no rigor, of course, in all this, as Gaffurio must have realized, for he selected carefully what he borrowed from Anselmi.

Franchino Gaffurio

Unlike Anselmi, Gaffurio does not project an unadulterated Christian vision of celestial harmony. Anselmi's description of the angelic choirs summarized above is inserted into a discussion of various myths about music in the opening chapter of *Theorica musice,* which is a vastly expanded *laus musicae* drawn from the parallel chapter of *Theoricum opus*. Musica mundana proper is discussed in the second chapter, but Gaffurio does not lose sight of Anselmi's sweeping view of celestial harmony, for he inserts several more passages from his treatise in the midst of classical sources to remind us that one should subordinate the classical writers to Christian theology. At least

10. See Simeon K. Heninger, Jr., *Touches of Sweet Harmony: Pythagorean Cosmology and Renaissance Poetics* (San Marino, California, 1974), p. 123.

1480 ed Lines	1492 ed. Lines	Source
1–9	1–7	Gaffurio
——	7–13	Anselmi 100.148
9–16	13–17	Boethius 1.2.187.26–29
16–17	18	Aristotle *De coelo* 2
18–26	19–23	Boethius 1.2.187.29–188.6
——	23–32	Anselmi 101.149–150
26–35	35–37	Cicero *Somnium Scipionis* 5.1
——	38–50	Anselmi 97.134–98.138; Ambrose *Exameron* 2
——	50–51	Gaffurio
35–55	51–64	Boethius 1.2.188.7–25
56–71	64–73	Macrobius, *Somnium* 2.3.12–15
71–79	73–78	Censorinus 13.2
79–99	78–90	Censorinus 13; Pliny *Hist. nat.* 2.22
——	90–92	Gaffurio
——	92–94	Anselmi 102.153
99–102	94–96	
——	96–97	Stravo *Geographia* 10
102–11	97–103	Censorinus 13.5

Figure 8.2:
Sources for Book I, chapter 2

that seems to be the message, but, given Gaffurio's patchwork method, one is never sure. The borrowings in the chapter are shown in Figure 8.2, which also displays a concordance between the *Theoricum opus,* 1480, and *Theorica musice,* 1492.

Despite the disparity of sources and the Christian-pagan synthesis, Gaffurio manages to project a coherent defense of the theory of cosmic music. He begins by relating that the Pythagoreans believe that the world is in constant motion and that the various celestial bodies and elements are mixed in such a way that their revolutions and collisions produce sounds and consonances. The supreme maker would not have perfected such a splendid machine only to leave it immobile and uselessly silent (Anselmi). Therefore philosophers believe that as the heavens turn, the troops of celestial spirits and human souls that have withdrawn to that region sing harmonic chants in admiration of his work (Anselmi). How could such a swift massive machine, in which the orbits of the stars are coordinated so perfectly, move silently and without harmony? (Boethius). Yet Aristotle denied that the spheres made any sound. God governs the heavens not casually but with order, so that the soul of the world is joined to bodies by means of proportions, such as sesquialtera, sesquitertia, and sesquioctava (Anselmi). A

harmony similarly unites the opposing forces of the four elements and the four seasons of the year (Boethius). Thus, according to Macrobius,[11] a certain number of *stadia,* or stades (a measurement based on the length of the Italian stadium, 625 Roman feet), separate the earth from the moon, the moon from Mercury, Mercury from Venus, Venus from the sun, the sun from Mars, Mars from Jupiter, Jupiter from Saturn, and Saturn from the sphere of the stars, and these distances are related as simple ratios. Pythagoras measured the distance from the moon to Mercury as a major semitone,[12] from earth to the moon as a tone, from Mercury to Venus a minor semitone, Venus to the sun a tone-plus-minor-semitone, from the sun to the earth a diapente, from the sun to Mars a tone, from Mars to Jupiter a minor semitone, from Jupiter to Saturn a major semitone, from there to the summit of the sky, the zodiac, a minor semitone,[13] and from the top of the sky to the sun a diatessaron. Thus, from the earth to the summit of the sky is five tones and two minor semitones, or a diapason. In this way Plato, and before him the Pythagoreans, concluded that the entire universe is made up of musical ratios and comprises a harmony. And Dorilaus said for this reason that the universe is the organ of God, on which he plays melodies that, because of the magnitude of the sounds and the limitations of our ears, are inaudible to us.[14]

In his last work, *De harmonia,* Gaffurio leaves behind the Christian overlay and adopts a Neoplatonic cosmology. The major sources for this revised view are Ficino's translation of Plato's *Timaeus,* Ficino's *Compendium in Timaeum,* and the Latin translation of Aristides Quintilianus. Gaffurio had purchased a copy of the *Opera* of Plato in the translation of Ficino already in 1489. This contained the *Timaeus,* including Ficino's introductory *Compendium,* the *Critias,* the *Laws,* the *Epinomis,* and the letters.[15]

11. *Somnium* 2.3.13; see also Censorinus *De die natali* 13.

12. Gaffurio's passage concerning the interval distances between the spheres is copied verbatim from Censorinus, except that Gaffurio has qualified the value of the semitones by "major" or "minor." The eventual source of the theory is Pliny *Natural History* 2.30, who also does not specify the size of the semitone.

13. Pliny *Natural History* 2.30 has *sescuplum,* a tone and a half.

14. Gaffurio, *Theorica* I, 2; Macrobius *Somnium* 2.4.14; Censorinus *De die natali* 13.1.

15. Otto Kinkeldey, "Franchino Gafori and Marsilio Ficino," *Harvard Library Bulletin,* 1 (1947):379–82. Below the colophon, which gives no date of publication, Gaffurio wrote: "Franchini Gaffori musicis professoris est hic liber / die vi maii 1489 emptus." The first edition of the *Opera* was by Laurentius de Alopa, Florence, 1484–85. Gaffurio must have owned the complete Plato, as among the books he donated to the Incoronata of Lodi was "Opera Platonis duplicat. in duobus voluminibus," according to Emilio Motta, "I libri della chiesa dell'Incoronata di Lodi nel 1518," *Il libro e la stampa* 1 (1907):105–12. At the time Kinkeldey saw the volume it was in the Houghton Library of Harvard University, on loan from its owner. It is no longer there, and the library does not know its whereabouts.

Ficino, by making the *Timaeus* accessible through his translation and commentary, gave the speculation about cosmic harmony a fresh and fruitful new direction. Cosmic harmony ceased to be a representation of the world in eternal balance; it became a play of forces that had moral consequences, that could influence and be influenced by men and demons. This was made possible by Plato's notion of a world soul that was in a number of ways analogous to the planetary system. Through the world soul the individual human soul could aspire to participate in cosmic harmony and absolute virtue.

Ficino asks why Plato made the soul a musical consonance. Although Plato had in mind the soul of the universe, Ficino applies this by analogy to the human soul:

> Musical consonance occurs in the element which is the mean of all [i.e., air], and reaches the ears through motion, spherical motion: so that it is not surprising that it should be fitting to the soul, which is both the mean of things, and the origin of circular motion. In addition, musical sound, more than anything else perceived by the senses, conveys, as if animated, the emotions and thoughts of the singer's or player's soul to the listeners' souls; thus it preeminently corresponds with the soul. Moreover, as regards sight, although visual impressions are in a way pure, yet they lack the effectiveness of motion, and are usually perceived only as an image, without reality; normally therefore, they move the soul only slightly. Smell, taste, and touch are entirely material, and rather titillate the sense organs than penetrate the depths of the soul. But musical sound by the movement of the air moves the body: by purified air it excites the aerial spirit which is the bond of body and soul: by emotion it affects the senses and at the same time the soul: by meaning it works on the mind; finally, by the very movement of the subtle air it penetrates strongly: by its contemperation it flows smoothly; by the conformity of its quality it floods us with a wonderful pleasure: by its nature, both spiritual and material, it at once seizes, and claims as its own, man in his entirety.[16]

Ficino had previously commented on the passage (32b) in which Plato explained that the four elements of the body of the universe were fire, air, water, and earth, and that the extremes—fire and earth—had two means; as in a geometrical proportion, fire is to air as air is to water, and air to water, and water to earth.[17] Now Ficino addresses himself to one of these means between earth and fire, namely air. It is through this medium that musical sounds reach the ears, and through them the aerial spirit that is the bond between the soul and the body. This gives music a more direct route to the feelings than, say, savors or touch. At the same time music is a link

16. Ficino, *Commentaria in Timaeum,* ch. 29, in *Opera omnia,* p. 1453, trans. in D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (London, 1958), pp. 8–9.

17. *Commentaria,* ch. 23.

beween a higher order of things and the human soul. The soul and the "celestial kithara" both vibrate to the same ratios. Just as a celestial melody is made of high and low pitch, and the atmosphere is composed of gravity and lightness, cold and heat, and humidity and dryness, so in human minds there are united gentleness and magnanimity, temperance and fortitude. Also, out of the two there can be a union, as of low and high voices. But here, it must be said, Ficino seems to introduce a concept of simultaneous consonance foreign to Plato's thought. The soul is able to judge and appreciate harmony because it is caused by a harmony that is higher than itself. "Our soul contains all the same proportions as the soul of the world. None of these ratios is mathematical; rather, they have a natural force. They are not to be thought of as solely mathematical ratios but as machinating and generating."[18]

Ficino's thought and the *Timaeus* itself are reflected in Gaffurio's treatment of cosmic harmony. One important component of ancient cosmology restored by Gaffurio is the role given to the Muses in planetary and earthly harmony. We shall see that Gaffurio quoted from Ficino's translation of the *Timaeus* the passage in which music, both harmony and rhythm, is said to have been given to intelligent men by the Muses to harmonize the inner discord in the revolutions of their souls.[19] In *De harmonia* the Muses take over from the angel choirs the role of producers and controllers of the cosmic music. This idea is not derived from Plato, who in recounting the myth of Er in the *Republic* assigned to individual sirens the singing of the tones of the musical scale, each on her proper sphere as she rotated around the spindle of Necessity. There were nine sirens, as there are Muses. Gaffurio, after reporting numerous theories about the Muses, drawn from a variety of authors, settles for the belief that the Muses are associated with particular spheres, modes, and degrees of the scale.

Ad haec Nos musas ipsas Astris modulisque (quod Plerique consentiunt) ita conuenire putamus; ut	We think that to these Muses certain stars and modes are fitting (and about this many agree), so that we

18. Ficino *Commmentaria,* ch. 29, p. 1453: "Constat enim anima nostra ex omnibus proportionibus quibus anima mundi. Qua quidem sicut nec in illa, ita nec in nostra rationes quaedam mathematicae sunt, sed potius naturales uim habentes, ad proportiones mathematicas non iudicandas solum, sed machinandas etiam atque generandas." In the edition possessed by Gaffurio the commentary was probably entitled "Compendium in Timaeum," as it is in the *Opera* of Plato (Basel, 1561), where it is reprinted as a preface to Ianus Carnarius' Latin translation. In the *Opera* of Ficino (Basel, 1576), reprinted by Bottega d'Erasmo, Turin, 1959, it is printed under the rubric of "Commentaria." In fact, it is neither a compendium nor a commentary but an introduction. Its contents only partly parallel those of the *Timaeus,* and Ficino introduces ideas quite foreign to Plato.

19. *Theorica,* I, 1, fol. a5r; Plato *Timaeus* 46d. See ch. 9 below.

eas solis chordis ipsis: quibus modulorum exordia conferuntur ascribiamus: singula singulis conferendo.[20]	shall assign particular notes [of the scale] on which modes begin to each of them.

With this remark Gaffurio introduces the famous figure in which a triple-headed dog, Cerberus, wagging a serpent's tail, is stretched over the strings of the octave canon (see Figure 8.3).[21] Gaffurio failed to name his sources for the analogies in the figure, James Haar believes, because his main source is a modern one, the music theorist Bartolomé Ramos de Pareja, with whom Gaffurio had had a disagreement. Gaffurio had borrowed a copy of Ramos' *Musica practica* from Giovanni Spataro, returning it to him full of marginal annotations,[22] much to Spataro's disgust. Ramos does have a figure that parallels Gaffurio's in the pairing of Muses, planets, scale-degree names, and modes.[23] Ramos, in addition, has circles delimiting the eight modal octaves, and for this reason, at least, encompasses two octaves in his diagram. Ramos adds a note below proslambanomenos, which he calls *Coruph,* and a note above nete hyperbolaeon, called *Crisis.* He also labels the scale degrees of the double octave Gamma to a, another feature missing in Gaffurio. Ramos' figure, though, lacks the pictorial representations and any mention of Apollo, the three Graces, Cerberus, or the three elements. Thus Gaffurio's figure appears to be at once an expurgation and embellishment of that of Ramos.

Gaffurio devised his figure before he knew the work of Aristides Quintilianus, so it is not surprising that the correspondences of Muses and modes do not agree with those of this ancient author.[24] The figure, indeed, was published as the frontispiece of *Practica musice* in 1496 without commentary. The sources that Ramos admits he used and which in fact yield the correspondences in the figure were Macrobius' commentary on Cicero's *Dream of Scipio* and Martianus Capella's *De nuptiis,* both of which were known to

20. *De harmonia,* V, 12, fol. 93v. In the translation below, *chorda* is rendered "note" rather than the usual "string," because in this context a *chorda* is a step of a theoretical gamut, not a string of a polychordal instrument.

21. There have been several exhaustive commentaries on this figure and its sources. They are listed in James Haar, "The Frontispiece of Gafori's *Practica musicae* (1496)," *Renaissance Quarterly* 27 (1974):7–22, which is the best of these studies.

22. These are given in footnotes to the edition by Johannes Wolf in Publikationen der internationalen Musikgesellschaft, II (Leipzig, 1901).

23. See Haar, "The Frontispiece," p. 19; Wolf ed., p. 61.

24. Gaffurio is forced to admit this at the end of his verbal description of the diagram: "Aristides autem quintilianus in calcae secundi musicae suae: quasi quodammodo huic contrariam musarum & modulorum conuenientiam pernotauit" (Aristides Quintilianus at the end of the second [book] of his Musica presented a correspondence of Muses to modes quite contrary to this).

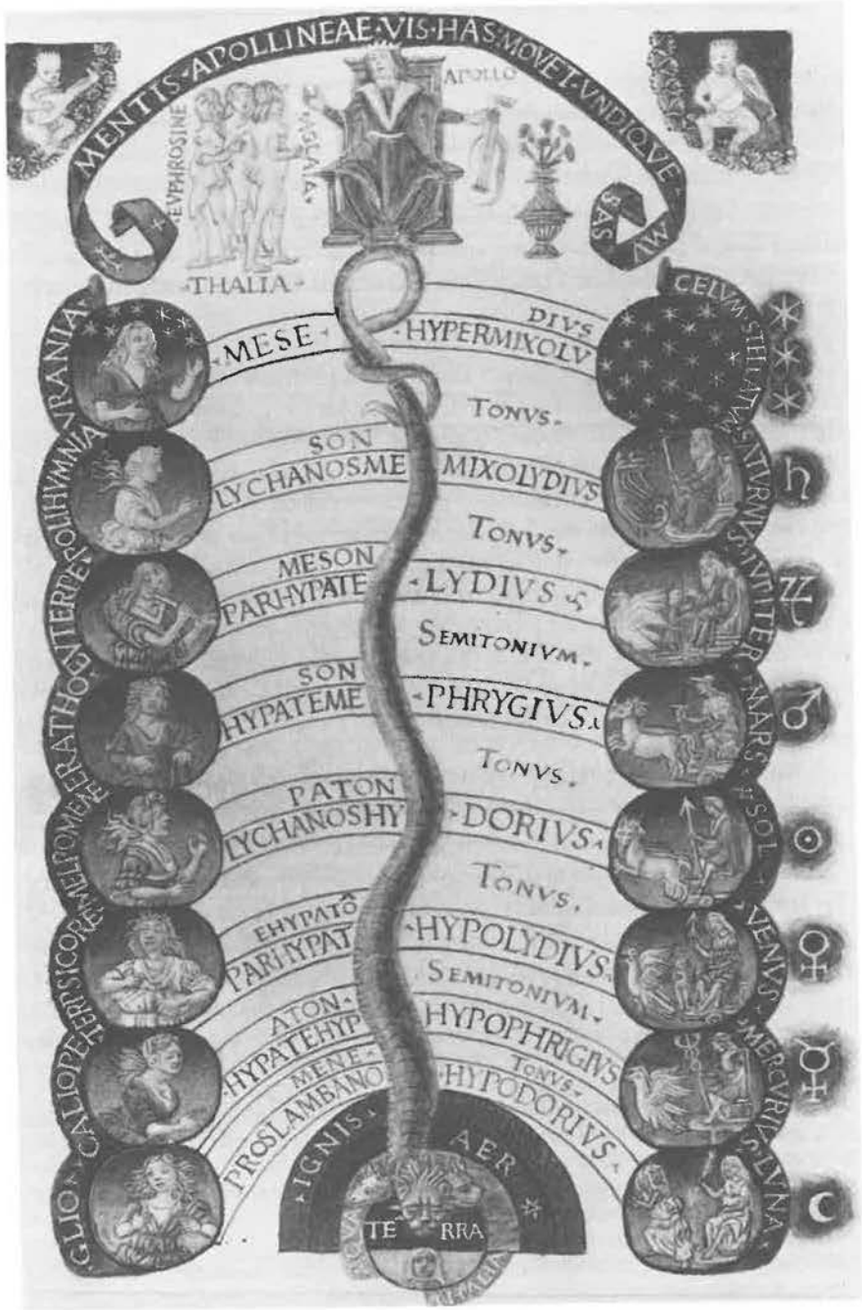

Figure 8.3.
The harmonious union of the Muses, strings, modes, and planets, in Vienna, Österreichische Nationalbibliothek, MS Ser. nov. 12745, fol. 64v.
Courtesy of Bild-Archiv der Österreichischen Nationalbibliothek, Vienna.

Gaffurio. The correspondence in the figure between scale degrees and planets is also reported by Boethius,[25] who ascribed it to Cicero, but he reports it as an alternate system to the one (that of Nicomachus) he seems to prefer. But these were not sources Gaffurio much favored, once he had access to Bryennius, Aristides, and Ptolemy.

In terms of the development of Gaffurio as a humanist, then, the figure marks an early stage; yet it is interesting to dwell upon it. The figure obviously represents the agreement of cosmic and instrumental harmony. As such it is highly appropriate as a frontispiece or illustration for *De harmonia,* and it is not altogether inappropriate for the *Practica,* though certainly less relevant. It is significant that the hierarchies of angels are not anywhere represented; here is a thoroughly pagan and classically inspired system. The use of the Hypermixolydian as the highest mode, which has puzzled some commentators, is consistent with this, as it follows a Hellenistic tradition, supported by Boethius and Bryennius. The placement of the Hypodorian on proslambanomenos, with the other modes following on the succeeding steps, is also consistent with Boethius; any resemblance to the plainchant modes is incidental.

The general layout of the figure has the appearance of a highly embellished monochord, or *chordotonus* as Gaffurio called it, whereas the version in Ramos has a more characteristic monochord design. On the musical monochord has been superimposed, as it were, the monochord of the cosmos, with medallions doubling as spheres, showing in the manner of the emblematic artwork of the time the attributes of the Muses and of the several gods and goddesses after whom the planets are named. The signs of the zodiac are also given, as is usual when the planetary system is represented. Apollo, as Musagetes, or leader of the Muses, is at the top of the diagram, holding an instrument that is a cross between a lira da braccio and a lute.

The function of the very prominent serpent has never been adequately explained. Meyer-Baer suggested that it shows the "Pythicos" side of Apollo, that of vanquisher of the serpent, on which he plants his feet. But Gaffurio identifies the serpent as Cerberus, a three-headed dog with hair of snakes that watches over the entrance to the lower world. Musically the hybrid animal functions as the string of the monochord. Apollo serves as a yoke for the string, the yoke, in turn, supported by the scroll, in the manner of ancient kitharas. The representation of the harmony of the four elements at the bottom completes the cosmic picture. Thalia is placed below the earth, because, according to Martianus Capella, after the eight spheres were assigned to eight of the Muses, one Muse was left, and she was assigned to Earth; Thalia was the appropriate choice, since she was the Muse of

Sembra trascurare Panofsky

25. *De institutione musica* 1.27.

agriculture, plant growth, and seed. The Graces (*Charites*), one of whom is Thalia, dancing at Apollo's right, associated with Apollo in Macrobius' *Saturnalia,* are not integrated in any clear way into the cosmic scheme. Gaffurio may have confused them with the three Fates who in the myth of Er help turn the spindle of Necessity around which the spheres revolve.

The figure comes at the end of a group of twelve chapters on the ancient modes in which Gaffurio drew on sources he worked upon in the early 1490's. It may have capped the end of an earlier version of Book IV, a version finished as early as 1496, since the *De harmonia* is repeatedly mentioned in the *Practica,* several times each in three of the four books,[26] suggesting that much of it was by then already drafted. Thus the figure of the serpent monochord may have been designed for *De harmonia.* The figure marks a dividing point in Book IV; after it Gaffurio exploits two sources available to him only in the late 1490's, namely Aristides and Ptolemy.

These two authors, as we saw in my first chapter, offer Gaffurio the means to expand the conception of cosmic harmony beyond the planetary and the one to one correspondences with music characteristic of the earlier chapters. Music or consonance controls the periodicity of the moon, the seasons, of births and fevers. It mediates between public bodies and between individual people to make possible civic peace and well-being and friendship. Thus the fifteen notes of the double-octave system correspond to the fifteen days of the waxing of the moon.[27] In the perfect, unmodulating system the hypaton tetrachord corresponds to earth, the meson to water, the synemmenon to air, the diezeugmenon to fire, and the hyperbolaeon to the summit of the sky.[28] The elements in turn are ascribed to certain seasons of the year and to numbers that form consonant ratios: spring and air to the number 8 (mild), summer and fire to 4 (hot), autumn and earth to 6 (dry), and winter and water to 12 (wet).[29]

These final chapters demonstrate a fascination with the ramifications of cosmic harmony, if not a well-digested reading of Aristides and Ptolemy. Indeed, Gaffurio barely scratched the surface. To be sure, the theorizing of these authors is rarely transparent, and in the translations of Burana and Leoniceno, it was positively opaque. The temptation to regard these chapters as a vain display of erudition is strong. Yet a genuine enthusiasm breaks through Gaffurio's feverish copying. He is carried away by the ideas he transmits. The depth of conviction is tempered at times by such feeble

26. *Practica,* I, 2; I, 4; I, 6; I, 7; II, 1; III, 1; III, 3; III, 13; III, 15; IV, 1; IV, 5.
27. Gaffurio, *De harmonia,* IV, 19; Aristides Quintilianus *De musica* 3.13.
28. Gaffurio, *De harmonia,* IV, 19; Aristides Quintilianus *De musica* 3.14, Burana trans., fol. 31r.
29. Gaffurio, *De harmonia* IV, 19; Aristides Quintilianus *De musica* 3.19; Burana trans., fol. 32v.

E qui non prende in considerazione Wind

avowals as: "We do not consider it incongruous to agree with the Pythagoreans and Plato," concerning the existence, that is, of discrete pitches in the cosmic music.[30] Usually the doctrines presented are attributed to an authority by such phrases as "posuit Aristides" (Aristides laid down),[31] "Plato in Timaeum docuit" (Plato taught in the *Timaeus*),[32] "diuidunt animam nostram Philosophi" (Philosophers partition our soul).[33] In these virtual disclaimers, Gaffurio defensively puts a distance between himself and the authorities, as he coolly reports their opinions without committing himself.

Yet what Gaffurio wants to believe he shows as much by what he fails to quote as by his citations. For example, he draws one sentence of Themistius' paraphrase of Aristotle's *De anima* (407b), which introduces the idea that the artist can create harmony out of wood and stone.[34] "When we receive something in sounds that is aptly and suitably put together, if it is intermingled and suitably in agreement with us, we take delight in it, recognizing it to be constructed in similitude with ourselves."[35] But the point of the passage in both Aristotle and Themistius—not evident in Gaffurio's selective quotation—is that the soul cannot be a harmony. Aristotle's and Themistius' arguments against the proposition are ignored. Gaffurio wants to believe and to persuade the reader to believe in the harmony of the soul.

In his treatment of musica humana likewise Gaffurio progressed from the 1480 version and the sources known to his predecessors—Boethius, Macrobius, and Censorinus— through the 1492 version, with its inclusion of Themistius, to an attachment to Aristides and Ptolemy, and a greater penetration of Plato through Ficino's translation and commentary in the *De harmonia.* The idea that the immortal soul is united to the body and the elements of the body are joined together by musical ratios, Gaffurio attributes at the outset to "the Pythagoreans and Platonists."[36] But it is obvious from his borrowing that the source is Boethius,[37] who states—and Gaffurio paraphrases—that a kind of consonance, like that of high and low voices, mixes the incorporeal vitality of reason with the body, joins the parts of

30. Gaffurio, *De harmonia,* IV, 14.
31. Ibid., IV, 13.
32. Ibid., IV, 15.
33. Ibid., IV, 17.
34. Themistius *Paraphrases* on the *De anima* of Aristotle, trans. Ermolao Barbaro (Paris, 1535), I, 23; Heinze ed., p. 25; 1554 ed., p. 74. For a fuller account of these editions, see ch. 9, n. 37.
35. *Theorica musice,* I, 3.
36. *Theoricum opus,* I, 3.
37. *De institutione musica* 1.2.

the soul, which Aristotle called rational and irrational, and intermixes the elements of the body. Consonance in sound is the mixture of low and high pitch striking the ears sweetly and uniformly. Such consonance can manifest itself in the suitability of the components of a composite structure or of successive things to each other. From Macrobius Gaffurio derives the idea that the body and soul are combined by means of numbers.[38] He concludes: "And so, just as the soul itself is joined to the body by numbers, so they are confirmed by musical harmonies made out of the same numbers, and we do not doubt that not only is the soul mixed with the body but [their] elements and movements are determined by, as it were, a natural disposition and fitting agreement."[39] Pythagoras and the Platonists believed that the soul is a harmony, Gaffurio adds. Theophrastus recognized musical harmony not only in the voice, like Socrates, or in movements of bodies, like Aristoxenus, but in both of these and in the motion of the soul.[40] Indeed, Pythagoras, according to Censorinus, believed that human birth depended on harmonic numbers.[41] The doctrine that Censorinus reports is based on the numbers 6, 8, 9, and 12, the numbers of days the lacteus humor, then blood, then flesh, and finally the body take to form. The total multiplied by 6 gives the length of a "minor" birth; multiplied by 7 the length of a "major" birth.

In *De harmonia* Gaffurio does not penetrate any deeper into musica humana, but he uses sources that are more ancient: Aristides Quintilianus and Ptolemy. The numerology of birth is reported according to Aristides. Healthy births and stillbirths result from consonant and discordant periods or days respectively. A healthy human birth requires 270 days, and this results from a harmony of numbers, those that represent the stable notes of the octave bounding the tetrachords: 6, 8, 9, and 12. These are added to make 35; then to this is added the sum of the numbers representing the consonances, 1, 2, 3, and 4—that is, 10—making 45. This number, multiplied by 6—the first sign of generation—produces 270.[42]

In both Aristides and Ptolemy, Gaffurio found further substantiation for the proposition that harmony, whether cosmic or sonic, could move the soul and body to certain virtues, states of mind, and sensations. The tetrachords, for example, promote the virtues: the hypaton and meson tetrachords temperance, the diezeugmenon fortitude, and the hyperbolaion

38. Macrobius *Somnium* 1.6.
39. *Theorica musice,* I, 3.
40. Censorinus *De die natali* 12.
41. Ibid., 11. Gaffurio expands the brief mention of this in the 1480 book to a lengthy disquisition in the 1492 version, drawn almost verbatim from Censorinus.
42. Gaffurio, *De harmonia,* IV, 18; Aristides Quintilianus *De musica* 2.18; Burana trans., fol. 32r.

prudence.[43] Such influences are possible because the human soul is organized according to musical ratios. The intellective part corresponds to the octave, the sensitive to the fifth, and the habitual to the fourth. The species of fourth are analogous to the motions of the habitual soul—increase, stasis, and decrease; the species of fifth, to the powers of the sensitive soul—sight, hearing, smell, and taste; the species of octave, to the functions of the intellective soul—imagination, intellect (Burana: *intellectus*), thought (*conceptus*), reflection (*mens*), opinion (*opinio*), reason (*ratio*), and knowledge (*scientia*),[44]

To Gaffurio the musician, cosmic and human harmony were more than abstractions; they were the very basis of music's power and purpose. In the dedication of the *Practica musice* to Duke of Milan Lodovico Maria Sforza, Gaffurio several times recalls music's power and its metaphysical status. After extolling its potential for soothing the cares of people of every condition, he speaks of its force over inanimate things. Finally he invokes musica mundana and humana.

Et enim si Platoni credimus qui Mundi animam Musica modulatione constare dixit: non video profecto cur dubitari possit caetera quoque qualicunque anima degentia: quam eis coelitus datam liquet: non affici laetarique nature suae congruentia: cum similitudinem sibi amicam esse iam palam constet.[45]	If we believe Plato, who said that the world soul consists of musical melody, I surely do not see why it should be doubted that any other living thing possessing a soul, which, it is clear, is a gift of heaven, is also affected by and rejoices in harmonies congruent with its own nature, since it is well known that one is inclined toward something like oneself.

All souls, then, are imbued with harmony, and they derive pleasure from music because it answers to the harmony within themselves.

In the first chapter of the *Practica* Gaffurio cites those who recommended the practice of singing and playing for the education of youth: the Pythagoreans, Platonists, and Peripatetics, and he singles out Aristoxenus, who, as reported by Cicero

ipsius corporis intensionem quandam velut in cantu & fidi- bus: quae harmonia dicitur:	maintained that a certain tuning pitch exists in one's body like that of the voice and instruments called

43. Gaffurio, *De harmonia,* IV, 20; Aristides Quintilianus *De musica* 3.16; Burana trans., fol. 31v.
44. Gaffurio, *De harmonia,* IV, 17; Ptolemy *Harmonics* 3.5; Leoniceno trans., fol. 51r–v.
45. Gaffurio, *Practica musice,* dedication.

sic ex totius corporis natura & figura varios modos fieri [recte: motus cieri] tanque in cantu sonos affirmauerit.[46]

harmony; just as sounds are made in singing, so out of the nature and form of the whole body issue various vibrations.

Gioseffo Zarlino

After Gaffurio comparatively little interest is shown by Italian music theorists in cosmic or human music until Zarlino. Pietro Aron, for example, gives only a perfunctory review of the subject.[47] Zarlino dedicated a chapter to each kind of music, more out of an academic desire for completeness than because cosmic and human music suited his purpose. Indeed, at the end of the chapter on musica humana he admits: "Because these things belong more to philosophical discussions than to those about music, I shall leave speaking any more about it, content to have said these few words and demonstrated the variety of animistic music, of which I shall make no further mention, since it little suits my purpose, or not at all."[48]

What interested him more than the conventional theories was the power that music had on the passions and the means by which it could be activated, and to these matters he devoted two chapters in Book II.[49] If Zarlino considered the Boethian categories at all, it was because he wanted to make a classification of music that departed from the conventional one, although starting from it. He wanted to define each class of music "so as not to stray from the good order maintained by the ancients, who desired that every discussion of anything that is done rationally must begin with a definition, in order that the subject of the discussion be understood."[50] He therefore divides all music into animistic (*animastica*) and organic (*organica*), the first containing musica *mondana* and humana, the second divided into harmonic, or natural—that is, vocal music—and artificial, or instrumental, music.

For Zarlino musica mondana bonds things seen and known in the heavens, joins the elements, and controls the seasons. With respect to the heavens, harmony reigns over the revolutions, distances, and parts of the celestial spheres, and it determines the aspects, nature, and locations of the seven planets. Although he concedes that Aristotle rejected celestial music, Zarlino

46. *Tusculan Disputations* 1.9.19–20: "proxime autem Aristoxenus, musicus idemque philosophus, ipsius corporis intentionem quandam, velut in cantu et fidibus quae harmonia dicitur, sic ex corpori totius natura et figura varios motus cieri tamquam in cantu sonos."

47. *Toscanello in musica* (Venice, 1523), 1529 ed., I, 4. The authors he mentions are Plato, Cicero, and Boethius, but he probably knew them only through Gaffurio.

48. *Le Istitutioni harmoniche,* I, 18.

49. Ibid., II, 7, 8.

50. Ibid., I, 5, p. 10.

pleads that it was nevertheless favored by Cicero and many ancient philosophers, particularly Pythagoras. Zarlino defends with some persuasion the idea of celestial harmony, if not its audible or inaudible music.

> But every reason persuades us to believe at least that the world is composed with harmony, both because its soul is a harmony (as Plato believed), and because the heavens are turned around their intelligences with harmony, as may be gathered from their revolutions, which are proportionate to each other in velocity. This harmony is known also from the distances of the celestial spheres, for these distances (as some believe) are related in harmonic proportion, which, although not measured by the sense, is measured by the reason.[51]

Zarlino attributes to Pliny the intervallic distances between the planets as measured by the Pythagoreans, but the doctrine he transmits, taken from Gaffurio, is based not on Pliny but on Censorinus. For a correlation between the parts of the sky and consonances, Zarlino refers the reader to Ptolemy. There is further correspondence between the longitudes and the diatonic, chromatic, and enharmonic genres, and between the latitudes and the modes. The faces of the moon are coordinated with the conjunctions of the tetrachords. As for the aspects of the planets, there is such a variety "that it is impossible to explain it."[52] Astrologers, however, believe that certain aspects are malignant, others benificent. For example, when Jupiter is found between Saturn and Mars, it tempers their ill effects. The elements and their associated qualities of hot-cold, dry-humid, are also mediated and harmonized by numerical proportions. Thus fire and water are twice mediated by air through the sesquialter proportion; heat mediates fire and air, and humidity mediates air and water. Other proportions govern the transmutation of one element into another, as water into air. A similar harmony is found in the four seasons. Therefore, when Mercury discovered the lyre or kithara, according to Boethius and Macrobius, he gave it four strings, after the four elements and four seasons, while Terpander gave it seven strings, in imitation of the seven planets.

Zarlino displays no deep commitment to this ancient lore, but he does not try to refute it. He omits any mention of angels, although he does say that "many were of the opinion that in this life every soul is won by music, and, although the soul is imprisoned by the body, it still remembers and is conscious of the music of the heavens, forgetting every hard and annoying labor."[53]

Zarlino is more decisive about musica humana, which, he asserts, every-

51. Ibid., I, 6, pp. 12–13.

52. Ibid., I, 6, p. 13.

53. Ibid., I, 6, p. 12.

Ptolemy 3.5	Gaffurio IV, 17	Gogava III, 4	Zarlino I, 7
phantasia	phantasia	imaginatio	imaginatione
nous	intellectus	mens	mente
ennoia	conceptus	memoria	memoria
dianoia	mens	inquisitio	cogitatione
doxa	opinio	opinio	opinione
logos	ratio	ratio	ragione
epistēmē	scientia	scientia	scienza

Figure 8.4.
Terminology in Ptolemy, Gaffurio, Gogava, and Zarlino

one can contemplate in himself. This harmony "mixes with the body the incorporeal animation of reason" and unifies the rational and irrational parts of the soul.[54] Zarlino's schedule for the development of the human embryo departs from that of Censorinus—the numbers are 6, 9, 12, and 18, at the end of which cumulative period of 45 days human generation is completed, and the body receives from God the intellective soul. Although the numbers combine to form fifths, fourths, and octaves, Zarlino would not call this musica humana. Rather, true human music is that which welds the parts of the body together and similarly those of the soul, and the two together. Zarlino, like Gaffurio, draws from Ptolemy the analogies between the consonances and the three parts of the soul and between the species of consonances and the intellective, sensitive, and habitual functions.[55] Zarlino's terminology is not unlike Gaffurio's, but this can be attributed to the coincidence of Gogava's and Leoniceno's solutions for the Latinization of the Greek terms. In the cases where Gaffurio and Gogava differ widely, Zarlino follows Gogava. For example, in the faculties of the intellective soul, which are compared to the seven species of diapason, Leoniceno-Gaffurio, Gogava, and Zarlino offer the mostly parallel solutions to Ptolemy's terminology shown in Figure 8.4.

Where Gogava and Gaffurio differ, namely, in the pairs *imaginatio-phantasia, memoria-conceptus, inquisitio-mens,* Zarlino followed Gogava. Zarlino chose *memoria* despite the fact that it is an incorrect translation of the Greek word, showing that he did not have the Greek before him. Another clue to the independence of Zarlino from Gaffurio in this chapter is the clinching statement that Anger, Reason, and Virtue harmonized could produce Justice or Fortitude. Gaffurio omitted discussion of this difficult passage in Ptolemy, which was adequately translated by Gogava but badly contracted by Zarlino.

54. Ibid., I, 7, p. 16.
55. Ptolemy *Harmonics* 3.5.

Another important kind of harmony is that joining the soul and body. The two are linked, Zarlino notes, by the spirit, a concept he attributes to the Platonists. In fact, however, as D. P. Walker has pointed out, Zarlino probably had in mind the *spiritus* of Ficino's *De triplici* vita.[56] Only those whose faculties are joined in harmony can appreciate music and enjoy refreshment of that spirit which links the soul and body. Those who lack the proportionate structure of the part of the brain near the ear that judges harmony are deprived of music's healing power:

> Nature has ordered things well in having joined (as the Platonists believe) our body and soul through the spirit. To each [body, spirit, and soul] Nature has provided appropriate remedies when they are weak and infirm. When it is listless and infirm, the body is brought back to health with cures wrought by medicine, and the afflicted and weak spirit, by the aerial spirits and by instrumental and vocal music, which are proportionate remedies for it. As for the soul, locked up in this corporeal prison, it is consoled by means of divine mysteries and sacred theology.[57]

Human harmony resides also in the union of the four elements of the body, "according to the philosophers," who say that the nerves are composed of earth and fire, the bones of water and earth, and the flesh of all four. If this should seem strange, no one would deny that the four humors—black bile, phlegm, blood, and choler—are united in the body through harmony.

Johannes Tinctoris

If celestial harmony had advocates in the fifteen and sixteenth centuries, it also had detractors. Some of them based their disbelief on Aristotle's refutation of this music; others went beyond to raise further objections. Tinctoris gave a prominent place to his rejection of the music of the spheres in the dedication (entitled *Prologus*) of the *Liber de arte contrapuncti* to his employer and patron in Naples, Ferdinand (Ferrante) I, king of Sicily. Why such a refutation should claim prime space in a treatise on counterpoint is not altogether clear. It may have been a lively local issue, since Giovanni Pontano in his *Urania, sive de stellis* had celebrated the planets but conspiciously failed to mention their music.[58]

Tinctoris found nothing but disagreement concerning the pitches the

56. D. P. Walker, *Spiritual and Demonic Magic,* p. 28.
57. Zarlino, *Istitutioni,* I, 4, p. 9.
58. See Giuseppe Saitta, *Il pensiero italiano nell'umanesimo e nel rinascimento* (Bologna, 1949) I, 635–36.

planets produced, despite the support celestial harmony had from estimable philosophers such as Plato, Pythagoras, Cicero, Macrobius, Boethius, and Isidor. Aristotle's position, which vigorously rejected the idea that there was any sound, real or potential, in the heavens, seemed to him wiser.[59]

Besides Aristotle himself Tinctoris invokes the authority of "his commentator, together with our more recent philosophers." It is not clear who these are. Seay identifies the commentator as Thomas Aquinas, who does, indeed, side with Aristotle on this question.[60] But it is not likely that Tinctoris would refer to Aquinas, a philosopher in his own right, as a commentator. More likely he referred in this way to Alexander of Aphrodisias or Themistius, both of whom commented on *De caelo*. The commentator is probably not Aquinas also for the reason that only in 1492–93 was Aquinas' commentary copied for Ferrante's library, suggesting that until then it was missing from the collection of books that would have been available to Tinctoris.[61]

Tinctoris does not review Aristotle's objections; he simply reports that the philosopher proved that there was neither actual nor potential sound issuing from the spheres. Aristotle's arguments should be recalled by us, however.[62] The philosopher cites several assumptions of the Pythagoreans: that the heavenly bodies must produce sound because they are so massive and move at high speed; that the speeds of the stars, judged by their distances, are in the ratios of musical consonances and thus produce a concordant sound; that this sound is not audible to men because it has been heard from birth. Aristotle objects that even if one accepts the last argument, loud sounds should leave evidence in other effects, such as splitting stones and other materials, for the noise of objects as large as the stars would be of this magnitude. To this retort Alexander added that if the sounds of these motions were in our ears, we would not hear those made by smaller objects. The critical point for Aristotle was that the stars and planets, not being self-moving, as he showed elsewhere in the treatise,[63] are carried passively and silently in the sweep of the revolving spheres, like the parts of a moving ship, or a ship drifting downstream.

If the commentator Tinctoris had read was Thomas Aquinas, Tinctoris

59. See the passage quoted in ch. 1 from *The Art of Counterpoint,* trans. Albert Seay, pp. 13–14.

60. *In Aristotelis libros de caelo et mundo expositio,* II, 14.

61. According to Tammaro de Marinis, *La biblioteca napoletana dei re d'Aragona* (Milan, 1947–52), I, 63–64, 74–75, n. 29, the manuscript of Aquinas' "Explanatio librorum Aristotelis de coelo et mundo" in Ferrante's library, now Paris, Bibliothèque Nationale, MS lat. 6525, was not copied until then.

62. *De caelo* 2.9.292b.

63. *De caelo* 2.8.

would have known further arguments both pro and contra. For Aquinas introduces the comment of Simplicius, in favor of the Pythagorean position, that the sounds of the celestial bodies is not corruptive of the senses, as excessively loud sound would be, but preservative and vivifying. Simplicius also denied that the Pythagoreans believed people failed to hear the harmony because of habituation; rather it was because their ears were not sensitive to this particular harmony, which Pythagoras himself could hear, just as dogs can smell things that men cannot. Aquinas counters Simplicius' arguments by pointing out that the sun's brightness, although it is vivifying, still corrupts our sight because of excessive light, and similarly the sound of planets would injure the ears. As to the second point, he argues that humans take pleasure in the fragrance of roses and lilies, which animals do not, whereas animals are aware of odors that promise food but not of certain others. But both men and animals recoil from excessive light. Thus there could be no sounds from the movements of celestial bodies unless perceived by men or unless their sense of hearing were ruined by the sounds.

All of these objections to the theory are not detailed in Tinctoris' account, of course. But many of them must have been known to him. It is strange that he did not debate the question in the two works that provided the best opportunity: *Complexus effectuum musices*[64] and *De inventione et usu musicae*.[65]

Who were "the more recent philosophers" unnamed by Tinctoris who denied the existence of a sounding cosmic harmony? One looks immediately at the circle around the Aragonese court in Naples. Giuseppe Saitta[66] has identified a group of philosophers and scientists whose activities centered on the Aragonese court. Giovanni Attaldo taught Aristotelian philosophy at the university and published commentaries upon Aristotle's works. Girolamo Tagliavia promulgated the opinion of Philolaus that the earth revolved around the sun and wrote on the system of the world. Antonio Ferrariis, "il Galateo," demonstrated that one might navigate west to reach the East Indies. Most important of all was Giovanni Pontano, a vigorous opponent of Florentine Neoplatonism. Although he alludes in his poem *Urania, sive de stellis* to mythological figures, such as Saturn and Jupiter, and to the signs of the zodiac, they are for him personifications of natural forces. In the very opening lines he refers to the the stars "slipping silently" (sydera mundo labantur tacito),[67] and nowhere in this or other astronomical

64. Albert Seay, ed., *Tinctoris Opera theoretica* II (American Institute of Musicology, 1975), pp. 166–77.

65. Karl Weinmann, ed., in *Johannes Tinctoris und sein unbekannter Traktat* "De inventione et usu musicae" (Tutzing, 1961).

66. *Il pensiero italiano nell'umanesimo e nel Rinascimento,* I, 634.

67. *Urania, sive de stellis,* in *Opera* (Venice, 1513), 1.2.

and astrological works does he broach the subject of the music of the spheres, as if it were unworthy of his attention.

Of the older humanist writers who articulated the case against the harmony of the spheres, the most notable was Coluccio Salutati, but since his unfinished *De laboribus Herculis,* in which he treated this question, was not published, his views may not have been known to Tinctoris. He began the first book, that which is of interest here, between 1383 and 1391, according to the editor, B. L. Ullman.[68] This first book is essentially a defense of poetry, and the subject of the spheres enters into it because, Salutati maintains, the poet intuits within his soul an admirable sweetness of universal harmony. But this exists only in the poet's imagination, not in the movements of the planetary bodies. After much deliberation, he says he arrived at the opinion that there was no probable reason for assigning musical melody, as the Platonists did, to the movement of the heavens.

Nam sonum, qui prorsus exigit aerem per quem giris infinitis sese succesive multiplicantibus explicet, cum supra peryferiam ignis impossibile sit secundum naturam aerem reperiri, vanum prorsus est celis ascribere et armoniam celestem, sicut illi creduntur facere, somniare.[69]	Since sound certainly requires air, through which it unfolds in infinite revolutions successively multiplying themselves, and since above the periphery of fire it is impossible to find air according to nature, it is surely false to attribute to the heavens a celestial harmony, or to dream of it, as they [the [Platonists] are thought to do.

Is not the idea of a celestial symphony laughable, he asks.

cum omnes spere rotunde sint, si sonum efficiant, ut illi velle videntur, a totius mundi circumferentia excitabitur sonus et supra totam machinam universi per inane quoddam, ubi nichil prorsus esse creditur, expandetur; imo potius expandi non poterit, cum nichil sit ultra celum quod ad sonus impulsum moveri queat,	Since all spheres are round, if they produced sound, as those [philosophers] appear to maintain, sound would be called forth from the circumference of the whole world, and it would be spread out over the entire machine of the universe, of no use to anyone, as nothing is believed to exist there. Nay, indeed, it could not spread beyond, because there is nothing beyond the sky that could be moved to stimulate sound

68. Coluccio Salutati, *De laboribus Herculis,* ed. B. L. Ullman (Zurich, 1951), p. vii. Salutati wrote to a friend in 1405 that he had finished the second book.

69. *De laboribus Herculis,* I, 5, p. 23.

et giros qui sonum deferunt	and to unfold the revolutions that propagate sound.[70]

Salutati saw a further difficulty with the theory. If sound were produced at the circumference of a sphere, it would have to be borne toward the center, but this would require a motion that is contrary to the natural motion of sound, which radiates from a center to a circumference, so that the circulations directed toward the center would break against the fluid circulations tending outward, and the sound would never reach the ear. The person receiving the sound appears to be located by Salutati on a surface, the earth, that is covered by the sphere as if by a great dome. The sound produced at the circumference of the dome would have to depart from that "concavity," as Salutati calls it, to descend toward the center, where the listening ear is situated. But the descent is prevented by the outward motion natural to sound. The fact that we hear thunder does not negate the argument, because thunder emanates from a certain region that makes a slit in the spaces of the orbs. That is to say, it does not proceed from the whole circumference in concentric circles inward, but in a lateral direction.

As with arguments against the spheres that we shall encounter later, Salutati departs from a particular conception of the cosmos, then applies principles of mechanics derived from the observation of nature to arrive at a legitimate conclusion. Although the original premise was faulty and the arguments insufficient, the exercise is significant in that a skeptical mind invoked a process of scientific inquiry concerning a natural phenomenon rather than accept as truth an untested metaphysical doctrine.

Francisco de Salinas

The first musical writer who took the trouble to present a refutation of the theory of celestial harmony is Francisco de Salinas. At the outset of his treatise *De musica libri septem* (1577), he declares that he will abandon the conventional division of music into mundana, humana, and instrumentalis to establish a tripartite division that is based on new criteria— whether it moves only the sense, only the intellect, or both. In the category that moves only the sense of hearing belong the songs of birds, which give pleasure but are not subject to harmonic ratio, if by chance harmonic intervals may be found in them. This is irrational and cannot properly be called music.

The second category is that "comprehended under the two [species] of the ancients, mundana and humana, the harmony of which is perceived not with the pleasure of the ears but the contemplation of the intellect."[71] Salinas

70. Ibid., I, 9, pp. 40–41.

71. Salinas, *De musica libri septem,* I, 1, p. 1.

would not deny, he says, that there is concord in the disparate movements of the celestial bodies, and particularly in the number 12, which contains the consonances and the whole tone, for this number was called musical (*musikotaton*) by Aristotle. But as to the sound of planetary motion, Salinas emphatically denied its existence:

> We do not believe that celestial motions yield any sounds at all, whether as subject or as efficient cause, as it pleases the physicists. Now aside from the reasons of Aristotle, which we did not wish to translate here, lest we seem to want to teach physics rather than music, it appears certainly probable that the creator of the universal framework would not have made anything superfluous any more than he would have failed to provide the necessities. For such would have been that celestial sound which could not be heard by anyone: not by men, since they give many reasons why it happens that this sound does not reach our ears; and not by the intelligences that move the heavens, since they neither have ears nor need them. For this reason I believe that one must come to the same conclusion concerning celestial music as the music of the elements. Since what is perceived in the combination of the elements and in the seasons depends not on the sense of hearing but on the judgment of reason, it is like that which is found in the parts of the soul in which all the proportions of the consonances are said to reside. Thus the rational faculty holds to the irascible a sesquialter ratio, in which the diapente is shown to be formed, and the irascible to the concupiscible, a sesquitertian, in which the diatessaron is found, resulting in the perfect diapason, in which the soul consists. And, just as in vocal or instrumental music the diapente contains the diatessaron but not the opposite, and the diapason contains them both but is not contained in them, so the faculty of sensation contains the vegetative but is not contained in it, and the rational faculty alone contains the other two but is not contained by them.[72]

Salinas, then, was willing to recognize a harmony in celestial movements, as also in the parts of the soul. But he would not call this music. Their architecture may be shaped by numerical proportions, but this is as far as Salinas would go.

Giovanni Battista Benedetti

A more rigorous refutation of the celestial harmony was undertaken by Giovanni Battista Benedetti. The exact date of his essay is unknown, since the book in which it was published, the *Diversarum speculationum mathematicarum & physicorum liber* of 1585, is a collection of studies undoubtedly compiled over a long period of time. It occurs in a chapter entitled "That the opinion of the Pythagoreans concerning the sound of the celestial bodies

72. Ibid., I, 1, p. 2.

was not adopted by Aristotle."[73] The opinion of the Pythagoreans is exploded through the glosses of the philosophers, Benedetti proclaims. The celestial orbs that they maintain they hear sounding are either contiguous or distant from each other. If they are distant, which no one believes, there is a vacuum between them, so that, not touching, they cannot emit a sound. Sound requires that air enter a confined place. If no air or fluid body exists in the ethereal region, the celestial orbs by themselves cannot produce sounds. Experimenting with a fluid body by passing it over another soft body, one will find no sound produced. Also, when a spherical body moves speedily around its own axis, it will not make any sound, since it is not displacing another body. If, on the other hand, the orbs are contiguous, then, because their surfaces are thought to be finely polished and soft, there is no roughness or unevenness to produce a sound when they are rubbed together.

Benedetti fails to find any of the harmonic proportions in the sky. He enumerates the ratios of the consonances, as defined not by the ancients but by modern musicians: 2:1, 3:2, 4:3, 5:4, 6:5, 8:3, and 5:3. The dissonances, which, he says, serve "harmonic modulations," are 9:8, 10:9, 16:15, 25:24, 29:28, and 27:25. Ptolemy, he argues, did not find any of the harmonic intervals in the aspects of the sky.[74] With musical intervals, the diapason can be divided by a harmonic mean into a diapente and diatessaron, and similarly a diapente into a ditone and semiditone, and if a semiditone is subtracted from a diapason, a major hexad remains, whereas if a ditone is subtracted from a diapason, a minor hexad remains. Nothing parallel happens when aspects are subtracted from each other. If a trine is subtracted from a sextile, another sextile remains, and if a quartile aspect is subtracted from the aspect of opposition, another quartile remains.[75] Benedetti admits that there is order in the velocities, magnitudes, distances, and influxes of the celestial bodies, for through the divine providence of God the universe is made perfect, but nothing in these quantities fits the proportions of musical harmony.

Celestial Harmony as Myth and Metaphor

Despite the increasing skepticism about the celestial harmonies, the notion continued to exert its fascination, particularly on poets and dramatists. The

73. *Diversarum speculationum mathematicarum & physicorum liber* (Turin, 1585), ch. 33: "Pytagoreorum opinionem de sonitu corporum coelestium non fuisse ab Aristotele sublatam," pp. 190–91.

74. But for another view, see Jamie Croy Kassler, "Music as a Model in Early Science," *History of Science* 20 (1982):117–20, where Ptolemy is shown to have noted the ratios between the angles as paralleling those of the consonances.

75. Translated into degrees of arc, taking a quartile, or 90 degrees, from the aspect of opposition, 180 degrees, leaves another quartile. Subtracting a sextile (60 degrees) from a trine (120 degrees) leaves a sextile (60 degrees).

most splendid celebration of the idea was the first intermedio of the entertainments of 1589 for the wedding in Florence of Grand Duke Ferdinand de' Medici and Christine of Lorraine. The verses were written by Giovanni Bardi, who was partial to Neoplatonic philosophy, and Ottavio Rinuccini. Rinuccini's chorus of sirens describe how they make the celestial spheres turn: "Noi, che cantando, le celesti sfere / Dolcemente rotar facciamo intorno" (We, as we sing, make the celestial spheres sweetly revolve). The classical source is Plato's *Republic,* Book 10, in which Socrates recounts the myth of Er. Indeed, the description of the entertainment by Bastiano de' Rossi, tells us—and the surviving scenic designs back him up— that at the center of the stage was a cloud bearing Necessity and the three Fates.[76] Around them turned the planets (see Figure 8.5). the spheres in which they moved as whorls within whorls. On the surface of each whorl was a siren, "hymning a single sound and note. The eight together form one harmony; and round about, at equal intervals is another band, of three in number, each sitting upon her throne: these are the Fates, daughters of Necessity, who are clothed in white raiment and have crowns of wool upon their heads, Lachesis and Clotho and Atropos, who accompany with their voices the harmony of the sirens—Lachesis singing of the past, Clotho of the present, Atropos of the future."[77] According to Rossi, the Fates invite the Sirens to climb upwards in the sky and to join Neccesity and the Planets in song:

Parche	*Fates*
Dolcissime Sirene,	Sweetest Sirens,
Tornate al Cielo, e 'n tanto	return to the heavens, and meanwhile
Facciam, cantando, a gara	let us raise, singing, in contest
Un dolce canto.	a sweet song.
Sirene	*Sirens*
Non mal tanto splendore	Never such splendor
Vide Argo, Cipro, o Delo.	did Argos, Cyprus, or Delos see.
Parche	*Fates*
A voi, regali amanti,	To you, royal lovers,
Cediam noi tutti gran Numi del Cielo.	all we great gods of the heavens yield.

They all then join in praising the wedding couple.[78] This is presented as a myth, along with others in the succeeding intermedi, all illustrating the

76. Bastiano de' Rossi, *Descrizione dell' apparato e degl' Intermedi fatti per la commedia rappresentata in Firenze nelle nozze de' Serenissimi Don Ferdinando Medici, e Madama Cristina di Loreno, Gran Duchi di Toscana* (Florence, 1589).

77. Plato *Republic* 617, trans. Jowett.

78. Italian text in *Musique des intermèdes de "La Pellegrina,"* ed. D. P. Walker (Paris, 1963), p. xxxix.

Figure 8.5.
Necessity and the three Fates, costume design by Bernardo Buontalenti, for the first intermedio of 1589, Florence, Biblioteca Nazionale Centrale, MS C.B.3.53

power of music: the contest of the Muses and Pierides, the battle between Apollo and the Python, the story of Arion saved by the dolphins, and the granting of music by the Muses to humanity. In associating the harmony of the spheres with these other myths Bardi relegated it to the realm of fiction. As John Hollander characterized the evocations of celestial harmony in seventeenth-century poetry, they became "decorative metaphor and mere turns of wit."[79]

79. John Hollander, *The Untuning of the Sky: Ideas of Music in English Poetry, 1500–1700* (Princeton, 1961), p. 19.

NINE

Gaffurio as a Humanist

Of the fifteenth-century writers who specialized in music Franchino Gaffurio was the most assiduous in seeking out classical sources. His *Theorica musice,* based principally on Boethius, presents corroborating or divergent views insofar as other authors were available to him. But Gaffurio worked under one severe limitation: he apparently could barely read Greek. Of the writings in that language only those translated into Latin or Italian, consequently, were accessible to him. There was a good number in the areas of literature and philosophy. But not one of the principal Greek treatises on music had yet been translated at the time of Gaffurio's *Theoricum opus musice discipline* (1480), his first exposition of musica theorica, and not even in the revised and expanded version published in 1492 as *Theorica musice* is there much evidence of his penetration into musical sources of antiquity. As we have already seen, Gaffurio did commission at around this time the translation of the most important of these: the *Harmonics* of Ptolemy, the *De musica* of Aristides Quintilianus, the *Harmonics* of Bryennius, the *Introduction* of Bacchius, and the three anonymous manuals known until recently as Bellermann's anonymous. Meanwhile Giorgio Valla's translation of Euclid's and Cleonides' short treatises came out in 1497,[1] and Carlo Valgulio's translation of pseudo-Plutarch's *De musica* appeared in 1507,[2] though Gaffurio may have seen it already in manuscript.[3]

That Gaffurio knew of the existence of some of these sources already in

1. *Cleonidae harmonicum introductorium* (Venice, 1497).
2. *Charoli Valgulii Prooemium in musicam Plutarchi ad Titum Pyrrhinum* (Brescia, 1507).
3. Gaffurio first mentioned it in *Angelicum ac divinum opus musice* (Milan, 1508), I, 18, fol. D4r. He calls him "Carolo Valgulio Bersano homo doctissimo & experto in tute le discipline." Although Gaffurio did not cite Plutarch in *Theorica* in 1492, he used material from his *De musica,* for example, in I, 1, fol. a1r–v. My attention was drawn to the Plutarch borrowings by Walter Kreyszig, who is preparing an English translation of the *Theorica* and study of sources as a Ph.D. dissertation at Yale University.

1492 is evident from his listing among writings on music in the beginning of his *Theorica* the following as authors of *copiosa volumina:* Aristoxenus, Ptolemy, Bryennius, Aristides Quintilianus, and Bacchius.[4] This listing in the first chapter of Book I, missing in the 1480 version, shows Gaffurio's increasing awareness of the Greek literature on music, however little of it he could read. Besides those works he knew survived, there were many others he knew by reputation and barely mentioned for the sake of completeness.

How many of the Greek and Roman writings did Gaffurio know firsthand? Of the five authors and the anonymi that he had translated, only Bacchius appears to be quoted directly in the *Theorica*. Unfortunately we do not know the date of completion of this translation, apparently done by Francesco Burana, for it does not survive. The earliest date on any of the surviving translations is 1494, when the Aristides Quintilianus and the anonymi were completed by Burana.[5] At this time Gaffurio knew Aristoxenus only through the biased commentary of Boethius, which in turn is derived from Ptolemy. Likewise, he knew Ptolemy's *Harmonics* only through Boethius and apparently did not realize that the entire Book 5 of Boethius was a Latin paraphrase and abridgment of part of Ptolemy's Book 1. Neither Aristides Quintilianus nor Bryennius is cited in the *Theorica,* though their names are mentioned. Nicomachus and Porphyry, although represented in manuscripts then available, were never more than names to Gaffurio.

The remaining "authors" on music named by Gaffurio were known to him only secondhand. Some are musicians whose writings, if there were any, do not survive: Theodorus Cyreniacus, Xanthus of Athens, Dionysodorus, Simmias of Thebes, and Aristo of Athens.[6] Others are authors who wrote only incidentally about music in works of more general scope or whose works survive only fragmentarily: Archytas, a mathematician who may have influenced the author of the *Division of the Canon,*[7] Philolaus, Eratosthenes, Theophrastus, and Heraclides Ponticus. Most of these must have been mere names to Gaffurio. On the other hand, he had available translations of Democritus, Xenophon, Aristotle, Plato, and Themistius. As for Latin authors, whether classical or medieval, there is no doubt that Gaffurio read them conscientiously.

In his *Theorica* Gaffurio aimed to embrace the entire corpus of musical

4. *Theorica musice,* I, 1, fol. a6r–v.

5. Concerning this and the other translations made for Gaffurio by Burana and Leoniceno, see ch. 6 above.

6. On these figures see Solon Michaelides, *The Music of Ancient Greece, An Encyclopaedia* (London, 1978).

7. Books VII–IX of the *Elements of Geometry* are also said to derive from Archytas. See Edward A. Lippman, *Musical Thought in Ancient Greece* (New York, 1964), p. 153.

theorizing left by the classical Greek authorities. Boethius was his main source, but where he could supplement him, Gaffurio earnestly tried to do so. On a number of points significant for music theory and aesthetics, Gaffurio was able to bring the ancient authors to bear directly on the Boethian doctrine. The most important fresh impulses came from his reading of the works of Plato in Marsilio Ficino's Latin translation, together with Ficino's commentaries on them, the Aristotelian *Problems* in the Latin translation published with d'Abano's commentaries, and the *Paraphrases* of Themistius on the *De anima* of Aristotle in the Latin translation of Ermolao Barbaro.

Whereas in much of the *Theorica* Gaffurio was content to paraphrase or even repeat Boethius verbatim, the almost direct contact with the words of Plato through Ficino inspired him to write his own commentary, in which he at times paraphrased Ficino but more often drew together from diverse dialogues the essence of Plato's ethical doctrine of music. Gaffurio's comentary on musical ethics, for example, occurs in a location parallel to that in Boethius, namely Book I, chapter 1, but it strikes out independently. The passage merits quotation in full:

> Socrates and Plato and also the Pythagoreans, attributing a moral resource to music, ordered by a common law that adolescents and youth, and young women too, be educated in music, not for inciting to desire, through which this discipline becomes cheapened, but for moderating the movements of the soul through rule and reason. Just as not every note is valid for a melody of sounds but only that which makes a good consonance, so also not all motions of the soul but only those that are suited to reason belong to the correct harmony of life.[8] God gave us sound and hearing for this purpose, as Plato in the *Timaeus* is seen to claim, for speech tends and contributes very much toward this purpose. For every use of music was given for the sake of harmony, and harmony, which has motions that are congruent and akin to the wanderings of our soul, was given by the Muses to men who use them with sagacity, not for pleasure devoid of reason, as is now seen to be its usefulness, but so that we may calm through it the dissonant revolutions of the soul and render it a harmony consonant within itself. Rhythm, too, was dedicated to this purpose, so that we might very aptly temper an immoderate character lacking grace in us.[9] Now since the nature of boys is restless and desirous of amusements all the time and on that account does not tolerate severe discipline, Plato himself orders that boys be educated in honest music, the pleasure of which most commonly offers the pathways of virtue. On the other hand, it is occasionally also to be assigned to older men as an honest amusement for the consolation of a laborious life. Those consolations which are valid to amuse this honest

8. Here begins an almost verbatim citation of Plato *Timaeus* 47c–e in Ficino's translation.

9. Here ends the direct quotation from Ficino's translation.

old age are to be studied in youth. For this reason Plato held these same boys in check by a triple bridle, that is fear, law, and true reason, lest they fall into the triple impulse of food, drink, and desire of coitus.[10] Thus, with moderate use from youth of honest pleasures, drawn away from shameful things, they would gradually be incited to serious studies. He wanted also that they have leisure for gymnastic games through exercise of the body, as by dance and wrestling. But dance, whether it imitates the words of the Muse [that is, the poet], marking her magnificence and freedom, or whether for the sake of good condition, nimbleness, and form of the body itself as well as its parts and members, it aptly flexes and bends each and every part so that it fosters a sufficiently harmonious motion that follows the universal orderliness of dance.[11]

. . . I agree with Plato that nothing flows so easily into the tender and soft souls as various tones of song, whose power in either direction is such that it can hardly be described, for it both excites the lazy and makes the excited relaxed, and, just as it relaxes souls, it also constricts them.[12] It was of interest to many cities in Greece to preserve this manner of the antique notes, cities whose mores were fallen to softness and transformed along with their songs, or were depraved with sweetness and corruption, as some believed, when their severity declined because of various vices, and the condition for this mutation existed in the ears and souls that had been changed. For this reason Plato, that very wise man of Greece, and by far the most learned, assiduously shunned this ruin, because he denied that it is possible to change musical laws without a change of the public laws.[13]

A central passage in the above quotation (delimited by footnotes 8 and 9) is drawn from Ficino's translation of the *Timaeus,* as may be seen in the comparison below (Gaffurio, left; Ficino, right).

Vocem nanque & eius auditum huius
rei gratia nobis deus dedit ut in
Timeo Plato uidetur asserere nam
ad hec ipsa sermo pertinet plurimum-
que conducit. Omnis enim musicae
uocis usus harmoniae gratia est
tributus. Atque & harmonia quae
motiones habet animae nostrae
discursionibus
congruas atque cognatas homini
prudenter musis utenti non ad
uoluptatem rationis expertem:
ut nunc uidetur est utilis: sed

Vocem quoque auditum que eiusdem
rei gratia deos dedisse nobis
existimo. Nam
ad haec ipsa sermo pertinet, plurimum-
que conducit, omnisque musicae
uocis usus harmoniae gratia est
tributus. Atqui & harmonia, que
motiones habet animae nostrae
discursionibus
congruas atque cognatas, homini
prudenter musis utenti non ad
uoluptatem rationis expertem,
ut nunc uidetur, est utilis: sed

10. Plato *Republic* 439a–e.
11. Plato *Laws* 673.
12. Plato *Republic* 401d–e.
13. Ibid. 424c.

a musis ideo data est: ut per
eam dissonantem circuitum animae
componamus ad concentum
sibi congruum redigamus.
Atque rhythmus ad hoc uidetur
esse tributus ut habitum in nobis
immoderatum gratiaque carentem
aptissime temperemus.[14]

a musis ideo data est, ut per
eam dissonantem circuitum animae
componamus, & ad concentum
sibi congruum redigamus.
Rhythmus quoque ad hoc uidetur
esse tributus, ut habitum in nobis
immoderatum gratiaque carentem
temperemus.[15]

Gaffurio's method of absorbing the ancient writings through direct quotation (without, to be sure, quotation marks) leads to some ambiguities. It is not clear whether Gaffurio's intention was to apply Plato's strictures to the music of his time, or whether, too busy copying, he allowed such an expression as "not for pleasure devoid of reason, as is now seen to be its usefulness," to creep into a statement that, lacking any sign of direct quotation, the reader, mistakenly perhaps, is likely to accept as Gaffurio's own reflection on the music of his time. Such ambiguity is inevitable in a book that is a quilt of quotations. Yet, from all we know of Gaffurio, Plato's puritan attitude fitted his own pious nature.

Another source of misunderstanding is Gaffurio's habit of juxtaposing quotations and paraphrases from various sources. For example, in defending the importance of number in music and in arithmetic, Gaffurio went to the dialogue *Epinomis,* the authorship of which is now in doubt, by way of Ficino's translation and commentary. This Gaffurio paraphrased, preserving key words (Gaffurio, left; Ficino, right):

In cunctis enim rebus Diuus Plato
in Philosopho siue Epinomide nume-
rum ipsum esse necessarium docet:
quod et si pluribus quoque rationibus
monstrari liceat recte nunc hanc
potissima ratione declaratur.
Nanque ceterae artes sublato
numero penitus euanescunt.
utque de nostra facultate sit
sermo. tota ipsa musica motus &
vocum numero indiget.[16]

Ita necesse est omnino numerum
praesupponere. Idemque
necessarium esse,
pluribus etiam rationibus
monstrari licet. Sed recte nunc
ratione hac ostenditur,
quod caeterae artes quas omnes
paulo ante enumerauimus,
sublato numero penitus euanescent.
. . . Nam et tota musica motus et
vocum numero indiget.[17]

In all things, Gaffurio wants to say, Plato taught that it is necessary to start with number, and that if number were removed, all the arts would

14. Gaffurio *Theorica,* I, 1.
15. Ficino trans., 1532 ed., p. 716.
16. Gaffurio, *Theorica,* II, 6.
17. Ficino trans., p. 920.

vanish.[18] The whole art of music depends on the numbering of movement and of notes. After a short commentary on the meaning of this passage, Gaffurio (left) shifts without warning from Plato's words to Ficino's "Argumentum in Epinomidem (right)."

Omnia denique mala esse censuit Plato quae concordi numero & pulchritudine carent: Quae vero consentientibus numeris coaptantur bona.[19]

Mala enim in superioribus nominauit; que concordi numero & pulchritudinem carent. Bona uero quae consentientibus numeris coaptantur.[20]

Gaffurio has here cited Ficino's conclusion as if it were Plato's: "Plato decreed, finally, that all things that lack harmony, number, and beauty are bad; good, on the contrary, are those things that are joined together through numbers that are in common accord."

A resource that Gaffurio did not exploit to full advantage at this time was the translation and commentary on the Aristotelian *Problems* by Pietro d'Abano published in 1475. As we saw in chapter 3, d'Abano transmitted together with his own commentary the translation by Bartolomeo da Messina, handed down from the thirteenth century.[21] Gaffurio already knew the *Problems* when he prepared the *Theoricum opus,* for he cited Problem 19.21 to support his contention that the fourth is tolerated in the higher parts of a contrapuntal texture but not as the lowest interval. The higher sounds, produced by faster and weaker motion, make a more fleeting impression on the ear than the lower notes, which occupy more time and give off more sound: "When the time and slowness is greater, it can make a greater discordance and consequently the dissonance is more greatly perceived, as Aristotle says in his twenty-first problem of music, with which the Conciliator [Pietro d'Abano] concurs in his commentary."[22] This problem, which inquires why out-of-tune notes are more noticeable when singers are in their lower range than in the high, thus permitted Gaffurio to rationalize the equivocal practice of treating the fourth as both a consonance and a dissonance, one of the most difficult usages to square with theory.

18. See *Epinomis* 977d–e, trans. J. Harward (Oxford, 1928), p. 84. The Greek text is published in *Platonis Epinomis Commentariis illustrata,* ed. Franciscus Novotny (Prague, 1960).

19. Gaffurio, *Theorica,* II, 6, fol. d1r.

20. Ficino, Argumentum, p. 917.

21. *Expositio problematum Aristotelis* (Mantua, 1475). Among the books in the library of the Church of the Incoronata in Lodi in 1518 was a copy of the *Problems* of Aristotle. That was the year that Gaffurio donated his library to the church, and the d'Abano commentary must have been in it. See Emilio Motta, "I libri della chiesa dell'Incoronata di Lodi nel 1518," *Il libro e la stampa* 1 (1907):105–12.

22. *Theoricum opus,* V, 8, fols. 112v–113r. This same reason is cited also in *Practica musice,* III, 6, but the passage is omitted in the *Theorica.*

Gaffurio seemed content with this rather feeble rationalization, even though he does go on to say that the fourth needs to be raised from the lowest position in a four-voice texture by only a major or minor third for its dissonance to be "extinguished."

In both the *Theoricum opus* and the *Theorica* Gaffurio cites Problem 19.41 to defend the claim of "Pythagoreans and Platonists" that only multiple and superparticular ratios generate consonances.[23] In this problem the Aristotelian author shows that the double fifth (ninth) or double fourth (seventh) do not form consonances, because they are neither superparticular nor multiple, implying that only these classes of ratios can produce consonances. This problem is brought into a similar discussion in Gaffurio's later work, *De harmonia.*[24]

In the final chapter of the *Theorica* Gaffurio contemplates the wonders of the system of *tropi,* or modes, of the Greeks for expressing diverse words and their meanings. The voice, he says, is apt for moving the souls of men, but even more so is the voice joined by instruments, which can excite, quiet, or expel passions of the soul.

> Thus it happens that the soul may be moved by a double affection, that is, through the excitement of both harmony and words, and that music soothes the human ears with wonderful sweetness derived as nowhere else from such measure, so much order, so much measured sonority. Aristotle, too, discusses this more rigorously in his *Problems concerning Music* and seems also to conclude thus. Again every tone or mode has a top and a bottom, which are drawn to the middle (mese). Indeed, without the mese the melody could not be drawn back alternately to the mode after a change.[25]

The unifying principle of the mode was a wonderful discovery, because the octave contains within itself all the harmonies, and it confines through the modes and tones the many diverse operations that composers utilize in voices and instruments. Gaffurio in this passage seems to refer to Problem 19.20, in which the function of the mese to bring a melody constantly back to a focal point is observed. He may also have had in mind 19.38, which speculates about the reason for the universal enjoyment of rhythm, song, and music in general, concluding that ordered movement is allied to our natures, which thrive on order, and that we are pleased by mixtures of sensations, particularly when extremes are harmonized through some concord. The *Problems* evidently helped Gaffurio to clarify his own thoughts concerning the ethos and functions of the modes.

Of the translations Gaffurio commissioned, the one he must have received

23. *Theoricum opus,* IV, 1; *Theorica,* IV, 1, fol. f4v.

24. *De harmonia,* II, 38, fol. 67r.

25. Gaffurio, *Theorica,* V, 8, fol. k4v.

first is that of the *Introduction to the Art of Music* by Bacchius Senior, for he quoted from it quite literally. The date of this translation is unknown and the text of it does not survive, but there is secure evidence that it existed, since it is mentioned both by Gaffurio in the first chapter of *De harmonia* and by Pantaleo Melegulus in his short biographical note at the back of this book.[26] In Book II, chapter 1, of the 1492 book (and missing in the 1480 version) Gaffurio (left below) introduced a long disquisition that derives partly from Bacchius (right below). From this author Gaffurio obtained the division of the elements of music as based partly on nature and partly on usage—"our practice."[27]

Elementorum enim huius musicae rationis quedam naturae insunt quedam usui nostro: Naturae insunt acumina grauitates & diastemata id est interualla ut Baccheus posuit. Vsui autem nostro ipsa pronunciatio & effectio morum circa ipsos sonos.[28]

How does music exist?
Partly by nature,
partly through our practice.
What sort of things by nature?
Height and depth of pitch and the intervals. What sort of things through our practice?
The rendering of emotion through the use of the pitches.[29]

Gaffurio borrows from Bacchius also the definitions of basic terms, such as tone, "the smallest part of a sung melodic utterance is a tone"; system, "that which is sung melodiously with more than two tones"; *diastema,* "the difference or interval between two tones that are different in acuity or gravity"; diesis, "the smallest of the diastemata or spaces or intervals . . . ; the diesis is the smallest interval that our natural capacity can produce by tension or relaxation"; "the double diesis is a semitone"; "a tone is that by which the diapente is greater than the diatessaron."[30]

Gaffurio also cites Bacchius concerning the number of modes (*modi*) and species of diapason used by the Greeks, which he says was seven.[31] Actually Bacchius stated that some sang only three *tropi:* the Lydian, Phrygian, and

26. The statement reads: "Praetereo ueterum musicorum graeca opera: Aristidae quintiliani: Manuelis Briennii: Bacchei senis Introductorium & Ptholomei harmonicon: quae omnia eius cura & impensa a diuersis interpretibus in latinum sunt conuersa." A slightly different version of this is in Lodi, Biblioteca Comunale Laudense, MS XXVIII.A.9.

27. Here I follow Meibom and Ruelle rather than von Jan, who emends *ethopoiia* of the manuscripts to *melopoiia.*

28. Gaffurio, *Theorica,* II, 1, fol. b6v.

29. Bacchius, von Jan ed., 2, trans. Otto Steinmayer, in Bacchius Geron, *Introduction to the Art of Music,* in press.

30. Bacchius *Introduction* 8.

31. Gaffurio, *Theorica* V, 8, fol. k4v.

Dorian. Others sang seven: the Mixolydian, the three just mentioned, and the Hypolydian, Hypophrygian, and Hypodorian.[32]

Gaffurio does not seem to have penetrated far into this treatise at this time. In the *Practica musice* he plumbed it further for definitions: of mutation as the transposition of something similar into a dissimilar location, borrowed from Bacchius' definition of *metabole,*[33] of the sensation of interval not as something audible but rather as something intelligible,[34] and for Aristoxenus' definition of *rhythm* as "a division of time according to each of the things that can be rhythmicized."[35] But he could also give a definition a twist not intended by the original author, as when, on the authority of Bacchius, he defines a *genre* of harmonic music as a "universal phenomenon exhibiting inner diversity and containing species or forms of various musical combinations which we call counterpoint," when what Bacchius called *genre* was "a certain part of harmonics that permits us to recognize the general character of a melody and that contains several diverse forms."[36] Whereas Bacchius was speaking of one of the aspects of the study of harmonics, which could be applied to the composition of melody, Gaffurio interpreted *genre* as a category of polyphonic music. Such misunderstandings were bound to arise when such fundamental terms as *harmonia* could not be isolated from the connotations it bore in Gaffurio's day.

The Greek author whom Gaffurio quoted most extensively in his *Theorica* was Themistius (c. 317–388 A.D.), specifically his *Paraphrases* on the *De anima* of Aristotle. All of Gaffurio's citations can be traced to the translation by Ermolao Barbaro (1454–93) first published in 1481 (Trevisio) and frequently reprinted.[37] Barbaro completed the translation in 1472 at the age of nineteen while reading for a doctorate in letters at the studio of Padua. He later planned to translate all of the works of Aristotle but succeeded in finishing only some of them before he died of the plague in Rome in 1493.

32. Bacchius *Introduction* 46.

33. Bacchius *Introduction* 58; Gaffurio, *Practica,* I, 4.

34. Bacchius *Introduction* 72; Gaffurio, *Practica,* III, 1.

35. Bacchius *Introduction* 93; Gaffurio, *Practica,* II, 1.

36. Bacchius *Introduction* 79; Gaffurio, *Practica,* III, 1, trans. Young, p. 123 as: "the principles of harmonious modulation are universal and produce diverse archetypes or ideal models, as well as diverse arrangements of song, which we call counterpoint."

37. The edition I used at Beinecke Rare Book and Manuscript Library at Yale was: *Themistii Peripatetici Lucidissimi, Paraphrasis In Aristotelis Posteriore, & Physica. In libro item de Anima, . . . Hermolao Barbaro Patricio Veneto Interprete* (Venice, 1554), but I usually cite the edition of Paris, 1535, available in the edition by Richard Heinze (Berlin, 1899). This was not the first translation of the *Paraphrases.* William of Moerbeke made one in 1267 for Thomas Aquinas, who used it in his own commentaries on the *De anima.* William's translation has been edited by G. Verbeke: *Themistius Commentaire sur le Traité de l'âme d'Aristote. Traduction de Guillaume de Moerbeke* (Louvain, 1957).

Barbaro aimed to render faithfully the thought of the author, yet in a style that is truly Latin, elegant, and personal. The translation of Themistius, according to Kristeller, is the first humanist translation of a Greek commentator on Aristotle.[38]

Gaffurio relied upon Themistius mainly for his penetrating commentary on Aristotle's theory of sound and hearing.[39] All of the passages citing Themistius appear first in the 1492 version of the treatise. Gaffurio credits Themistius at least once in each chapter in which he draws upon him, but although he quotes him verbatim (or with only a few changes of word order), he does not employ quotation marks. In this he is consistent, for quotation marks do not appear anywhere in the treatise, though they were common enough in publications and manuscripts of the period. In Book II of the edition of 1492, forty-nine lines of chapter 1, on the definition of music and its elements, forty-five lines of chapter 2, on sound and the voice, and four lines of chapter 4, on the formation of consonance, are direct quotations of Themistius.

Gaffurio showed good judgment in relying so heavily on Themistius' theory of sound. Through this author's commentaries on Aristotle, supplemented by insights from Nicomachus (through Boethius), Gaffurio transmits the most enlightened explanation of the nature, production, and propagation of sound known to the ancient world. This will be shown in chapter 10 below.

The work of musica theorica that Gaffurio completed after the *Theorica musice* was the book published in 1518 as *De harmonia musicorum instrumentorum opus*.[40] The publication date is misleading, however, because all of the surviving manuscripts were completed much earlier. Since in this work Gaffurio had a chance to utilize the translations of the Greek musical treatises he had commissioned, it is crucial to determine how much time he had to absorb these long and complex works while continuing to serve in the demanding job of maestro di capella at the Duomo of Milan.

Gaffurio speaks in the dedication of the printed edition of keeping "this somewhat reluctant treatise at home, although it was awaited by all musicians; through a certain inborn modesty the confined work did not dare to appear in public."[41] But actually he was eager to bring it out, and it awaited only a patron to subsidize the high cost of printing. The manuscript copies that survive attest to the difficulty he had in finding sponsorship. Clement Miller in the introduction to his translation of *De harmonia* has

38. Kristeller, *Studies*, pp. 342–43.
39. *De anima* 2.8.419b–421a.
40. Milan, 1518; facs. ed., Bologna, 1972.
41. Franchinus Gaffurius, *De Harmonia Musicorum Instrumentorum Opus*, introduction and translation by Clement A. Miller (American Institute of Musicology, 1977), p. 34.

discussed three of these manuscripts, but two others that are relevant to our study were apparently unknown to him. What the manuscripts contribute to the publication history of this book will be detailed in the following annotated chronological list.

1. Lodi, Biblioteca Comunale Laudense, MS XXVIII.A.9. Two inscriptions appear at the end of the manuscript: "Die vero Veneris vigesimoseptimo Mensis Martii hoc opus tradidit Absolutum anno Millesimmo quingentesimo" and "Revisum castigatumque est hoc musicum volumen die duodecimo Martii 1514 ab Auctore in aedibus Divi Marcellini Mediolani." These indicate that Gaffurio finished the work on 27 March 1500, but numerous autograph pasted and marginal insertions as well as the final inscription attest to his continued revision until 12 March 1514. The short biography of the author by Pantaleone Melegulo that is appended to the treatise contains evidence that the dedicatee for whom this beautifully illuminated codex was intended was Bonifacio Simonetta (c. 1441–1502), abbot of the Monastery of San Stefano del Corno. But after the French takeover of the city, he evidently fell out of favor, for on 25 May 1502 Scaramuccia Trivulzio, a relative of the marshall of France who took the city, replaced him. Both the dedication and a portrait of the abbot appear to have been erased in this manuscript. Gaffurio was forced to find another patron.
2. Paris, Bibliothèque Nationale, MS lat. 7208. This was a copy apparently presented or made for Nicolò Leoniceno, translator of Ptolemy's *Harmonics*. It ends with the following words: "Finis. Laus deo: Die Veneris 27° Martij 1500 ego presbiter Franchinus ultimam huic operi manum apposui in Edibus diui Marcellini porte cumane ciuitatis mediolani." (The End. God be praised. On Friday, 27 March 1500, I, Father Franchinus, put my last hand on this work in the edifice [church] of Saint Marcellino at the Porta Cumana of the city of Milan.) This copy, which has not previously been noted in the literature on Gaffurio, is marked at the top of the recto of the first flyleaf: "Dnj Nicolai Leonicenj." It was obviously given to Leoniceno by the author in recognition of the help Leoniceno's translation of Ptolemy had been to him. The binding appears to be the original one, and although this flyleaf is not watermarked, the second flyleaf has the same watermark as the remainder of the pages of the manuscript, a pair of scissors with an arrow, similar but not identical to Briquet 3735, dated 1515, and forms with the back flyleaves a single double folio with that bearing Leoniceno's name. The Paris copy may be one of the earliest made, since the table of contents ends with chapter 6 of Book III, whereas the text that follows has the complete book, as well as all of Book IV.

3. Lyon, Bibliothèque Municipale, formerly Palais des Arts, MS 47. The inscription at the end shows that it was written by Gaffurio himself: "Die jovis, vigesimo augusti milessimo quingentessimo, ego presbiter Franchinus, hora vigesima tertia ultimam huic exemplo manum posui quod ad exemplari diligenter exscripsi in edibus Divi Marcellini, porte Cumane, civitatis Mediolani." This vellum manuscript, still in its original binding, elegantly illuminated, was offered to Charles Jaufred (Carlo Gioffredo), president of the Parliament of the Dauphiné (Grenoble) and vice-chancellor of the Senate of Milan. The date of dedication is uncertain, but it must be around 1505–06, when three other books published in Milan were dedicated to Jaufred: Alexander Minutianus' edition of Livy, July 1505; Aulus Janus Parrhasius (Aulo Giano Parrasio), an edition of Claudianus, *De raptu Proserpinae cum commentariis,* 12 December 1505; and Johannes Maria Cataneus, an edition of Pliny, *Epistolarum libri x,* 1506. This copy of Gaffurio's treatise is mentioned by Caretta, Cremascoli, and Salamina in a bibliographical listing, but the authors apparently never saw it.[42] Like the Paris manuscript, it is a faithful copy of the first layer of the Lodi manuscript without any of the later additions. But entire chapters are missing. Evidently Jaufred did not accept the responsibility of sponsoring the book, and Gaffurio had to continue his search for a patron.
4. Naples, Biblioteca Nazionale, MS VIII.D.11. Franchinus Gaforus, *Theorica artis musicae.* This manuscript, undated, is indexed in Kristeller, *Iter italicum,* I, 403, and is described by Miller as a "study codex," the work of two scribes; it omits some of the diagrams.
5. Vienna, Österreichische Nationalbibliothek, Codex Ser. nov. 12745. This illuminated presentation copy contains a dedication to Johannes Grolier and once belonged to him.[43] It exhibits the following traces of its origins:

   fol. 2 [after table of contents]: "Ego Bernardinus de la rupere scripsi hunc librum expletum die lune' 19° Aprilis 1507."

   fol. 68v: "... Franchinus Gafurius ... p[er]fecit 26° / mensis Martij 1500 Aetatis sue anno quadragesimonono." Grolier became the French king's treasurer and Intendant of Milan in 1509.[44] The manuscript was apparently first prepared for presentation to another patron, as Unterkircher has shown that there are marks of a different coat of arms under the present one.[45] Grolier must have answered Gaffurio's plea for a subsidy, because the printed edition is also dedicated to him. A presentation copy of the printed book with a manuscript dedication to Grolier by Gaffurio is in Paris, Bibliothèque de l'Arsenal.[46]

42. Alessandro Caretta, Luigi Cremascoli, and Luigi Salamina, *Franchino Gaffurio* (Lodi, 1951), p. 135.

43. Concerning this manuscript, see Franz Unterkircher, "Eine Handschrift aus dem Besitze Jean Groliers in der Oesterreichischen Nationalbibliothek," *Libri* 1 (1950–51):51–57.

44. Miller trans., introduction, p. 13.

This history of delays and variant exemplars reveals that Gaffurio not only had the opportunity but in fact continued to revise the work between 1500 and 1514. In these fourteen years he could have penetrated more deeply into the translations from the Greek, but did he? The revisions tell us that he did not; the insertions that reached the printer but are missing in the Paris manuscript all pertain to modern authors with whom Gaffurio was feuding or to matters that do not touch upon the ancient sources.[47] Gaffurio was content to let the Greek sources rest. There is evidence, indeed, in some autograph glosses on Johannes de Muris that in 1499 he had moved on to investigate medieval music theory.[48]

These circumstances surrounding the publication of Gaffurio's last treatise have considerable bearing on our evaluation of his utilization of the Greek writings on music theory. If the treatise as it stands in the printed edition of 1518 had reflected twenty years or more of assimilation of Greek theory from original sources, our judgment of it would to have to be more severe than if the published treatise remained essentially as it was drafted in 1500, which has been shown to be the case. The 1500 version communicated, as far as the ancient sources were concerned, Gaffurio's definitive statement. Since most of the translations are dated, it may be concluded that Gaffurio had had the Bacchius translation at least eight years, the Aristides Quintilianus and anonymi about six years, the Bryennius a little more than three years, and the Ptolemy barely one year before he completed the draft of the *De harmonia* in 1500.

Although he may have lost interest in the classical authors after 1500, Gaffurio's principal motivation for publishing one more treatise on speculative music after the *Theoricum opus* and the *Theorica musice* was the new insights he received from the translations he had commissioned. For these Gaffurio had gone to two humanists who were learned in both Greek and Latin literature and philosophy, though neither of them had previously been concerned with music.

As we saw in chapter 6, Giovanni Francesco Burana translated the treatises

45. Unterkircher, "Eine Handschrift," p. 53.

46. Ibid., p. 51.

47. For an account of these additions, see Miller, trans., introduction, pp. 18–24.

48. *Glossemata quaedam super nonnullas partes theoricae Johannis de Muris,* Milan, Biblioteca Ambrosiana, MS H.165 inf., dated 1 January 1499. See Caretta et al., *Gaffurio,* p. 135.

of Aristides Quintilianus and Manuel Bryennius and the anonymous treatises known as Bellerman's anonymous. He may also have translated the Bacchius Senior *Introduction*. Gaffurio's own copies of Burana's translations of the three musical treatises, which he gave to he Church of the Incoronata of Lodi in 1518, are now in the Biblioteca Capitolare of Verona.[49] The Aristides translation is dated 1494, and the anonymi 15 April 1494. The Bryennius is not dated in this manuscript, but a copy in Gaffurio's hand now in Lodi indicates at the end that Gaffurio finished copying it on 5 January 1497.[50] However, the translation must have been finished at about the same time as the others, since Gaffurio cites Bryennius in the *Practica musice* of 1496.

Gaffurio's copy in his own hand[51] of Leoniceno's translation of Ptolemy's *Harmonics* is one of the two exemplars that survive, the other being a presentation copy, but not autograph.[52] The translation is preceded by a letter of dedication, written in Ferrara and dated March 1499, from Leoniceno to Petro Barotio, bishop of Padua and a close friend of Gaffurio, who apparently had commissioned the translation at Gaffurio's instigation.[53] As we saw, Leoniceno owned a manuscript copy, now in Paris, of *De harmonia* in the version finished in 1500. In addition to the notation on the first flyleaf, "Domini Nicolai Leoniceni" ([property] of Dominus Nicolaus Leonicenus), there are marks in Greek on the second flyleaf, and on fol. 109r, where Melegulo mentions the four Greek authors translated for Gaffurio, the four names are listed in the right margin in Greek letters, probably in Leoniceno's hand. There are no other marginal notes except those belonging to the treatise itself. The postils, which mainly agree with those of the printed edition, appear to be in Gaffurio's hand.

Before proceeding to an analysis of the utilization of the Greek sources in *De harmonia,* brief mention of their usage in the immediately preceding work, *Practica musice,* should be made. Clement Miller, in the notes to his English translation of this treatise and in his study of 1968, has drawn

49. MS CCXL (201); description in F. Alberto Gallo, "Le traduzioni dal Greco per Franchino Gaffurio," *Acta Musicologica* 35 (1963):172–74; idem, "Musici scriptores graeci," in *Catalogus translationum et commentariorum: Mediaeval and Renaissance Translations and Commentaries,* ed. Edward Cranz and Paul O. Kristeller, III (Washington, 1976), 67–68. The list of holdings of the Incoronata library (see Motta, "I libri," p. 111) names only the Aristides Quintilianus, probably because it was the first item of a group.

50. Lodi, Biblioteca Comunale Laudense, MS XXVIII.A.8.

51. London, British Library, MS Harl. 3306, fols. 1–46.

52. Rome, Biblioteca Apostolica Vaticana, MS Vat. lat. 4570, fols. 1–58.

53. Gaffurio in *De harmonia,* II, 23, fol. 24v, calls Barotio "vita moribus et doctrina uiri integerrimi ac mei amantissimi."

attention to Gaffurio's dependence on both ancient and modern sources.[54] Miller has shown that the treatise was drafted over a long period of time and that traces of earlier versions which survive reveal a progressive penetration into the heritage of ancient learning. The book was apparently begun in 1481, and a version of Book I dated 1487 by the scribe cites only four writers: Boethius, Marchettus, Guido, and Isidor.[55] Book I as printed in 1496 cites in addition Bacchius, Martianus Capella, Anselmi,[56] Pietro d'Abano, and Bryennius. Book II must have been finished in an early version by 1492, since it was published that year in an Italian condensation by a pupil of Gaffurio, Francesco Caza, as *Tractato vulgare de canto figurato*.[57] Book IV, on numerical proportions, derives from a work that Gaffurio finished around 1483 and that exists in manuscript in Bologna.[58] Miller has compiled a list of the sources cited in the 1496 publication, and it is a long and impressive one.[59] It includes all of the works translated for Gaffurio except one, the *Harmonics* of Ptolemy, which was apparently not finished until later.

Recourses in the *Practica* to the translations of Aristides, Bacchius, and Bryennius are neither numerous nor important. Gaffurio cites Bacchius, as we saw, for his definition of mutation and Aristoxenus for that of rhythm and the idea that the harmonic principles of melody making are universal.[60] He also draws from Bacchius the nice distinction between the intelligibility and audibility of the interval between two notes, a silent phenomenon that is nevertheless perceived.[61]

Aristides Quintilianus is cited twice in the *Practica,* as a source of information about the Greek poetic feet,[62] and with reference to the division of the whole tone into four enharmonic dieses.[63] These citations are entirely accessory to the arguments at hand.

54. Clement A. Miller, ed. and trans., Franchinus Gaffurius, *Practica musicae;* idem, "Gaffurio's *Practica musicae,*" *Musica Disciplina* 22 (1968):105–28.

55. Bergamo, Biblioteca Civica, MS E4.37.

56. Giorgio Anselmi, *De musica,* ed. Giuseppe Massera (Florence, 1961).

57. Milan, 1492

58. *Franchini Gafori Laudensis Musices professoris tractatus practicabilium proportionum ad R[everen]dum d[omi]num Coradolum Stangam doctorem Egregium ac S. Antonii Cremon[ensi] preceptorem,* MS A69. See Gaetano Gaspari, *Catalogo della Biblioteca musicale G. B. Martini di Bologna* (Bologna, 1961), I, 216.

59. Gaffurio, *Practica,* Miller trans., p. 110.

60. See above n. 54.

61. Gaffurio, *Practica,* III, 1: "Intervalla vero cum sint quidam taciti transitus a sono ad sonum non sunt audibilia ut Baccheus inquit sed intelligibilia." Bacchius *Introduction* 72.

62. Gaffurio, *Practica,* II, 2; Aristides Quintilianus *De musica* 1.15.

63. Gaffurio, *Practica,* II, 6; Aristides Quintilianus *De musica* 1.7.

On the other hand, Gaffurio used significantly, if not extensively, the anonymi.[64] In an exceptionally restrospective discussion of rhythm and meter, in which Gaffurio recalls the ancient meters and the theories of Diomedes, Augustine, Quintilian, and Bede, he publishes for the first time a table of the Greek temporal signs extracted from one of the tracts. The durations represented by the signs are symbolized as follows:

- ⎯ a breve of one tempus
- ≃ a minor long of two tempora
- ⌐ a long of three tempora
- ⌙ a long of four tempora
- ω a long of five tempora

Gaffurio further notes that the arsis was represented by placing a dot after the durational sign, while the thesis was marked by the absence of a dot.[65] Gaffurio was to use this knowledge of the ancient rhythms to construct a two-voice melody for a stanza of a fifteen-stanza Sapphic ode by Lancino Curzio, "Musices septemque modos planete," published in *De harmonia*.[66]

Although Gaffurio's publication of the rhythmic signs is not of the order of importance of Galilei's later publication of the pitch signs, it was a step in the direction of lifting the veil of mystery from the practice of Greek music. The two disclosures are worlds apart also in the significance the two authors attached to their revelations. Galilei sought a model for modern music, whereas Gaffurio ends the discussion apologetically, implying that to go into more detail about the methods of applying the ancient time values to melodic composition was a useless exercise, because they were "incongruous and foreign to our customs."[67]

The scope of *De harmonia musicorum instrumentorum opus,* despite the expression "of musical instruments" in the title, lies squarely in the field of musica theorica. But it enlarges upon this field as defined by the contents of the *Theorica musice,* which comprehended the curriculum established by Boethius. The *De harmonia* expands this domain to include both studies of

64. Friedrich Bellermann, *Anonymi scriptio de musica Bachii senioris introductio artis musicae* (Berlin, 1841); Dietmar Najock, *Drei anonyme griechische Traktate über die Musik. Eine kommentierte Neuausgabe des Bellermannschen Anonymus,* Göttinger musikwissenschaftliche Arbeiten, II (Kassel, 1972).

65. Gaffurio, *Practica,* II, 2. Bellermann Anon. I, 1–3; Najock pp. 67–69. The anonymous theorist defines Gaffurio's first sign as worth two tempora. Gaffurio's second sign is not in the edited text.

66. IV, 10, fol. 89r; see transcription in Giuseppe Vecchi's introduction to the facsimile edition (Bologna, 1972), p. ix.

67. Gaffurio, *Practica,* II, 2; Miller trans., p. 73.

greater relevance to music as practiced by modern musicians and questions of cosmic harmony in relation to the human soul and experience. The act of writing the *Practica musice* and his years as director of a cathedral choir had undoubtedly made Gaffurio more sensitive to problems of music theory that he had been content to gloss over earlier.

If we compare the contents of the *Theorica* and the *De harmonia* we find certain areas of overlap, to be sure. Basic definitions, the system of ratios and their manipulation, the proportions and means, the construction of the Greek gamut, the modes and genera, the intervals, all these are found in both treatises. But the weight given to certain topics differs. In the *Theorica* there is but one chapter on the genera of tetrachords and one on the Greek gamut; in the *De harmonia* most of Book I is devoted to them. Here also Gaffurio proposes a new genus, the *permixtum*. Book II of *De harmonia* deals entirely with matters untouched in the other treatise, the description of the chromatic and enharmonic and the various "shades" of tuning set forth by Archytas, Aristoxenus, and Ptolemy. Book III of *De harmonia,* in addition to a review of the arithmetical, geometrical, and harmonic progressions, contains detailed chapters on these three types of means, and in a separate chapter proposes a new one, the sonorous mean (medietas sonora), which mediates the major and minor sixths and tenths.

Book IV of *De harmonia* deals with the relationships of sounding music to celestial bodies and the effects of music on the senses, body, and mind, and its analogy to the parts of the mind and to other things measured by numbers. Gaffurio's main purpose remains, as in his previous theoretical works, to unite in an orderly way in one place all that is written by various authors in many volumes: "... ut studiosorum profectui concinna, compendiosaque brevitate consuluisse dicar; ut quae forent sparsim per Authorum volumina, requirenda in uno opere, convenienti rerum ordine congesta reperiantur."[68] Occasionally, as with the theory of the *medietas sonora,* or of the imperfect consonances, Gaffurio makes an original contribution to the body of speculation handed down by the Greek and Latin authors. But the main source for what is new in the *De harmonia* is the small corpus of newly translated Greek works.

It would be tedious to trace the indebtedness of Gaffurio to the translated treatises on every point. It is more instructive to show how he benefited from them in a number of areas in which *De harmonia* makes a distinctive contribution to the body of theoretical knowledge available at this time. These are in the areas of fundamental definitions, the genera, the shades of tuning, and the modes. The four topics are chosen not only because they

68. *Practica,* dedicatory letter.

represent the most positive contributions of the volume, but because in these areas the humanist revival of ancient theory made its greatest impact on musical practice and thought in the sixteenth century.

Gaffurio, like writers before him, tended to adopt the categories of Boethius until gradually he became aware that alternatives existed in the older theoretical literature that perhaps Boethius did not know or simply failed to cite. One of the contributions of Boethius that had proved most lasting was the precision of his distinctions and categories; so it is not surprising that in his earlier treatises Gaffurio followed him. But like other followers of Boethius, he was trapped in the Boethian bias for distinctions that are based on number.

We have seen that in these earlier works Gaffurio supplemented the standard Boethian definitions with others culled from various sources as they became available to him. The intent of these amplifications is not always clear, but they seem inspired more by a desire for completeness than by a critical search for an optimum set of categories. Even in *De harmonia* we seek in vain a critique of theoretical categories. Still, a process of selection was at work, and categories that do not proceed entirely from *ratio* are given attention, if not always favorably. The first chapters of *De harmonia* are rich in categories, many of them unknown to pre-Renaissance Europe, which Gaffurio harvested from the translations of Aristides Quintilianus, Bacchius, and Bryennius, three late interpreters of classical Greek theory.

Already in earlier writings Gaffurio had reported the distinction emanating from Aristoxenus and passed on by Boethius between the continuous and diastematic voice. Now, in his chapter "Concerning Sounds and their Distinctions" (I, 2), he cites a slightly different dichotomy proposed by Aristides, "continuous" and "discrete."[69] The continuous voice is that used by those who read aloud or speak, while the discrete voice is that of singers. Whereas the continuous voice passes over the degrees (*intensiones* and *remissiones*) of pitch quickly, the singing, discrete voice makes these manifest through extension.[70] Bacchius, he notes, calls the continuous voice "pedestrian," while the other he calls "melodizing" (*modulata*) or suitable to melody (*melodiae proprias.*)[71]

For the rest of the chapter Gaffurio paraphrases Bryennius. First he draws from him the comment that sound is never really continuous, because between the percussions of the air there are silences, and it is only the imagination (*phantasia*) that converts these multiple sounds received by the

69. Aristides Quintilianus *De musica* 1.4.

70. Aristides Quintilianus *De musica* 1.4; Gaffurio adds a comment from Bryennius *Harmonics* 1.3, that it is called continuous because it does not seem to the ear to stay in one place.

71. Bacchius *Introduction* 69.

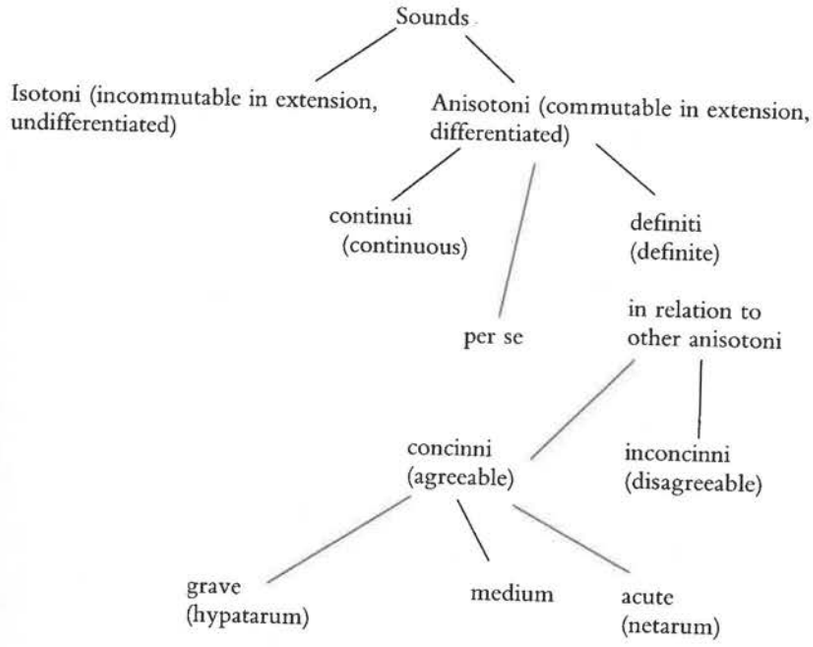

Figure 9.1:
Classification of sounds in Bryennius

ear into a continuous one. He closes the chapter with a description of the classification of sounds by Bryennius, which may be rendered most easily in tabular form (Figure 9.1).

Although Gaffurio, as was his habit, voiced no preference for one or the other system of classification, he was obviously entranced with the completeness of Bryennius' categories and their progression from the undifferentiated to the qualitatively and quantitatively selective. Gaffurio's translator coined the terms "isotoni" and "anisotoni" for their Greek cognates, and Gaffurio did not recognize that these were the same terms that Ptolemy used and that Boethius translated as "unisonae" and "non unisonae." Burana's translation failed to make clear that isotones are monotones, because he translated *tasin* as "extension" rather than "tension." Gaffurio neglects to clarify the terms and seems untroubled by the fact that the category of isotone as he describes it is quite meaningless.[72]

72. Perhaps judiciously Gaffurio omits a level of division Bryennius interposed between *concinni* and grave-medium-acute, namely the threefold division of *concinni* into *consoni, unisoni* (or *antiphoni*), and *dissoni*. The translation of Bryennius here may not have been clear, or Gaffurio may have preferred to save these distinctions for the following chapter on intervals.

Chapter 3, "On Various Definitions of Intervals and their Differences," opens with a passage from Burana's translation of Aristides Quintilianus, which is quoted verbatim except for the insertion of Boethius' definition of musical interval. Aristides recognized two meanings of "interval," "in general" (*communiter dictum,*) that is, any magnitude determined by fixed boundaries, and "in particular" (*private,*) that is, the magnitude of tones circumscribed by two sounds. The next seventy lines of this chapter are lifted almost verbatim from Burana's translation of Bryennius (1.5). Gaffurio here cites the five criteria by means of which Bryennius distinguishes intervals from one another: (1) magnitude, (2) consonance or dissonance, (3) composite or simple, (4) the genus (diatonic, etc.) to which it belongs, and (5) rational or irrational. The magnitudes recognized by Bryennius go from disdiapason down to diesis, to which Gaffurio adds the apotome. Among the consonances, Bryennius recognizes a class of *antiphonae,* that is, diapason and disdiapason.[73]

Intervals are classed dissonant that are smaller than the trihemitone (minor third) or that are composed entirely of tones, such as the tritone, tetratone, pentatone, and the like. Composite intervals are those that are not adjacent, such as in the diatonic perfect system between hypate hypaton (B) and lichanos hypaton (d). Incomposite are the adjacent steps in any genus, such as between hypate hypaton (B) and parhypate hypaton (c) in the diatonic, or the semiditone in the chromatic.

In explaining the fifth distinction, between rational and irrational, Gaffurio turns from Bryennius to Aristides Quintilianus and Bacchius, and this with good reason, since Bryennius is sketchy on this point. Aristides, if too brief, is more explicit. The passage that Gaffurio quotes from Aristides (without quotation marks, to be sure) defines rational intervals as those whose ratios we can declare. We call *ratio* an integral and known mutual relation among numbers. Rational intervals are the diatessaron in the epitrite ratio, the diapente in the hemiolia, the diapason in the dupla, the diapason-plus-diapente in the tripla, and the disdiapason in the quadrupla.[74] Gaffurio skips over Aristides' definition of irrational intervals as those in which no ratio can be found. He prefers to quote Bacchius, who "is of the opinion that those whose ratio is difficult to assign are for this reason called irrational." Actually Bacchius speaks of irrational only in reference to the duration of time that is more than two breves but less than a long and "therefore cannot be compared in a ratio, and for this reason is called irrational."[75]

73. Here Gaffurio notes that Boethius called this category *aequisonae* and *paraphona,* whereas the diapente and diatessaron he called *symphoniae.* Two of these terms coincide with the threefold classification in Ptolemy *Harmonics* 1.7: *homophonoi, symphonoi,* and *emmeleis,* which Boethius *(De institutione musica* 5.10) rendered "aequisonae," "consonae," and "emmeles."

74. Aristides Quintilianus *De musica* 1.7.

Gaffurio senses the inadequacy of all these definitions and suggests that some intervals are rational according to both nature and art, namely the diatessaron and diapente, the diapason, diapason-plus-diapente, and disdiapason. Others are rational only by art, that is to say, they have a determinate ratio, such as the whole tone of 9:8 proportion, but are not agreeable to the ear and therefore are not rational by nature. Others are produced only by nature in that they are pleasing to the ear, such as the incomposite ditone (the sum of two whole tones) and the incomposite trihemitone (the sum of three semitones), the diapente-plus-tone and the diapente-plus-semitone, but their numerical relations (such as 81:64) cannot be proportionately measured on a string, therefore failing in rationality by art. He admits that it is possible to divide the double-octave system in such a way that the ditone is in the ratio 5:4, the semiditone 6:5, the diapente-plus-tone 5:3, and the diapente-plus-semitone 8:5, and that these can be divided on a string. But they have other disadvantages that exclude them from consideration, he objects. Indeed, in a later place, he shows that 5:4, being superparticular, cannot be divided into two equal tones, as the Pythagorean ditone, 81:64, can.[76] Gaffurio evidently realizes that the acceptance of thirds and sixths as consonances and the possibility of dividing the string to produce them by means of simple ratios blurs the once clear distinction between rational and irrational intervals. He is forced to introduce the double requirement of nature (sense of hearing) and art (ratio), for, while some satisfy the one or other criterion, only the truly "rational" intervals accepted by Aristides satisfy both.

Bryennius is again the source for the determination of the names of the fifteen strings of the perfect system. Gaffurio follows him almost verbatim, except where he occasionally abbreviates Bryennius' elaborate etymologies, notably concerning the terms *mese, trite diezeugmenon,* and those for the steps from nete diezeugmenon to nete hyperbolaion.[77] The division of the monochord for the diatonic tetrachords, which Gaffurio starts from the tetrachord hypaton, is not based on Bryennius, however, and although the numbers for the string lengths agree with those of Boethius, the order of partition of the string differs and may be attributed to Gaffurio himself.[78]

75. Bacchius *Introduction* 95.

76. Gaffurio, *De harmonia,* II, 34.

77. Gaffurio, *De harmonia,* I, 4, fols. 7v–8r; Bryennius *Harmonics* 1.2.

78. There is a sprinkling of further references to Bryennius throughout the *De harmonia:* to Bryennius *Harmonics* 2.2 in Gaffurio II, 16, fol. 38v, and to 3.7 in II, 14, fol. 35v, but they involve small points only.

It was from Ptolemy that Gaffurio derived the revelations that were to have the most lasting influence on Western music. The tunings that Ptolemy proposed, one of which was the syntonic diatonic adopted by leading theorists in the sixteenth century, were previously unknown except to those who read Ptolemy in Greek. Numerous other Greek tunings, or shades, of the various genera were already familiar through Boethius, whose fifth book was a translation and condensation of the first book of Ptolemy's *Harmonics*. Of Boethius' five books this one attracted the least interest through the Middle Ages and the early Renaissance. Not only is it incomplete—only the first eighteen and part of the nineteenth of the thirty chapters announced in the table of contents are extant—but it deals with matters that were of remote relevance to traditional theory. In the chapters of Ptolemy that Boethius probably failed to complete, Ptolemy set forth his preferred divisions of the tetrachord in the three genera and gave his reasons for rejecting the divisons of the Pythagoreans, Archytas, Aristoxenus, and Didymus. In the extant chapters Boethius transmitted Ptolemy's discussion faithfully, though occasionally he omitted passages of importance. The chapter headings of the missing portion of Boethius' compendium of Ptolemy may have led Gaffurio to seek out Ptolemy's book and have it translated. Some of the headings bore particularly on the new ideas on tuning propagated by Ramos de Pareja:[79] chapter 21, "How Ptolemy divided the diatessaron into two parts"; 22, "Which are the dense genera, which the least, and how the proportions are adapted, and concerning the division of the enharmonic of Ptolemy"; 26, "The division of the soft diatonic of Ptolemy"; 27, "The division of the intense diatonic of Ptolemy"; 28, "The division of the toniaic diatonic of Ptolemy"; and so on.

Gaffurio's chapters 16–20 of Book II of *De harmonia* are dedicated to the exposition of Ptolemy's theories on the division of the tetrachords through the various shades. Chapters 18–20 specifically contain the material missing in Boethius. Besides filling the breach of Boethius' missing chapters, Gaffurio goes also to Ptolemy's Book II, chapter, 13 for the division of the three genera according to Didymus.

Gaffurio's method in these chapters is to follow Ptolemy's prose consecutively through the translation of Leoniceno, but rather than repeat Leoniceno verbatim, rewrite his Latin. Whether he did this rewriting because he did not like Leoniceno's prose style or whether it was because he expected Leoniceno to see it is a matter for speculation (Gaffurio sent Leoniceno a manuscript copy, which, as we have seen, is in Paris). It may have been some of both. Leoniceno's prose is even more obscure at times than Gaffurio's, although the syntax is simpler and more direct. Occasionally Gaffurio preferred to copy out the reductions of Ptolemy by Boethius, whose treatise he obviously kept close at hand as he drafted the book.

79. Ramos de Pareja, *De musica tractatus* (Bologna, 1482).

The following passage (left), on the division of the tetrachord by Aristoxenus, for example, parallels Ptolemy (1.12), but it is obviously taken, though in a truncated form, from Boethius (right):

Aristoxenus autem ut duodecimo primi harmonicae Ptholomeus scribit: quadrifaria tradidit toni diuisionem: diuidit namque tonum in duas partes aequales quas semitonia uocat. Diuidit quandoque in tres aequas partes & eas uocat dieses chromatis mollis. Aliquando autem in quattuor: quas diese enharmonicas dicit.[80]	Hoc igitur diatessaron Aristoxenus per genera tali ratione partitur. Diuidit enim tonum in duas partes atque id semitonium vocat. Dividit in tres, cuius tertiam vocat diesin chromatis mollis. . . . Quoniam enim quarta pars toni diesis enarmonios nuncupari praedicta est.[81]

Gaffurio preserves the thought sequence and most of the syntax of Boethius, but he adds the important information that these are equal divisions.

The following short example illustrates Gaffurio's method of clarifying and glossing Leoniceno's translation of Ptolemy (Gaffurio, left; Leoniceno, right):

Chromaticum sesqualterum genus utrunque interuallorum spissi id est duo grauori tetrachordi interualla facit quartam partem cum octaua unius toni utrunque nouenario describens. Ac	Sesquialtera uero chromatis, utriunque, duorum interuallorum densi, facit, quartam partem, & octauam, unius toni.
reliquum maius & acutissimum unius toni est cum dimidio & quarta toni parte: quod numero.42. pernotatur: ut hic constat.[82]	Reliquum, unius, cum dimidio, & quartum qualium illorum quidem, utrunque.9. hoc uero 42.[83]
In the chromatic genus hemiolion, he makes each of the intervals of the pycnon, that is, the two lower intervals of the tetrachord, a fourth part plus an eighth part of one tone, assigning 9 to both. And the other larger and higher [he	In the hemiolion of the chromatic he makes each of the two intervals of the pycnon a fourth part plus an eighth part of a tone. The other [he

80. Gaffurio, *De harmonia*, II, 16, fol. 37r.
81. Boethius *De institutione musica* 5.16 (Friedlein ed., p. 365).
82. Gaffurio, *De harmonia*, I, 16, fol. 37v.
83. Ptolemy *Harmonics* 1.12; Leoniceno, fol. 15r.

makes] of one tone and a half plus a fourth part of a tone, which is indicated by the number 42, as is evident here [diagram follows].

makes] of one [tone] plus a half and a fourth. Thus the former each are 9, the latter, however, 42. [Diagram accompanies the statement.]

In this description of the chromatic hemiolion of Aristoxenus, Gaffurio prefers the term "spissum," which was used by Boethius to translate *pycnon,* to Leoniceno's "densum." In the previous discussion Gaffurio (following Ptolemy) had explained that Aristoxenus divided the whole tone into 24 parts. Thus a fourth part, 6, and an eighth part, 3, add up to a value of 9 for each of the lower intervals of the chromatic tetrachord, while the higher interval contains 24 plus 12 plus 6, or 42 parts. Leoniceno's is a perfectly adequate translation of Ptolemy's terse statement, which is accompanied by a clear diagram; Gaffurio's amplification makes some concessions to the modern reader by reminding him of the meaning of pycnon and of the fact that the uppermost interval of the chromatic is always larger than the sum of the two lower intervals.

Gaffurio's chapter on the shades of Aristoxenus (II, 16) presents from Ptolemy 1.12–14 essentially the material that Boethius summarizes in 5.14, 16, and 18. The divisions of the tetrachords, measured in twenty-fourths of a tone, are presented for one type of enharmonic, three chromatics, and two diatonics. Only when Gaffurio comes to enumerate the errors of Aristoxenus does he contribute something not in Boethius, for he reports Ptolemy's criticisms more fully, gathering them together from several chapters. Gaffurio enumerates five errors committed by Aristoxenus.

1. He divides the tone into two equal parts, when 9:8, a superparticular ratio, cannot be so divided. This error is not cited by Ptolemy, who may have thought it specious, since Aristoxenus is not dividing ratios but abstract distances, for the span of 24 units of a pitch scale may be divided at will.

2. He expresses interval differences in simple numbers instead of proportions (Boethius 5.13; Ptolemy 1.13).

3. He presents only two types of chromatic tetrachord, when more should be shown. Moreover the difference between these two—the malakon (soft or flat), and the hemalon (equal)— lies in the lowest interval, namely one-twenty-fourth of a tone, too small to be perceived. Boethius (5.18) reports only the second objection, Ptolemy (1.14) both.

4. Aristoxenus makes the lowest intervals equal in the chromatic tetrachords, whereas the middle interval should always be larger (Ptolemy 1.14; not in Boethius). Gaffurio omits mention of another difficulty (Ptolemy 1.14):the lowest interval of the chromatic should never be as large as that of the diatonic. Aristoxenus assigned twelve parts equally to the lowest interval of the chromatic toniaion, diatonic malakon (soft or flat), and diatonic syntonon (intense or sharp), the difference between the last two hinging on the middle interval, which has six parts in the malakon, eight in the syntonon.

5. The two types of diatonic Aristoxenus presents are too few, for more can be found (Ptolemy 1.14; Boethius 5.18).

Aristoxenus remains, in Gaffurio's book, as in the books of Boethius and Ptolemy, a shadowy figure, talked about but never permitted to speak for himself. Perhaps because Aristoxenus was so maligned by Boethius, Gaffurio was not stimulated to read his work directly, and his treatise is conspicuous by its absence from among those that Gaffurio had translated. To be sure, the *Harmonic Elements* was harder to find in the available codices, but there were several copies that would have been accessible to Gaffurio's translators.[84]

Although Archytas (fl. 400 B.C.) and Didymus (b. 63 B.C.) were centuries apart, Gaffurio combines the discussions of their divisions of the tetrachords into a single chapter (II, 17). Boethius never reached Didymus in his compendium, since Ptolemy postponed discussion of him until his second book. Gaffurio, taking advantage of Leoniceno's complete translation, cleverly inserted a discussion of the tetrachords of Didymus at this point, where they could be compared with the tetrachords of the others. This is the first notice that Didymus received in the Renaissance.

The exposition of the tetrachords of Archytas agrees in substance with that of Boethius (5.18), but, as as in the case of the errors of Aristoxenus, Gaffurio reports Ptolemy's account of the errors more fully. He also interpolates some objections of his own. In brief the divisions of Archytas, as outlined by Ptolemy are:

Diatonic: 9:8 8:7 28:27
Chromatic: 32:27 243:224 28:27
Enharmonic: 5:4 36:35 28:27

Gaffurio details seven objections to these divisions:

1. In the diatonic Archytas made the middle interval larger than the highest, whereas they should be equal, namely 9:8. Gaffurio attributes this objection to Ptolemy 1.13 (recte 14), but it is of his own making, inconsistent with Ptolemy's own preference for two unequal intervals at the top.

2. Another objection invented by Gaffurio is that Archytas made the lowest interval of the diatonic smaller than 256:243, which is the minor semitone. Here he is applying the alien yardstick of the standard Pytha-

84. Manuscripts surviving in Italy today from before the sixteenth century are Vat. gr. 191; Venice, Marciana gr. 322; Naples, gr. III.C.2 (G. Valla's manuscript); Bologna, Biblioteca Universitaria, MS 2432.

gorean tuning to a tetrachord division in which the value of the Pythagorean minor semitone has no relevance.

3. In the chromatic neither the ratio of the next-to-the-lowest string to the highest nor to the next-to-the-highest is superparticular, despite Archytas' insistence upon the virtues of this class of proportions (Ptolemy 1.14; Boethius 5.18).

4. The next-to-the-lowest string of the chromatic is only 256:243 lower than the parallel string of the diatonic, whereas it should be lower by more than that. Gaffurio attributes this objection to Ptolemy, but again it is of his own devising.

5. The lowest interval in the chromatic, 28:27, is too small (Ptolemy 1.14; Boethius 5.18). It should be 22:21, says Gaffurio, following Boethius, although Ptolemy does not imply this.

6. The lowest interval of the enharmonic is the same as that of the other genera, although it should be smaller, as is consistent with the nature of this genus.

7. He made the lowest interval, 28:27, much larger than the middle one, 36:35, which is contrary to the nature of the enharmonic.[85] Gaffurio ignores two further objections of Ptolemy: Archytas' divisions fail to conform to the generally known scales, and they do not do justice to the many possibilities that exist for each genus.

Gaffurio is much more faithful to Ptolemy in setting forth the tetrachords of Didymus. He does not consider, to be sure, the context of Ptolemy's remarks in the chapter entitled "The Improvements of the Canon Proposed by the Musician Didymus," which follows a critique of the one-string monochord. Ptolemy explains that Didymus was the first to improve the utilization of the monochord by allowing both sides of a string divided by a movable bridge to be plucked. Gaffurio presents only the section of the chapter that deals with the proportions used in dividing the tetrachord (Ptolemy 2.13.15–32). Didymus, he says, gives divisions only for the greater perfect system, and then only in the diatonic and chromatic, although he recognizes also the enharmonic. The proportions he reports may be outlined as follows:

Chromatic: 6:5 25:24 [16:15]
Diatonic: 9:8 10:9 [16:15]

Ptolemy, Gaffurio reports, condemns Didymus for making the lowest interval in the chromatic larger than the middle one. In the diatonic he should also not have made the highest interval larger than the middle, which is

85. Miller's translation of this remark (II, 17, p. 104) is incorrect in that it has Gaffurio charging that the middle interval is larger.

contrary to the natural simple character of this genus. Didymus sinned, Gaffurio says, in making the lowest interval of the enharmonic equal to the other two, when it should be smaller.

Peccauit insuper: grauissimas in tribus generibus proportiones aequaliter disponens: cum in enharmonico minorem esse opporteat grauissimam tetrachordi proportionem quam in diatonico & chromatico . . . et adhuc sequentes proportiones, duorum generum, aequales cum minores opporteret, his, quae sunt, in Diatonico.[86]	He sinned, further, in disposing the lowest interval equally in the three genera, because it is essential that in the enharmonic the lowest [interval] of the tetrachord be smaller than in the diatonic and chromatic . . . and further, the consequent [that is, the lowest] ratios of the two genera [he made] equal, whereas they need to be smaller than those in the diatonic.

Gaffurio confused the issue here by introducing the enharmonic, about which Didymus was silent.[87] Ptolemy is clear on this point; Gaffurio went astray earlier in the chapter, when he (left, below) attributed to Didymus a position concerning the enharmonic that is not warranted by Leoniceno's translation of Ptolemy (right):

Nam accutissimam tetrachordi chordam in enharmonico genere ad eam quae grauissimae uicinior est (puta Hypaten meson ad Parhypaten hypaton) secundum sesquiquartam proportionem ponit.[89]	Nam antecedentus, tetrachordorum ad tertias, ab ipsis, secundum sesquiquartam proportionem, ponit ut utrisque generibus.[88]
Now he placed the highest string of the tetrachord in relation to that which is next to the lowest in the enharmonic genus (that is, Hypate meson to Parhypate hypaton) according to the sesquiquartan ratio.	Now the antecedents [that is the highest strings] of the tetrachords in relation to the third from these he placed according to the sesquiquartan proportion in both genera.

As Gaffurio correctly stated at the outset, Didymus gave the proportions only for the chromatic and diatonic, so that the 5:4 proportion between the top string and the next-to-the-lowest could apply only to these two genera.

86. Gaffurio, *De harmonia* II, 17, fol. 39r.

87. Leoniceno may have sowed the seed for Gaffurio's mistake by making "his, quae sunt" plural, when it was singular in Ptolemy *Harmonics* 1.13 (Düring ed., p. 68, line 31), referring back to *logos* (ratio) in *"logous . . . isous."*

88. Ptolemy *Harmonics* 2.13; Leoniceno trans., fol. 35r.

89. Gaffurio, *De harmonia,* II, 17, fol. 39r.

Gaffurio had reason to give special attention to chapters 15 and 16 of Book 1, in which Ptolemy presented his own solutions for the divisions of the tetrachords in the three genera. Boethius in the fragment of eleven lines that survives of his last chapter (5.19) gave only the general principles that Ptolemy followed—just enough to excite the reader's curiosity—but not details of the tetrachord divisions. These principles, as summarized by Boethius, are that all the ratios should be superparticular, that the lowest interval should be smaller than any of the others, and that in the dense tetrachords the pycnon should be smaller than the remaining interval, whereas in the diatonic no interval may be as large as the remaining two taken together.[90] To make up for the truncation in Boethius, Gaffurio followed Leoniceno's translation punctiliously, though not literally, interpolating string lengths omitted by Ptolemy and skipping an occasional speculative digression. All of chapters 18, 19, and 20 of Book II of Gaffurio, including most of the diagrams, are thus adapted from Leoniceno's translation.[91] In these three chapters Gaffurio revealed for the first time in print and in a language read by European musicians Ptolemy's own solutions for dividing the tetrachords.[92]

Because of the delay in publication of the *De harmonia* Gaffurio anticipated these revelations in his *Angelicum ac divinum opus musice* of 1508. Book I, chapters 14–16, of that work are a compendium in Italian of *De harmonia,* Book II, chapters 17–20, to which Gaffurio refers the reader for a fuller treatment of the subject.[93] Since the treatment in *Angelicum opus* is drastically abbreviated, the following discussion will be based on *De harmonia.*

Ptolemy's tetrachord divisions were for several decades disseminated mainly through Gaffurio's book. Even after a complete translation of the *Harmonics* was published by Antonio Gogava in 1562, Gaffurio's exposition remained the main source. Therefore it is worth reviewing in detail Gaffurio's exposition of this material.

Without recalling the principles that Boethius had attributed to Ptolemy,

90. Boethius thus reached Ptolemy *Harmonics* 1.15, Düring ed., p. 33, line 27.

91. Gaffurio omits Ptolemy *Harmonics* 1.15, Düring ed., p. 33, lines 1–27; p. 36, line 28, to p. 37, line 5; p. 37, lines 12–20; Ptolemy *Harmonics* 1.16, Düring ed., p. 38, lines 6–17; p. 38, line 29, to p. 39, line 14; p. 40, lines 8–13. The diagrams on fols. 41v and 44v are Gaffurio's (added after 1500); all the other diagrams are from Leoniceno, but Gaffurio inserts the string names for the hypaton tetrachord.

92. Giorgio Valla described these tunings in *De expetendis* (1501), "De musica," IV, 8–15, but this work was ignored by musicians, and it could not have been known to Gaffurio at the time he wrote these chapters.

93. The woodcut employed to print the diagrams of Ptolemy's enharmonic in *Angelicum opus,* ch. 14, was reused for *De harmonia,* II, 28, fol. 40v; other similar parallel diagrams are in *Angelicum opus,* ch. 15 and *De harmonia,* II, 18, fol. 41r; and *Angelicum opus,* ch. 15 and *De harmonia,* II, 18, fol. 42r.

Enharmonic	276		345		360		368
		5:4		24:23		46:45	
Chromatic malakon (Gaffurio: molle)	210		252		270		280
		6:5		15:14		28:27	
Chromatic syntonon (Gaffurio: intentum)	66 (*sic*)		77		84		88
		7:6		12:11		22:21	

Figure 9.2:
Dense tetrachord divisions proposed by Ptolemy

Gaffurio launches immediately into an analysis of the division of the tetrachord. Ptolemy, he says, shows that the ratio 4:3 can be divided into two superparticular ratios only by the following proportions: 5:4 and 16:15; 6:5 and 10:9; and 7:6 and 8:7. For the genera with pycnon the top large interval gets the larger ratios 5:4, 6:5, or 7:6; the two lower intervals taken together are assigned one of the smaller ratios 16:15, 10:9, or 8:7. For this purpose each of the smaller ratios must be divided into superparticular proportions that would be approximately equal. To accomplish this the terms of the ratio, 15 and 16, are tripled, yielding 45 and 48, which are mediated by 46 and 47. The latter is rejected, because it does not form superparticular ratios with both 45 and 48—the boundary numbers. The ratios 48:46 (24:23) and 46:45 are, however, both superparticular. Thus 16:15 may be divided into 24:23 and 46:45, 10:9 by the same method is divided into 15:14 and 28:27, and 8:7 into 12:11 and 22:21. The larger upper intervals are used for the "softer"—we would say flatter— genera, whereas the more intense—we would say sharper—genera will have smaller intervals on top. Thus 5:4 best suits the enharmonic, whereas 6:5 and 7:6 are the basis for the chromatic. The tetrachords shown in Figure 9.2. ensue.[94] Before passing on to the less dense tetrachords, Gaffurio inserts a table that compares graphically the sizes of the intervals of the diatonic, chromatic, and enharmonic "of Pythagoras" as given by Boethius and the enharmonic and chromatic malakon of Ptolemy, leaving out, inexplicably, the chromatic syntonon.

Gaffurio's chapter 19 attacks the less dense genera, following Leoniceno's translation of Ptolemy 1.15. Since the twofold division 5:4 X 16:15 does not produce a suitable threefold division of 4:3, Ptolemy takes for the higher interval of the twofold division 8:7 and for the lower 7:6. By the method

94. The string lengths given by Gaffurio in *De harmonia,* II, 18, are taken from Leoniceno's translation of Ptolemy's *Harmonics* 1.15 and must have been in his manuscript of Ptolemy, though they do not appear in Düring's edition. The highest string of the chromatic syntonon correctly reads 67 in Leoniceno, but 66 is Gaffurio's misreading rather than a misprint, because Gaffurio also gives 66 in *Angelicum opus,* I, 15.

of triplication used earlier he derives 10:9 and 21:20 by splitting 7:6, and to this adds 8:7:

Diatonic malakon	63	72	80	84
		8:7	10:9	21:10

Still following Ptolemy, Gaffurio affirms that if the preceding divisions are tried on a monochord (*chordotono chordulas*) the ear will find it desires nothing better. But Ptolemy actually suggested trying them out on an eight-string kanon, in which the strings were stretched to an equal tension.[95]

Ptolemy describes one further shade, the *homalon,* or "equal," diatonic. Tripling the terms of the ratio 4:3 to get 12 and 9, he interpolates the numbers 11 and 10, producing the series 12, 11, 10, 9. These permit three almost equal ratios: 10:9, 11:10, 12:11; and, if the tetrachord is expanded to a fifth through the ratio 9:8 for the tone of disjunction it may be extended to a series of four ratios:[96]

Diatonic homalon	8	9	10	11	12
(aequale)		8:9	10:9	11:10	12:11

Gaffurio finally comes to the discussion of the diatonic ditoniaion (Pythagorean tuning), which, according to Ptolemy, is an approximation of the syntonon. Ptolemy introduces it somewhat apologetically, as a substitute tuning for the syntonic, because it lacks the superparticular ratios that he made a requirement at the outset. The name given to this genus by Ptolemy, *ditoniaion,* he derives from the fact that it has two consecutive whole tones at the top. Gaffurio rendered this in Latin "diatonum diatonicum," judiciously emending Leoniceno's "tonium diatonicum." Ptolemy finds this genus acceptable, because the highest ratio, 9:8, differs only slightly from the 10:9 of the syntonic, and the lowest ratio, 256:243, though not superparticular, is very close to 16:15, which is. And in both these diatonics the middle interval is 9:8. Indeed, the difference between the pair of 9:8 intervals of the ditoniaion and the pair 10:9 X 9:8 of the toniaion is only 81:80, and the difference betwen 256:243 and 16:15 is minimal, namely 258:256, says Gaffurio, misreading Leoniceno's 259:256.[97] Two 9:8 intervals joined together are also used in place of the 5:4 as the top interval of the enharmonic tetrachord.

95. Leoniceno did not render faithfully the phrase τοῦ διά πασῶ περιέχοντος οκταχόρδον κανόνος, "an eight-string kanon containing an octave" (Düring ed., p. 37, line 7). Leoniceno translated it as "diapason continente tetrachordi regula." Throughout the book Ptolemy insisted on using such an eight-string instrument in preference to a monochord.

96. The string lengths given by Gaffurio, *De harmonia,* II, 20, fol. 44r, are not in Leoniceno, nor is the diagram on fol. 44v, which, furthermore, does not appear in the Paris manuscript.

97. They are both wrong, for 256:243 × 25:26 = 243:240, though expressed as a function of 256, 259 is closer than 258. Leoniceno, fol. 21r; Gaffurio, *De harmonia,* II, 20, fol. 45r.

Either Gaffurio wished to play down the substitute nature of the genus in Ptolemy's theory or a few lines were dropped by the printer, because mention of the substitution of 10:9 and 256:243 appears in Gaffurio only in reference to the enharmonic. His version (left) may be compared with Leoniceno's (right):

. . . qua re cum
nullis sit
profectus effatu dignus propter
minimam differenntiam. [Lacuna?
. . . . . .
. . . . . .
. . . . .] Vtebantur
quandoque in Enharmonico tetrachordo bis sequioctaua loco
sesquiquartae in acutiore interuallo: rursusque minore semitonio
loco sesquiquintae decimae in
duobus grauissimis tetrachordi
interualis.[98]

Propter quod in neutro propositorum
generum, constituitur, aliquis
effatu dignus profectus, abutentibus
ipsis, in intento quidem diatonico,
& sexquioctaua, loco, sexquinonam,
secundum antecedentem locum: &
lemate loco sexquiquintadecimam,
secundum sequentem locum. In
enharmonio vero, & bis sexquioctaua
loco, sexquiquartae secundum
antecedentem locum, & lemate
rursus, loco sexquiquintadecimam,
secundum ambos, sequentes
locos.[99]

. . . for this reason,
it is not worthy of mention
because of the minimal difference. [Lacuna?. . . . . .
. . . . . .
. . . . . .
. . . . .]
They sometimes used in the enharmonic tetrachord the 9:8 twice
in place of the 5:4 in the
high interval, and, further,
the minor semitone in place
of the 16:15 in the two bottom
slots of the tetrachord.

Because of this in none of the genera
proposed is it worthy of mention if
by some [the tetrachord] is constructed
contrary to usage in the syntonic
diatonic with a 9:8 in place of the
10:9 at the top spot, and with the
limma in place of the 16:15 in the
lowest place. In the enharmonic,
however, twice 9:8 [is used]
in place of the 5:4
and
the limma in both the
lower slots in place of the 16:15.

Whether this was a slip or not, Gaffurio was decidedly more positive about the virtues of the ditoniaion than Ptolemy, bolstering its prestige with the authority of Boethius and Guido, who considered it "more natural and better than the others," adding later that "it was established by Pythagoras

98. Gaffurio, *De harmonia,* II, 20, fol. 45r.

99. Ptolemy, *Harmonics* 1.16.40; Leoniceno trans., fol. 21r.

and before him celebrated musicians and even posterity as the first and most excellent according to nature and art, being called simply diatonic."[100]

On the other hand, Gaffurio missed no opportunity for disparaging the thirds and sixths that resulted from some of Ptolemy's tunings. In analyzing the implications of Ptolemy's enharmonic tetrachord, which uses a ditone of 5:4, Gaffurio attacks Ramos de Pareja for assigning the ratio 5:4 to the ditone in his monochord division.[101] Similarly, Gaffurio shows the interval produced by the ratio 6:5 in Ptolemy's chromatic malakon to be larger by 81:80 than a tone-plus-semitone, always, of course, in terms of the Pythagorean diatonic. In another chapter (II, 37), Gaffurio shows that the minor sixth in the proportion 8:5 is larger by the same fraction (81:80) than the diapente-plus-semitone. However Gaffurio is beguiled by the possibility of mediating the fifth, 3:2, by a major and minor third "as composers call them," in the proportions 5:4 and 6:5, making the series 4:5:6.[102] In an addendum to the 1500 version of *De harmonia* that appears in the printed edition, Gaffurio presents a diagram entitled "The Dimension of Superpartient Consonances Accommodated through Reason and Sense to Superparticularity According to Ptolemy"[103] (see Figure 9.3).

Here it is shown that such "consonances" as the major third, which normally has a superpartient ratio (81:64), can be converted to superparticularity (5:4). Gaffurio makes the remarkable discovery that if a string is divided into six equal parts, successive portions with respect to the whole or the previous portion will produce the series minor third, major third, fourth, fifth, and octave in the superparticular ratios of Ptolemy's syntonic diatonic, forming the arithmetic progression 6:5:4:3:2:1. His diagram also shows that the major sixth in the ratio 5:3 and the minor sixth in the ratio 8:5 result from this division. The discovery of this phenomenon does not seem to have swayed him, however, from opposing any rival to the Pythagorean monochord.[104]

100. *De harmonia,* II, 21, fol. 46r. Giovanni Spataro was to criticize this stand in *Errori de Franchino Gafurio da Lodi* (Bologna, 1521), IV, Error 17, saying that strings were not measured before Pythagoras, nor was this tetrachord adopted by posterity, because, although musical writers followed Boethius in promoting the Pythagorean monochord, "in active practice they held to a different method" (fol. 19v). In V, Error 16, fol. 21v, Spataro states that the syntonic diatonic "produced by Ptolemy, is that which today is practiced in active music."

101. Gaffurio, *De harmonia,* II, 34; Ramos, *Musica Practica,* Pt. III, Sec. 2, ch. 3.

102. Gaffurio, *De harmonia,* II, 35, fol. 62v. In *Practica,* III, 2, Gaffurio admits that in a sixth mediated by a third, the mean pitch must be lowered a small amount by tempering the fourth in the direction of the fifth, and the major third downward toward the minor third.

103. This figure is pasted on p. 89 of the Lodi manuscript and is missing in the Paris and Vienna manuscripts. It occurs on fol. 64v of the 1518 edition.

104. In the *Angelicum opus,* I, 17, fol. D1v, Gaffurio expresses surprise at Ptolemy's recognition of the octave-plus-fourth as a consonance, whereas he fails to recognize the sixths,

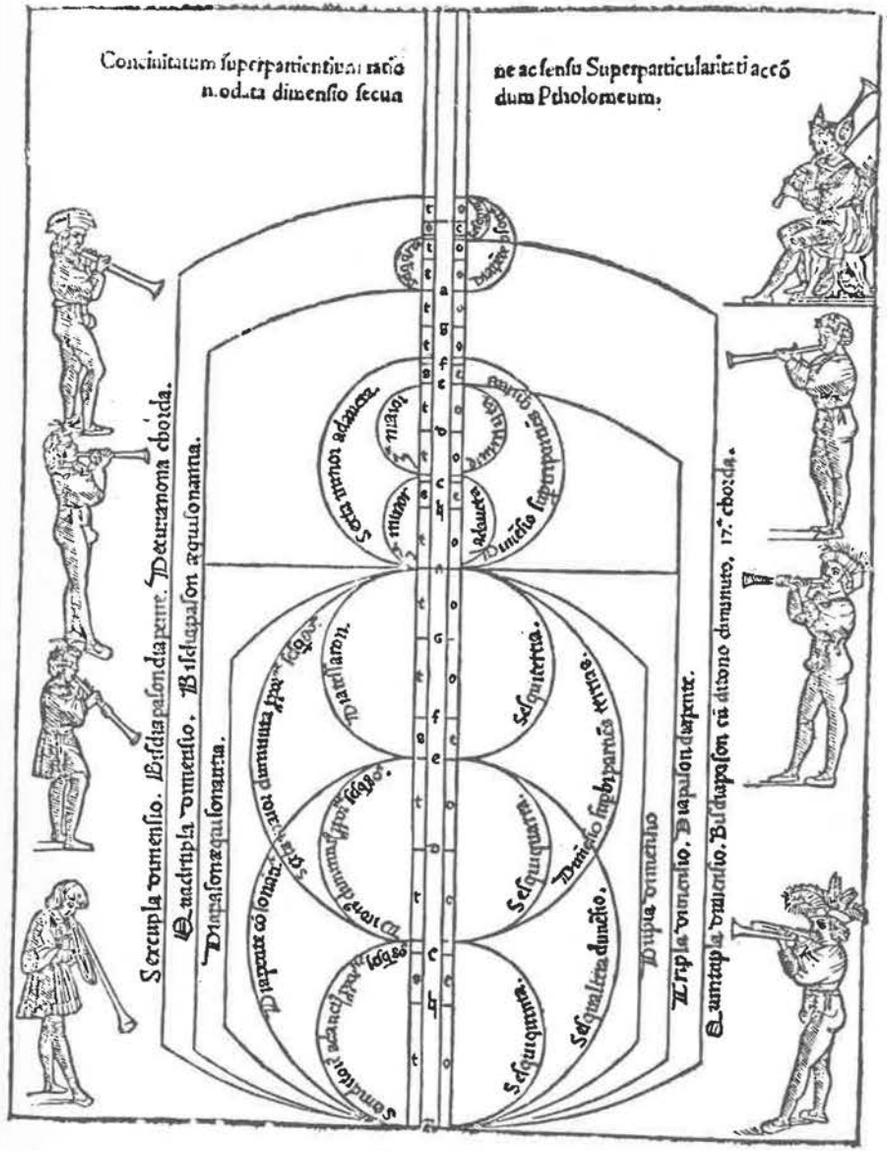

Figure 9.3.
The dimension of superpartient consonances accommodated through reason and sense to superparticularity, according to Ptolemy, from Gaffurio, *De harmonia,* 1518, II, 37, fol. 64v

Gaffurio's attitude toward Aristoxenus seems to have softened after the first draft of *De harmonia*. In the addendum discussed above he notes that Jacobus Faber published a method of equally dividing a superparticular proportion by geometrically finding the mean proportional between two points on a string, thereby realizing the division of the 9:8 tone into two equal semitones, thought by Boethius to be impossible.[105]

Of the very rich treatise of Aristides Quintilianus, translated for him by Burana, Gaffurio drew mainly theories of a metaphysical or aesthetic nature. The most important exceptions to this statement are definitions of the "continuous" and "discrete" voice (I, 2, fol. 3r), the twofold definition of interval (I, 3, fol. 3v), the definition of rational and irrational intervals (I, 3, fol. 5r), the definition of the chromatic and enharmonic genera as condensations of the diatonic (II, 8, fol. 31r), and the first half of the chapter on the division of the whole tone into four dieses (II, 15, fol. 36v). Gaffurio demonstrated good judgment in extracting particularly passages dealing with philosophical matters, because, of all the Greek writers, Aristides was most concerned with the broader implications of the art of music. In submitting a capsule history of the modes in the first chapter of Book IV, Gaffurio cites Aristides' testimony that the Greeks sometimes called the modes "mores" (Greek *ēthe*) because of their capacity to excite the affections of the soul and body (IV, 12, fol. 83v).

The last chapters of *De harmonia* (IV, 12–20) are inspired by the classical analogies between various elements of music and the Muses, the sexes, the spheres, the numbers, the useful arts, the parts of the soul and body and their functions, the physical elements, the virtues, and the senses. The sources for these speculations are numerous, but prominent among them are Ptolemy and Aristides, both of whom dedicated lengthy and serious discussions to them.

Gaffurio's chapter 13, "That of the Celestial Bodies Some Are Masculine, Some Feminine, Others Mixed," is lifted in its entirety from Aristides Quintilianus.[106] Chapter 17, "That The Parts of the Soul Are Suited to the Intervals," is a juxtaposition of Ptolemy's 3.5 and a section from Aristides.[107] Leoniceno's translation of Ptolemy is reproduced verbatim except for some

which are products of the joining of superparticular proportions: 5:4 X 4:3, what "composers call the major sixth," and 6:5 X 4:3, the concord "called by singers minor sixth." Gaffurio disagreed with Ptolemy's classification of the octave-plus-fourth, because the notes of this interval "do not make a smooth concord at all but make a discord together."

105. Jacques Lefèvre d'Etaples, *Musica libris demonstrata quattuor*, (Paris, 1496); (Paris, 1552), III, 35, fols. 29v–30v, cited in Gaffurio, *De harmonia*, II, 37, fol. 65r.

106. *De musica* 3.21.

107. Düring ed., p. 95, line 28, to p. 97, line 27; Aristides Quintilianus *De musica* 3.25.

passages that are summarized. Ptolemy here compares the intellective, sensitive, and habitual parts of the soul to the octave, fifth, and fourth respectively. The three species of diatessaron are compared to the states of the habitual soul: growth, stability, and decay; the four species of diapente to the sensitive soul's sight, hearing, smell, and taste; and the octave's seven species to the parts of the intellect: phantasy, intellect, conception, mind, opinion, reason, and knowledge. An alternate division of the soul into rational, irrational, and concupiscible is similarly related to the consonances and their species.

The most interesting part of this chapter is derived from Aristides and concerns the *furor poeticus*.[108] Here Aristides describes the condition of enthusiasm or inspiration that gives rise to the composition of melody. The soul is oppressed by terrestrial concerns. Having rejected wisdom, it is lost in ignorance and forgetfulness and is at the mercy of the turbulence of the body, replete with terror and consternation. Thus the soul returns to a state not unlike that of its birth; yet because of the soul's great ignorance and oblivion, this condition resembles that of madness. In this state the soul gives forth, it is said, a melody, which is capable of soothing through a certain imitation the irrational part of the soul. Gaffurio reports the passage faithfully, following Burana's translation closely, but in the end he misses the point that melody is the product of this enthusiasm and not solely a cure for it.[109]

108. Aristides Quintilianus *De musica* 3.25; Gaffurio, *De harmonia*, IV, 17, fol. 98r, beginning "Ex Melodiae" and ending "animae et intellectus." Further indebtedness of Gaffurio's Book IV to Aristides may be noted in the following parallel or nearly parallel chapters: IV, 16 = 3.8–9; IV, 18 = 3.18; IV, 19 = 3.13–14.19; IV, 20 = 3.16.

109. Gaffurio, IV, 13, fol. 98r: "Quam quidem ob multam ignorantiam & obliuionem insania refertam: melodia mitigandam esse censuerunt."

TEN

The Ancient *Musica speculativa* and Renaissance Musical Science

Speculative music theory at the beginning of the Renaissance, with rare exceptions, was dominated by the Pythagorean, Platonic, and Neoplatonic traditions. As stated earlier (chapter 1), the first ancient music-theoretical source that humanists rediscovered was Boethius, an author identified with these traditions. Though read and respected throughout the Middle Ages, particularly for his *Consolations of Philosophy,* Boethius needed to be repossessed as an authority on ancient music, to be reclaimed from medieval theory. The accretions of the plainchant theorists had to be brushed away, and his image altered from that of a universal musical lawgiver to that of a transmitter of ancient learning. Fifteenth-century humanists could not identify precisely Boethius' sources, but it was clear that he leaned a great deal on Nicomachus and Ptolemy and was against the Aristoxenians. Although there were Aristoxenian elements in both Nicomachus and Ptolemy, and Ptolemy did not always sympathize with the Pythagoreans, Boethius was identified as a Pythagorean.

Pythagoras is usually cited early in a treatise as the inventor of music or the discoverer of the ratios of the consonances. Typically the legend of the blacksmith's shop is recounted. Almost everyone depended upon the embroidered version of the story told by Boethius.[1] The older and fuller accounts of this legend, by Nicomachus and Gaudentius, were not known until the mid-sixteenth century.[2]

As told by Boethius the story goes as follows. By divine will Pythagoras happened to pass a blacksmith's shop, from which he heard diverse sounds as the apprentices were hammering, and these sounds blended in consonances. Upon observing the smithies and reflecting on what he saw, he theorized that the diversity of pitches was caused by the diversity in strength of those hammering. But on testing the theory by having them exchange hammers, he found that this was not true. He then examined the weights of the hammers and found that one which weighed twice another sounded with it a diapason. Comparing other weights, he found that those in the ratio of 3:2 produced a fifth, and those in the ratio of 4:3 produced a fourth. By this means he determined the ratios of the consonances. After returning home, he made further tests. He attached weights to strings, blew on pipes of various lengths, and filled and partly filled glasses with water and struck them with a copper or iron rod. In all these experiments he found that the same ratios caused the same consonances.

Johannes Gallicus, who relied heavily on Boethius' treatise and referred to it as "that Music, which the so often mentioned Boethius turned into Latin from Greek,"[3] was dubious about Pythagoras' role in this incident. Around a figure of an anvil surrounded by four hammers bearing the numbers 6, 8, 9, and 12, Gallicus writes that it was more likely Jubal who made the discovery of the ratios of the hammers than Pythagoras, as handed down by the Greeks.[4] In the text itself Gallicus represents Jubal addressing the blacksmiths: "Exchange hammers, I pray you, and strike again, for I sense that not a small secret of nature hides either in your arms or in the hammers themselves."[5] After this experiment, Jubal concluded that the weights of the hammers and not the force of the blows determined the pitches.

Gallicus did not give an authority for his ascription of the discovery to Jubal, but Gaffurio, some years later, did. After paraphrasing the account of the story in Boethius, Gaffurio noted that Josephus attributed this investigation to Jubal before the flood, and in the appended figure Jubal is shown overseeing six smithies, five of them swinging hammers weighing 4, 6, 8, 12, and 16 pounds. In accordance with the account by Boethius, three other woodcuts show Pythagoras coaxing the same consonances from bells, water glasses, strings with weights attached, and pipes (see Figure 10.1). These figures illustrate Gaffurio's paraphrase from Boethius.[6]

In both Boethius and Gaffurio, the legend is introduced to show that,

1. *De institutione musica* 1.10–11.

2. For an English translation of the account by Nicomachus, see Flora Rose Levin, "Nicomachus of Gerasa *Manual of Harmonics:* Translation and Commentary" (Ph.D. diss., Columbia University, 1967), pp. 28–32.

3. *Ritus canendi,* I, 4; Coussemaker ed., IV, 304; Seay ed., 11.13: "ea namque musica, quam totiens allegatus Boetius de Graeco vertit in latinum."

4. *Ritus canendi,* I, 10; Coussemaker ed., IV, 310; Seay ed., 21.13: "Tradunt Graeci Pythagoram Hanc inveniisse fabricam./ Sed magis puto consonum/ Opinari dictum Iubal,/ Suum fratrem Tubal Cain/ Frequentasse fabricantem/ Qui ferro patet extitit/ Ac aere malleantium."

5. Ibid., I, 10; Coussemaker ed., IV, 310; Seay ed., 21.7: "Mutate, quaeso malleos ac iterum percutite, non enim parvum aut in vestris brachiis, aut in ipsis malleis latere sentio naturae secretum."

6. Gaffurio, *Theorica musice,* I, 8.

Figure 10.1.
The discovery of the ratios of the consonances by Jubal and Pythagoras, from Gaffurio, *Theorica musice*, I, 8

given the inadequacy of the hearing when confronted with a multitude of sensations, only the reason coupled with accurate observation and measurement can establish the true relationships of tones. Yet neither author gives evidence of observation or measurement, or reasoning thereon, and neither attempts to demonstrate anything geometrically, mathematically, or by logical induction or deduction. Boethius and Gaffurio simply recount a legend and remain in a narrative mode throughout these chapters. A correspondence between consonances and ratios having been established in this fashion, no further defense appears to them necessary, and this is true also of Nicomachus and Gallicus.

Of the four woodcuts in Gaffurio's figure, only the last represents phenomena that are verifiable. If pipes 4, 6, 8, 9, 12, and 16 units long are alike in other respects, the sequence of intervals that Gaffurio aimed to illustrate, a series comparable to A E a b e a′, will result when they are blown. In the other four cases—hammers, bells, glasses partly filled with water, and strings stretched by weights —the intervals will not be the same. With hammers the result is unpredictable, since the pitch emitted depends more on the metal struck than on the hammers. With bells and water glasses the relationships are complex. In the case of weights attached to strings the frequency will vary as the square of the weights. The one medium with which Gaffurio had direct experience, the single stretched string, the division of which would support the series of ratios he wished to demonstrate, is not brought into the account.

Although statements such as Gaffurio's wear some of the trappings of scientific research and demonstration, they are transparent appeals to authority and legend and cannot be considered scientific expositions at all. Hardly indicative of the current state of knowledge of sound, which in all of these authors is quite sophisticated at times, chapters such as these on the hammer story are concessions to a literary convention. Sometimes Gaffurio contrasts different opinions among the ancient authorities, but here too conventional erudition prevails over any impulse to critical choice.

Even in this indiscriminately eclectic, antique-worshipping environment, Valgulio's open-minded defense of both Pythagoreans and Aristoxenians is notable. He was not blind to their differences. The harmonists he recalls, "attribute more authority to the judgment of the ear than to that of reason, like the Aristoxenians do." The canonists "assign the first and most approved grade of judgment to the reason, as the Pythagoreans do, who with respect to genus are also harmonists." Ptolemy held to a middle way and maintained that a musician proceeds correctly "when the judgment of the ears accords with that of the reason."[7]

7. Valgulio, *Proemium*, 1530 ed., fol. 247r. See ch. 5 above, for a detailed treatment of his views.

Franchino Gaffurio

Gaffurio similarly contrasts the views of Plato and Nicomachus but is unable to choose one over the other. In a passage that is common to the *Theoricum opus* of 1480 and the *Theorica musice* of 1492, Gaffurio presents Plato's explanation of the mechanics of consonance:

Sit uero auribus ipsa consonantia secundum Platonem hoc modo: quom acutior sonus qui uelocior est grauem praecesserit in aurem celer ingreditur: offensaque extrema eiusdem corporis parte quasi pulsus iterato motu reuertitur: sed iam segnior nec ita celer ut primo impetu emissus aduenit: quo circa acutior ipse sonus nunc grauior rediens sono primum graui uenienti similis occurrit misceturque ei unam efficiens consonantiam.[8]

According to Plato, consonance strikes the ear in this way: the higher of the two sounds, which is speedier, precedes the low sound and enters the ear quickly, and when it has met the innermost part of the ear, it bounces back, as if it were impelled with repeated motion. But now it arrives more slowly, not fast as when emitted by the first impulse. For this reason this higher sound, now returning lower, presents itself as similar to the approaching low sound, and is blended with it, making one consonance

This explanation of consonance was given by Plato in *Timaeus* 80a–b, but Boethius or his source added the clarification of how the faster sound slows down to reach a correspondence with the slower sound, namely, by bouncing back and forth in the innermost part of the ear. Gaffurio in 1480 had no direct access to Plato; so he could not appreciate that he was transmitting a later interpretation along with Plato's views.

Gaffurio now finds in Boethius a competing theory, attributed to Nicomachus.[9] A sound consists of not one impulse but many in quick succession. When a string is tense, it produces frequent and dense pulsations; when it is loose, it produces slow and rare pulsations. If the percussions of the low sounds are commensurate with the percussions of the high sounds, then consonance will result, otherwise not. The words with which Boethius reports Nicomachus' thoughts are repeated almost verbatim by Gaffurio.[10]

In a section of the *Theorica musice* not held over from the 1480 version, Gaffurio went to what was probably the most enlightened source then

8. *Theoricum opus*, II, 3; *Theorica*, II, 4, fol. c5v. This is a paraphrase of Boethius *De institutione musica* 1.30.

9. This is not preserved in Nicomachus' extant works.

10. *Theoricum opus*, II, 3; *Theorica*, II, 4, fol. c5v.

available on the science of sound, the *Paraphrases* of Themistius (c. 317–38 A.D.) on the *De anima* of Aristotle in the Latin translation of Ermolao Barbaro.[11] Themistius now became Gaffurio's main source for the theory of sound and hearing. Themistius had insisted, as d'Abano was later to do, that the air struck by the sounding object was not the same as that which reached the ear. He noted, following Aristotle, that the notions of grave and acute were assigned to sounds by analogy with touch, and elucidated this by saying that the acute voice stabs the air and pungently wounds it, while the grave tone hits bluntly and spreads as it hits. Whereas the acute sound moves the sense a great deal quickly, the grave sound moves it little slowly.[12]

Gaffurio depended on Themistius also to explain the mechanism of hearing. The nature of the ear is akin to that of air in that the ear is congenitally filled with air, which is excited by the air outside and transmits the motion to little sensitized tinders inside a tissue of little breadbaskets (*paniculae*) filled with air. The outside and inside air are continuous, which explains why animals do not hear by their other bodily parts.[13]

Gaffurio made no attempt to reconcile the Aristotelian and Pythagorean-Platonic traditions in his *Theorica musice*. The split became even more intense in Gaffurio's last treatise, *De harmonia*, in which he turned to a wider variety of Greek sources, often eclectic themselves. As he darts from one to another it is nearly impossible to detect any consistent philosophy. Yet when a question touches on some of the fundamental tenets of music theory, he takes a conservative, Boethian position.

Such a question is the tuning of the diatonic scale. Despite the alternatives to the Pythagorean tuning offered by Ptolemy, some of them better suited to current musical practice, Gaffurio never departed from the system sanctioned by Boethian authority. It is characteristic of him to overlook the incompatibility of the ancient theory of intervals with the way composers employed consonances in polyphony. Whereas Boethian theory recognized only the few consonances acceptable by Pythagorean standards, later called "perfect" consonances, musical practice in the fifteenth century required that one of these, the fourth, be treated in most polyphonic situations as a dissonance and that the perfect consonances be mixed and alternated with so-called imperfect consonances, thirds and sixths. In the tuning prescribed by Boethius, the major third was a ditone, 81:64, and the minor third, 32:27, neither too displeasing as a simultaneous concord by itself, but grating

11. Themistius *Paraphrases* on Aristotle, *De anima*, Latin trans. Ermolao Barbaro (Paris, 1535), ed. Richard Heinze (Berlin, 1899).

12. Ibid., II, 30, fol. 74.

13. Gaffurio, *Theorica*, II, 2: Themistius, *Paraphrases*, Barbaro trans., II, 28, fol. 72.

when combined together in a three-part chord. One of the tunings described by Ptolemy, indeed the diatonic he most favored, permitted better-tuned thirds on most degrees of the scale, namely those in the ratios 5:4 and 6:5. This was his syntonic diatonic. Yet Gaffurio could not bring himself to accept it.

Ramos de Pareja

The mathematician Bartolomé Ramos de Pareja (c. 1440–after 1491) in 1482 had proposed a similar but not identical tuning purely as a practical strategy.[14] Ramos appears not to have read any of the Greek sources directly, but, like Gallicus and Gaffurio, had studied Boethius closely. He read him, however, more critically than his predecessors. Ramos began the prologue of his book with an encomium of Boethius, paying tribute to the profound arithmetical and philosophical foundations on which the work of Boethius rests and proclaiming that it always has been and always will be greatly prized by the learned. At the same time it always has been and always will be neglected by half-educated musicians, who find it obscure and sterile. This statement may reflect Ramos' own ambivalence toward Boethian theory. He frequently cites its authority for definitions and ancient musical lore; yet, after praising it as subtle, delightful, and useful to theorists, and with only a mild complaint that the monochord division of Boethius is "laborious and difficult for singers to learn,"[15] Ramos proceeds to overturn completely the Pythagorean system. Slily constructing a monochord division that would correct the tuning of the imperfect consonances, he proposes it simply as a method that anyone moderately educated will easily understand. Only toward the end of the book does he make it plain that his imperfect consonances have simpler ratios than those of the Pythagorean system, namely 5:4 and 6:5 for the major and minor thirds, and 5:3 and 8:5 for the major and minor sixths.[16]

According to Ramos' disciple Giovanni Spataro, Ramos arrived at his diatonic division independently of Ptolemy and Didymus,[17] although his system seems to graft the two. The string lengths shown in Figure 10.2, which Ramos does not reveal but were later calculated by John Hothby,

14. *Musica practica* (Bologna, 1482; facs. ed., Bologna, 1969), I, 1, 2; ed. Johannes Wolf in Publikationen der Internationalen Musikgesellschaft, Beihefte, II (Leipzig, 1901), p. 1.

15. Ibid., I, i, 2; Wolf ed., p. 4.

16. Ibid., III, ii, 3; Wolf ed., p. 98.

17. *Errori di Franchino Gafurio da Lodi* (Bologna, 1521), Error 17, fol. 22r: "Io non dico/ o Franchino: che el mio preceptore habia tolto el suo Monochordo da Ptolomeo: perche questo io non el scio di certo: Ma io dico/ che el suo Monochordo predicto non e dissimile da quello de Ptolomeo/ dicto di sopra."

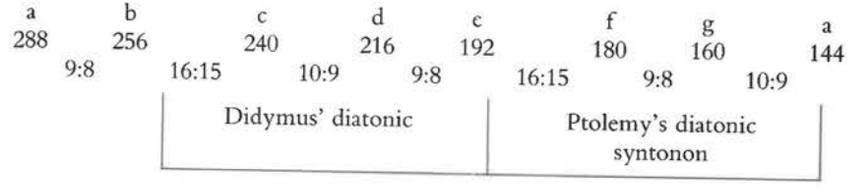

Figure 10.2:
Ramos de Pareja's monochord division

result from the division of the monochord presented by Ramos.[18] All the thirds on this monochord are just, or pure, that is, 5:4 and 6:5, except B–D (32:27). However, as Hothby pointed out, there are also two poor perfect consonances, the fourth, D–G (27:20), and the fifth, G–D (40:27).[19] Ramos expanded this diatonic system into a fully chromatic scale in a later chapter, but, aside from one more pure third (B♭–D), the thirds are either larger or smaller than just intervals.[20]

Even after Gaffurio discovered that Ramos' innovation was corroborated by Ptolemy, Gaffurio continued to oppose it and attacked Ramos by name in passages he added to his *De harmonia* before publication. He refutes the proposition that a ditone may be in the 5:4 ratio by appeals to authority—Jacques Lefèvre d'Étaples (Jacobus Faber Stapulensis), Boethius, and Porphyry—and by invoking the legendary Pythagoras.

> But a sesquiquartal proportion, since it is superparticular, cannot ever be divided into two equal proportions, as Boethius laid down in the third [chapter] of the first [book] of his Music. So Pythagoras despised all intervals that deviated from the purity of the multiple and superparticular [ratios], omitting in his investigation of consonant and equisonant tones intervals made agreeable sounding by the addition or subtraction of a minimal increment, because a very small error is not evident to the sense of hearing. But Ptolemy does not seem to have agreed with him altogether, for he constituted the incomposite ditonic interval in the enharmonic by subtracting a minimal interval, assigning to [the remaining interval] the proposed superparticular ratio that singers call major third, granted that it is a ditone diminished. We, however, were led to demonstrate [the intervals] with reason, even if the sense does not perceive the

18. *Musica practica*, I, i, 2. Ramos translates the points on his string h to p into mese to nete hyperbolaeon and also to letters in the Guidonian gamut, a to a' in his figure of the following chapter.

19. John Hothby, *Excitatio quaedam musicae artis per refutationem*, in Johannes Octobi, *Tres tractatuli contra Bartholomeum Ramum*, ed. Albert Seay (American Institute of Musicology, 1964), p. 25.

20. *Musica practica*, I, ii, 5.

minimal differences, for harmonics, as Porphyry says, hinges on the examination of differences.[21]

Although Gaffurio cites the favorable attitude of Ptolemy toward the sesquiquartal third, he is obviously not swayed from his loyalty to the Boethian-Pythagorean heritage, and his final appeal is to a defender of the rationalist position, Porphyry.

Giovanni Spataro

The defense of Ramos' position was assumed by his pupil, Spataro, choirmaster at San Petronio in Bologna. He was at a considerable disadvantage, for he could not read Latin and had to use an Augustinian friar to translate for him. This also meant that most of the humanist literature was unavailable to him. Spataro nevertheless boldly pointed out errors in Gaffurio's reading of Boethius and other authors. On the point made in the above quotation, Spataro pleads that Ramos should not be blamed for describing the tuning that singers actually use, namely a ditone of 5:4 proportion and not the theoretical one of 81:64. The difference between them, 81:80, is not, as Gaffurio claims, inaudible. Ramos considered it significant and distinctly audible.[22]

Spataro insinuates that Gaffurio admitted the defeat of his own and Pythagoras' theories when he acknowledged that musicians tempered certain intervals by ear, purposely altering consonances from their rational proportions. This *participatio,* as it was called, Spataro argues, means that all intervals besides the octave deviate from the Pythagorean proportions; in other words, the Pythagorean doctrine is unsuited to musical practice, "for if the Pythagorean arrangement followed by you needs the aid of heightening and lowering, such an arrangement in the sole Pythagorean genus cannot suit musical practice. Through this adjustment of the Pythagorean diatonic genus, one passes from this genus to that called by Ptolemy intense diatonic. I say that you *tacite* conclude that the Pythagorean doctrine, as far as practice is concerned, is altogether useless, deceptive, and futile."[23]

21. Gaffurio, *De harmonia,* II, 34, fol. 52v. All of this quotation dates from 1500 except the last sentence, which was added before publication in 1518. The subsequent three chapters similarly reject the 6:5, 5:3, and 8:5 ratios for the remaining imperfect consonances.

22. Spataro, *Errori,* Error 22, fol. 21v.

23. Ibid., Error 26, fols. 22v–23r: "perche se la pythagorica institutione (da te seguitata) ha bisogno de aiuto per intensione: et remissione/ tale institutione non potrà conuenire per se al Musico exercitio: in lo solo diatonico genere pythagorico: & perche (per tale adiuuamento) del genere diatonico pythagorico, se passa in quello genere chiamato da Ptolomeo intentum diatonicum genus. Dico che da te (tacite) e concluso/ che la pythagorica doctrina (in quanto a la exercitatione) essere omnino inutile: frustatoria: & uana."

Spataro's case was built entirely on his observation of practice. He was sure that the syntonic diatonic tuning of Ptolemy, "which divides the tetrachord by the ratios 16:15 at the bottom, then 9:8 and 10:9—a monochord produced by Ptolemy—is that practiced in active music today."[24] Spataro's knowledge of Ptolemy evidently came from Gaffurio and Boethius, for like them he made the mistake of attributing a Hypermixolydian octave species to Ptolemy.[25]

Lodovico Fogliano

It was not until Lodovico Fogliano's treatise *Musica theorica* (1529) that the imperfect consonances in just tuning received a logically developed defense. Fogliano was exceptionally well qualified to deal with questions of Greek music theory. He had experience as a singer and composer, and he knew Greek well enough to contemplate the translation of the works of Aristotle into Italian. Pietro Aretino wrote to him: "If you start to render in our vernacular the Greek of Aristotle, you will be the cause of making bigger than men those people who, not understanding the language of others, cannot derive benefit from a gift of nature. Surely you alone are qualified to clarify the obscure with your plain speech, sweetly opening the senses, confused in the clouds of the material. Therefore get on with your honored translation, providing for the enrichment of ambitious intellects."[26]

All that is left of Fogliano's work on Greek authors is a collection of extracts, definitions, and compendia, arranged by subject, in a manuscript headed "Flosculi ex philosophia Aristo. et Auerroijs A ludouico foliano mutinensi excerpti et in hunc vtilissimum ordinem redacti."[27]

Zarlino had a high opinion of Fogliano's work and in response to an inquiry from Gian Vincenzo Pinelli, Giuseppe Moleto prompted Zarlino to report what he knew of him. "I spoke to S. Zerlino on the subject of Foliano. He says that he was neither priest, friar, nor monk, and he never practiced music in public, but that he lived in Venice for a very long time. He was Modenese. He says that for someone who went slowly into musical

24. Ibid., Error 16, fol. 21v: "quale diuide el tetrachordo/ per semitonio sesquintadecimo in graue & per tono sesquioctauo/ & tono sesquinono: & perche tale monochordo (da Ptolomeo producto) e quello/ che in la actiua Musica oggi se exercita."

25. Ibid., Errori 25–26, fols. 36r–37r.

26. Pietro Aretino to Lodovico Fogliano, 30 November 1537, quoted by Girolamo Tiraboschi, *Biblioteca modenese* (Modena, 1781–86), II, 307.

27. Paris, Bibliothèque Nationale, MS lat. 6757, fols. 1–74v. At folio 74v we read: "Expliciunt flosculi doctrina aristo. et auerroijs. Incipiunt quaedam fragmenta diuersarum materiarum." The manuscript ends on fol. 88. Included in the "Flosculi" is material on harmonics, music in education, and the moral effects of music, drawn from Aristotle's *De anima, Politics,* and Averroës' commentaries on the *Metaphysics, Ethics, Posterior Analytics,* and *De anima.*

propria aliqua uox, sit consonantiae diapason, propter esse, et ipsas, et species aequales, numero. Assumpta enim diapason, secundum inter media, quodammodo loci, constitutionis perfectae, hoc est, quae sunt, a situ mediarum, suprema, hypate, nominata, ad neten, disiunctarum: ut uox amicabiliter reuertat, et uersetur, circa medias, maxime melodias, raro, ad extremas exiens, propter eius, quae est, praeter modum, remissionis, ut intentionis, uaehementiam, et uiolentiam. media quidem, secundum potentiam, mixolÿdij, adaptabitur, loco paranetes disiunctarum, ut tonus, primam speciem faciat, in proposito diapason: media uero, Lÿdij, loco tertiae disiunctarum, secundum secundam speciem, media, phrigij loco, parameses, secundum tertiam speciem, media uero dorij loco mediae faciens quartam et mediarum speciem diapasson.[12]

step of the diapason consonance, because these [tonoi] and the species are equal in number. We have adopted the diapason in the middle with respect to the locus of the perfect system, that is, the one from the supreme —the hypate—of the medians [hypate meson], as named by position, to the nete of the disjunct [diezeugmenon], for the voice willingly returns and revolves around the middle—rarely sending a melody out to the extremes because of the vehemence and force [required] for those [pitches] that are beyond the normal in laxity or tension [lowness or height of pitch]. Thus the middle note by function of the Mixolydian will be adapted to the locus of the paranete of the disjunct, so that the tonos might produce the first species in the proposed diapason. The middle note of the Lydian [will be adapted] to the locus of the third of the disjunct [trite diezeugmenon] in keeping with the second species; the middle note of the Phrygian, to the locus of the parames, in keeping with the third species, the middle note of the Dorian, though, to the locus of the middle note [mese], producing the fourth and middle [species] of diapason.

Ptolemy's explanation of how the tonoi and octave species are intertwined is here expressed for the first time in the Latin language. Although Ptolemy does not openly state that the purpose of the tonoi is to produce the seven different octave species within the central octave, this is implied, and Leoniceno's translation, "ut tonus primam speciem faciat in proposito diapason," conveys quite unambiguously the purposive tone of the construction "hin' ho tonos to pròton eidos en tō proskeimenō poiēsē tou dia pasōn" (Düring 65.7–8).

12. Ptolemy *Harmonics* 2.11, Leoniceno trans., fol. 32v.

Franchino Gaffurio

Gaffurio was in a good position to bridge the gap between humanists and musicians with regard to the Greek modes. He was the beneficiary of translations of several major Greek musical authors. He apparently possessed a copy of Gallicus' *Ritus canendi,* for he mentions it in the *Theorica musice.*[13] And he knew Boethius thoroughly. The delay in publication of *De harmonia* after its completion in 1500 gave him plenty of time to absorb the contents of Valla's *De expetendis,* which came out in 1501. He also knew Valla's translation of Cleonides, for he cites it.[14] Despite these advantages, it cannot be said that Gaffurio added materially to the knowledge of the Greek tonal system.

Gaffurio's chart of the Greek tonoi in *Theorica musice* (see Figure 11.5) hints at a derivation from Gallicus' chart.[15] Eight transpositions of the same A-a scale with the names Hypodorian to Hypermixolydian are represented on a grid. Each transposition has the identical letters A to a to indicate that they all have the same intervallic pattern. In introducing the chart Gaffurio explains:

> The philosophers called these seven species of diapason modes from *modulando* or from *moderando,* since they observed that through them every progress of modulation is moderated through certain limits of tension and relaxation. Now the first species of diapason, going from the string proslambanomenos to mese, or from A re to a la mi re, they called Hypodorian. When every step of the Hypodorian undergoes a raising of a whole tone, the second mode, that is, Hypophrygian, results. If all the steps of this Hypophrygian are raised by a semitone, they form the Hypolydian. Raising this system in turn by a tone yields the Dorian.[16]

Gaffurio has here confused octave species, modes, and tonoi. The confusion started in his *Theoricum opus* of 1480, where he spoke of octave species, tropes, *maneries,* constitutions, and modes as interchangeable concepts. He also introduced there the post-Boethian method of dividing the octave into either a fourth below and a fifth above, or the reverse, which he said was the more consonant and perfect division. In both the 1480 and 1492 treatises the chart (Figure 11.5) and the discussion of the modes are part of a chapter entitled "Concerning the species of the diapason consonance," and this chapter follows a similar one on the species of diatessaron and diapente. Gaffurio demonstrates the octave species in the manner of the plainchant

13. Fol. a7r, I, 1: "musice facultatis libellum clericis perutilem descripsit." This remark is not in the earlier version, *Theoricum opus,* of 1480.

14. *De harmonia,* II, 16, 23.

15. The identical chart occurs in *Theoricum opus,* 1480, V, 8.

16. *Theorica musice,* V, 8, fol. 3kv.

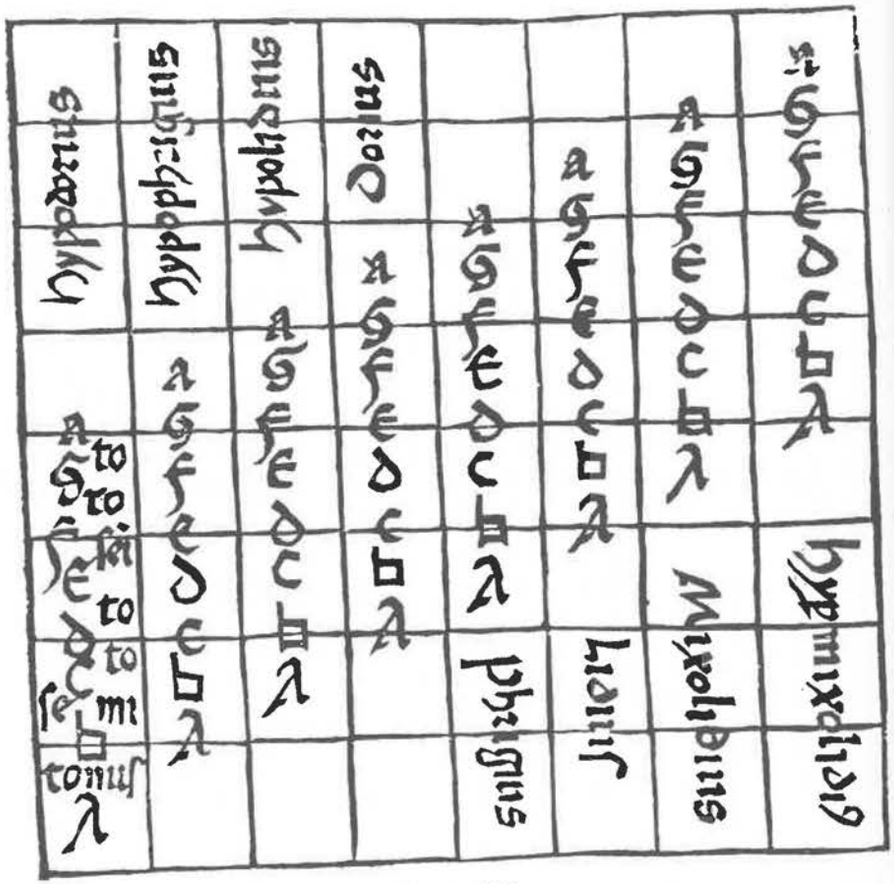

Figure 11.5.
The Greek tonoi according to Gaffurio, *Theorica,* V, 8

theorists. The first species of diapason is made up of the first species of diatessaron, A-d, and the first species of diapente, d-a; the second and third species of diapason are similarly constructed of the second and third species of diatessaron and diapente. But beginning with the fourth species of diapason, d-d', the diapente is below the diatessaron.

In the passage quoted above, which is only in the 1492 version, Gaffurio first says that the philosophers called these seven octave species modes. Then he shows that the first of these species could be transposed successively by tone, semitone, tone, tone, semitone, tone to produce further modes. Thus modes, it would appear, could be both different species and transpositions of a single species. (We shall see that in *De harmonia* Gaffurio eliminated this confusion.)

By introducing "the philosophers" Gaffurio makes a subtle transition from the plainchant theorists to Boethius, who called the transpositions *modi*. However Boethius reported a different scheme of transpositions: tone, tone, semitone, tone, tone, semitone, tone. Gaffurio's departure may have been deliberate, because he justifies it by the Guidonian gamut.

On the other hand Gaffurio may have been misled by the diagram in the edition of Boethius published by Joannes Gregorius de Gregoriis fratres in 1492.[17] Otherwise Gaffurio follows Boethius. He recognizes the functional, or dynamic, nomenclature in that he sees each mode as rising from its proslambanomenos to its mese:

> Thus the proslambanomenos or A re of the Hypodorian is surpassed by the height of a tone by that which is the same of the Hypophrygian. Similarly also the mese or a la mi re of the Hypophrygian exceeds that one which is the same of the Hypodorian by the height of a tone. Thus the intervening steps and the whole order of steps of the Hypophrygian happens to exceed the remaining intervening steps of the entire Hypodorian order by the dimension of a tone. The same order and process occurs in the others.[18]

Gaffurio then makes a cryptic remark that is also derived from Boethius: "It is agreed that these seven modes are deduced according to the seven species of diapason from the same strings and steps, one higher or lower than the other."[19] Boethius did not explain how the modes could be derived from the species, and Gaffurio does not shed any light on this. Having by some process derived seven modes from seven octave species, Gaffurio, again following Boethius, adds an eighth, the Hypermixolydian, which, he says, Ptolemy "put on top" of the rest (*superadnexuit*).[20]

In *De harmonia,* completed eight years later, after Gaffurio had had a chance to consult the translations of Bryennius, Aristides Quintilianus, and Ptolemy, the discussion of the octave species is separated from that of the modes. Indeed, they are in different books. He starts the chapter on the octave species (II, 32) with a citation of Ptolemy, but then proceeds to set them forth in the medieval manner, dividing them into species of fourths

17. In the reprint of 1499 that I have seen, the tonoi rise in the diagram as in Gaffurio: tone, semitone, tone, etc., although the text gives the proper sequence of tone, tone, semitone, etc. In the 1499 edition 4.15 is numbered 4.14.

18. Ibid., V, 8, fols. k3v–k4r.

19. Ibid., V, 8, fol. 4kr. Compare this to Boethius *De institutione musica,* 4.15: "Ex diapason igitur consonantiae speciebus existunt, qui appellantur modi, quos eosdem tropos vel tonos nominant. Sunt autem tropi constitutiones in totis vocum ordinibus vel gravitate vel acumine differentes."

20. Boethius *De institutione musica* 4.17; Friedlein ed., 348.3.

and fifths and numbering them as in his two earlier works. This system has no connection with Ptolemy, who numbered them: 1, b-B; 2, c′-c; 3, d′-d; up to 7, a′-a (2.3). The order in Boethius is similar except that he always names the lower note first, thus: 1, B-b; 2, c-c′, etc. (4.14).

Inspired by Ptolemy (2.3), probably through Boethius (4.14), on the other hand, is the discussion of the species as terminated by fixed or movable notes (II, 32). This leads Gaffurio to consider placing all of the seven species within the extremes of two fixed notes, proslambanomenos and mese. The different arrangements of tones and semitones requires the division of the octave into a continuous series of semitones, or what Gaffurio calls the *genus permixtum,* a concept he borrowed from Anselmi. (See, for example, the first two species in Figure 11.6). Although Gaffurio expresses the location of the steps of each species in terms of string lengths in the Pythagorean tuning, the scheme of seven octave species may be thought of as the equivalent of the pitches A to a in the modern major keys of C, B♭, A, G, F, E, and D. Just as Ptolemy's tonoi transpose his seven species into the central octave from hypate meson to nete diezeugmenon, so Gaffurio's species transpose his own medieval species into the A-a octave. Gaffurio does not relate either the ancient or modern modes to these transposed species. It is merely an interesting but abstract speculative exercise.

All of Book IV of *De harmonia* is devoted to the modes. Gaffurio draws from a multiplicity of sources concerning their history, ethical effects, and cosmic analogies. This literature is entirely about the ancient tonoi and harmoniai; yet Gaffurio applies it indiscriminately to the plainchant modes, to which the ancient names are assigned (IV, 3–7). Despite the fact that he now had Leoniceno's very adequate translation of Ptolemy, Gaffurio baldly affirms that "Ptolemy, to bring the entire double octave system into accord with the modes, placed on top an eighth mode that would seize upon the highest species of diapason between mese and nete hyperbolaion and that would surpass in pitch the Mixolydian mode by a tone; he called it the Hypermixolydian, as if to say 'above the Mixolydian' " (IV, 9). In only one place does Gaffurio seem to return to the Boethian theory of the modes, which had been the basis of his treatment of the subject in his two earlier works of musica theorica. This is in a chapter entitled "By how great an interval any mode (*tonus*) is lower or higher than another" (IV, 11). Here he makes the statement: "The Hypodorian mode is the lowest of all; it is lower than the Hypophrygian mode in the order of its entire constitution by the interval of a tone." A little later he defines the location of the Hypophrygian in similar terms: "The Hypophrygian mode is higher than the Hypodorian in the entire order of its constitution by the interval of a toniaeic [9:8] step. It is lower than the Hypolydian by the interval of a semitone (not by a tone, as some have laid down)." Gaffurio is deliberately

Figure 11.6.
The first two species projected on the octave proslambanomenos to mese, from Gaffurio, *De harmonia,* II, 32, fol. 57r

departing in the detail of the distances between modes from Boethius and his sources, yet modeling his discussion on them—that is, instead of Ptolemy's tone, tone, semitone, tone, tone, semitone, Gaffurio prefers, as in the *Theorica,* the pattern of the natural gamut from A to a: tone, semitone, tone, tone, semitone, tone, tone. Whether by raising the "entire order of the constitution" (*totum constitutionis ordinem*) or the "order of the entire constitution" (*totius constitutionis ordine*) Gaffurio meant to transpose the entire species of the Hypodorian octave to seven higher levels is open to question because of the inexactness of his language.

Gaffurio considered the system of eight modes perfect, because it completely filled the double octave. However he notes that Aristoxenus named in addition to the standard eight five more, namely, the Hypoiastian, Hy-

poaeolian, Iastian, Aeolian, and Hyperiastian. But Bryennius, he reports, considered them useless for an audible harmony of a full and integrated system and suitable only for display of erudition (*Harmonics* 2.4, Jonker ed., 164.3–8). In an addition Gaffurio made after the 1500 redaction of his treatise and before its publication in 1518 (fol. 91r), he points out that Martianus Capella spoke of fifteen modes altogether, a semitone apart from each other. But Gaffurio finds that these more than fill out an octave, which has only twelve equidistant semitones according to Aristoxenus. Also added just before publication was the chart showing this semitonal multiplication of modes (fol. 81v).

Gaffurio's modal theory does not do justice to the sources he possessed. In *Theorica musice* he failed clearly to distinguish between octave species and tonoi, although he seemed to have grasped the difference between the ancient and the modern systems. In *De harmonia* he was evidently too eager to apply ancient erudition to the modern system of modes to show openly that the ancient Greek system was fundamentally different from the modern. It would have made the entire Book IV irrelevant to modern harmonics had he done so. Unfortunately both Glarean and Zarlino trusted Gaffurio and borrowed heavily from him concerning the ethos of the modes, their structure, the octave species, and the ancient nomenclature.

There is another side to the impact of Gaffurio's learning. Mistaken though he was about the ancient modes, he impressed even highly trained and sophisticated readers with the wealth of information about them that he had gathered. Rather little attention had been paid to the modes in treatises of composition or even speculative works. Gaffurio made them central to harmonic theory precisely at the moment when accounts of the marvelous effects of ancient music were daring modern musicians to recapture that power. By appearing to disclose the secrets of the modal system that was reputed to have fabulous powers, Gaffurio stimulated the revival of modal theory and the striving for modal consciousness and purity.

Gioseffo Zarlino

Zarlino had an ambiguous relationship with the Greek "modes," as he called them. Part IV of his four-part *Le Istitutioni harmoniche* develops a theory of modality for modern composition. But the first eight chapters survey the modes and modality in antiquity. For what purpose, one may ask, since Zarlino was convinced that modern composers used the modes "in a manner very different from the ancients" (IV, 10). How many modes there were, in what order they should be named, what intervals separated them, how many steps each had and of what size—things about which the ancient authors differed—did not matter to him, because those modes served different ends and a different kind of music from that currently practiced. Why then spend eight chapters on the ancient modes?

Zarlino did not venture into this thorny subject only to display his erudition, although he was not averse to doing so. I believe he did it to expose the naiveté of Glarean's boast that in his dodecamodal scheme he had reconstructed the ancient Greek system. Just as Zarlino invested nine chapters of Part III in refuting the position of Nicola Vicentino on chromatic and enharmonic music without ever naming him (III, 72–80), so without once dropping Glarean's name Zarlino makes the Swiss humanist's presumption the hidden agenda of these chapters of Part IV.

Zarlino had reason to feel uneasy about Glarean's *Dodekachordon*. Its central thesis obviously appealed to Zarlino, for he adopted it. He could not help finding Glarean's expansion of the traditional eight-mode system to twelve an eminently practical strategy. The literature of both monophonic and polyphonic music abounded with pieces that ended on A or C and exhibited the octave species identified with these notes. Theorists and apologists had gone to great lengths to fit such pieces into an eight-mode configuration, and that rather unsuccessfully. Glarean's proposal, therefore, made good practical sense. Glarean's proof of why there could be no more than twelve modes also convinced Zarlino, for he repeats it (IV, 11). The emphasis on the harmonic and arithmetic divisions of the octave as the essential characteristics of the authentic and plagal modes—concepts peripheral to modal theory before Gaffurio—became central to both Glarean and Zarlino. In numerous details, then, Zarlino copied Glarean's exposition of the twelve-mode system. But Zarlino could not abide Glarean's classicizing rationalizations. Glarean felt bound to legitimize the twelve-mode system by classical examples and concepts, perhaps because he assumed—mistakenly—that the eight-mode system rested on them too. Glarean erected an elaborate historical argument to prove that in naming the four new modes Aeolian, Ionian, Hypoaeolian, and Hypoionian he was restoring some of the neglected Aristoxenian modes. He also scoured Gaffurio's writings and those of Martianus Capella and others for ethical characteristics of the ancient modes that would fit his set of twelve. Zarlino recognized that this was a vain enterprise. Whatever the ancient modes may have been, they surely were not the modes of Glarean.

Zarlino's is the best analysis of the nature of ancient modality that anyone had made until then. It draws upon a wide range of Greek and Roman sources and practically leaves the medieval tradition out of the discussion. He inquires first into the meaning of the word and concept "mode." In ancient usage it did not have the restrictive meaning of a scalar pattern but united a panoply of characteristics within a poetico-musical medium of expression. He concludes: "We can truly say that in ancient times a mode

mi in the middle. The steps are named both in terms of the medieval litteraeclaves and the Greek string designations. To the left of the perfect-system bar are seven bars representing the seven octave species turned modes. The fourth line from the bottom in each bar represents the mese in that mode, which is labeled at the far left. The highest mode, Mixolydian, is constructed out of the ascending interval species limma, tone, tone, limma, tone, tone, tone, equivalent to the octave hypate hypaton to nete diezeugmenon, or B-b, with its median note, the fourth from the bottom, situated on paranete diezeugmenon, the step assigned to the Mixolydian as its mese. Similarly the Lydian is built from the second octave species, tone, tone, limma, tone, tone, tone, limma, around the mese on trite diezeugmenon, and so on for the rest. Since Mei recognizes that the tonoi are all formed from the same arrangement of pairs of conjunct tetrachords around a tone of disjunction, he marks this tone of disjunction in each bar as a split key, rising alternately tone limma at the left and limma tone at the right. The Mixolydian shows clearly the pattern of two conjunct tetrachords descending tone, tone, semitone, tone, tone, semitone, below the disjunction, while the Hypodorian exhibits the same conjunct pair above that the disjunction. In the other modes no more than one complete tetrachord falls within the octave span. The tones of disjunction—and, consequently, the tonoi—rise in thirds. Taking the note below the disjunction (mese) as a measure, the sequence of transposed "thetic mesai," if we may call them that (Mei did not!), is B, d, f♯, a, c♯′, e′, g′.

Mei seems to have been misled by the statement in Ptolemy that functional mese (the "dynamic mese" of modern commentators) of the Mixolydian coincides with the locus of the paranete diezeugmenon, and that other notes are similarly assigned the mese function in the other tonoi. If the entire greater perfect system is transposed to accompany the mese, the octave species will be projected on the central span, hypate meson to nete diezeugmenon, and in each octave species the thetic mese will naturally be the fourth note from the bottom.[39] This phenomenon, different from what Mei conceived, may be seen in Figure 2.6 of chapter 2.

In the course of his explanation Mei seizes the opportunity to berate Gaffurio and Glarean for blindly following Boethius in the pursuit of the eighth mode:

Qua in re nostrorum hominum prudentiam saepe requiro, qui octauum hunc a Ptolemaeo modorum numero adiectum tradiderunt, Franchini Gafurij praesertim, uirj sane in hoc studio exercitatissimj ac longe doctissimi:

In this matter I often wonder about the sagacity of our men who transmitted that this eighth was added to the number of modes by Ptolemy, particularly that of Franchinus Gafurius, a man certainly very experienced and altogether very learned in this discipline.

Nam de Glareano minus est meo quidem iudicio mirandum; is enim Gafurij authoritate qui se Ptolemaej scripta legisse testatus fuerat, facile, cum ipse ea non legerit, decipi potuit: Gafurius uero, qui legit, et Ptolemaej sensum non est assecutus, et Boethij uerba, si modo ea legit non oscitanter, in suam sententiam interpraetatus detorsit: Boethius enim, cum de Hypermixolydio uerba faceret, ueritus nimirum, quando septem tantum esse modos, qui uidelicet ipsae diapason formae, affirmasset, atque octauum hunc postea eorum numero admiscuisset, ne parum ipse sibi constare uideretur, rationem se huius adiectionis paulo posterius allaturum est pollicitus, quod uero cum praestitisset, atque eam diligenter exposuisset, haec ille statim subiecit: ATQUE HIC EST OCTAVVS MODVS; QUEM PTOLEMAEUS SUPERANNEXVIT. Quae Gafurium in eam sententiam accepisse uel facile credere possumus, ut Hypermixolydij authorem inuentoremque Ptolemaeum existimasset. Quod non modo falsum est, sed a Ptolemaei quoque sententia penitus alienum.[40]

Less to be wondered at, in my opinion, is Glareanus. Since he did not himself read the writings of Ptolemy, he could easily be deceived by the authority of Gafurius, who, it has been witnessed, read them, if only sleepily, and did not pursue the sense of Ptolemy, but, persuaded by the words of Boethius, distorted the meaning. As for Boethius, since he mentioned the Hypermixolydian, when he affirmed that there are seven modes, as many evidently as the species of diapason, and mixed in with their number afterwards an eighth, lest this seem to have been a trivial thing to him, he promised to bring forward a reason for this addition a little later. This, indeed, he both fulfilled and industriously explained. He submitted it presently: "ATQUE HIC EST OCTAVUS MODUS; QUEM PTOLEMAEUS SUPERANNEXUIT." We can easily believe that Glareanus accepted Gafurius' judgment, so that he considered Ptolemy to be the author and inventor of the Hypermixolydian. This is not only false but completely alien to any opinion of Ptolemy.

Thus was the fiction of Ptolemy's addition of an eighth mode finally put to rest. Although Mei's work remained unpublished, his interpretations of the tonoi according to Aristoxenus, his followers, and Ptolemy were pub-

39. A more succinct discussion of the ancient modes is found in Mei's "Trattato di musica" in Paris, Bibliothèque Nationale, MS lat. 7209/2, pp. 53–56, trans. in Palisca, *Girolamo Mei*, pp. 50–53.

40. Mei, *De modis*, pp. 90–91. The references to Boethius are the following: *De institutione musica* 4.17; Friedlein ed., 343.16–18: "Septem quidem esse praediximus modos, sed nihil videatur incongruum, quod octavus super adnexus est," and 4.18, 348.2–3: "Atque hic est octavus modus, quem Ptolomaeus superadnexuit."