

*LE ISTITUTIONI HARMONICHE* OF GIOSEFFO ZARLINO, PART 1  
A TRANSLATION WITH INTRODUCTION

by

LUCILLE CORWIN

A dissertation submitted to the Graduate Faculty in Music in partial  
fulfillment of the requirements for the degree of Doctor of Philosophy,  
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Allan Atlas

\_\_\_\_\_  
Date

\_\_\_\_\_  
Chair of Examining Committee

David Olan

\_\_\_\_\_  
Date

\_\_\_\_\_  
Executive Officer

Barbara Hanning

Anne Stone

Ruth DeFord

Supervisory Committee

THE CITY UNIVERSITY OF NEW YORK

## Abstract

*LE ISTITUTIONI HARMONICHE* OF GIOSEFFO ZARLINO, PART 1  
A TRANSLATION WITH INTRODUCTION

by

Lucille Corwin

Advisor: Professor Barbara Hanning

This dissertation is the first version of the dedication, prologue, and Part 1 of Gioseffo Zarlino's *Le istituzioni harmoniche* with parallel texts in Italian (1558 edition) and English. Changes made in the 1573 edition, including Zarlino's marginal notes, appear as footnotes to the Italian text. In footnotes to the English translation I have provided definitions, identified lesser-known authorities cited by Zarlino, worked out mathematical examples, or explained choices of translation.

The forty-four chapters of Part 1 of *Le istituzioni harmoniche* treat the history, praises, and uses of music; definitions of music and its aspects; the relationship between numbers and music; justifications of the Senario (the number 6) as the basis of consonance; and mathematical definitions and procedures that serve to provide a foundation for Zarlino's theories. Zarlino's diagrams as well as my explanatory diagrams and tables are interspersed throughout the text.

In my introduction I provide a biography of Zarlino; discuss influences on Zarlino and writers whom Zarlino influenced in turn; present information about his position among the humanists of his day; and give a summary of Part 1 of *Le istituzioni harmoniche*. The appendices provide further information and illustrations.

## MECHANICS OF THIS DISSERTATION

I chose to translate the 1558 edition of *Le istituzioni harmoniche* because it was the earliest edition of Zarlino's treatise. The changes he made in 1573 are indicated in footnotes to the Italian text. His most extensive variant within Part 1 appears in the Prologue and constitutes a different rationale for the structuring of *Le istituzioni*. The 1573 version of this passage appears as a footnote in the translation of the Prologue, pages 116-119.

Only the errata pertaining to Part 1 are listed in the translation of *A i lettori*, page 101.

In reproducing the Italian text of *Le istituzioni*, I have taken Claude Palisca's renderings of Zarlino's spelling and orthography in Palisca's *Humanism in Italian Renaissance Musical Thought* as its model. Thus, Zarlino's employment of "u" and "v", "i" and "j" remains unchanged, while the "ess-tzet (ß)" and the script "s" have been replaced with "ss" and "s" respectively. A tilde (~) over a letter in the original indicates a contraction, which I have omitted in the transcription, instead spelling the words in full for the reader's convenience. Zarlino's accentuation is not always consistent with modern Italian usage; the accents (or lack thereof) in the Italian text are exactly as they appear in the 1558 edition. Deviations from modern spelling are followed by "[sic]." Page numbers of the 1558 version are notated within the text in boldface in square brackets.

Most of the diagrams from the 1558 edition were unchanged in 1573, and all have been reproduced and annotated. In 1573, Zarlino added more detailed information to the

diagram in Chapter 5. Both diagrams have been reproduced and glossed in the translation.

Page references to Plato's dialogues are given first as they appear in *Plato, Complete Works*, ed. John M. Cooper (Indianapolis: Hackett Publishing Company, 1997), and then in parentheses as the "Stephanus numbers" that are commonly used in scholarly references to the works of Plato. These numbers and letters indicate the corresponding page and section on that page of the relevant volume of the Greek text of Plato as edited (Paris, 1578) by the French scholar Henri Estienne (in Latin, Stephanus). Page references to Aristotle are given first as in *The Basic Works of Aristotle*, ed. Richard McKeon (New York: Modern Library, 2001), and then in parentheses as they are in the edition of Aristotle's Greek text published by the Berlin Academy, 1831-1870.

Footnotes beneath the Italian text refer to variants between the 1558 and 1573 editions of *Le institutioni*. Where the 1573 text differs significantly from 1558, a translation is provided in the footnote. Minor variants, such as transposition of word order, spelling differences, and differences of tense, such as conditional in 1573 replacing future in 1558, are included but not translated. Zarlino's marginal notes, which provide the original references to the works he cites, are included among these footnotes.

Footnotes beneath the English translation serve several purposes. These include information about the more obscure real and mythological figures to whom Zarlino refers, references to *Dimonstrationi harmoniche*, workings-out of mathematical formulas, and explanations of variants in translations of the same word. Addenda and commentary to the chapters on multiplication, addition, subtraction, and proportions further explain Zarlino's methods of calculation.

Well-known historical personages such as Euclid, Plato, Aristotle, Ptolemy, Augustine, et al. need no comment, nor do gods of antiquity such as Mercury and Apollo. In many places, Zarlino refers to Aristotle as “the Philosopher,” as was common practice since medieval times. The first occurrence of this reference is given a footnote; subsequently, only “the Philosopher” is used, with “Philosopher” capitalized only when it refers to Aristotle. Marcus Tullius Cicero, the Roman statesman and author, is sometimes referred to as “Tullius,” and Virgil (Publius Vergilius Maro), the Roman poet as “il Poeta.” Again, only the first mention is footnoted.

I have used the following pitch convention: absolute pitches are indicated by the notation in Figure 1; pitch classes are denoted in upper-case letters and are not italicized.

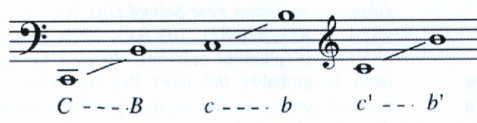


Figure 1. Absolute pitches.

#### ON THE TRANSLATION

For translation of words and expressions not used in modern Italian—for example, *avegna che* (although), *conciosia*, *conciosia che*, *imperoche*, and *percioche* (because), *etiando* (also, because, furthermore), and *parmi* (it seems to me)—I used John Florio’s *Queen Anna’s New World of Words, or Dictionarie of the Italian and English Tongues* (London: Melch, Bradwood, 1611).

I have adopted Claude Palisca’s translation of *Musica mundana* as “music of the cosmos.” Some of Zarlino’s words have been given additional explanation in the translation without the use of brackets. *Suoni* and *voci*, when they occur together, are

often translated as “instrumental sounds” and “vocal sounds.”<sup>1</sup> However, in Chapter 10, where Zarlino defines instrumental music as “harmonia, la quale nasce da i suoni & dalle voci,” *suoni* and *voci* are translated as “sounds” and “itches.” *Harmonia* is rendered as its cognate, “harmony,” when referring to concord or consonance. For example, in Chapter 2, “i cieli nel girarsi esser cagione di harmonia” is translated as “the turning of the spheres to be a manifestation of harmony.” In Chapter 9, “Musica Rithmica diremo esser quella harmonia, che si sente nel verso, ouero nella prosa...” is translated, “We will call ‘rhythmic music’ the harmony that is perceived in poetry or prose.” When *Harmonia* is used to refer to patterns or arrangements of intervals, as in Chapter 14, “si ritrouauano appresso gli antichi Musici sei specie di harmonia poste in vso, cioè la Doria...” *Harmonia* has been retained, capitalized and italicized in the translation; the preceding phrase is translated, “Beyond this were found, according to the ancient musicians, six species of *Harmonia* in use: Dorian...”

Some of the mathematical terminology requires a contextual reading in order to be translated correctly. Translations of specific ambiguous terms are elucidated in footnotes in the chapters in which they occur. For example, in Chapter 44, Zarlino uses *sottrare* to mean either “to divide” or “to subtract;” and *sommare* to mean either “to

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<sup>1</sup> Tigrini gives literal support for this translation in Part 1, Chapter 4, of *Il compendio della musica*, which is entitled *Che differenza sia tra'l suono, & la voce* (What the difference is between *il suono* and *la voce*). He writes, *Se bene appresso il Musico questi due nomi, cioè Suono, & voce sono equiuochi; è nientedimeno trà loro questa differenza; che il suono è vna percussione d’Aria indissoluta in sino all’vdito, che può nascere da i corpi duri, & inanimati; & la voce, è vna percussione d’aria respirata, la quale nasce solo da i corpi animati; onde il Filosofo. Vox autem sonus est quidam animati. Di maniera che ogni suono è suono, non già per lo contrario ogni suono è voce.* (Although for the musician, these two names, i.e., *suono* and *voce*, are ambiguous, there is nonetheless this difference between them: *il suono* is a percussion of the air that is discernable to the sense of hearing, which can arise from hard and inanimate objects, and *la voce* is a breathed percussion of the air that arises solely from living bodies, whereby the Philosopher states, *vox autem sonus est quidam animati*. Therefore, [one can say that] every *voce* is a *suono*, but the contrary, that every *suono* is a *voce*, is not true.) Orazio Tigrini, *Il compendio della musica* (Venice: Ricciardo Amadino, 1588), 3.

multiply” or “to add.” Footnotes are also used to demonstrate and clarify some of Zarlino’s mathematical procedures.

In Chapter 30, Zarlino appears to use *Rationali* to mean proper fractions whose values are less than 1 (*Equalità*), as an antonym for *Reali*, which in this context means improper fractions, whose values are greater than 1. He does not intend *Reali*—literally, “real”—as an antonym for “imaginary.” The concept of imaginary numbers (i.e., some roots of negative numbers, for example, the square root of  $-1$ ) was first introduced by Girolamo Cardano, also known as Cardan (1501-1576), in his 1545 treatise, *Ars magna*. It is possible that Zarlino was aware of Cardan’s discovery. However, in Zarlino’s context, proper/improper fractions are the appropriate interpretations of *proportionali rationali/proportionali reali*. To avoid any possible interpretation of a literal translation of *rationali* as its cognate (rational; pertaining to ratios), *rationali* has been translated as “fractional,” in the limited sense of “pertaining to proper fractions.” The cognate of *reali*, “real,” has been retained and here means “pertaining to improper fractions.”

In the translation, the word “Senario” is always retained and capitalized because of its central position in Zarlino’s theory of consonance. The first occurrences of “Binario,” “Ternario,” “Quaternario,” and “Quinario” are transliterated and capitalized; subsequent occurrences of these words are rendered as the numerals 2, 3, 4, and 5, respectively. When “Form” and “Matter” are used as concepts, as in Chapter 2, they are capitalized. In Chapter 12, *Vna* and *Vnità* are translated as “One,” capitalized, when meant as an origin or source. The Greek names of the intervals—diapason, diapente, diatessaron, ditone, and semiditone—are not capitalized, nor are the names of poetic feet, e.g., pyrrhic, iambic, etc. The anglicized versions of the names of the proportions and the

adjectives derived therefrom, such as sesquialter/sesquialteral, are not capitalized.

Zarlino's free and sometimes inconsistent capitalizations of words not capitalized in English are not capitalized in this translation.

I have frequently tried to recast Zarlino's long, convoluted sentences into smaller sentences without altering their meaning. Unlike our practice, a colon at the end of a phrase often prefaces the beginning of a new thought. At times, retaining the flavor of the original was better served by replacing a colon with a semicolon. Throughout, I have tried to render Zarlino's prose into idiomatic English.

## ACKNOWLEDGMENTS

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Zarlino's diagrams in the 1558 edition of *Le institutioni harmoniche* were reproduced by arrangement with Broude Brothers, Ltd., publishers of the facsimile of this edition.

My husband, James Corwin, and my children by birth and by marriage—Susanna and Scott Stickle, Kenneth, Henry, Chuhyon, and Catherine Corwin—deserve a profound degree of gratitude for their infinite patience, support, and encouragement.

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## Section I: Introduction

## PREFACE: INTRODUCTION TO ZARLINO AND HIS TREATISE

In the prologue to the first edition of his treatise *Le istituzioni harmoniche* (1558), Gioseffo Zarlino states that his work is intended for those who wish to learn how to compose music in a beautiful, learned, and elegant fashion (*componer musicalmente con ordine bello, dotto & elegante*).<sup>1</sup> Zarlino insists that a true musician must be versed in the speculative as well as the practical aspects of music; holding himself to these standards, he wishes to try to perfect matters concerning theory and practice, and to gratify all those who delight in such disciplines.

However, *Le istituzioni harmoniche* is not merely a collection of theoretical principles and rules of composition. It is also a reflection of the era in which it was written and it reveals the viewpoint of a Roman Catholic priest who was also an active member of a humanistic society in a time of religious upheaval.

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<sup>1</sup> Gioseffo Zarlino, *Le istituzioni harmoniche* (1558; repr. New York: Broude Brothers, 1965), 2.

## ZARLINO'S LIFE<sup>2</sup>

Gioseffo Zarlino was born to Giovanni and Maria de' Zarlini on January 31, 1517, in Chioggia, a seaport at the southern end of the Lagoon of Venice, fifteen miles from Venice (Figure 2). As a youth in Chioggia he studied grammar with Giacomo Eterno Sanese and arithmetic and geometry with Giorgio Atanagi, a tutor of mathematics. He first studied organ with Marco Antonio Cavazzoni, organist at Chioggia Cathedral in 1536-1537, and music theory with Francesco Maria Delfico, a Franciscan friar. The Franciscans were a potent force in Zarlino's early life. His uncle Bartolomeo entered the order in 1521. Gioseffo Zarlino received his first tonsure in 1532, took minor orders in 1537, and became a deacon in 1539. In the same decade, his life as a professional musician centered around Chioggia Cathedral. He was recorded as a singer there in 1536 and served as organist around the time he was awarded his deaconship.

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<sup>2</sup> For biographical information on Zarlino, I am indebted to Bernardino Baldi, *Cronica de mathematici, overo Epitome dell'istoria delle vite loro* (1707, edited by Elio Nenci as *Le vite de'matematici*, Milan: FrancoAngeli, 1998); Claude Palisca, "Zarlino," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com> (accessed November 19, 2003); Palisca, "Zarlino," *Die Musik in Geschichte und Gegenwart*, Friedrich Blume, ed., *Personteil* (Kassel: Bärenreiter, 1968), 14: columns 1017-1022; Wolfgang Horn, "Zarlino," *MGG*, rev.ed., Ludwig Finscher, ed., *Personteil* (Kassel: Bärenreiter, 2006), 17: columns 1348-1354; Rebecca Edwards, "Setting the Tone at San Marco: Gioseffo Zarlino Amidst Doge, Procuratori and Cappella Personnel," *La cappella musicale di San Marco nell'età moderna*, Francesco Passadore and Franco Rossi, eds. (Venice: Edizioni Fondazione Levi, 1998), 389-400; Iain Fenlon, *Music and Culture in Late Renaissance Italy* (Oxford: Oxford University Press, 2002); and Isabella Palumbo-Fossati, "La casa veneziana di Gioseffo Zarlino nel testamento e nell'inventario dei beni del grande teorico musicale," *Nuova rivista musicale italiana* 20 (1986), 633-649.



Plate 1. The Lagoon of Venice<sup>3</sup>

Zarlino moved to Venice in 1541 and became a pupil of Adrian Willaert, then *maestro di cappella* of St. Mark's church. Not only did Zarlino study composition, he also studied logic and philosophy under Cristoforo da Ligname, a medical doctor and philosopher from Padua. He studied Greek with Guglielmo Fiammingo and learned the rudiments of Hebrew from a nephew of the renowned Hebrew grammarian Elia Tesbite. In 1549, Zarlino published *Musici quinque vocum moduli*, a collection of nineteen motets, all of which, save for a seven-voice *Pater noster*, use five voices, as implied by the title of the volume. (See Table 1 below.) Zarlino was later to use eleven of these motets as examples in Part 4 of *Le istituzioni*. The contents of *Musici quinque* manifest Zarlino's scholarly interests: theology, linguistics, and studies of antiquity. The

<sup>3</sup> John Julius Norwich, *A History of Venice* (New York: Random House, 1989), xvii.

dedication even alludes to the function of music in sacred Egyptian rites!<sup>4</sup> Included are a modally ordered cycle of eight motets based on the Song of Songs,<sup>5</sup> as well as several works of a possible autobiographical nature: a lament on the 1546 death of Marchesino Vacca of Chioggia; an antiphon proper to St. Martin, patron of the church in Chioggia in which Zarlino was trained; another antiphon to St. Mark, one of the patron saints of Venice; and an ode on a newly-composed text in Horatian style, possibly an acknowledgement of Zarlino's classical studies.<sup>6</sup> Additional motets and madrigals appeared in anthologies published between 1548 and 1555.

The printing privilege and right to sell the first edition of *Le istituzioni armoniche* was granted in 1557. *Le istituzioni armoniche* was published in 1558; in that year, Zarlino was elected to a *mansionaria*, a minor benefice funded by testamentary bequest, at the Scuola Grande di Santa Maria della Carità, at a salary of twenty-five ducats a year. He was obligated to celebrate a daily mass as well as prepare a choral mass for the first Sunday of each month and all other solemn occasions of the Scuola. In 1560 he competed unsuccessfully for the position of *maestro di cappella* at Padua Cathedral.

One year after Willaert's death in 1562, Cipriano de Rore, Zarlino's fellow pupil, became *maestro di cappella* at St. Mark's. According to Rore himself, this position did

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<sup>4</sup> Gioseffo Zarlino, *Motets from 1549. Part II: Eleven Motets from "Musici quinque vocum moduli,"* ed. Cristle Collins Judd (Middleton, WI: A-R Editions, 2007), 2.

<sup>5</sup> For a detailed discussion of these motets, see Zarlino, *Motets from 1549. Part I: Motets Based on the Song of Songs,* ed. Cristle Collins Judd (Middleton, WI: A-R Editions, 2006), vii-xxii.

<sup>6</sup> A complete list of the 19 motets in Zarlino's 1549 collection can be found in Zarlino, *Motets from 1549. Part II,* viii.

not work out because of administrative difficulties caused by the division of the chapel into two choirs, as well as a low salary, and he resigned the next year.<sup>7</sup>

Until 1807, the church of St. Mark was not the cathedral of Venice but the private chapel of the doge. The *Procurati di Supra*, members of the major council and the Council of Ten, which headed the Venetian government, were responsible for all matters of administration of St. Mark's, including the hiring, promoting, firing, and disciplining of all its employees. To solicit candidates for the position of *maestro di cappella*, a letter describing its benefits—including an annual salary of 200 ducats, plus free housing<sup>8</sup>—was sent to Venetian ambassadors at various European courts. Zarlino's "erudition and experience in the art of music, as well as his prudence and modesty in performing his duties," were cited as significant factors in his winning the position in 1565. The document that extended this appointment reads in part:

*1565 adì. 5. lujo. Desiderando li clarissimi Signori Procuratori...provedere d'un maestro per la capella di S. Marco che sia non solamente dotto e pratico della musica, ma, come quello che ha da essere superiore alli altri musici, sia anche prudente et modesto in far el suo officio, havendo havuta ottima informatione della sufficientia e della modestia di Messer pre Iseppo Zarlino, et havedone voluto...haver sopra ciò participatione con sua serenità l'hanno eletto per maestro della sopradetta capella....*<sup>9</sup>

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<sup>7</sup> See Jessie Ann Owens, "Rore, Cipriano de," *Grove Music Online* (accessed January 23, 2006); and Ellen Rosand, "Music in the Myth of Venice," *Renaissance Quarterly* 30 (1977), 511-537; see 519.

<sup>8</sup> This letter, in I-Vas, PSM as Letter, Reg. 193, fol. 129<sup>v</sup>, lists the benefits of the position in the following manner: *...se veniriano a tal servitio...li daressimo ducati 200/ all'anno de provisione e la casa gratis et saria primario maestro in una città dalla quale ne caverà et gran utile et gran honore.* (...if he were to come to serve...we would give him 200 ducats a year as salary, and free housing, and he would be the first maestro in a city from which he could obtain both great financial rewards and great honor.) Giulio Ongaro, "Sixteenth-century Patronage at St. Mark's, Venice," *Early Music History* 8 (1988), 99-100. The salary of *maestro di capella* at St. Mark's is confirmed in Oliver Logan, *Culture and Society in Venice, 1470-1790* (New York: Charles Scribner's Sons, 1972), 260.

<sup>9</sup> This document is preserved in the State Archives of Venice, reg. 35, fol. 88<sup>v</sup>, and is transcribed in Ongaro, 114.

July 5, 1565. The honorable *Procuratori*, wishing to provide as maestro for the chapel of St. Mark's someone who should be not only learned and experienced in the art of music, but, as that person must be superior to all other musicians, someone who should also be prudent and modest in performing his duties, [and the Procurate] having had excellent reports on the ability and modesty of *messer pre* Iseppo Zarlino, and having conferred about this matter with His Serenity, have appointed him maestro of the said chapel.

Upon assuming his teacher's position, Zarlino resigned his benefice at the Scuola di Carità. In the same year, he was appointed as one of four chaplains to the nuns of the convent of San Lorenzo, which at the time was under the jurisdiction of the church of San Severo.<sup>10</sup> At this time Zarlino established residence in a house close to the parish of San Severo, where he lived for the rest of his life.

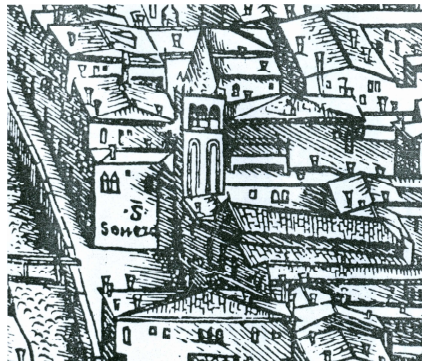


Plate 2. The Church of San Severo, Venice.  
Engraving by Jacopo de' Barbari (c.1445-1516).<sup>11</sup>

Zarlino's duties at St. Mark's included preparing music for major church feasts and their vigils, composing music for special occasions, instructing the choirboys (*zaghi*)

<sup>10</sup> The church of San Severo, originally established in the Castello *sestiere* of Venice during the ninth century, was destroyed in the fire of 1106 and rebuilt in Byzantine style. Among its artworks was a Crucifixion by Tintoretto. The church was deconsecrated in 1813; subsequently it housed a mill and a carpenter's shop before it was demolished in 1825.

<sup>11</sup> Umberto Franzoi and Dina Di Stefano, *Le Chiese di Venezia* (Venice: Alfieri, 1976), 408. This church was in *sestiere* Castello, but is no longer standing.

in counterpoint, *canto fermo*, and *canto figurato*;<sup>12</sup> and keeping apprised of the choirboys' progress, as well as informing the *Procuratori* when their voices broke so that measures could be taken to fill the need for sopranos and other high voices. Zarlino was charged with maintaining the discipline of the choir during Mass; no singer was permitted to leave the service without Zarlino's express permission.

Zarlino composed occasional music for major events: ceremonial music for Venice's 1571 military victory over the Turkish navy at Lepanto; a work for the 1574 state visit of Henri III of France; as well as a piece in retrospective praise of that event reputedly performed on Ascension Day a year later; and a Mass of Thanksgiving (after the outbreak of the plague of 1575-76) to celebrate the groundbreaking of the Church of the Redeemer. However, many of the compositional responsibilities of Zarlino's position were fulfilled by the organists at St. Mark's: Claudio Merulo, who had been appointed in 1557; Andrea Gabrieli, who was appointed the year after Zarlino began his tenure; and Giovanni Gabrieli, Andrea's nephew, who replaced Merulo on a temporary basis in 1584, then permanently in 1585. Giovanni served concurrently with Andrea until Andrea's death in August, 1585. As a result, Zarlino had time to write and revise his treatises, as well as pursue non-musical interests and correspond with his contemporaries in many fields.

An inventory dated February 8, 1590, four days after Zarlino's death, reveals that the contents of his house evidenced his many interests.<sup>13</sup> Among his musical instruments were a lute, a monochord, an enharmonic clavicembalo constructed for him by the

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<sup>12</sup> The term *canto fermo* refers to plainchant; *canto figurato* designates music with measured rhythm (normally polyphony).

<sup>13</sup> This inventory is catalogued in Palumbo-Fossati, "La casa veneziana," 633-649.

keyboard maker Domenico Pesaro in 1548,<sup>14</sup> as well as a chromatic clavicembalo said to have been made by the Venetian Vincenzo Columbi, builder and preserver of the organs of St. Mark's. Other objects in Zarlino's study were two astrolabes, a mesolabe, a clock with counterweights, three clepsydras, two globes, and a brass sphere.<sup>15</sup>

Zarlino's library, which included almost a thousand volumes, was mentioned as one of the most prominent in Venice in a guidebook to Venice, *Venetia citta nobilissima et singolare, Descritta in XIII. Libri (Venice, Most Noble and Singular City, Described in Thirteen Books, 1581)*, by Francesco Sansovino (1521-1586), son of the architect Jacopo Sansovino. The inventory lists the library as containing 290 books printed in folio, 294 in quarto, 354 in ottavo, and 206 in duodecimo, plus a volume of parchment<sup>16</sup> in folio. In his will, dated February 3, 1589, one year before his death, Zarlino leaves his library to a nephew, Iseppo Colonna, but only on the condition that his nephew wished to study. Zarlino states that in the contrary case, the volumes would go to the *Zoccolanti*, the strictest branch of the Franciscans.<sup>17</sup> Unfortunately, Zarlino's wish was not respected; the library was sold to the Dominican brothers of SS. Giovanni e Paolo, and the titles of his books have to date not been determined.<sup>18</sup>

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<sup>14</sup> Zarlino refers to this instrument as follows: *...vno di tali istrumenti feci fare io l'anno di nostra salute 1548 in Vinegia [sic], per vedere, in qual maniera potessero reuscire le harmonie Chromatice, & le Enharmonice...il quale fece Maestro Dominico Pesarese fabricatore eccellente di simili istrumenti...* (...one of such instruments I had made in the year 1548 in Venice in order to see in what manner I could construct the chromatic and enharmonic genera... which was made by Maestro Dominico Pesarese, excellent builder of similar instruments...) (*Ist.* [1558], 140).

<sup>15</sup> The astrolabe, mesolabe, and clepsydra are described in Appendix I.

<sup>16</sup> Written as *Bergamina* in the inventory (facsimile in Palumbo-Fossati, "La casa veneziana," 646), and rendered as *pergamena*, "parchment," in Palumbo-Fossati, "La casa veneziana," 642, n. 11.

<sup>17</sup> *Voglio che tutta la libreria che io mi ritrovo sia di Iseppo mio nipote figliuolo di Marta mia nezza e di messer Vincenzo Colonna; la qual gli lasso con patto che voglia studiare; perché altrimenti voglio che sia de' Frati Zoccolanti di S. Francesco...* (I wish that my entire library go to Iseppo, my nephew, son of Marta, my niece, and of Signore Vincenzo Colonna, on the condition that he study; otherwise, I wish that it

During his lifetime, Zarlino was respected as a mathematician. His biography is included among others prominent in the field in Bernardino Baldi's *Cronica de mathematici*.<sup>19</sup> Among Zarlino's correspondents were the mathematicians Francesco Patrizi and Giuseppe Moletto, as well as the bibliophile Gian Vincenzo Pinelli, in whose home in Padua scientists, antiquarians, and men of letters frequently met.

A medal, shown in Plate 3, was coined in Zarlino's honor.

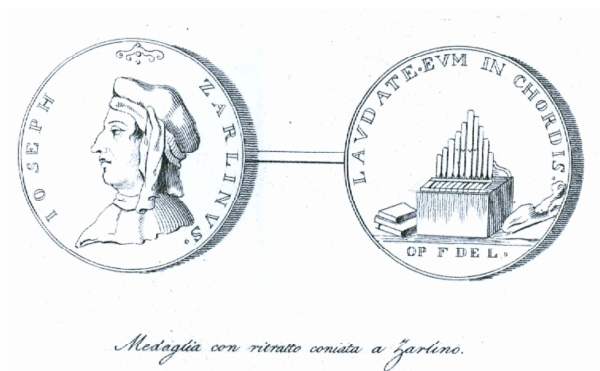


Plate 3. Medal in Honor of Zarlino.<sup>20</sup>

The reverse of the medal shows a pneumatic organ, books on its left side and a trombone or horn on its right. The siglum *Op. F. de L.* appears underneath.

An emblem created by Giovanni Maria Artusi, Zarlino's pupil, appears in Artusi's treatise, *Impresa del molto R.M. Gioseffo Zarlino* (Bologna, 1604). This emblem is shown in Plate 4.

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go to the *Zoccolanti*...), Palumbo-Fossati, "La casa veneziana," 638. For further information on the *Zoccolanti*, see <<http://www.newadvent.org/cathen/03320b.htm>>.

<sup>18</sup> Palumbo-Fossati, "La casa veneziana," 638-640.

<sup>19</sup> Baldi knew Zarlino during his lifetime. For bibliographical information, see above, page 2, n. 2.

<sup>20</sup> Francesco Caffi, *Storia della musica sacra nella già cappella ducale di San Marco in Venezia dal 1318 al 1797* (Venice: G. Antonelli, 1854), 126. Caffi describes the medal, but provides no information about its provenance. The siglum *Op. F. de L.* is possibly a reference to the coin's designer.

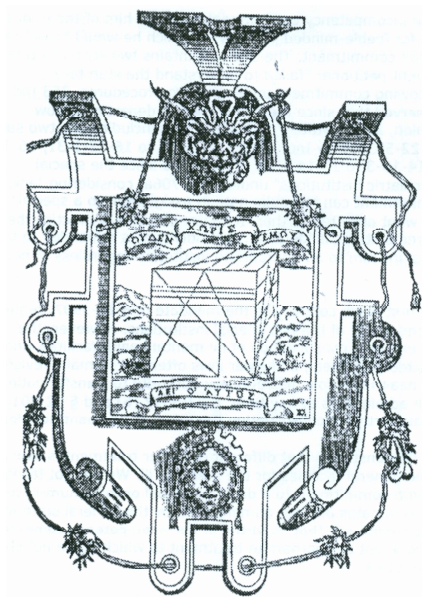


Plate 4. Artusi's Emblem in Honor of Zarlino.<sup>21</sup>

In this treatise, Artusi explains that the words on the banner above the diagram, “ΟΥΔΕΝ ΧΩΡΙΣ ΕΜΟΥ” (*ouden choris emou*, nothing apart from me), signify that nothing exists without the harmony ordained by God. The phrase on the banner below, “ΑΙΩΤΟΣ ΑΥΤΟΥ” (*aeiho autos*, always the same), refers to Artusi's perception of Zarlino's character as unswayed by trials or triumph. The mathematical constructions on the three visible faces of the cube are analogous to the consonances represented by the ratios of the Senario.

### ZARLINO'S WORKS

Zarlino's earliest published compositions, the volume of five-voice motets mentioned above, appeared in 1549. A collection of twelve six-voice motets was published in 1566. In addition, 6 other motets, 3 lessons for the dead, and 14 madrigals

<sup>21</sup> Giovanni Maria Artusi, *Impresa del molto R.M. Gioseffo Zarlino da Chioggia* (Bologna: Giovanni Battista Bellagamba, 1604), [v].

were included in anthologies. The four occasional compositions mentioned earlier, as far as we know, have not survived. Table 1 is a chronological listing of Zarlino's compositions that were published during his lifetime.<sup>22</sup>

Contents	Publication	Publisher	RISM
1 madrigal, 5 v.	<i>Il terzo libro di madrigali di Cipriano Rore et di altri eccellentissimi musici</i>	G. Scotto (Venice)	1548 <sup>9</sup>
19 motets	<i>Iosephi Zarlini Musici quinque vocum Moduli, Motecta vulgo nuncupata, Lib. I</i>	A. Gardane (Venice)	Z 99
1 motet, 6 v.	<i>Il primo libro de motetti a sei voci da diversi eccellentissimi musici composti</i>	Scotto	1549 <sup>3</sup>
1 motet, 5 v.	<i>Primo libro de motetti a cinque voci da diversi eccellentissimi musici composti</i>	Scotto	1549 <sup>7</sup>
2 motets	<i>Tertius tomus Evangeliorum</i>	J. Montanus and U. Neuber (Nuremburg)	1555 <sup>11</sup>
6 madrigals, 5 v.	<i>I dolci et harmoniosi concerti fatti da diversi eccellentissimi musici sopra varii soggetti. A cinque voci. Lib. I</i>	Scotto	1562 <sup>5</sup>
1 madrigal, 5 v.	<i>I dolci et harmoniosi concerti...A cinque voci, Lib. II</i>	Scotto	1562 <sup>6</sup>
3 lessons for the dead and 1 motet, 4 v.	<i>Motetta D. Cipriani de Rore et aliorum auctorum quatuor vocum</i>	Scotto	1563 <sup>4</sup>
12 motets	<i>Iosephi Zarlini Clodiensis musici celeberrimi, atue illustriss. et excellentiss. Domini Venet. musices D. Marci moderatoris, Modulationes sex vocum, per Philippum Iusbertum, musicum Venetum collectae</i>	Francesco Rampazetto (Venice)	Z 100
1 madrigal	<i>Di Hettor Vidue et d'Alessandro Striggio e d'altri eccellentissimi musici, madrigali a V &amp; VI voci</i>	Rampazetto	1566 <sup>23</sup>
1 madrigal, 5 v.	<i>Suavissimae et iucundissimae harmoniae</i>	T. Gerlach (Nuremburg)	1567 <sup>1</sup>
1 motet	<i>Primo libro di gli eterni mottetti di Orlando Lasso, Cipriano Rore et d'altri eccel. musici a 5 et 6 voci</i>	Scotto	1567 <sup>3</sup>

Table 1. Zarlino's Compositions Published during His Lifetime.

<sup>22</sup> The information on Zarlino's musical compositions is taken from Wolfgang Horn, "Zarlino," *MGG*, rev. ed., Ludwig Finscher, ed.; Palisca, "Zarlino," *Grove Music Online*; and Palisca, "Zarlino," *MGG*, Friedrich Blume, ed. Three motets—*Nemo potest venire ad me*, *O sacrum convivium*, and *Victimae paschali laudes*—appeared in more than one publication.

Contents	Publication	Publisher	RISM
3 madrigals, 4 v.	<i>Terzo libro del desiderio Madrigali</i>	Scotto	1567 <sup>16</sup>
1 madrigal, 5 v.	<i>Corona della morte dell'illustre signore, il sig. Comendator Anibal Caro</i>	Scotto	1568 <sup>16</sup>
1 madrigal, 5 v.	<i>I dolci frutti primo libro de vaghi et dilettevoli madrigali</i>	Scotto	1570 <sup>15</sup>

Table 1 (continued)

Zarlino's fame rests upon his theoretical writings about music. *Le istituzioni harmoniche*, first published by Zarlino himself in 1558, was reissued by the Venetian publisher Francesco de i Franceschi Senese in 1561. His other theoretical works include *Dimostrazioni harmoniche* (1571), a revised edition of *Le istituzioni* (1573), and *Sopplimenti musicali* (1588), all published by Senese. In 1589, Zarlino published his collected treatises under the title *De tutte l'opere del R. M. G. Zarlino ch'ei scrisse in buona lingua italiana (All the Works of the Reverend Messer G. Zarlino that he Wrote in Proper Italian)*, which included further revisions to *Le istituzioni*. Giovanni Battista Martini (Padre Martini), in his *Storia della musica (History of Music, 1757)*, lists a treatise in manuscript entitled *Che la Quarta e la Quinta sono mezane tra le Conson. perfette & imperfette (The Fourth and the Fifth lie Between the Perfect and Imperfect Consonances)*; this work, bearing the same title as Chapter 7 in Part III of *Le Istituzioni*, is presumed lost.<sup>23</sup> Table 2 is a chronological list of Zarlino's treatises on music published during his lifetime.

<sup>23</sup> Martini's bibliographical listing is in Giovanni Battista Martini, *Storia della musica* (1757, repr. Graz: Akademische Druck u. Verlagsanstalt, 1967), vol. 1, 468. Wolfgang Horn's article in *MGG*, col. 1351, lists this as a lost treatise.

Contents	Publication	Publisher	Year
Music treatise in Italian in 4 parts	<i>Le istituzioni harmoniche</i>	(self-published)	1558
Reissue of the 1558 edition	<i>Le istituzioni harmoniche</i>	F. Senese (Venice)	1561
Music treatise in Italian	<i>Dimostrazioni harmoniche</i>	Senese	1571
Revision of the 1558 treatise	<i>Le istituzioni harmoniche</i>	Senese	1573
Music treatise in Italian	<i>Sopplimenti musicali</i>	Senese	1588
Compilation of previous writings. Zarlino's music treatises appear as vols. 1-3; vol. 4 includes his non-musical writings.	<i>De tutte l'opere del R. M. G. Zarlino ch'ei scrisse in buona lingua italiana</i>	Senese	1589

Table 2. Zarlino's Treatises on Music Published during His Lifetime.

### ZARLINO THE PRIEST

Zarlino manifested his adherence to the values of the Roman Catholic Church in many ways. He performed the priestly duties of celebrating Mass and hearing confessions throughout his life.

Another example of Zarlino's adherence to the Church's values concerns the reformation of liturgical music proposed by the Council of Trent, which exhorted composers to set text in an intelligible fashion. In Part 4 of *Le istituzioni*, Zarlino denounces as barbarisms (*barbarismi*) the setting of words in Gregorian chant with an accent on the wrong syllable,<sup>24</sup> and recommends actually revising the chant settings in

<sup>24</sup> ...douemo osseruare, di accomodare ... le parole della Oratione alle figure cantabili, con tali Numeri, che non si oda alcun Barbarismo; si come quando si fà proferire nel canto vna sillaba longa, che si douerebbe far proferir breue: o per il contrario vna breue, che si douerebbe far proferir longa; come in infinite cantilene si ode ogni giorno; il che veramente è cosa vergognosa. Ne si ritroua questo vizio solamente nelli Canti figurati; ma anco nelli Canti Fermi, si come è manifesto a tutti coloro, che hanno giuditio: Conciosia che pochi sono quelli, che non siano pieni di simili barbarismi; & che in essi infinite volte non si odi proferire le penultime sillabe di queste parole Dominus, Angelus, Filius, Miraculus, Gloria, & molte altre... (...we must observe, in order to accommodate the words of the text to melodic figures with such rhythm that one does not hear any barbarism, as happens when one sets a long syllable to what should be a short note, or on the contrary, a short [syllable] to what should be a long note, as in many

such cases.<sup>25</sup> In 1577, almost twenty years after the publication of *Le institutioni*, Pope Gregory XIII issued a brief that charged Palestrina and Zoilo, former members of the Papal Choir, with the task of revising Gregorian chant.

Zarlino's published works outside the field of music, shown in Table 3, include a biography of his fellow Chioggian Matteo di Bassi of Urbino, founder of the Capuchins, the most conservative branch of the Franciscan order; a treatise that attempts to fix the exact date of Christ's crucifixion; books on calendar construction and reform, one of which was commissioned by Pope Gregory XIII; and a treatise on resignation written for Eleonora d'Este, duchess of Ferrara, upon the death of her mother.

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melodies one hears every day. It is truly a shameful thing. One does not find this error merely in *canti figurati*, but also in *canti firmi*, as is apparent to all of those who have judgment. There are few that are not full of such barbarisms in which infinite times one hears [accented] the penultimate syllable of these words – *Dominus, Angelus, Filius, Miraculus, Gloria*, and many others...) *Ist.* (1558), 340.

<sup>25</sup> *il che sarebbe cosa molto lodeuole, & tanto facile da correggere, che mutandoli poco poco, si accommodarebbe la cantilena...* (changing [the setting] slightly in order to accommodate the melody [to the words] would be a very praiseworthy thing and very easy to correct...) *Ibid.*

Contents	Publication	Publisher	Year
Biography of the life of Matteo di Bassi of Urbino	<i>Informationi intorno la origine della congregazione de i Reverendi Frati Capuccini</i>	Nicolini (Venice)	1579
Attempt to fix the date of Christ's crucifixion	<i>Discorso intorno il vero anno, et il vero giorno nel quale fu cricifisso il N. S. Giesu Christo</i>	Nicolini (Venice)	1579
On various aspects of time, construction of calendars, and solar and lunar cycles (in Latin)	<i>De veri anni forma, sive de recta eius emendatione</i>	Officina Varisciana (Venice)	1579
Consideration of questions posed by the reform of the Gregorian calendar	<i>Resolutioni de alcuni dubii sopra la correctione dell'anno di Giulio Cesare, ordinata dalla S. D. N. S. Papa Gregorio XIII</i>	Polo (Venice)	1583
Treatise on resignation	<i>Utilissimo trattato della patientia, a tutti quelli che desiderano vivere christianamente</i>		1583

Table 3. Zarlino's Writings outside the Field of Music Published during his Lifetime.

### ZARLINO THE HUMANIST

Of the dictionary definitions of “humanism,” the one most relevant to a study of Zarlino reads, “the revival of classical letters, individualistic and critical spirit, and emphasis on secular concerns characteristic of the Renaissance.”<sup>26</sup> The term *Humanismus* was coined in 1808 by the German pedagogue Friedrich I. Niethammer (1766-1848)<sup>27</sup> “to signify a pedagogical direction whose end was to orient education toward the human content of ancient culture,”<sup>28</sup> and derives from the *studia humanitatis*—grammar, rhetoric, poetry, history, and moral philosophy – a curriculum that was a reordering and expansion of the medieval Trivium (grammar, rhetoric, and

<sup>26</sup> Webster's *Encyclopedic Unabridged Dictionary of the English Language*, s.v. “Humanism.”

<sup>27</sup> Charles E. Trinkaus, *The Scope of Renaissance Humanism* (Ann Arbor: University of Michigan Press, 1983), 3.

<sup>28</sup> Don Harrán, *Word-Tone Relations in Musical Thought* (Neuhausen-Stuttgart: Hänssler-Verlag, 1986), 10.

dialectic). By the beginning of the fifteenth century, “humanism” as a profession had been established in the Italian civil and diplomatic services, in schools, in ecclesiastical centers, and in princely and private households.<sup>29</sup> The application of the term *humanista* to a well-known teacher and historian, Carlo Sigonio (1520-1584), in a letter written by the polymath Ercole Bottrigari (1531-1612), a correspondent of Zarlino, shows that the term must have been used, at least during the late Renaissance.<sup>30</sup>

The complete title of the 1558 edition of *Le istituzioni* refers to three of the five disciplines of the *studia humanitatis* and reads,

*LE ISTITVTIONI / HARMONICHE / DI M. GIOSEFFO ZARLINO DA CHIOGGIA; / Nelle quali; oltre le materie appartenenti / ALLA MUSICA; / Si trouano dichiarati molti luoghi / di Poeti, d’Historici, & di Filosofi; / Si come nel leggerle si potrà chiaramente vedere.*<sup>31</sup>

The harmonic institutions of Messer Gioseffo Zarlino of Chioggia in which, beyond matters pertaining to music, are found many passages stated by poets, historians, and philosophers, as can be clearly seen by reading them.

The Greek distich directly underneath the title acknowledges God as the final determinant of events –thus combining a gesture to antiquity with an acknowledgement of the supremacy of God. The same pair of verses is displayed on the title page of every one of Zarlino’s published works on music theory.

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<sup>29</sup> Trinkaus, *The Scope of Renaissance Humanism*, 17.

<sup>30</sup> ...il Sigonio non solamente buon musico contrapuntista (ond’ei venisse, come per ischerzevole disprezzo di ciò, da suo fratello Carlo Humanista nelle prime catedre de’principali studij d’Italia lettore di chiarissima fama, detto Solfanino) ma versato molto nella lettione delle Istituzioni e delle Demostrationi armoniche del Zarlino. (...[Gandolfo] Sigonio was not only a good musical contrapuntist [whence he came to be called “Little Solfa,” as if in playful disdain of this (skill) by his brother Carlo the humanist, a teacher of the most illustrious fame in the chief seats of the principal universities of Italy], but also very proficient in the teaching of Zarlino’s *Istituzioni* and *Dimostrationi armoniche*...) Bottrigari, “Lettera di Federico Verdicelli.” This letter, written in 1601, is quoted in Maria Rika Maniates, “The Cavalier Ercole Bottrigari,” in *Music Theory and the Exploration of the Past*, ed. Christopher Hatch and D. W. Bernstein, (Chicago: University of Chicago Press, 1993), 185, n. 71. The translation is in Maniates, “The Cavalier Ercole Bottrigari,” 155.

<sup>31</sup> Zarlino, *Ist.* (1558), frontispiece.

¶ Θεὺ δίδόντος, οὐδὲν ἰσχύει φθόνος.  
Καὶ μὴ δίδόντος, οὐδὲν ἰσχύει πόνος.

If God grants it, envy is of no avail.  
If God does not grant it, effort is of no avail.<sup>32</sup>

A reproduction of the title page of the 1558 edition appears as Plate A4.1 in Appendix 4.

For the *humanisti*, classical studies assumed the highest importance, and the writers and philosophers of ancient Greece and Rome served as models. Society was seen as having realized its highest achievements during antiquity, subsequently having fallen into a dark period, and then having been revitalized through the discovery and study of classical sources. This view of history informs Zarlino’s chronicle of music, related in the prologue of *Le istituzioni*: music was held in the highest esteem in antiquity, then descended to an “extremely low baseness” (*infima bassezza*); but thanks to the genius of Adriano Willaert, its ancient glory has been regained and even surpassed.

In the sphere of music, the works of several authors between the fourth and sixth centuries C.E.—Boethius, Macrobius, Martianus Capella, and Cassiodorus—served to transmit aspects of ancient Greek music theory to the Middle Ages. The last decade of the fifteenth century saw the first translations of, among other theorists, Cleonides, Ptolemy, Bryennius and Quintilianus. By Zarlino’s time, many of the ancient writings on music had become available.<sup>33</sup> Zarlino himself, although he had studied Greek, asked Antonio Gogava (1529-1569), a physician and student of mathematics and classical languages, to translate the *Harmonic Elements* of Aristoxenus into Latin.

<sup>32</sup> Translation in Paolo Da Col, “The Tradition and Science: The *Istitutioni harmoniche* of Gioseffo Zarlino,” introductory essay to *Le istituzioni harmoniche* (1561, repr. Bologna: Arnaldo Forni, 1999), 36.

<sup>33</sup> For a comprehensive discussion of these writings and their availability to Renaissance theorists, see Palisca, *Humanism*, especially Chapters 2, 6, and 7.

Another manifestation of humanism is the concern for text setting. In *The Republic*, Plato writes that song is composed of words, harmonic mode, and rhythm, and the mode and rhythm must fit the words.<sup>34</sup> Zarlino's discussion of the relationship between text and music, the source of the Monteverdi brothers' later justification of the *seconda prattica*, occurs in Part 4, Chapters 32 and 33, of *Le istituzioni*.

Zarlino's detailed description of text underlay was not the earliest post-antiquity writing to address this issue. MS *Lat. 336, coll. 1581*, in the Biblioteca Marciana, Venice, contains a folio by Antonius de Leno possibly dating from as early as 1420 that counsels singers and composers on text underlay.<sup>35</sup> Giovanni Maria Lanfranco (c. 1490-1545) in *Scintille di musica (Sparks of Music, 1533)* "prescribed eight rules for aligning notes and syllables which...Zarlino took over (without acknowledging his source) and expanded into ten [rules]"<sup>36</sup> in Part 4, Chapter 33 of *Le istituzioni*.<sup>37</sup> Earlier in *Le istituzioni*, Zarlino acknowledges that the *Scintille* treats issues of note durations, but does not mention this treatise's author by name.<sup>38</sup>

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<sup>34</sup> Plato, *Complete Works*, ed. John M. Cooper (Indianapolis: Hackett Publishing Company, 1997), 1035 and 1037 (Stephanus, 398 d and 400 d).

<sup>35</sup> For details on this and other treatises that treat text underlay, see Don Harrán, "New Light on the Question of Text Underlay Prior to Zarlino," *Acta Musicologica* 45 (1973), 24-56, and Harrán, "In Pursuit of Origins: The Earliest Writing on Text Underlay (c. 1440)," *Acta Musicologica* 50 (1978), 217-240.

Nicola Vicentino's statement on text underlay declares that short and long syllables of text be set to short and long note values, respectively (Nicola Vicentino, *L'antica musica ridotta alla moderna prattica* [1555; repr. Kassel: Bärenreiter, 1959], 269). This corresponds to Zarlino's first rule (*Ist.* [1558], 341).

<sup>36</sup> Don Harrán, "In Pursuit of Origins," 217.

<sup>37</sup> Zarlino, *Ist.* (1558), 341.

<sup>38</sup> Zarlino, *Ist.* (1558), 279.

Another manifestation of humanism is encoded in some of Zarlino's historiated letters. The initial letter of each chapter of *Le istituzioni* is illustrated with a mythological scene. The first letter of the Prologue, the letter M, is shown in Plate 5.



Plate 5. The Initial M, Prologue of *Le istituzioni* (1558).<sup>39</sup>

The figures portray the Greek legend of Apollo's flaying of Marsyas. Nicola Vicentino (1511 - c. 1576), who studied briefly with Willaert in Venice, uses a depiction of the same myth to illustrate the initial M of his 1555 treatise, *L'antica musica ridotta alla moderna prattica* (Plate 6).<sup>40</sup>



Plate 6. The Initial M, Prologue of Vicentino's *L'antica musica ridotta alla moderna prattica*.<sup>41</sup>

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<sup>39</sup> Zarlino, *Ist.* (1558), 1.

<sup>40</sup> Zarlino was undoubtedly aware of Vicentino's work, but was not a proponent. Edward E. Lowinsky, in *Music in the Culture of the Renaissance, and other Essays* (Chicago: University of Chicago Press, 1989), 75, writes that to Zarlino, Vicentino is represented by the flayed Marsyas. Chapter 74 of Part 3 of *Ist.* is a discourse on the unsuitability of the chromatic and enharmonic genera for compositions of Zarlino's time. Without mentioning names, Zarlino writes, *Et se bene alcuni hanno opinione di comporre a i nostri giorni le antiche harmonie Chromatiche & le Enharmoniche, non è però così...* (Although some think they should compose in our times in the antique harmonies of the chromatic and enharmonic [genera], such is not the case...) *Ist.* (1558), 282.

<sup>41</sup> Vicentino, *L'antica musica*, 3.

The first letter of the prologue is the only instance where the Marsyas legend is used to illustrate the initial M. The other instances of the initial M in *Le istituzioni* (1558) all present the same portrait of Mars and Venus in passionate embrace, as shown in Plate 7.



Plate 7. The Initial M of Part 1, Chapter 9 of *Le istituzioni* (1558).<sup>42</sup>

In the 1573 edition of *Le istituzioni*, Zarlino uses different historiated initial letters. The initial M of the prologue to the latter edition, another representation of Marsyas and Apollo, is more similar to Vicentino's in that both figures are standing, as shown in Plate 8. As in 1558, the only depiction of the of Marsyas legend occurs in the prologue.



Plate 8. The initial M, Prologue of *Le istituzioni* (1573).<sup>43</sup>

Why the Marsyas legend? This legend accrued several layers of meaning over time. In the myth, the satyr Marsyas challenges Apollo to a musical contest. After the

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<sup>42</sup> Zarlino, *Ist.* (1558), 19.

<sup>43</sup> Zarlino, *Ist.* (1573), 1.

Muses judge that Apollo plays better on the lyre than Marsyas does on the flute, the god ties Marsyas to a tree and flays him alive. Ovid relates this tale in *Metamorphoses* (VI, 383-401).<sup>44</sup> It also appears in Gaffurio's *Theorica musica*.<sup>45</sup>

One interpretation of the legend reads that as a satyr, "Marsyas was a follower of Bacchus, and his flute was the Bacchic instrument for arousing the dark and uncontrollable passions that conflict with the purity of Apollo's lyre. The musical contest between Apollo and Marsyas was therefore concerned with the relative powers of Dionysian darkness and Apollonian clarity; and if the contest ended with the flaying of Marsyas, it was because flaying was itself a Dionysian rite, a tragic ordeal of purification by which the ugliness of the outward man was thrown off and the beauty of his inward self revealed."<sup>46</sup> Another reading sees Apollo's lyre as representing the celestial harmony of *musica mundana*, whereas Marsyas' flute represents *musica humana* and *musica instrumentalis*.<sup>47</sup> Plato's *Symposium* compares Socrates to Marsyas as one who is ugly on the outside, but who contains the power within to move the emotions.<sup>48</sup> Lines 19-27 in

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<sup>44</sup> The passage begins, ...*satyri reminiscitur alter, / quem Tritoniaca Latous harundine victum / adfecit poena. "quid me mihi detrahis?" inquit; / "a! piget, a! non est" clamabat "tibia tanti." / clamanti cutis est summos direpta per artus, / nec quicquam nisi vulnus erat; cruor undique manat, / detectique patent nervi, trepidaeque sine ulla/ pelle micant venae...* (...another [storyteller] recalled the satyr whom the son of Latona had conquered in a contest on Pallas' reed, and punished. "Why do you tear me from myself?" he cried. "Oh, I repent! Oh, a flute is not worth such price!" As he screams, his skin is stripped off the surface of his body...) This translation is by Frank Justus Miller in Publius Ovidius Naso, *Metamorphoses*, trans. Frank Justus Miller (London: William Heinemann, 1916), 317.

<sup>45</sup> See the English translation, *The Theory of Music*, 9.

<sup>46</sup> Edgar Wind, *Pagan Mysteries in the Renaissance* (New York: Barnes & Noble, 1968), 172.

<sup>47</sup> Margaret Flansburg, review of *The Myth of Apollo and Marsyas in the Art of the Italian Renaissance*, by Edith Wyss, *Renaissance Quarterly* 51/2 (Summer 1998), 632.

<sup>48</sup> Plato, *Complete Works*, 497-499 (Stephanus 215b – 217a).

Canto 1 of Dante's *Paradiso* implore divine intervention to inspire the poet to sing as sweetly as Apollo played when he vanquished the satyr.<sup>49</sup>

In Renaissance art, the flaying of Marsyas was a popular subject, depicted in painting, drawing, and sculpture by masters such as Perugino, Michelangelo, Raphael, Jacopo Sansovino, Titian, and Andrea Schiavone. A native of Dalmatia, Schiavone many have used Marsyas as a metaphor for the torture of Christians by the Turks during the Ottoman wars.<sup>50</sup> The Catholic Reformation posited yet another interpretation of the Marsyas myth, invoking the satyr's punishment as an example of the just deserts of those who lack the appropriate fear of God.<sup>51</sup>

### THE ACCADEMIA VENETIANA

Toward the end of the fifteenth century, scholars and men of letters in many cities in the Italian peninsula created societies for the purpose of studying classics, philosophy, and religion. These associations, which had formal statutes, were called *accademie*. The Venetiana was founded in Venice in 1557 and heavily financed by the patrician Federigo Badoer (1519-1593). In a 1549 letter to Andrea Lippomano, a fellow patrician whose

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<sup>49</sup> *Entra nel petto mio, e spira tue / si come quando Marsia traesti / de la vagina de le membra sue. / O divina virtù, se mi ti presti / tanto che l'ombra del beato regno / segnata nel mio capo io manifesti, / vedra' mi al piè del tuo diletto legno / venire, e coronarmi di le foglie / che la materia e tu mi farai degno.* (Enter into my breast; within me breathe / the very power you made manifest / when you drew Marsyas out from his limbs' sheath. / O godly force, if you so lend yourself / to me, that I might show the shadow of / the blessed realm inscribed within my mind, / then you would see me underneath the tree / you love; there I shall take as crown the leaves / of which my theme and you shall make me worthy.) This translation is in Dante Alighieri, *The Divine Comedy of Dante Alighieri: A Verse Translation with Introductions and commentary by Allen Mandelbaum. [III. Paradiso]* (Berkeley: University of California Press, 1982), 3.

<sup>50</sup> Zdravko Blazeković, "What Marsyas May Have Meant to the Cinquecento Venetians, or Andrea Schiavone's Symbolism of Musical Instruments," *Music in Art* 26 (2001), 41.

<sup>51</sup> Edith Wyss, *The Myth of Apollo and Marsyas in the Art of the Italian Renaissance* (Newark, DE: University of Delaware Press, 1996), 121.

family were bankers (as was Badoer's) and patrons of art and architecture, Badoer had stated his criteria for the formation of a good Venetian citizen—criteria which became his goals in founding the Venetiana.

*...saranno molti, che...in picciol tempo...potrai divenire vera posseditrice di varie lingue, e della philosophia morale, dell'histoire, e della cosmographia, delle cose di stati, et dell'arte del ben dire, ma che le bisogna versare in questi anni nella philosophia naturale, nella Theologia, et nella cognitione di quelle scientie che della terra al cielo inalzano le menti nostre.*<sup>52</sup>

There are many who, in a short time, would be able to become true possessors of various languages and of moral philosophy, history, and cosmography, of matters of state, and of the art of oratory; but there is also the need to become knowledgeable during these years in natural philosophy, in theology, and in the understanding of those sciences which elevate our minds from the earth to heaven.<sup>53</sup>

Badoer intended his academy to unite the *vita attiva*, the life of service to the state, with the *vita contemplativa*, the life devoted to learning.

The Accademia Venetiana was also called the Accademia della Fama. The figure of Fame appears in the center of the frontispiece of every one of its publications. The emblem depicts Fame as a winged woman, a trumpet in one hand, a banner inscribed with the motto, "*Io volo al cielo per reposarmi in Dio*" (I soar to heaven in order to rest with God) streaming from the other hand, one foot resting on a globe.<sup>54</sup> Plate 9a is a reproduction of this frontispiece; Plate 9b is a detail of the character of Fame.

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<sup>52</sup> Paul Lawrence Rose, "The Accademia Venetiana: Science and Culture in Renaissance Venice," *Studi veneziani* 11 (1969), 238-239. Badoer's entire letter to Lippomano is reproduced in Rose, 236-240.

<sup>53</sup> My translation.

<sup>54</sup> Lina Bolzoni, "Rendere visibile il sapere: l'Accademia Veneziana fra modernità e utopia," *Italian Academies of the Sixteenth Century*, D. S. Chambers and F. Quiviger, ed. (London: The Warburg Institute, 1995), 61.

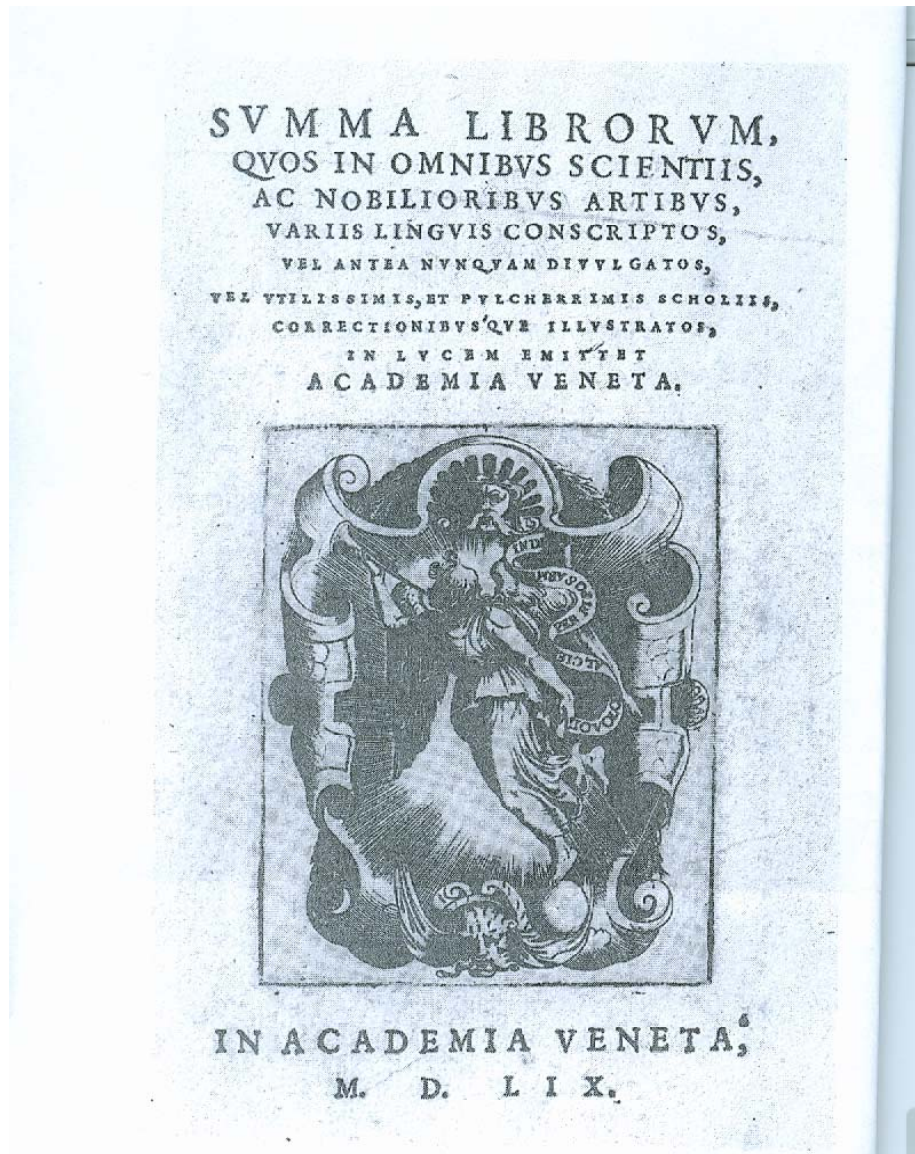


Plate 9a. Frontispiece of the *Summa librorum* of the Venetiana.<sup>55</sup>

<sup>55</sup> Iain Fenlon, "Zarlino and the Accademia Venetiana," *Italian Academies of the Sixteenth Century*, D.S. Chambers and F. Quiviger, eds. (London: The Warburg Institute, 1995), 90.



Plate 9b. Detail of “Fame” on the frontispiece of the *Summa librorum* of the Venetiana.<sup>56</sup>

The Venetiana was structured in four departments, or *consigli*. The Consiglio Iconomico functioned as the treasury. The Consiglio Politico was designed to manifest the utility of learning to the state by collecting foreign intelligence and promoting the reputation of the Serenissima abroad. The role of the Consiglio Oratorio was not only to support the study of grammar, rhetoric, and logic (the medieval *trivium*), but also to

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<sup>56</sup> *Ibid.*

maintain a “strong thread of civic and political Christianity which ran through the Venetiana’s activities.”<sup>57</sup> The Consiglio delle Scienze was divided into four *stanze* (so named because these “rooms,” i.e. divisions, reflected the use of the original space within Badoer’s palace): theology, philosophy, mathematics, and *umanità*. Mathematics was further subdivided into geometry, arithmetic, astrology, music, and cosmography. Thus, the four *consigli* were considered to embrace all of the knowledge of the time as well as ensure the moral and scientific education of the state. Badoer’s *Istrumento di Deputatione* (1560) likens its structure to that of the human body, made in God’s image.<sup>58</sup> Its administrative staff consisted of four notaries and a secretariat and was headed by Bernardo Tasso (1493-1569), the father of Torquato Tasso and a poet in his own right, whose salary as head of the academy—two hundred ducats—was the same as the salary of the *maestro di cappella* of St. Mark’s.

In a letter dated January 22, 1558, to Bernardo Tasso, the Venetian patrician and poet Girolamo Molino (1500-1569) wrote of the Venetiana:

*[A’] giorni passati s’è congregata insieme una nobile compagnia, sotto titolo di Accademia Veneziana, di alcuni dotti, e fioriti ingegni, avendo intenzione di giovare a letterati, e al mondo, col metter le mani così nei libri di Filosofia, come di altre facultà: e non solo purgar quelli degli infiniti errori, e incorrezioni che nel vero portano seco attorno, con molto danno degli studiosi, ma farli insieme con molte utili annotazioni, e discorsi e scolj, e tradotti appresso in diverse lingue, uscire in luce nella più bella stampe, e carta che si sia ancor veduta.*<sup>59</sup>

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<sup>57</sup> Iain Fenlon, *Music and Culture in Late Renaissance Italy* (Oxford: Oxford University Press, 2002), 125.

<sup>58</sup> Badoer’s rationalization and details of this similitude are quoted in Bolzoni, “Rendere visibile il sapere,” 67-68.

<sup>59</sup> Martha Feldman, *City Culture and the Madrigal at Venice* (Berkeley: University of California Press, 1995), 117-118.

In recent days a noble company of learned and flourishing talents has met together under the title of Accademia Veneziana, with the intention of serving literati and the world by taking on books on philosophy as well as other disciplines. And [they have done this] not only to purge them of infinite errors and mistakes that surround the truth, to the detriment of scholars, but to bring them to light with the most beautiful printing and paper ever seen, together with many useful annotations, discourses, and scholarly notes, and later to translate [them] into several different languages.<sup>60</sup>

Initially the Venetiana held daily meetings at Badoer's residence, but later it moved to the anteroom of the library of St. Mark's, the Biblioteca Marciana, shown in Plate 10.



Plate 10. The Biblioteca Marciana, Venice.  
(The Campanile at Piazza San Marco is behind the Marciana.<sup>61</sup>)

The Marciana, constructed by the architect Jacopo Sansovino (1486-1570), was part of an urban renewal project promoted by Doge Andrea Gritti to revitalize the area around St. Mark's Square. Valuable manuscripts assembled by Cardinal Bessarion (1403-1472), the historian and scholar of Greek, are among the Marciana's collection. Badoer felt that its anteroom, the ceiling of which was decorated by Titian (Plate 11), was an ideal setting for public lectures.

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<sup>60</sup> My translation.

<sup>61</sup> <<http://www.snowtao.com/cruise/venfams.htm>> (accessed June 3, 2007).



Plate 11. The anteroom of the Marciana.<sup>62</sup>  
(Titian's painting, *La Sapienza* [*Wisdom*, 1560] adorns the ceiling of the anteroom.)

By 1560, the Venetiana had about a hundred members, including nearly all the most prominent intellectuals of Venice. Zarlino may have been chosen for membership because he was knowledgeable in several disciplines, and thus perceived “as a figure of wide learning, not only in music, but in logic, philosophy, and ancient philology.”<sup>63</sup> He was one of the four members responsible for overseeing the operations of the music *stanza*.<sup>64</sup>

The Venetiana intended to publish three hundred volumes, including scientific treatises, classical, Arabic, medieval, and modern works, as well as works of

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<sup>62</sup> <[http://www.phaseitalia.com/italiano/biblioteca\\_marciana.htm](http://www.phaseitalia.com/italiano/biblioteca_marciana.htm)> (accessed June 3, 2007).

<sup>63</sup> Feldman, *City Culture*, 172.

<sup>64</sup> A list of the *Musici* of the Venetiana in a transcription of Badoer's *Istrumento* in the *Giornale dell'italiana letteratura* 23 (1808), 63, reads:

“Il Reverendo P. Fra Francesco da Venezia ai Crocchieri  
Il Magnifico M. Hieronimo Orio  
Il Magnifico M. Alessandro Contarini  
Il Reverendo P. Iseppo Cerlino”

(Feldman, *City Culture*, 136, n. 57).

jurisprudence. Plate 12 is a reproduction of the list of the eleven proposed works on music theory in the final version of the catalog, issued in 1559. Six of these are works of antiquity; the rest were produced during the Renaissance. *Le istitutioni* was not included, possibly because its recent publication and the fact that it was written in Italian marked it as already accessible.

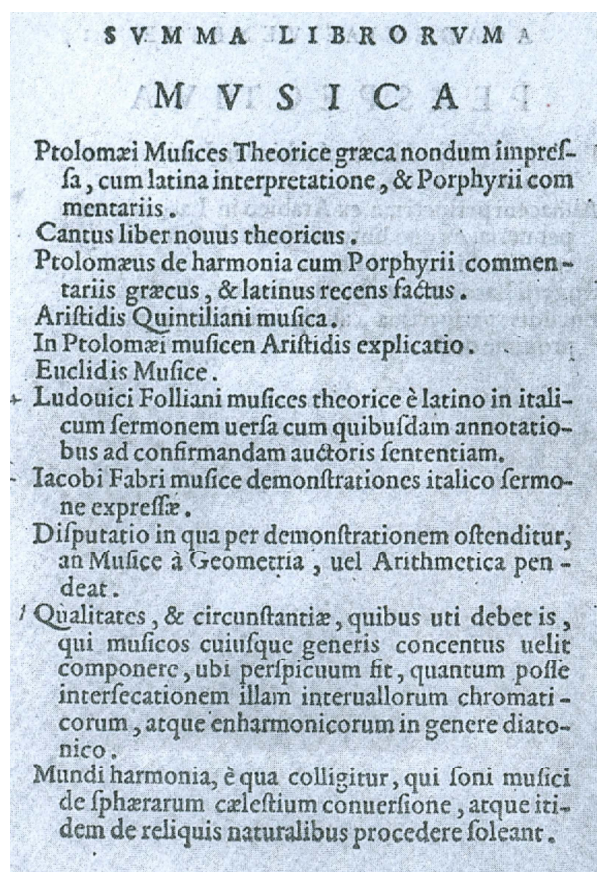


Plate 12. The Venetiana's Works on Music Intended for Publication.<sup>65</sup>

Items one and three on the list refer to Ptolemy's *Harmonika* and Porphyry's commentary on the *Harmonika*. The *Harmonika* had been available in Latin since 1551. It was proposed to publish the Greek text together with a new Latin translation of both

<sup>65</sup> Fenlon, "Zarlino and the Accademia Venetiana," 90.

works. The second item, “*Cantus liber novus theoreticus*,” may signify the *Liber musica novus*, a manuscript from Bessarion’s donation that contains eleven music treatises of classical antiquity.<sup>66</sup> Aristides Quintilianus’s *De musica* and Euclid (whose *Introductio harmonica* is now attributed to Cleonides) are represented in the *Liber musica novus*. Quintilianus’s commentary on Ptolemy was a separate item in Bessarion’s collection.<sup>67</sup> Of works on music written during and after the fifteenth century C.E., the Venetiana proposed to publish Italian translations of the *Musica theoretica* of Fogliano and *Musica libris demonstrata quattuor* of “Iacobi Fabri” (Jacques Lefèvre d’Étaples). The provenances of the treatises *Disputatio in qua per demonstrationem ostenditur, an musica a geometria, vel arithmetica pendeat* (a discussion on whether music belongs to geometry or arithmetic) and *Qualitates, & circumstantiae, quibus uti debet is, qui musicos cuiusque generis concentus velit componere, ubi perspicuum fit, quantum posse intersecationem illam intervallorum chromaticorum, atque enharmonicorum in genere diatonico* (how music may best be harmoniously composed in the chromatic, enharmonic, and diatonic genera) have not been positively identified. The final treatise may refer to Francesco Giorgio Veneto’s *De harmonia mundi* (1525).<sup>68</sup> All of the last five works on the *Summa*

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<sup>66</sup> This MS is now in the Marciana, MS Grec. 322 (coll.711). An inventory of 1474 lists the contents of the *Liber novus* as follows: “*Liber musicae novus in quo continentur Aristidis Auintilianus de musica libri XXXV, Manuelis Briennii de musica libri XXXV, Plutarchi de musica liber unus, Euclidis introductio in musicam et eiusdem partitio instrumenti, Aristoxenis de elementis musicae libri III, Alipii introductio in musicam, Gaudentii introductio in musicam, Nicomachi enchiridion in musicam, eiusdem aliud enchiridon, Ptolemei musica in libris III, videlicet ipse textus, Porphyrii expositio in primum secundi, liber optimus, in pergameno, et difficilis inventu.*” See Lotte Labowsky, *Bessarion’s Library and the Biblioteca Marciana: Six Early Inventories* (Rome: Edizioni di storia e letteratura, 1979), 222.

<sup>67</sup> This volume was listed as “*Musica Ptolemei cum expositione Aristidis Quintiliani et Briennii, in papiro*” in inventories of the Marciana as late as 1546, but has no signature in the Marciana at the present time. (Ibid.)

<sup>68</sup> Francesco Giorgi Veneto, a member of the patrician family Zorzi, is also known as “Francesco Giorgi” or “Francesco Zorzi.” “Veneto” refers to his birthplace. *De harmonia mundi* is listed in the *Summa librorum* under “Metaphysics.”

*liborum musica* deal with *musica theorica*.

Glarean's *Dodecachordon* had been listed in an earlier, Italian edition of the *Summa librorum* but was not included in the final Latin version.<sup>69</sup> Unlike Glarean, the named authors whose books were listed are cited in *Le istituzioni*.

However, only about forty books were actually printed, free of charge, by Paolo Manuzio. The Venetiana was short-lived. One reason for its demise may have been its relationships with suspected heretics and Protestants during a time when the Catholic Reformation was carrying out the Inquisition with increasing vigor. As an example, Francesco Giorgio Veneto was suspected of heresy and some of his books were placed on the Index.<sup>70</sup> In 1560 the publisher Manuzio left Venice and the Accademia to live in Rome, depriving the Venetiana of his gratuitous services.

Additionally, the Venetiana incurred huge debt.<sup>71</sup> Badoer himself was suspected of fraud and imprisoned. In 1561, Badoer declared bankruptcy and the Venetiana was closed on government orders.<sup>72</sup>

In summary, Zarlino's humanistic beliefs are manifested throughout Part 1 of *Le istituzioni*. He makes many references to classical writers within the text, further augmenting these references by the marginal notes in the 1573 edition. The historiated letters at the beginnings of some of the chapters of *Le istituzioni* illustrate legends of

<sup>69</sup> Feldman, *City Culture*, 133.

<sup>70</sup> See Bolzoni, "Rendere visibile il sapere," 65-66 and 74; and Cesare Vasoli, "Il tema musicale e architettonico della 'Harmonia mundi' da Francesco Giorgio Veneto all'Accademia degli Uranici e a Gioseffo Zarlino," *Musica e storia* 6 (1998), 195ff.

<sup>71</sup> For details of the Venetiana's financial woes, see Rose, "The Accademia Venetiana," 212-214.

<sup>72</sup> An attempt to revive the Accademia della Fama was made in 1593. Noteworthy among the members of the new Accademia were Jacopo Tintoretto and Galileo Galilei.

antiquity. He writes that music was emerging from a dark period to recapture the high level it had achieved during the time of the ancient Greeks, and credits one individual, Willaert, with the restoration of its honor. As secular concerns, Zarlino writes of the health benefits of music and its use in warfare, and emphasizes the importance of music in education, a view held by Plato in *The Republic*. Zarlino's position of responsibility within the Accademia della Fama was a public commitment to his humanistic views.

### **ABOUT *LE ISTITUTIONI HARMONICHE***

In the dedication to *Le istituzioni harmoniche*, Zarlino asserts that he has been wishing for some time to perfect his musical knowledge and to share his ideas with people who “delight” in matters of theory and practice.<sup>73</sup> Teaching composition is but a part of the goal of enabling his students “to be placed with merit among the ranks of perfect and honored musicians.”<sup>74</sup> Zarlino’s description of the structure of *Le istituzioni* in the prologue explains why he writes about the speculative aspects of music first: “we speak about truly knowing things when we know the principles of their essence.”<sup>75</sup> Thus, the 44 chapters comprising Part 1, which are translated here, deal with numbers, proportions, and mathematical operations that Zarlino deemed necessary to his consideration of consonance and dissonance.

Part 1 may be divided into three sections. In the prologue and first eleven chapters, Zarlino presents the history, praises, uses, and definitions of music. Chapters 12 through 20 present the roles of number in music; Chapter 13 introduces the Senario as the source of musical consonance. Chapters 21 through 44—with the exception of Chapter 41, an essay on how music fits into the Aristotelian models of cause—define proportions and illustrate the mathematical operations of proportions.

Part 2 of *Le istituzioni*, consisting of 51 chapters, deals with the syntonic diatonic tuning system and divisions of the monochord in all the genera.<sup>76</sup> The 80 chapters in Part

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<sup>73</sup> *io poteua...le cose, che appartengono alla Theoretica, & alla Prattica, ritirar verso la loro perfeitione; per far cosa grata a tutti color, che di tal facultà si diletano...* Zarlino, *Ist.* (1558), 4.

<sup>74</sup> *esser posto nel numero de i Musici perfetti & honorati*; Zarlino, *Ist.* (1558), 18.

<sup>75</sup> *diciamo di veramente conoscer le cose, quando li principij di esse conosciamo*; Zarlino, *Ist.* (1558), 11.

<sup>76</sup> Parts 1 and 2 have been translated into German by Michael Fend as *Theorie des Tonsystems. Das erste und zweite Buch der “Istitutioni harmoniche” (1573)* (Frankfurt am Main: Peter Lang, 1989). A partial

3 include discussions of intervals as they relate to composition, rules of counterpoint, notation and note values, and criteria that distinguish good from poor compositions.<sup>77</sup>

Part 4, consisting of 36 chapters, deals with the modes as well as with text setting.<sup>78</sup>

The title page of the 1573 edition of *Le institutioni* includes the words, “newly improved in many places, and expanded with many beautiful secrets of practical matters.”<sup>79</sup> The most significant change is in Part 4—the discussion of the ordering of the modes. The 1558 edition presents the twelve modes first introduced in Glarean’s *Dodekachordon* (1547). In *Dimostrationsi harmoniche*, a work incorporating dialog, explanatory prose, mathematical “demonstrations” in the style of Euclid, and many charts and diagrams, Zarlino changes Glarean’s order so that mode 1 has C as its final.<sup>80</sup> The 1573 and 1589 editions of *Le institutioni* reflect the ordering of the modes presented in *Dimostrationsi*. Although most of the changes occur in the fourth part of *Le institutioni*, Zarlino does refer to *Dimostrationsi* in Part 1 of the revised *Le institutioni*; these references are footnoted in the translation.

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English translation of Part 1, Chapter 2, can be found in *Source Readings in Music History*, Leo Treitler, general ed., vol. 3, *The Renaissance*, Gary Tomlinson, ed. (New York: W.W. Norton, 1998), 16-21.

<sup>77</sup> Part 3 has been translated into English by Guy A. Marco and Claude Palisca as *The Art of Counterpoint* (New Haven: Yale University Press, 1968). This translation is based on the 1558 edition.

<sup>78</sup> Part 4 has been translated into English by Vered Cohen as *On the Modes* (New Haven: Yale University Press, 1983). Cohen uses the 1558 edition as the basis of her translation and footnotes what she considers significant changes in the 1573 edition.

<sup>79</sup> *di nuouo in molti luoghi migliorate, & di molti belli secreti nelle cose della Prattica ampliate*. Zarlino, *Ist.* (1573), Frontispiece.

<sup>80</sup> See Richard L. Crocker, “Why did Zarlino re-number the modes?” *Studies in Medieval Music Theory and the Early Sequence* (Great Yarmouth, Norfolk, Great Britain: Gailliard, 1997), 1-10.

## SOURCES AND INFLUENCE OF *LE ISTITUTIONI HARMONICHE*

### SOURCES

In Part 1 of *Le istituzioni harmoniche*, Zarlino synthesizes traditional elements of speculative theory in an original way in order to justify the tuning system he promulgates in Part 2. This in turn serves to provide the logic that ultimately supports his compositional method of Parts 3 and 4. The organization of *Le istituzioni* was a model for treatises of Salinas, Zacconi, Mersenne, and Rameau, among others.

“To fulfill the goal he had set for himself he saw that he had to raise every question anew, to doubt every previous solution, to reason out and prove the most obvious principles.”<sup>81</sup> Although he affirms—and paraphrases—Boethius in many instances, Zarlino departs from Boethius both in his definition of the “perfect musician” and in his categorizations of types of music.

Zarlino’s employment of the Senario as the mathematical basis for consonance is unique. Although writers before him used proportions of the numbers of the Senario in order to describe consonance, no one used these numbers to *define* consonance. To Zarlino, thirds and sixths are consonant because of numerical relationships, and not because of the way they sound. In addition, no other writer provides as thorough a tutorial in mathematics as does Zarlino.

In Part 1 of *Le istituzioni*, Zarlino uses and acknowledges classical sources that represent many disciplines. Within the text, Zarlino cites the ancient Greek authorities Plato, Aristotle (to whom Zarlino often referred as “the Philosopher” in accordance with medieval scholars, especially the Scholastics), Pythagoras, Ptolemy, and Euclid. Plato’s

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<sup>81</sup> Palisca, *Humanism*, 245.

influence is evident in the discussion on education in Chapter 4. Zarlino is indebted to the Pythagoreans as well as the Platonists for his emphasis on number as the basis of music. The discourse on causality in Chapter 41 is based directly on arguments in Aristotle's *Physics*.

Boethius occupies a special place among the Latin writers. In Chapter 6, Zarlino uses and acknowledges two quotes from Boethius's *The Consolation of Philosophy*. Elsewhere, he paraphrases other material. For example, Boethius's and Zarlino's definitions of *musica mundana* and *musica humana* are very close.

## Boethius

*Et primum ea, quae est mundana, in his maxime perspicenda est, quae in ipso caelo vel compage elementorum vel temporum varietate visuntur.*<sup>82</sup>

The first kind [of music], the cosmic, is discernable especially in those things which are observed in heaven itself or in the combination of elements or the diversity of seasons.<sup>84</sup>

## Zarlino

*La Mondana è quell'harmonia, che non solo si conosce essere tra quelle cose, che si veggono & conoscono nel cielo: ma nel legamento de gli Elementi, & nella varietà de i tempi ancora si comprende.*<sup>83</sup>

Cosmic [music] is the harmony that is not only known to exist between the things that we see and know in the heavens, but can also be grasped from the connections among the elements and from the passing of the seasons.<sup>85</sup>

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<sup>82</sup> Anicius Manlius Severinus Boethius, *De institutione arithmetica, libri duo / De institutione musica, libri quinque*, ed. Gottfried Friedlein (Frankfurt am Main: Minerva, 1966), 186.

<sup>83</sup> Zarlino, *Ist.* (1558), 12.

<sup>84</sup> Translation by Calvin M. Bower in Boethius, *Fundamentals of Music* (New Haven: Yale University Press, 1989), 10.

<sup>85</sup> My translation.

*Humanam vero musicam quisquis in sese ipsum descendit intellegit. Quid est enim quod illam incorpoream rationis vivacitatem corpori misceat, nisi quaedam coaptatio et veluti gravium leviumque vocum quasi unam consonantiam efficiens temperatio? Quid est aliud quod ipsius inter se partes animae coniungat, quae, ut Aristoteli placet, ex rationabili irrationabilique coniuncta est? Quid vero, quod corporis elementa permiscet, aut partes sibimet rata coaptatione contineat? Sed de hac quoque posterius dicam.*<sup>86</sup>

Whoever penetrates into his own self perceives human music. For what unites the incorporeal nature of reason with the body if not a certain harmony and, as it were, a careful tuning of low and high pitches as though producing one consonance? What other than this unites the parts of the soul, which, according to Aristotle, is composed of the rational and irrational? What is it that intermingles the elements of the body or holds together the parts of the body in an established order?<sup>88</sup>

*La Musica humana poi è quell'harmonia, che può esser intesa da ciascuno, che si riuolga alla contemplatione di se stesso: imperoche quella cosa, la quale mescola col corpo la viuacità incorporea della ragione, non è altro, che vn certo adattamento & temperamento, come di voci graui & acute; il quale faccia quasi vna consonanza. Questa è quella, che congiunge tra se le parti dell'Anima, & tiene vnita la parte rationale con la irrationale; & è quella, che mescola gli elementi, ouer le qualità loro nel corpo humano con ragioneuole proportione.*<sup>87</sup>

Human music is the harmony that can be understood by anyone who turns to self-contemplation, because that which blends the incorporeal brilliance of reason with the body is none other than a certain adaptability and temperament, as of low and high voices, as if they were to make a consonance. This is what joins the parts of the soul within itself and holds the rational and irrational parts together, and blends the elements, or their qualities, in the human body in rational proportion.<sup>89</sup>

Boethius subdivides *musica instrumentalis* into three categories, defined by their modes of sound production:

*Tertia est musica, quae in quibusdam consistere dicitur instrumentis. Haec vero administratur aut intentione ut nervis, aut spiritu ut tibias, vel his, quae ad aquam moventur, aut percussione quadam, ut in his, quae in concave quaedam aerea feriuntur, atque inde diversi efficiuntur soni.*<sup>90</sup>

<sup>86</sup> Boethius, *De institutione arithmetica / De institutione musica*, 188-89.

<sup>87</sup> Zarlino, *Ist.* (1558), 16.

<sup>88</sup> Translation by Bower in Boethius, *Fundamentals of Music*, 10.

<sup>89</sup> My translation.

<sup>90</sup> Boethius, *De institutione arithmetica / De institutione musica*. 188.

The third kind of music is that which is said to rest in various instruments. This music is governed either by tension, as in strings, or by breath, as in the aulos or those instruments activated by water, or by a certain percussion, as in those which are cast in concave brass, and various sounds are produced by those.<sup>91</sup>

Likewise, Zarlino divides music produced by instruments (which he calls *Musica artificata*, “artificial music”) into the families of winds, strings, and percussion (*da fiato, da chorde, & da battere*).<sup>92</sup> It is generally assumed that Boethius’s *musica instrumentalis* includes music produced by the human voice, although this is not specified in *De institutione musica*.<sup>93</sup> Zarlino, however, makes a point of differentiating vocal music from music produced by instruments, identifying it as *Musica...harmonica, o naturale* (“harmonic or natural music”).

In two cases, Chapters 5 and 11 of Part 1 of *Le istituzioni*, Zarlino reduces the number of Boethius’s categories from three to two. The first instance is in the classification of types of music. Whereas in Book 1, Chapter 2 of *De institutione musica* Boethius describes *musica mundana*, *musica humana*, and *musica instrumentalis*, in Chapter 5 of *Le istituzioni* Zarlino subsumes *musica mundana* and *musica humana* into a category he names *musica animastica*. Boethius’s *musica instrumentalis* is retained as a separate category, called *musica organica* by Zarlino. In this way Zarlino differentiates music that resides within the cosmos and within the soul—the latter, a manifestation of

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<sup>91</sup> Translation by Bower in Boethius, *Fundamentals of Music*, 10.

<sup>92</sup> Zarlino, *Ist.* (1558), 11.

<sup>93</sup> See, for example, Donald J. Grout and Claude V. Palisca, *Music in Western Civilization*, 4<sup>th</sup> ed. (New York: W.W. Norton, 1988), 38.

the view expressed in Chapter 2 of *Le istituzioni* that God created man in the image of the cosmos<sup>94</sup>—from music that is created and produced by human beings.

Figure 2 compares Boethius's and Zarlino's categories of the types of music.

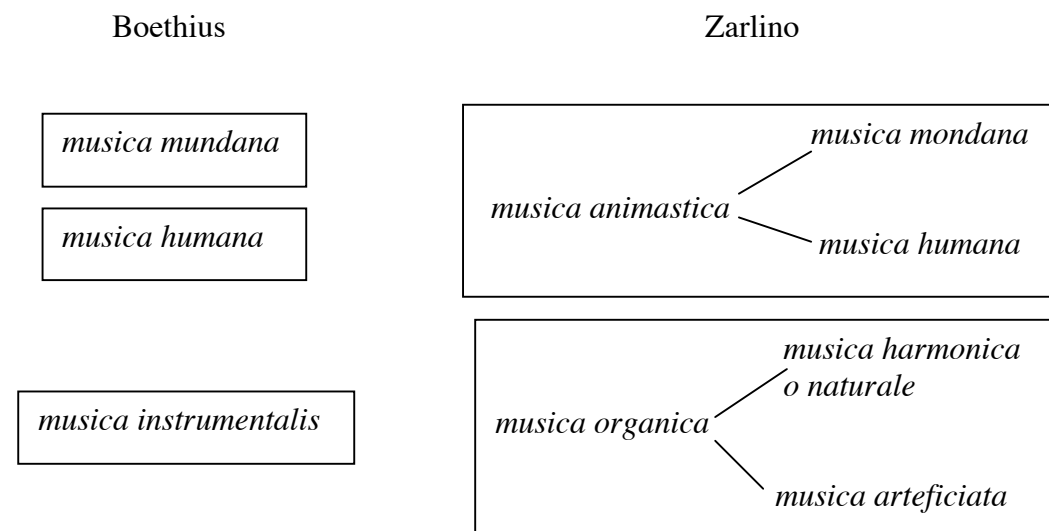


Figure 2. Comparison of Boethius's and Zarlino's Categories of the Types of Music.

In the second case, Boethius recognizes three categories of people who are occupied with music, in Book I, Chapter 34 of *De institutione musica*: performers (*quod instrumentis agitur*), composers (*figit carmina*), and judges (*quod instrumentorum opus carmenque diiudicat*). He relegates instrumentalists to the lowest position in his hierarchy, likening them to artisans and slaves. In Boethius's opinion only the adjudicator deserves to be called *musicus* (“musician”), since his ability for judging is grounded in reason or thought appropriate to music, such as discernment of modes and

<sup>94</sup> ...*hauendo Iddio creato l'huomo alla similitudine del Mondo maggiore, detto da Greci κοσμος, cioè ornamento, ouero ornato; & essendo fatto a quella similitudine di minor quantità, a differenza di quello vien chiamato μικροκοσμος, cioè piccol mondo...* (...because God created man in the image of the higher world, called *kosmos*, that is, “ornament” or “ornate,” by the Greeks, He made him a smaller semblance of that [higher world]; to distinguish him from it he came to be called *mikrokosmos*. that is, “little world.”) *Ist.* (1558), 7.

rhythms, the genera of songs, and consonances. However, Zarlino replaces the Boethian model with a division of musicians into two categories, speculative and practical. The goal of the speculative musician “consists solely of understanding the truth of things grasped by the intellect,”<sup>95</sup> whereas the goals of the practical musician are solely performance and composition.<sup>96</sup> Zarlino argues that the body is the deputy of the soul, from which knowledge and reason originate. But in music, mere speculation is fruitless without the achievement of “its final goal, which consists of the playing of natural or artificial instruments, through which such goal is achieved, just as the player without the help of reason could never execute his work with any perfection.”<sup>97</sup> Thus, the speculative and the practical cannot be separated. To Zarlino, the “perfect musician” (*musico perfetto*) is both an accomplished theorist and a performer/composer.

Among Latin writers besides Boethius, Virgil (sometimes referred to as “The Poet”) and Ovid are also quoted. Cicero (“Tullio,” Cicero’s middle name), Horace, and Macrobius are mentioned as well.

Boccaccio, the only Italian poet named, is credited for one explanation of the etymology of the word *musica*, in Boccaccio’s books on the genealogy of the gods.<sup>98</sup>

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<sup>95</sup> *Quella il cui fine consiste nella cognitione solamente della verità delle cose intese dall’intelletto ...* Zarlino, *Ist.* (1558), 20.

<sup>96</sup> Initially, Zarlino writes, ... *la Prattica solamente è per l’operare...* (...practice is aimed solely at execution...) Ibid. Later on in this chapter, he becomes more specific, stating that ... *il Prattico... piglia il nome... non dalla scienza, ma dall’operare, come dal Comporre è detto Compositore; dal Cantare è detto Cantore; & dal Sonare vien chiamato Sonatore* (...the practitioner... derives his name... not from the science, but from [its] execution: namely, from composition [he] is called composer; from singing, singer; and from playing, player.) Zarlino, *Ist.* (1558), 21.

<sup>97</sup> ... *suo fine, che consiste nell’essercitio de naturali & artificiali istrumenti, col mezzo de i quali ella viene a conseguirlo: si come ancora l’artefice senza l’aiuto della ragione mai potrebbe condurre l’opera sua a perfettione alcuna.* Zarlino, *Ist.* (1558), 20.

<sup>98</sup> Ibid.

Zarlino also draws upon Greek mythology, philosophy, and history. Philosophers mentioned include the Greeks Xenocrates, Theophrastus, Diogenes, and Empedocles. Historians include the Greeks Berosus of Chaldea and Diodorus and the Romans Pliny the Elder, Valerius Maximus, and Pausanias. Zarlino mentions the Roman statesmen Gaius Gracchus and Marcus Terentius Varro, the generals Scipius Africanus the Elder and the Younger, and the architect Vitruvius. In discussing the curative powers of music, Zarlino cites the physicians Herophilus, Asclepiades, and Avicenna. The mathematicians Campanus of Novara, who translated Euclid into Latin, and Giordano of Nemi are authorities for Zarlino's number theory. In the 1573 and subsequent editions Zarlino adds marginal notes that give chapter and verse references to many of his sources.<sup>99</sup> Zarlino's notes not only serve to impress readers with his erudition but also provide references for his statements.

Zarlino also quotes from the Bible when it suits his purposes. Of his other religious sources, St. Augustine is acknowledged most often. Other references include Sts. Ambrose, Hilary, and Basil the Great; Lactantius, Dionysius the Areopagite, and Isidor of Seville, all Christian scholars and defenders of the faith; and Josephus Flavius, the Jewish scholar.

With one exception—the French theologian and humanist Jacques Lefèvre d'Étaples (1455-1536)<sup>100</sup>—Part 1 of *Le institutioni* does not acknowledge Zarlino's

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<sup>99</sup> Appendix 2 lists the references that Zarlino cites in his marginal notes.

<sup>100</sup> Zarlino refers to Jacques Lefèvre d'Étaples (Giacomo Fabro Stapulense) in a marginal note in the 1573 version (Zarlino, *Ist.* [1573], 54), in his discussion of harmonic proportionality. The work cited is *Musica libris demonstrata quattuor* (1496).

indebtedness to any theorist who published treatises within the preceding century.<sup>101</sup>

Nevertheless, even the title of his seminal treatise is similar to that of a previous work:

Pietro Aaron's *Libri tres de institutione harmonica*, published forty-two years earlier.

Table 4 lists Zarlino's immediate predecessors from whose works he most obviously borrowed, their dates of birth and death, their major works, and publication dates.

Name	Birth-Death	Major Work(s)	Date
Franchino Gaffurio	1451-1522	<i>Theoricum opus musice discipline</i> ( <i>Theoretical Work on the Discipline of Music</i> )	1480
		<i>Theorica musice</i> ( <i>Theory of Music</i> )	1492
		<i>Practica musice</i> ( <i>Practice of Music</i> )	1496
		<i>Angelicum ac divinum opus musice</i> (treatise in Italian based on <i>Practica musice</i> )	1508
		<i>De harmonia musicorum instrumentorum</i> ( <i>On the Harmony of Musical instrumentalis</i> )	1518
Bartolomeo Ramis de Pareia	1440 - c.1490	<i>Musica practica</i> ( <i>Practice of Music</i> )	1482
Marsilio Ficino <sup>102</sup>	1433-1499	<i>Commentary on Plato's "Timaeus"</i>	1495
		<i>De triplici vita</i> ( <i>Three Books on Life</i> )	1498
Jacques Lefèvre d'Étaples	1455-1536	<i>Musica libris demonstrata quattuor</i> ( <i>Music Demonstrated in Four Books</i> )	1496
Pietro Aaron	1480-1545	<i>Libri tres de institutione harmonica</i> ( <i>Three Books on Harmonic Foundations</i> )	1516
		<i>Toscanello in musica</i> ( <i>Book on Music in the Tuscan Language</i> )	1523; rev.1529
		<i>Trattato ...di tutti gli tuoni</i> ( <i>Treatise on All the Modes</i> )	1525
		<i>Lucidario in musica</i> ( <i>Elucidation of Music</i> )	1545
Lodovico Fogliano	1475-1542	<i>Musica theorica</i> ( <i>Theory of Music</i> )	1529
Giovanni Maria Lanfranco	c.1490-1545	<i>Scintille de musica</i> ( <i>Sparks of Music</i> )	1531
Heinrich Glarean	1488-1563	<i>Dodecachordon</i>	1547

Table 4. Treatises Published within 100 Years before *Le istituzioni*.

<sup>101</sup> In Part 3, Chapter 71, Zarlino does mention Gaffurio, Fogliano, and Aaron by name in the text. He cites Gaffurio's and Fogliano's speculations on musical proportions and Aaron's contributions to mensuration (*Ist.* [1558], 279).

<sup>102</sup> Although Ficino was not a music theorist, I have included him in this list because his *Commentary on Plato's "Timaeus"* discusses Plato's creation myth involving musical consonances and Zarlino paraphrases some phrases of *De triplici vita* (see examples, pages 44-45 below).

Gaffurio devotes Chapter 4 of the first of the five books of his *Theorica musicae* to *musica instrumentalis*, subdividing this category into music produced by “natural instruments,” i.e., parts of the human body, and “artificial instruments.” He subdivides “artificial instruments” further, in a manner similar to Boethius. Zarlino seems to have copied Gaffurio’s description of the production of music by “natural instruments” almost verbatim without acknowledgement. Only the order of the anatomical parts responsible for such production has been changed. The parallel passages are cited below.

## Gaffurio

*Musice harmonica comprahendit & regit productos sonos humana uoce naturalium instrumentorum auxilio: quae quidem apud Philosophum sunt Pulmo Gutur Palatum lingua labia & dentes.*<sup>103</sup>

Harmonic music comprises and controls the tones produced by the human voice with the aid of natural “instruments.” According to the Philosopher [Aristotle], these “instruments” are the lung, the throat, the palate, the tongue, the lips, and the teeth.<sup>105</sup>

## Zarlino

*Li naturali sono quelle parti che concorrono alla formatione delle voci; come sono la Gola, il Palato, la Lingua, le Labbra, li Denti, e finalmente il Polmone, dalla natura formate.*<sup>104</sup>

The natural [instruments] are those parts that join together in the production of the voice: they are the throat, the palate, the tongue, the lips, the teeth, and finally the lungs, all formed by nature.<sup>106</sup>

Like Gaffurio, Zarlino divides the “artificial instruments” into families of wind, string, and percussion instruments.

Marsilio Ficino, Pietro Aaron, and Lodovico Fogliano are other theorists whose work Zarlino uses but does not acknowledge in Part 1 of *Le istituzioni*. Ficino, who

<sup>103</sup> Franchino Gaffurio, *Theorica musicae* (Milan: Philippus Mantegatius, 1492), 14<sup>f</sup>.

<sup>104</sup> Zarlino, *Ist.* (1558), 10.

<sup>105</sup> Franchino Gaffurio, *The Theory of Music*, trans. Walter Kurt Kreyzig (New Haven: Yale University Press, 1993), 39.

<sup>106</sup> My translation.

translated the complete works of Plato from Greek into Latin, was a physician as well as a scholar, astrologer, and ordained priest. In the last section of his medical treatise, *De vita*, Ficino discusses the curative power of music. He says that human spirit is composed of air and therefore is affected by the power of music, which is transmitted through the same medium, air. In Part 1, Chapter 4, of *Le istituzioni*, Zarlino writes in similar fashion that the spirit joins the body and soul together, and that music has the power to remedy ills of the spirit.

## Ficino

*Neque mirum id quidem: nam quum cantus sonusque ex cogitatione mentis & impetu phantasiae, cordisque affectu proficiscatur, atque una cum aere facto & temperato, aereum audientis spiritum pulset, qui animae corporisque nodus est, facile phantasiam movet, afficitque cor & intima mentis penetralia penetrat.*<sup>107</sup>

Nor is this surprising, for since song and sound arise from the cogitation of the mind, the impetus of the phantasy, and the feeling of the heart, and, together with the air they have broken up and tempered, strike the aerial spirit of the hearer, which is the junction of the soul and body, they easily move the phantasy, affect the heart and penetrate into the deep recesses of the mind.<sup>109</sup>

## Zarlino

*Et però bene hà ordinato la natura, che hauendo in noi, mediante lo spirito, congiunto insieme (come vogliono i Platonici) il corpo & l'Anima; a ciascun di loro, essendo deboli & infermi, hà proueduto di oportuni rimedij: impero che il Corpo languido & infermo si viene a risanare co rimedij, che li porge la Medicina; & lo Spirito afflito & debole da gli spiriti aerie, & dalli suoni & canti, che gli sono proportionate rimedij...*<sup>108</sup>

And perhaps it is good that nature ordained that our body and soul are joined together by means of the spirit (as the Platonists believe). To each of them [the body and the soul], when weak and infirm, it has provided opportune remedies, because the languishing and sick body is cured with the remedies that medicine offers, and the soul afflicted and weakened by the spirits of the air [is cured] with the sounds and songs that are its appropriate remedies.<sup>110</sup>

<sup>107</sup> Marsilio Ficino, *Opera Omnia*, vol. 1 (Turin: Bottega d'Erasmus, 1962), 651.

<sup>108</sup> Zarlino, *Ist.* (1558), 9.

<sup>109</sup> Translation in Daniel P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella*. (London: The Warburg Institute, 1958), 6.

<sup>110</sup> My translation.

Zarlino also relates Ficino's specific example of music's ability to overcome the bite of the tarantula.<sup>111</sup>

Ficino

*Esse uerò Phoebeam medicam quae in sono, & eo quidem certo potentiam, ex eo patet, quod quae in Apulia tacti Phalangio sunt, stupent omnes, semiamines quae iacent, donec certum quisque suum quae sonum ondiat. Tunc enim saltat ad sonum apte, sudat inde, atque conualescit.*<sup>112</sup>

...there is indeed in certain sounds a Phoebean and medical power is shown by the fact that in Apulia whoever is stung by the tarantula is stunned and lies half-dead until he hears a certain sound proper to him. Then he dances along with the sound, works up a sweat, and gets well.<sup>114</sup>

Zarlino

*... per via della Musica si oprano cose marauigliose: imperoche tanta è la forza de i suoni & de i balli contra il veleno delle Tarantole, che in breuissimo tempo risana color, che da esse sono stati morsi: come si vede ogni giorno per esperienza nella Puglia paese abundantissimo de tali animali.*<sup>113</sup>

... by means of music marvelous things come about, because so great is the power of sound and dance against the poison of the tarantula, that after a short time those who had been bitten were healed, as one witnesses every day firsthand in Puglia, a country that abounds in these creatures.<sup>115</sup>

Aaron's examples of how the ancients used music to enhance pursuits in the disciplines of oratory and warfare are freely paraphrased. Here are the passages:

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<sup>111</sup> The role of music as a cure for tarantism, the dancing mania manifested by the bite of the tarantula, is discussed in depth in Gary Tomlinson, *Music in Renaissance Magic: Toward a Historiography of Others* (Chicago, University of Chicago Press, 1993), 157-167.

<sup>112</sup> Ficino, *Opera Omnia*, vol. 1, 562.

<sup>113</sup> Zarlino, *Ist.* (1558), 7.

<sup>114</sup> Translation in Gary Tomlinson, *Music in Renaissance Magic: Toward a Historiography of Others* (Chicago, University of Chicago Press, 1993), 164.

<sup>115</sup> My translation.

## Aaron

...*Gaio graccho chiarissimo oratore de suoi tempi, quando oraua al popolo, teneua un musico dopo le spalle, che con una fistula occultamente gli daua i modi de la pronontia, hora remessi, hora concitati.*<sup>116</sup>

...Gaius Gracchus, the most famous orator of his time, when he spoke to the people, had a musician behind his shoulders, who with a reed-pipe quietly gave him the manner of delivery, now relaxed, now agitated.<sup>118</sup>

*Se Timotheo con modulatione concito Alessandro magno a prendere larme in mano, come fusse presente il nimico che a morte lo sfidasse, & concitato che lhebbe, inmantenente con altro tuono molle & quieto lo placo...*<sup>120</sup>

## Zarlino

...*Gaio Gracco huomo di soma eloquenza: imperoche sempre, ch egli hauea a parlare dauanti al popolo, teneua dietro a se vn seruo musico perfettissimo,<sup>6</sup> il quale ascosamente con uno Flauto d'auorio sonando gli daua la misura, cioè la voce, ouero il tuono di pronuntiare in tal modo, che ogni volta che lo vedeua troppo inalzato lo ritiraua, & vedendolo troppo abbassato lo incitaua.*<sup>117</sup>

...[whenever] Gaius Gracchus, a man of the greatest eloquence...had to speak in front of people he kept a servant behind him, a highly gifted musician who, unbeknownst to all, by playing his ivory flute would give him the tuning note, that is, the pitch or tone of delivery, in such a way that whenever he saw that he went too high, would bring him down, and seeing that he went too low, would raise him.<sup>119</sup>

*Timotheo...con la Musica incitaua il Re Alessandro al combattere; & quello medesimo essendo incitato riuocaua.*<sup>121</sup>

<sup>116</sup> Pietro Aaron, *Toscanello in musica*. (Venice, 1539; facsimile Kassel: Bärenreiter, 1970, ed. Georg Frey), fol. A iv<sup>r</sup>.

<sup>117</sup> Zarlino, *Ist.* (1558), 5.

<sup>118</sup> Translation in Pietro Aaron, *Toscanello in Music*, tr. Peter Bergquist (Colorado Springs: Colorado College Music Press, 1970), Book I, 10.

<sup>119</sup> My translation. The similarity between Aaron's and Zarlino's passages lies in the phenomenon that when a person is agitated, his voice often goes up in pitch, and when the person calms down, his voice becomes lower in pitch.

<sup>120</sup> Aaron, *Toscanello in musica*, [fol. A iv<sup>r</sup>].

<sup>121</sup> Zarlino, *Ist.* (1558), 7.

If Timotheus with a mode excited Alexander the Great to take up arms, as if an enemy were present who threatened his death, as excited as he was, Timotheus calmed him with another tone, quiet and soft.<sup>122</sup>

Timotheus...used music to exhort King Alexander to fight, and in the same way, [when the king was] being excited, [Timotheus] urged [him] to retreat.<sup>123</sup>

Zarlino held the theorist and composer Lodovico Fogliano (1475-1542) in high esteem. In a letter to Pinelli, Giuseppe Moleto writes,

*...ho parlato col S. Zerlino in materia del Foliano, egli dice che non era ne prete, ne frate, ne monaco, et che non esercito la musica in luogo publico, ma che sene é vissuto à Venetia lunghissimo tempo. Esso modonese, et dice di più che per huomo che andasse à lentone nelle cose della musica, ha scritto meglio d'ognun' altro intorno à tal cose.*

I spoke to S. Zerlino on the subject of Foliano. He says that he was neither priest, nor 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 things, he wrote better than anyone else on the subject.<sup>124</sup>

Zarlino cites Fogliano's definition of music as sonorous number almost verbatim.

Fogliano

Zarlino

*Numerus sonorus... nihil aliud est: nisi numerus partium sonori corporis: utputa: chordae: Quae numeri ac discreti accipiens rationem: nos certiores reddit de quantitate soni ab ea producti.*<sup>125</sup>

Sonorous number...is nothing other than the number of the parts of a sounding body, like a string. This number is a discrete quantity that renders us more certain of the quantity of the sound that it produces.<sup>127</sup>

*...il Numero sonoro non è altro, che il numero delle parti d'un Corpo sonoro, come sarebbe di vna chorda, la quale pigliando ragione di quantità discreta, ne fa certi della quantità del suono da lei prodotto.*<sup>126</sup>

...sonorous number is none other than the number of the parts of a sounding body, like a string that, being taken as a discrete quantity, defines the quantity of the sound that it produces.<sup>128</sup>

<sup>122</sup> My translation.

<sup>123</sup> My translation.

<sup>124</sup> Letter and translation in Palisca, *Humanism*, 235-236.

<sup>125</sup> *Ibid.*, 246.

<sup>126</sup> Zarlino, *Ist.* (1558), 29.

<sup>127</sup> Translation in Palisca, *Humanism*, 246.

<sup>128</sup> My translation.

Some of these ideas—e.g., spirit as the means by which body and soul are connected, music as sounding number—were not original to theorists of the early fifteenth century, but (as Zarlino recognizes in his acknowledgement of the Platonists in the passage on music as a remedy for illness) reiterations of concepts that had been around since antiquity. In turn, Zarlino’s successors drew upon his teachings, but were more apt to credit their source.

### INFLUENCE

Both the practical and the speculative aspects of *Le istituzioni* remained potent forces in music pedagogy for many years. During Zarlino’s lifetime, his students presented treatises of their own based on *Le istituzioni*. Giovanni Maria Artusi (1540-1613) reformatted the third part, drawing up tables of Zarlino’s rules in *L’arte del contraponto ridotta in tavole* (*The Art of Counterpoint Presented in Tables*, 1586). The composition manual of Orazio Tigrini (c.1535-1591), *Il compendio della musica nel quale si tratta dell’arte del contrapunto* (*Compendium of Music, in which the Art of Counterpoint is Treated*, 1588), dedicated to Zarlino, whom he called the “father and beginning of our age of music,” also uses a four-part structure although it deals only with the practical aspects of music, as does the *Ragionamento di musica* (*Rules of Music*, 1588) of Pietro Pontio (1532-1596). Around 1570-71, Vincenzo Galilei (late 1520s - 1591) began to write a compendium based on *Le istituzioni*; however, as a result of his independent study of Greek modal and tuning systems he broke away from Zarlino’s doctrine, publishing *Dialogo della musica antica et della moderna* (*Dialogue on Ancient*

and *Modern Music*) in 1581. Subsequent to the publication of Galilei's *Dialogo*, Artusi wrote several prose works that attacked Galilei.<sup>129</sup> Zarlino's *Sopplimenti musicali* is a refutation of Galilei's views. Galilei countered *Sopplimenti* with *Discorso intorno all'opere di Messer Gioseffo Zarlino* (*Discourse on the Works of M. Gioseffo Zarlino*, 1589).

Curiously, both Artusi and another pupil of Zarlino's, Gandolfo Sigonio (fl. Bologna, c. 1570-1590), became embroiled in controversies in which each side expressed respect for Zarlino. The Monteverdi-Artusi controversy began with the publication of *L'Artusi, overo Delle imperfettioni della moderna musica* (*L'Artusi, or On the Imperfections of Modern Music*, 1600), a decade after Zarlino's death. Artusi, condemning the use of "prohibited" dissonance and "modal mixtures" in Claudio Monteverdi's madrigals *Cruda Amarilli* and *Anima mia, perdona* and alluding to Zarlino's transmission of the rules of counterpoint, writes, "If the purpose can be attained by observing the precepts and good rules handed down by the theorists and followed by all the practitioners, as has been my intention, what reason is there to go beyond the bounds to seek out new extravagances?"<sup>130</sup> Giulio Cesare Monteverdi, responding on behalf of his brother, Claudio, implies that Zarlino had given Claudio license to go

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<sup>129</sup> Two satirical pieces are now lost, but portions of Artusi's *Lettera apologetica del Burla Academico Burlesco al R.<sup>do</sup> D. Vincentino Spada da Faenza* (1588) and *Trattato apologetico in difesa dell'opere del R.<sup>do</sup> Zarlino da Chioggia* (1590) survive. See Maria Rika Maniates, "The Cavalier Ercole Bottrigari and his Brickbats." In *Music Theory and the Exploration of the Past*, edited by Christopher Hatch and D. W. Bernstein, 137-188. (Chicago: University of Chicago Press, 1993), 137-188.

<sup>130</sup> "...se con la osseruatione de' precetti, & delle buone regole lasciate da Theorici, & osseruate da tutti li pratici, so puote hauere lo intento; che proposito è volere fuori delli termini, cercare delle strauaganterie?" Giovanni Maria Artusi, *L'Artusi overo delle imperfettioni della moderna musica* (1600; repr., Bologna: Forni Editore, 1968), 42<sup>v</sup>; translation in Margaret Murata, "Giovanni Maria Artusi: From *Artusi, or, Of the Imperfections of Modern Music*." In *Source Readings in Music History*, revised edition, general editor Leo Treitler, vol. 4: *The Baroque Era*, ed. Margaret Murata (New York: Norton, 1998), 25.

beyond the rules, writing, “The Reverend Zarlino concedes that the practice taught by him [the *prima prattica*] is not the one and only truth.”<sup>131</sup>

Ercole Bottrigari cites Gandolfo Sigonio as “a good musical contrapuntist” and “very proficient in the teaching of Zarlino’s *Istitutioni* and *Dimostrazioni harmoniche*.” In his treatise *Discorso intorno à’ madrigali e à’ i libri dell’Antica musica ridutta alla moderna prattica da D. Nicola Vicentino*, probably written between 1591 and 1594, Sigonio upholds Zarlino’s disdain for the views of Vicentino on the ancient Greek chromatic and enharmonic genera. Bottrigari, an advocate of Vicentino, excoriates Sigonio in correspondence.<sup>132</sup>

The two volumes of *Prattica di musica* (*The Practice of Music*; Volume I was published in 1592, Volume II in 1622) by Lodovico Zacconi (1555-1627) contain much material on vocal practice and pedagogy. The second volume uses some of Zarlino’s examples in its chapters on modes and counterpoint.

Many of Zarlino’s teachings were disseminated throughout Western Europe. Sethus Calvisius (1556-1615), in *Melopoeia* (1592), was the first to convey Zarlino’s theoretical ideas to German readers. Calvisius’s circle of friends included Michael Praetorius and the astronomer Johannes Kepler.<sup>133</sup> In *Harmonices mundi* (*Harmony of the World in Five Books*, 1619), Kepler agrees with Zarlino’s optimal division of the monochord, although Kepler derives his conclusion by geometrical, rather than

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<sup>131</sup> Reuer. *Zarlino confessa, non essere quel vna verità...* Claudio Monteverdi, *Tutte le opere di Claudio Monteverdi*, vol. 10, ed. G Francesco Malipiero (Vienna: Universal Edition, 1926-1968), 71; translation in *Source Readings*, vol. 4, 33.

<sup>132</sup> For a detailed discussion of the Sigonio-Bottrigari controversy, see Maniates, “Cavalier,” *passim*.

<sup>133</sup> Michael Dickreiter, *Der Musiktheoretiker Johannes Kepler* (Berne: A. Franck AG Verlag, 1975), 57, points out that Calvisius’ writings embrace *musica practica*, whereas Kepler’s deal with *musica theoricæ*.

arithmetical, reasoning.<sup>134</sup> In some places in *Musurgia universalis sive ars magna consoni et dissoni in X. libros digesta* (*Universal Music Making, or the Art of Consonance and Dissonance, Summarized in Ten Books*, 1650), the Jesuit Athanasius Kircher (1601-1680) used the name of “dorian” for the C modes, which Zarlino used in the 1573 edition of *Le istituzioni*.<sup>135</sup> Kircher corresponded with Kepler and derived much of his doctrine on counterpoint in *Musurgia universalis* from Zarlino.

The English theorist and composer Thomas Morley (c. 1557-1602) certainly was familiar with *Le istituzioni*. In *A Plaine and Easie Introduction to Practicall Musicke* (1597), Morley lists Zarlino among the “late writers” whose “authorities be either cited or used in this booke. Such as have written of the Art of Musicke...”<sup>136</sup> Specifically, Morley presents Zarlino’s examples on the notation of musical time and rules of counterpoint and directs the reader to further study of concord and discord in “The second part of Zarlino his harmonicall institutions....”<sup>137</sup>

Johann Mattheson (1681-1764), the German theorist and author of, among other treatises, *Der vollkommene Kapellmeister* (*The Complete Kapellmeister*, 1739), writes that Jan Pieterszoon Sweelinck (1562-1621), whose school in Hamburg at the turn of the seventeenth century produced many composers and organists, had studied with Zarlino in

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<sup>134</sup> Kepler’s derivation of consonances by geometrical means is summarized in Appendix 3.

<sup>135</sup> Eric T. Chafe, *Monteverdi’s Tonal Language* (New York: Schirmer Books, 1992). 43.

<sup>136</sup> Thomas Morley, *A Plaine and Easie Introduction to Practicall Musicke* (1590; repr. London: Oxford University Press, 1937), [218].

<sup>137</sup> Morley, [211].

Venice. Although no archival evidence exists to support Mattheson's statement,<sup>138</sup> it is known that Sweelinck was familiar with *Le istitutioni* and used it as a teaching tool. The portions of the third part of *Le istitutioni* which Sweelinck was thought to have translated, known as *Compositions-Regeln* (*Rules of Composition*), are now believed to have been written by Calvisius.<sup>139</sup> In any case, *Compositions-Regeln* was handed down through Sweelinck's Hamburg pupils, among them, Jan Adams Reinken, Jacob and Johannes Praetorius, and Samuel and Gottfried Scheidt. Andreas Werckmeister (1645-1706), in his *Harmonologica Musica* (*Musical Harmony*, 1702), mentions a Dutch translation of *Le istitutioni*, now lost, which may have been the original form of Sweelinck's *Compositions-Regeln*.

French translations of portions of *Le istitutioni* dating from the first quarter of the seventeenth century can be found in the Bibliothèque Nationale in Paris.<sup>140</sup> René Descartes (1596-1650) in *Compendium musicae* (*Compendium of Music*, 1618) acknowledges Zarlino's contribution to the art of composition. The description of the compositional practice of the early seventeenth century in the *Traité de l'harmonie universelle* (*Universal Treatise of Harmony*, 1627), of Marin Mersenne has been said to be largely based on the work of Zarlino.<sup>141</sup> Jean-Philippe Rameau (1683-1764) was well acquainted with *Le istitutioni*. His *Traité de l'harmonie réduite à ses principes naturels* (*Treatise on Harmony Reduced to its Natural Principles*, 1722) uses the same four-part

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<sup>138</sup> Paul Walker, From Renaissance 'Fuga' to Baroque Fugue: The Role of the "Sweelinck Theory Manuscripts," *Schütz-Jahrbuch* 7-8 (1985-86), 93.

<sup>139</sup> Adam Adrio and Clytus Gottwald, "Calvisius," *Grove Music Online* (accessed February 13, 2005).

<sup>140</sup> These translations, from the 1573 edition, can be found in J. Le Fort, *Quatre livres ou parties des Institutions harmoniques*, Paris, BN, MS fr. 19101.

<sup>141</sup> Albert Cohen, "Mersenne, Marin," *Grove Music Online* (accessed June 23, 2007).

structure as does *Le istituzioni*; like Zarlino, Rameau devotes the first two parts to the speculative and the last two parts to the practical. There are further parallels between the *Traité* and Part 1 of *Le istituzioni*. Among these are: (1) Both include mathematical formulas, among them those of the arithmetic and harmonic means, to derive intervals from the fundamental string. (2) Both derive perfect and imperfect consonances from the numbers of the Senario.<sup>142</sup> (3) Both generate all intervals from the octave.<sup>143</sup> While Zarlino writes that all the perfect and imperfect consonant intervals can be generated from the Senario, Rameau recognizes only three primary consonances besides the octave: the fifth and the major and minor third. The fourth, the major sixth and the minor sixth arise by inversion (*renversement*).<sup>144</sup>

The Italian virtuoso violinist and composer Giuseppe Tartini (1692-1770) also acknowledges his debt to Zarlino. In the context of an explanation of the chromatic and enharmonic genera in *Trattato di musica (Treatise on Music, 1754)*, Tartini states, “I have read all this in Zarlino, a reasonable man and diligent collector of old things.”<sup>145</sup>

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<sup>142</sup> *L'on a trouvé, en un mot, que toutes les Consonances étoient continuës dans les six premiers nombres...* Jean Philippe Rameau, *Traité de l'harmonie réduite à ses principes naturels* (1722; repr., New York: Broude Brothers, 1965), 3. Citations from *Traité de l'harmonie* are replicated exactly as they appear in the facsimile of the 1722 edition. Accentuation in some cases differs from modern French usage.

<sup>143</sup> *...que l'on confronte ensuite une définition si claire & si juste de cette partie fondamentale de l'Harmonie avec les règles & les exemples de cet Auteur, l'on y trouvera par tout des contradictions qui nous tiennent toujours en doute & en suspend...* *Traité*, 49; translation in Rameau, *Treatise on Harmony*, trans. Philip Gossett (New York: Dover, 1971), 59.

<sup>144</sup> “...il n'y a que trois Consonances premières, qui sont la Quinte & les deux Tierces, dont se compose un accord qui s'appelle naturel ou parfait, & d'où proviennent trois Consonances secondes, qui sont la Quarte & les deux Sixtes, dont se composent deux nouveaux accords qui sont néanmoins renversez du premier, laissant à part l'Octave qui doit être sous-entenduë dans chacun de ces accords...” *Traité*, 13-14. For further discussion of Rameau's comments on Zarlino's writings, see Alan Gosman, “Rameau and Zarlino: Polemics in the *Traité de l'harmonie*,” *Music Theory Spectrum* 22/1 (Spring 2000), 44-59.

<sup>145</sup> *Tutto ciò ho letto nel Zarlino, uomo ragionevole, e diligente raccoltore delle cose antiche.* Giuseppe Tartini, *Trattato di musica secondo la vera scienza dell'armonia* (1754; repr., New York: Broude Brothers, 1966), 121.

Zarlino's work is not only a compendium of the *prima prattica* brought to its pinnacle by Adriano Willaert, but it also constitutes a bridge to the all-important contribution of Johann Joseph Fux, whose *Gradus ad Parnassum* (1725) is still used in the basic study of counterpoint today.

### MUSIC AND NUMBER: THE SENARIO

Although tunings using the integers 1 through 6 were known as early as the first century B.C.E., Zarlino's explanation of consonance as ratios of these integers is without precedent. In antiquity, the function of the tunings that used the ratios of the Senario was entirely different.

The Pythagoreans believed that number was the underlying principle of everything in nature. The prevalent tradition from antiquity through the Renaissance was that Pythagoras himself discovered that notes sounded by a vibrating string depended on the string's length, and that consonance was produced by plucking equally taut strings of lengths in ratios formed by any two numbers belonging to the tetractys, the integers 1 through 4. These ratios and their corresponding intervals, known to today's students of theory as "perfect" intervals, are shown in Table 5.

Ratio	Zarlino's name for interval <sup>146</sup>	English equivalent
2:1	diapason	octave
3:1	diapason diapente	octave plus a fifth
4:1	disdiapason	two octaves
3:2	diapente	fifth
4:2 (reduces to 2:1)	diapason	octave
4:3	diatesseron	fourth

Table 5. Intervals Defined by the Tetractys.

<sup>146</sup> See Figure 15.1, page 284.

In *Harmonics* (mid-second century, C.E.), Ptolemy writes that Didymus, the Greek grammarian and music theorist (c. 80-10 B.C.E.), introduced divisions of the monochord in the diatonic and chromatic genera that place “the leading [highest] notes of the tetrachords in the ratio 5:4 to the notes third in succession from them [inclusive] in both of the genera, and to the second notes in succession in the ratio 6:5 in chromatic and 9:8 in diatonic.”<sup>147</sup> Didymus’s chromatic division seems to be the earliest that uses the ratios 5:4 and 6:5. These ratios are not said to form consonances. Figure 3 depicts Didymus’s tetrachords in modern notation.



Figure 3. Diatonic and Chromatic Tetrachords of Didymus.

Among Ptolemy’s several divisions of the monochord is the syntonic diatonic. Zarlino’s illustration of this division (Appendix 5, Plate A5.2) shows the ratios between the highest and third-highest pitches of each of the four tetrachords outlined on the left-hand side of the diagram to be 5:4, and the ratios between the second-highest and lowest pitches of the same tetrachords to be 6:5.

Using modern notation, Figure 4 compares Didymus’s diatonic tetrachord with Zarlino’s interpretation of the same tetrachord within Ptolemy’s syntonic diatonic tuning.

<sup>147</sup> Andrew Barker, ed. *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory* (New York: Cambridge University Press, 1989), 343. The square brackets in the quotation are Barker’s.

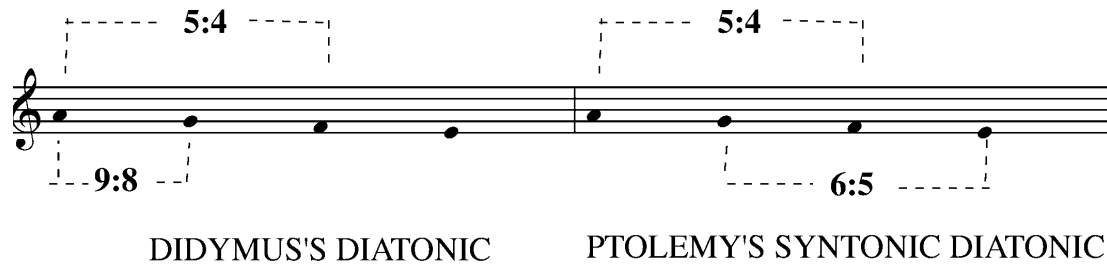


Figure 4. Didymus's Diatonic and Ptolemy's Syntonic Diatonic Tetrachords.

Zarlino gives twenty-five reasons for the significance of the number 6, but by no means is he the first writer to laud its special characteristics. In *The Republic*, Plato terms 6 the “marriage number,” the product of the male, 3, and the female, 2.<sup>148</sup> Among other writers, Aristides Quintilianus, in *De musica libri tres*,<sup>149</sup> points out that 6 is “perfect and the first number completed by its own parts.”<sup>150</sup> Zarlino's inclusion of ratios formed by any two numbers 1 through 6 among consonances yields most of what today's theory students consider major and minor consonances. The octave, the fifth, the fourth, the major third, and the minor third are defined by ratios that use the elements of the Senario, as shown in Table 6.

<sup>148</sup> For further discussion of numbers with special characteristics, see Plato, *Complete Works*, 1158 (Stephanus, 546 b-c).

<sup>149</sup> In his article on Quintilianus in *Grove Music Online*, Thomas J. Mathiesen suggests a terminus post quem of the first century C.E. and a terminus ante quem of the fourth century C.E. for *De musica libri tres*. (Thomas J. Mathiesen, “Aristides Quintilianus,” *Grove Music Online* (accessed July 19, 2006).

<sup>150</sup> Aristides Quintilianus, *On Music in Three Books*, trans. Thomas J. Mathiesen (New Haven and London: Yale University Press, 1983), 179.

Ratio	Zarlino's name for interval	English equivalent
5:1	disdiapason con il ditono	two octaves plus a major third
5:2	diapason con il ditono	octave plus a major third
5:3	essachordo maggiore	major sixth
5:4	ditono	major third
6:1	disdiapason diapente	two octaves plus a fifth
6:2 (reduces to 3:1)	diapason diapente	octave plus a fifth
6:3 (reduces to 2:1)	diapason	octave
6:4 (reduces to 3:2)	diapente	fifth
6:5	semititono	minor third

Table 6. Intervals, Not Shown in Table 5, Defined by the Senario.

Walter Odington's *Summa de speculatione musice* (*Summary of Musical Thought*, c. 1300) provides an early reference to a definition of consonance that uses ratios between numbers of the Senario. Odington includes the ditone and semiditone—major third and minor third—among the “imperfect consonances” (*concordes discordiae*) and speculates that their ratios in practice might approach the superparticular ratios of 5:4 and 6:5, respectively.<sup>151</sup> He does not, however, invoke the Senario per se.

Ramis de Pareia's division of the monochord in *Musica practica* assigns the same ratios to the perfect and imperfect consonances as does Zarlino.<sup>152</sup> He writes that he provided this division for the benefit of students who are not learned in arithmetic and geometry,<sup>153</sup> and does not assign any special power to the number 6.

<sup>151</sup> For further elaboration of Odington's theory of consonances, see Hugo Riemann, *Hugo Riemann's "History of Music Theory, Books I and II: Polyphonic Theory to the Sixteenth Century,"* tr. Raymond Herbert Haggh (Lincoln: University of Nebraska Press, 1962), 98-99.

<sup>152</sup> For a comparison of Ramis's and Zarlino's divisions of the monochord, see Appendix 5.

<sup>153</sup> *...ne et arithmetica et geometriam addiscentem prius cognovisse esset necessarium...* Ramos de Pareja, *Música práctica de Bartolomé Ramos de Pareja*, trans. and ed. Clemente Terni (Madrid: Joyas Bibliográficas, 1983), vol. 2, 139.

In *Musica theorica*, Fogliano defines the major third as the proportion 5:4 and the minor third as 6:5 for the reason that these proportions are the most pleasing to the ear.<sup>154</sup> He also defines the proportions of the major and minor sixth as 5:3 and 8:5, respectively.<sup>155</sup> Like Odington and Ramis, Fogliano does not present his ratios as manifestations of the mystical attributes of the Senario. Fogliano's illustrations of these ratios are shown in Plate 13.

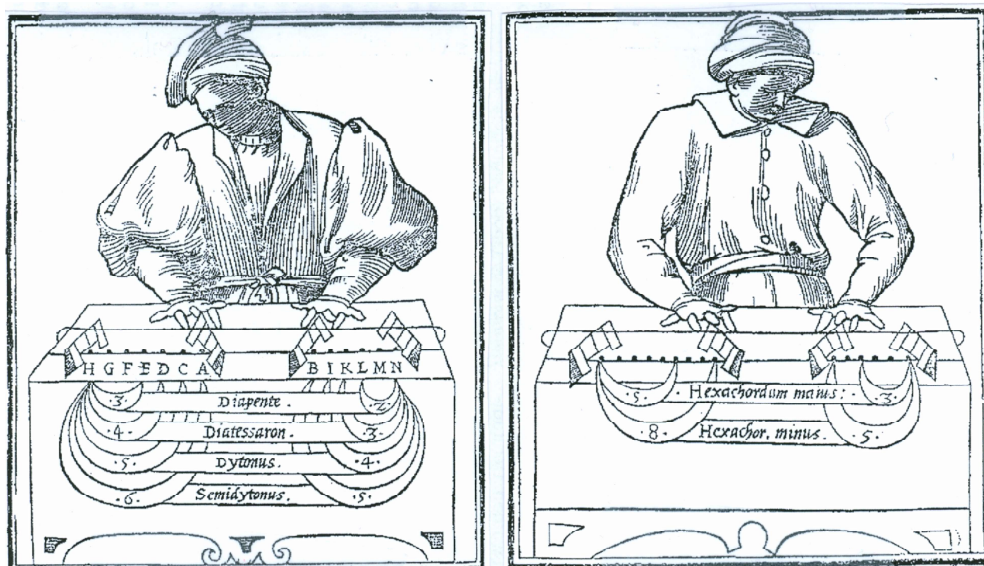


Plate 13. Fogliano's Depiction of the Ratios of Major and Minor Thirds and Sixths.<sup>156</sup>

During Zarlino's lifetime, both Vincenzo Galilei and the Spanish theorist Francisco de Salinas (1513-1590, in *De musica libri septem* [*On Music, in Seven Books*], 1577), preferred tuning major and minor thirds and sixths according to the proportions of the Senario because they were the most pleasing to the ear, not because of mathematical

<sup>154</sup> *Dytonum: qui sesquiquarta constat proportione: audies: Postremo si secundum sex et quinque fiat percussio: semidytonum in sesquiquinta habebis proportione....* Lodovico Fogliano, *Musica theorica* (1529; repr., Bologna: Forni Editore, 1970), sec. 2, fol. XII<sup>v</sup>

<sup>155</sup> Fogliano, *Musica theorica*, sec. 2, fol. XIII<sup>v</sup>.

<sup>156</sup> Fogliano, *Musica theorica*, sec. 2, fols. XIII<sup>r</sup> and XIV<sup>r</sup>.

reasoning. Galilei, despite his bitter dispute with Zarlino over tuning, admits, “*io subito confesserò che quello che noi hoggi cantiamo convenga più che con altra Distributione con il medesimo Sintono di Tolomeo* (I will at once admit that what we sing today agrees more with this syntonon of Ptolemy than with any other distribution [of ratios of the monochord].”<sup>157</sup>

After Zarlino’s death, several writers on music referred to the Senario. Among the most renowned were the German astronomer Johannes Kepler (1571-1630), the Swiss mathematician Leonhard Euler (1707-1783), and the Italian violin virtuoso and theorist, Giuseppe Tartini (1692-1770).

In his *Harmonice mundi libri v* (*Harmony of the World in Five Books*, 1619), Kepler arrives at the proportions included in the Senario, but uses a geometric procedure. He deduces the consonances from the regular polygons that can be inscribed in a circle using only a straight-edge and compasses.<sup>158</sup>

Euler, in *Tentamen novae theoriae musicae* (*An Attempt at a New Theory of Music*, 1739), investigates consonance from a theoretical point of view. In his tables of intervals, those whose ratios he assigns the highest degrees of consonance or “sweetness” (*suavitatis*) correspond to the intervals generated by the Senario.<sup>159</sup>

Tartini invokes the Senario in his account of the difference tone, which he calls the phenomenon of the third sound (*il fenomeno del terzo suono*) in *De’ principj dell’armonia musicale contenuta nel diatonico genere* (*On the Principles of Musical*

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<sup>157</sup> Daniel Pickering Walker, *Studies in Musical Science of the Late Renaissance* (London: E.J. Brill, 1978). 17; translation by Walker.

<sup>158</sup> Appendix 3 describes Kepler’s method.

<sup>159</sup> These tables can be seen in Patrice Bailhache, “Music Translated into Mathematics: Leonhard Euler” <<http://sonic-arts.org/monzo/euler/euler-en.htm>> (accessed June 16, 2007).

*Harmony Contained within the Diatonic Genus*, 1767).<sup>160</sup> The upper staff of Figure 5 shows the pitches of the violin's open G-string and the five pitches which result from its equal division into two, three, four, five, and six parts. The lower staff shows Tartini's demonstration of the resultant difference tone between the successive divisions of the string and the open string. (The audible difference tone, in fact, sounds one octave lower than the pitch indicated in Tartini's diagram.)

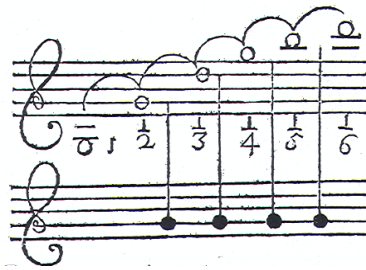


Figure 5. Difference Tones.<sup>161</sup>

Another use that Tartini makes of the Senario is to derive the first of his three aspects of the major chord from the mathematical series 1, 1/2, 1/3 ... 1/6 (the reciprocals of the Senario). He rationalizes that these aspects are based physically on the *terzo suono*.<sup>162</sup>

Tartini's derivation of the major chord is shown in Figure 6. Note that in this example *C* is the actual difference tone of the intervals *g-c*, *e'-c*, and *g'-c*.

<sup>160</sup> Giuseppe Tartini, *De' principj dell'armonia musicale contenuta nel diatonico genere* (1767; repr., New York, Broude Brothers, 1967), 5. When an interval in just intonation is played with sufficient volume, a third sound, lower than either of the two sounds being played, can be heard (...*che dati due suoni simultanei forti, e prolungati, date due voci simultanee forti, e prolungate, si sente un terzo suono simultaneo, diverso dai due dati suoni, e dalle due date voci*). I have experienced this when playing thirds, fourths, fifths, and sixths on the violin. Tartini explains that the third sound of the octave and unison are inaudible because they are in unison with one of the generating tones. (*È fisicamente certo, che il commune udito musicale arriva a distinguer chiaramente la sua intonazione in tutte le combinazioni di due suoni del Diatonico genere: eccettuate, come si è detto, le due degli unisoni, e delle ottave, ed altre da ciò dedotte, e dipendenti come si spiegherà in progresso*. Tartini, *Principj*, 5.)

<sup>161</sup> Tartini, *Trattato*, 18.

<sup>162</sup> ...*la simultanea combinazione di tutti i suoni della sestupla, ed è combinazione di sistema universale...fisico per il terzo suono: dimostrativo per l'armonica proporzione, e serie degl'intervalli: musicale per il complesso di tutti gli attuali semplici consonanti intervalli*. Tartini, *Principj*, 28.

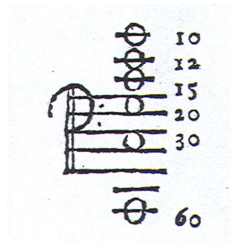


Figure 6. Tartini's Major Chord.<sup>163</sup>

The concept that consonance—including thirds and sixths, as well as the octave, fifth, and fourth admitted as such by the Pythagoreans—is connected to ratios of the integers from one through six, has thus been seen as early as the fourteenth century, and as late as the middle of the eighteenth century. Zarlino's list of the reasons why the number 6 is so special to consonance is the most extensive of all. This list lies within the speculative realm; unlike some theorists before and after him, Zarlino does not include a "pleasing sound" as one of his reasons for defining consonance by means of the Senario.

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<sup>163</sup> Ibid.

## SUMMARY OF *LE ISTITUTIONI HARMONICHE*, PART 1

After the title page and the announcement of a ten-year privilege of printing issued by the Signoria of Venice, the 1558 edition of *Le istituzioni harmoniche* begins with a dedication followed by the table of contents and an introductory letter to the reader (*A i lettori*), which includes printing errata. The established firm of Francesco de i Franceschi Senese reissued *Le istituzioni* in 1561. The publication of the 1573 edition by Senese obviated the need for a renewal of Zarlino's ducal privilege of printing.

In his 1558 letter to the reader, Zarlino promises to translate *Le istituzioni* into Latin if he sees that his work is truly appreciated (*che queste mie fatiche veramente vi siano care*). He was already thinking about publishing another treatise, *Dimostrazioni harmoniche*, mentioned several times in the text of *Le istituzioni*; the *Dimostrazioni* eventually appeared in 1571. In the 1573 letter to the reader, Zarlino explains that he decided not to publish a Latin translation of *Le istituzioni*—although he had done a good deal of the work—because he felt his time would be better spent in writing an eighteen-volume compendium encompassing the speculative and practical aspects of music. This latter work never materialized.

## DEDICATION

Amid much fanfare about the importance of acquiring knowledge, about his own years of studying music theory and practice, and with lavish praise for the material and spiritual contributions that Vincenzo Diedo (1499-1559), the patriarch of Venice, made to the Church, Zarlino dedicates *Le istituzioni* to Diedo. In 1559, the patriarch, in turn, was

to demonstrate his closeness to Zarlino by choosing Zarlino as a signatory to his will.<sup>164</sup> Zarlino hopes that Diedo's patronage can protect him against censure by "some soul of ill will" (*alcuno di animo tanto maligno*). Zarlino retains Diedo as the dedicatee of the 1573 *Istitutioni*, even though by then Diedo had been dead for fourteen years! But Diedo was a controversial figure. On the one hand, he was an active prosecutor in ferreting out heresy and supporting the institutional church.<sup>165</sup> He also commissioned the architect Andrea Palladio (1508-1580) to design a new façade for the church of San Pietro di Castello (Plate 14), at that time the patriarchal cathedral of Venice.<sup>166</sup>



Plate 14. Façade of the Church of San Pietro di Castello.<sup>167</sup>

<sup>164</sup> See Zarlino, *Motets from 1549, Part 1*, xviii. A photocopy of Diedo's will is housed in the Moldenhauer archives in the Library of Congress; a link to this document can be accessed through the Moldenhauer website at <<http://memory.loc.gov/ammem/collections/moldenhauer/>>.

<sup>165</sup> For an example of Diedo's role in prosecuting heresy, see Daniele Santarelli, "Morte di un eretico impenitente," *Storia del mondo* 16 (1978), <<http://www.storiadelmondo.com/16/santarelli.algerio.pdf>>, (accessed April 10, 2006).

<sup>166</sup> In 1807, St. Mark's became Venice's patriarchal seat. Some consider Palladio to have been the most influential sixteenth-century disciple of Vitruvius, the first-century Roman architect, in the quest for harmony of form.

<sup>167</sup> <<http://www.chorusvenezia.org/museo/castello/castello1.htm>> (accessed January 9, 2007).

On the other hand, Diedo's political enemies accused him of tax evasion and a luxurious lifestyle; he was forced to repay 2,000 ducats in back taxes to the Serenissima.

#### PROLOGUE, CHAPTERS 1-4: HISTORY, PRAISES, AND USES OF MUSIC

The prologue to *Le istituzioni* precedes Part I; it is not included in the table of contents. In the prologue God is credited with having given man the spoken voice, which distinguishes him from animals. Zarlino relates his views, common to many Renaissance authors, on the evolution of human society, speech, harmony, rhythm, meter, and poetry. He credits Willaert, as we have seen, with restoring music's ancient honor, from which it had descended to an "extreme baseness" (*infima bassezza*), and likens him to a "new Pythagoras." Zarlino was not the first writer to compare Willaert with a revered figure of antiquity. In the viol method *Letzione seconda pur della pratica di sonare il violone d'arco da tasti* (1543), the instrumentalist and pedagogue Silvestro Ganassi (1492-mid 16<sup>th</sup> century) had called Willaert the "new Prometheus of celestial harmony."<sup>168</sup>

Zarlino concludes the prologue with an outline of the four-part structure of *Le istituzioni*. The last paragraph paraphrases the titles of the first four chapters of Part I, providing an efficient segue into the content of the *laus musicae* of the treatise.<sup>169</sup>

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<sup>168</sup> ...il non mai a bastanza lodato messer Adriano nuouo Prometheo della celeste Armonia scorno del passato, Gloria del presente, & maestro del futuro seculo, quello senza dubbio all'uniuerso piacera che dal suo diuino giudicio sia lodato. (...one cannot sufficiently praise messer Adriano, the new Prometheus of celestial harmony, scorner of the past, glory of the present, and master of the future century; without a doubt it is pleasing to the universe that his divine guidance is praised.), Silvestro Ganassi, *Letzione seconda pur della pratica di sonare il violone d'arco da tasti*. (1543; repr., Bologna: Forni Editore, 1970), fol. Aii<sup>o</sup>.

<sup>169</sup> "...l'origine & certezza della Musica, le sue laudi, a che fine ella si debba imparare, l'utile che si hà di essa, in che modo la douemo vsare, & altre cose simili (the origins and certainty of music, its praises, to what end it must be learned, its usefulness, how it must be used, and other similar things), *Ist.* (1558), 2

In Chapter 1, *Della origine e certezza della Musica* (On the Origins and Certainty of Music), Zarlino presents the Aristotelian view that God gave man the intelligence to contemplate celestial matters and understand the occult and divine by means of the five senses in order to elevate man above the animals. Hearing is the most valuable and necessary of the five senses in the comprehension of science by the intellect. Citing the authority of Diodorus, Lucian, Lactantius, Pliny, Macrobius, and Boethius, Zarlino offers the Biblical origin of music – music began with Jubal Cain. The legend of Pythagoras and the hammers in the discovery of musical consonance is related as a reinforcement of the mathematical basis of the principles of harmony. Because numbers have certainty and music is based on numbers, music is part of the mathematical sciences.

Chapter 2, *Delle laudi della Musica* (On the Praises of Music) follows the tradition of the *laus musice*, praise of the benefits of music written in the Bible and by authors of antiquity and cited in music treatises by Zarlino's predecessors from Boethius through Vicentino.<sup>170</sup> In his *laus musice*, Zarlino credits the Pythagoreans for the view that the human soul is shaped by similar musical ratios as those that govern the world, and indeed, as those that affect the turning of the celestial spheres. According to Plato, music embraces all disciplines; Zarlino gives examples from grammar, oratory, poetry, architecture, and astronomy.

Zarlino writes that the harmony of the spheres is rooted in nature. The Christian belief that everything is dependent on the Prime Mover is reinforced by Zarlino's stating that the order of things ordained by the Creator produces a silent harmony of the universe. Because the soul of the cosmos is harmony, our soul is the cause of harmony

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<sup>170</sup> For examples of writers on music and their *laus musice*, see Ann E. Moyer, *Musica Scientia: Musical Scholarship in the Italian Renaissance* (Ithaca: Cornell University Press, 1992), passim.

within us, as God created man in the image of the higher world.<sup>171</sup> Music is necessary to the Christian, because in its science one finds beatitude.<sup>172</sup> The only proper way to praise and thank the Creator is through music.<sup>173</sup> Animals, birds, and even rivers, springs, and stones respond to music. Music has health benefits; it cures the sick and the insane. Music inspires warriors in battle. Those who have no knowledge of music are ignorant and deficient.

In this chapter, as in the succeeding two chapters, Zarlino emphasizes the need for a balance between music and other disciplines. He writes, “Diogenes the Cynic justly and wisely mocked the musicians of his time, who had tuned the strings of their kitharas yet had untidy and discordant souls, having abandoned the harmony of manners.”<sup>174</sup>

Chapter 3, *A che fine la Musica si debba imparare* (To What End Music Must Be Learned), makes the point that the true goal of music lies beyond sensual satisfaction and intellectual exercise. Through music the soul becomes predisposed to good habits and one can lead a life of good habits (*via de buon costumi*). Chapter 4, *Dell’vtile che si ha della Musica, & dello studio che vi douemo porre, & in qual modo vsarla* (On the Uses of Music, and How It Must Be Studied, and in What Way to Use It), gives further examples of music as a remedy for body and soul. Zarlino declares that the ancients

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<sup>171</sup> “...hauendo Iddio creato l’huomo alla similitudine del Mondo maggiore...” *Ist.* (1558), 6.

<sup>172</sup> “...la Musica è necessaria all’huomo Christiano; Conciosia che nella scienza di essa si ritroua la beatudine.” *Ibid.*

<sup>173</sup> “...non che altro, che la Musica, si lauda et ringratia il Creatore,” *Ibid.*

<sup>174</sup> “...meritamente, & sapientemente Diogene Cinico beffaua li Musici de suoi tempi, li quali hauendo le chorde delle loro cetere concordi, haueano l’animo incompsto & discorde, essendo abbandonato dall’harmonia de costumi.” *Ist.* (1558), 7.

counseled young men to study music together with gymnastics in order to fashion a prudent life, a view elaborated upon in Plato's *Republic*.

#### CHAPTERS 5 THROUGH 11: DEFINITIONS OF MUSIC AND ITS ASPECTS

In Chapter 5, *Quello che sia Musica in vniuersale, & della sua Divisione* (What Music Is in General, and concerning Its Divisions), Zarlino defines music as “nothing other than harmony.”<sup>175</sup> Zarlino translates and expands the pronouncement, *harmonia est discordia concors*, a paraphrase of Empedocles that appears in the frontispiece of Gaffurio's *De harmonia musicorum instrumentorum opus* (Plate 15), calling music a “discordant concord, a concord of different things that may be joined together.”<sup>176</sup>



Plate 15. Frontispiece, Gaffurio's *De harmonium musicorum instrumentorum opus*.<sup>177</sup>

<sup>175</sup> “...Musica non è altro che Harmonia,” *Ist.* (1558), 10

<sup>176</sup> “...vna discordante Concordia ,, Concordia di varie cose, le quali si possono congiungere insieme”. *Ibid.* True to form, Zarlino credits Empedocles, but not Gaffurio, for this statement.

<sup>177</sup> Franchino Gaffurio, *De harmonium musicorum instrumentorum opus* (1518; repr., [Rome]: American Institute of Musicology, 1977), 9.

As mentioned above, Zarlino's division of music into *musica animastica* and *musica organica* departs from Boethius's categorizations of *musica mundana*, *musica humana* and *musica instrumentalis*. Zarlino's *musica animastica* includes *musica mundana* and *musica humana*,<sup>178</sup> while his *musica organica* encompasses music for both "natural" (i.e., voice) and "artificial" (winds, strings, and percussion) instruments.<sup>179</sup> Four types of music can be composed for both categories of *musica organica*: plainsong (*cantus firmus*), measured music (*cantus figuratus*), rhythmical music, and metrical music. Zarlino draws a diagram that illustrates the relationships among the various types of *musica animastica* and *musica organica*.<sup>180</sup> The 1573 edition reproduces this diagram with greater detail.<sup>181</sup> For example, in 1558 he simply writes *MVSICA* in a circle, whereas in 1573 he writes *LA MVSICA è di due/sorti* in the corresponding circle. Both diagrams are reproduced as Figures 5.1 and 5.2, pages 187-188 below.

Beyond the rationalizations touched upon in Chapter 2, Zarlino goes into great detail in Chapter 6, *Della Musica mondana* (On Cosmic Music), to justify his opinion—shared by, among others, Pythagoras, Cicero, Boethius, and Ficino, but negated by Aristotle, Tinctoris, and Glarean—that music is produced in the heavens. Man is unable to hear this celestial harmony since it exists on a higher plane than humans can

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<sup>178</sup> Zarlino defines *musica animastica* as "...*harmonia, che nasce dalla compositione di varie cose congiunte insieme in un corpo; auenga che tra loro siano discrepanti; come è la misura de i quattro Elementi, ouero di altre qualità in vn corpo animato*" (...harmony that arises from the combination of various things joined together in one body regardless of their discrepancies, as seen in the measure of the four elements, or of other qualities in a living body), Ibid.

<sup>179</sup> "...*harmonia, che può nascere da varij istrumenti. Et questa di nuouo partiremo in due: percioche si ritrouano due sorti d'istrumenti, cioè Naturali & Arteficiali.*" (...harmony that may arise from various instruments. And this we will divide again into two [categories] because there are two sorts of instruments, natural and artificial.), Ibid.

<sup>180</sup> Zarlino, *Ist.* (1558), 11.

<sup>181</sup> Zarlino, *Ist.* (1573), 15.

comprehend.<sup>182</sup> The distance between the earth and the moon is given as 12,600 stadia, a figure stated by Macrobius and Pliny.<sup>183</sup> Table 7 illustrates Zarlino's description of the correspondence of musical intervals with distances between the orbits of celestial bodies.

Orbit of	to Orbit of	Interval
Earth	Moon	tone
Moon	Mercury	major semitone
Mercury	Venus	minor semitone
Venus	Earth	3 tones + a semitone = diapente
Moon	Sun	2 tones + a semitone = diatessaron
Sun	Mars	tone
Mars	Jupiter	minor semitone
Jupiter	Saturn	major semitone
Saturn	"farthest heaven, where the signs of the zodiac lie" <sup>184</sup>	minor semitone
farthest heaven	Sun	diatessaron
Earth	farthest heaven	5 tones + 2 minor semitones = diapason

Table 7. Intervals That Correspond to Distances between Heavenly Bodies.

The positions or actions of celestial bodies determine several musical concepts, as Table 8 shows. The placement and movement of the celestial bodies are other means of understanding cosmic harmony.

Position/Action of Celestial Bodies	Result as Musical Concepts
signs of the zodiac	consonances
motion from east to west	deeper sounds
motion in the "middle of the heavens"	higher sounds
distances of planets from earth	diatonic, chromatic, enharmonic genera
diameters of planetary orbits	tropes or modes
phases of the moon	conjuncts of the tetrachords

Table 8. Musical Concepts Determined by Positions and Actions of Celestial Bodies.

<sup>182</sup> ...*gli orecchi nostri non possono capire la dolcezza dell'harmonia celeste, per l'eccellenza et grandezza sua.* (our ears are unable to understand the sweetness of celestial harmony, because of its excellence and grandeur) Zarlino, *Ist.* (1558), 12.

<sup>183</sup> See Moyer, *Musica Scientia*, 45.

<sup>184</sup> *l'ultimo cielo.* Zarlino, *Ist.* (1558), 13.

God created the elements, as He created everything else, of “numbers, weights, and measure” (*in Numero, in Peso, & in Misura*<sup>185</sup>)—a paraphrase of the verse in the Book of Wisdom 11:21 (*omnia in mensura, et numero et spondere disposuisti*), which Zarlino cites in a marginal note in 1573.<sup>186</sup> Cosmic harmony may be grasped from the connections of numbers, weights, and measures among the four elements (earth, water, air, and fire). Zarlino inserts a diagram (Figure 6.1, page 210) that illustrates the number assigned to each of the four elements, qualities shared between pairs of elements, and the proportion associated with each quality. The data in Zarlino’s diagram are summarized in Table 9.

Element	Assigned Number	Paired with	Quality shared	Proportion
Earth	8	Water	Coldness	3:2
Water	12	Air	Wetness	3:2
Air	18	Fire	Heat	3:2
Fire	27	Earth	Dryness	27:8

Table 9. Numbers, shared qualities and proportions of the four elements.

Mercury’s four-stringed lyre or kithara reflects the four seasons as well as the four elements, while Terpander’s seven-stringed lyre is in the image of the seven planets.<sup>187</sup> Zarlino states, but does not explain, that Mercury’s instrument inspired the Greater Perfect System.

In Chapter 7, *Della musica humana* (On Human Music), Zarlino writes that anyone who practices self-contemplation is able to understand *musica humana*. He first

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<sup>185</sup> *Ist.* (1558), 14.

<sup>186</sup> In Chapter 12, Zarlino reiterates that “at the very beginning of the world...all things created by God were ordained by him with number” (*dalla prima origine del mondo...tutte le cose create da Dio furono da lui col Numero ordinate...*) [*Ist.* (1558), 21.]

<sup>187</sup> In a marginal note in the 1573 edition, Zarlino credits Boethius and Macrobius with passing on this legend. (*Ist.* [1573], 21).

defines *musica humana* as the connection between aspects of the human body and soul and relates these connections to numbers as well as to musical concepts.<sup>188</sup>

A second definition of *musica humana* is “the order observed by nature in the creation of our bodies.”<sup>189</sup> The number of days, 45, which elapses from conception to a person’s recognizability as a human being, is seen as the sum of the numbers 6, 9, 12, and 18, each of which represents the elapse of days between conception and a particular phase of development of the embryo.<sup>190</sup> Zarlino presents a diagram (Figure 7.1, page 226) that shows all the proportions that can be made between pairs of these four numbers and names the consonances that they represent: diapente, diatessaron, diapason, and diapason diapente.<sup>191</sup>

*Musica humana* manifests itself in one’s actions; in one’s soul, whose parts correspond to the consonances of the diapason, diapente, and diatessaron; and as combinations of body and soul. Zarlino credits the Platonists with the assignment of qualities corresponding to the number of species present in the diapason, diapente, and diatessaron to the three parts of the soul named by Ptolemy, intellect, feelings, and habit, and to specific manifestations of these three parts. Zarlino’s interpretation of the correspondence of the intervals to the qualities and parts of the soul according to the Platonists and Ptolemy is shown in Table 10.

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<sup>188</sup> See above, page 25.

<sup>189</sup> *quell’ordine, che osserua la Natura nella generatione de nostri corpi*. Ibid.

<sup>190</sup> This theory of human development from conception appears in Gaffurio, *The Theory of Music*, 37. Gaffurio’s discussion, in turn, is a paraphrase of Censorinus, whose treatment of life in utero can be found in Censorinus, *De die natali liber*, ed. Otto Jahn (Amsterdam: Editions Rodopi, 1964), 27-29.

<sup>191</sup> Zarlino, *Ist.* (1558), 17.

Interval	Intervals/ Species	Part of soul (Ptolemy)	Qualities		Part of soul	Qualities
Diapason	7	intellect	mind imagination memory thought opinion reason science		reason	perspicacity ingenuity diligence guidance wisdom prudence experience
Diapente	4	feelings	sight hearing smell taste (touch is common to all)		anger	moderation or temperance animosity fortitude tolerance
Diatessaron	3	habit	growth summit decline		cupidity	sobriety forbearance respect

Table 10. Qualities of the Soul that Correspond to the Number of Species In Various Intervals.

These qualities interact with and modify each other.<sup>192</sup> Furthermore, bodies are composed of the four elements. Imbalance and infirmity of the soul result from imbalance of the four humors—melancholic, phlegmatic, sanguine, and choleric.

In Chapters 8 and 9, *Della Musica piana, & misurata; o vogliamo dire Canto fermo, & figurato* (On Plainsong, and Measured Music, or As We May Call It, *Cantus Firmus* and *Cantus Figuratus*) and *Della Musica Rithmica, & della Metrica* (On Rhythmic and Measured Music), Zarlino defines the four categories of natural as well as artificial (i.e., instrumental) music mentioned in Chapter 5. Plainsong consists of notes of equal length denoted by characters or simple figures (*Caratteri, o figure semplici*) called notes (*Note*). Measured music uses a variety of note durations, represented as notes of

<sup>192</sup> ... tale harmonia nelle potenze di essa anima, si come nell'Ira, nella Ragione; & nelle Virtù; come sarebbe dire nella Iustitia & nella Fortezza: percioche queste cose tra loro si vengono a temperare nel modo che nei suoni della consonanza si contempera il suono graue con l'acuto. (...we can still see such harmony in the power of this soul, as in [the interaction of] anger and reason; and in the virtues, namely, in justice and fortitude, because these things come to mitigate each other in the way that low and high pitches mitigate each other in the sounds of consonance.) Zarlino, *Ist.* (1558), 17.

different shapes. Rhythmic music is derived from the number of syllables and the sounds of words of poetry or prose.<sup>193</sup> Metrical music stems from the diversity of poetic feet and the length of syllables, and arises from the sound of vowels, not of consonants. Both rhythmical and metrical music derive from natural, i.e., vocal music.

A definition of instrumental music as that harmony which arises from instrumental sounds and pitches<sup>194</sup> appears in Chapter 10, *Quello che sia Musica in particolare, & perche sia cosi detta* (What Music Is in Particular, and Why It Is Thus Called). In addition, Zarlino states that music is a speculative mathematical science that considers numbers, proportions, and pitches. Zarlino names several theories of the derivation of the word “music.” The first, he writes, is from the Greek Μαεισθαι (*maiesthai*). The second is from the Greek μωσθαι (*mosthai*), the meaning of which is “to search or investigate” (*cercare, o inuestigare*), according to Zarlino’s reference to Plato’s *Cratylus*.<sup>195</sup> The third, which Zarlino favors, is from the combination of the Egyptian or Chaldean words *mon* (water) and *echos* (sound).<sup>196</sup>

Chapter 11, *Divisione della Musica in Speculatiua & in Prattica; per la quale si pone la differenza tra il Musico & il Cantore* (Division of Music into [the] Speculative

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<sup>193</sup> Aristoxenus, in his *Rhythmic Elements*, writes that rhythm is concerned with durations and the perception of durations. Rhythm arises when the division of durations takes on a determinate organization – but not every organization of durations is rhythmic. Zarlino’s definition of rhythmic music, because it takes the sounds of words into consideration, is closer to St. Augustine.

<sup>194</sup> ...*harmonia, la quale nasce da i suoni & dalle voci...* Zarlino, *Ist.* (1558), 19.

<sup>195</sup> Zarlino does not define Μαεισθαι. In *Cratylus*, Socrates asks, “Do you know what *maiesthai* means?” Hermogenes responds, “Yes, it means ‘to search.’” (Plato, *Complete Works*, 138 [Stephanus, 421a]). The explanation of *mosthai* given in *Cratylus* is, in the words of Socrates, “As for the Muses and music and poetry in general, they seem to have derived their name from their eager desire (*mosthai*) to investigate and do philosophy” (Plato, *Complete Works*, 124 [Stephanus, 406a]).

<sup>196</sup> *Grove Music Online* gives the etymology of the Latin *musica* as taken from the classical Greek *mousike*, which originally referred to works or products of all or any of the nine Muses. See Bruno Nettl, “Music,” *Grove Music Online* (accessed August 10, 2006).

and [the] Practical, Through Which One Differentiates between the Musician and the Performer), makes the point that cognition is worthier than execution, but speculation is fruitless without the performer. The perfect musician is proficient in both aspects of music.

## CHAPTERS 12 THROUGH 16: NUMBER AND THE SENARIO

Chapter 12, *Quanto sia necessario il Numero nelle cose; & che cosa sia Numero; & se l'Unità è numero* (How Necessary Number Is in Things, and What Number Is, and Whether One Is a Number) introduces the role that number plays in music. Number is necessary because number was the model of all things God created; God ordained everything he created with number, and nothing makes sense without it. Zarlino uses Euclid's definition when he maintains that "number is a multitude composed of many Ones."<sup>197</sup> The Bible affirms the importance of number; in number, the Pythagoreans saw the divine. Of the attributes of number, Zarlino writes, "Number sharpens ingenuity, confirms memory, draws the intellect to speculation, and contains all things in itself."<sup>198</sup> One itself is not a number, but the generator, "the very beginning of number,"<sup>199</sup> just as a point is not a line but the beginning of a line.

Zarlino names and gives examples of ten species of numbers in Chapter 13, *Delle varie specie de Numeri* (Of the Various Species of Numbers): even, odd, "evenly even" (powers of two), prime, composite, pairs of non-prime numbers that have no common

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<sup>197</sup> ...il Numero essere moltitudine composta di più unità. *Ist.* (1558), 21.

<sup>198</sup> *Il Numero acuisce l'ingegno, conferma la memoria, indirizza l'intelletto alle speculationi, & conserua nel proprio essere tutte le cose.* *Ibid.*

<sup>199</sup> *La quale unità ben che non sia numero, tuttaua è del numero principio.* *Ist.* (1558), 22.

factor save 1,<sup>200</sup> pairs of numbers with common factors, squares, cubes, and perfect numbers (numbers that are sums of their factors). In music, understanding the characteristics of the ten species of numbers enables one to comprehend and investigate “harmonic or sounding number, contained in the first perfect number, the Senario.”<sup>201</sup> It is here that the terms “sounding number” and “Senario” appear in *Le istituzioni* for the very first time.<sup>202</sup>

The proportions that produce all the simple consonances (except the minor sixth, which Zarlino constructs by maneuvering the numbers of the Senario in Chapter 16) exist between any two numbers from one to six. Zarlino begins his list of reasons for the supremacy of the Senario with the statement that God created the world in six days, and continues his enumeration of twenty-four additional reasons in Chapter 14, *Che dal numero Senario si comprendeno [sic] molte cose della natura & dell’arte* (How Many Things of Nature and Art May Be Understood through the Senario). Chapter 15, *Delle Proprietà del numero Senario, & delle sue parti; & come in esse si ritroua ogni consonanza musicale* (Of the Properties of the Senario, and of its Parts, and How Every Musical Consonance Can Be Found in Them) pairs each proportion of numbers within the Senario with its corresponding consonance, illustrating this pairing with a diagram

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<sup>200</sup> e.g., the numbers 9 and 25.

<sup>201</sup> ...*la cognitione loro serue nella Musica alla inuestigatione delle passioni del proprio soggetto, il quale è il Numero harmonico, ouer sonoro, contenuto nel primo numero perfetto, il quale è il Senario... Ist.* (1558), 23.

<sup>202</sup> The concept of music as “sounding number” can be traced back to the Pythagoreans, who viewed musical notes as “items possessing magnitude of some sort.” (Andrew Barker, ed., *Greek Musical Writings, Volume II*, 8). In *The Republic*, Plato attributes a kinship between astronomy and “harmonics” to the Pythagoreans thus: “...as the eyes fasten on astronomical motions, so the ears fasten on harmonic ones” (Plato, *Complete Works*, 1146 [Stephanus, 530d]). Those who can be questioned about harmonics “seek out the numbers that are to be found in ... audible consonances.” (Plato, *Complete Works*, 1147 [Stephanus, 531c]). In the sixteenth century, Fogliano was the first to use the term, “sounding number.”

(Figure 15.1, page 284). Dissonances are generated by multiplying pairs of numbers of the Senario with each other and with squares of each number from one to six, shown in an additional diagram (Figure 15.2, page 289).

The definitions of simple and compound consonances given in Chapter 16, *Quelle sia Consonanza semplice, e Composta; & che nel Senario si ritrouano le forme di tutte le semplici consonanze; & onde habbia origine l'Essachordo minore* (What Simple and Compound Consonances are; and How the Forms of all the Simple Consonances may be Found in the Senario; and Whence the Minor Sixth Originates) are not the same as the definitions of simple and compound consonances we use today. Our simple consonances are those that occur within an octave, including the octave; our compound consonances are those that can be expressed as one or more octaves plus a simple consonance. In 1558, Zarlino defines compound consonance with a long description of the superpartient proportion, a ratio in which a number can be inserted between the two terms, or, as Zarlino says, “mediated” (*mediati*); two proportions result from this mediation. His example is the major sixth, 5:3. By inserting 4 between them, two proportions result: the ditone, 5:4, and the diatessaron, 4:3. The ditone and diatessaron do not add up to an octave. In contrast, a simple consonance is defined by a superparticular proportion; the difference between its terms is one, and therefore another integer cannot be inserted in between them. In Zarlino’s calculations, the ratios 6:2, 6:3 and 6:4 are always reduced to their lowest terms, 3:1, 2:1, and 3:2 respectively. In 1573, Zarlino reverses the order of the definitions of simple and compound consonances; their meaning, however, remains the same.

Zarlino rationalizes that the minor sixth, although represented by the ratio 8:5, is still a consonance, because it is generated by two ratios—diatessaron (4:3) and semiditone (6:5)—that occur within the Senario. The terms 8 and 5 can be mediated by 6. Therefore, although the minor sixth is not actually found in the Senario, it is found “in potentiality,” because it can be constructed from proportions that lie within the Senario, and it does exist among the numbers that are part of the first cubic number, 8.<sup>203</sup> Zarlino then concludes that without knowledge of proportions one cannot learn anything about music.

#### CHAPTERS 17 THROUGH 20: NUMBER AS IT RELATES TO MUSIC

Zarlino defines “continuous” and “discrete” quantities in Chapter 17, *Della quantità continua & della discreta* (On Continuous and Discrete Quantities), where his explanations agree with prevailing concepts. Members of the discrete quantity are distinct and separate, as is the set of positive integers. Examples of discrete quantities include a speech and a herd of animals. The continuous quantity accepts an infinity of divisions. A line, a surface, and a body are examples of the continuous quantity. In Part Two, Chapter 18, Zarlino writes that sounds in potential reside in the continuous quantity in a sounding body.<sup>204</sup>

Chapter 18, *Del soggetto della Musica* (On the Subject of Music) is an examination of contrasts. Within the discrete quantity, numbers are “simple” (*semplice*)

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<sup>203</sup> *Et benche essa tra le parti del Senario non si troui in atto,<sup>203</sup> si troua nondimeno in potenza: conciosiache dalle parti contenute tra esso piglia la sua forma ... la onde tra'l primo numero Cubo, il quale è 8. viene ad hauer in atto la sua forma.* (Although not found in the parts of the Senario in actuality, it is found nevertheless in its potential, because it takes its form from the parts contained within it ... so that within the first cubic number, 8, it comes to actualize its form.) *Ist.* (1558), 27-28.

<sup>204</sup> *...li Suoni primieramente si ritrouano in potenza nella quantità continua detta Corpo sonoro... Ist.* (1558), 86.

because they exist in themselves. The concept of “relative” (*numero relato*) is concerned with numerical relationships that are defined by two or more numbers, such as the double and triple proportions. Within the continuous quantity, objects such as the line, the surface—indeed, consistent with Zarlino’s cosmology, the earth—are “things of perpetual repose (*cose di perpetua quiete*) and are the materials of geometry. In 1558, Zarlino writes that the celestial bodies are things of “continuous movement” (*continouo mouimento*), whereas in 1573, he states that these objects “turn and move by themselves” (*sono girate, & hanno in se stesse il mouimento*); these are the materials of astronomy. Musicians use relative numbers to understand the differences between sounds. Again, Zarlino explains that music is sonorous number, clarifying this concept further in Chapter 19, *Quello che sia Numero sonoro* (What Sonorous Number Is). A sonorous body must satisfy three conditions: it must be clean, hard, and long (*polito, duro, and largo*). These conditions cannot be quantified by studying man because the parts of the body from which sounds arise cannot be measured. The monochord is ideal for measuring relationships among sounds and Zarlino promises a deeper explanation of the monochord and its ratios in Part II of *Le istituzioni*. Here, he declares that sonorous number is the true subject of music because, although all bodies can produce sounds, only combinations of sounds that embody specific proportions can generate consonances.

In Chapter 20, *Per qual cagione la Musica sia detta subalternata all’Arithmetica, & mezana tra la mathematica, & la naturale* (Why Music is said to be Subordinate to Arithmetic, and Placed between Mathematics and Natural [Science]), Zarlino explains the position of the science of music within the quadrivium. There are two kinds of science.

Principal or subordinating science depends on principles discernable by intelligence and perception,<sup>205</sup> such as arithmetic and geometry. Secondary or subordinate science incorporates principles from one of the principal sciences as well as other tenets derived by means of the senses. Zarlino cites perspective as an example of a subordinate science. The subject of perspective is visible line; the study of line is a part of geometry, and visibility is an attribute of the sense of sight. Music shares number with arithmetic, but adds sonority. Thus, music is subordinate to natural science because of its sonorous aspect. Music is more of a mathematical science than a natural science.<sup>206</sup> Zarlino then reiterates two arguments from Chapter 11: form is nobler than matter,<sup>207</sup> and music only becomes perfect when it is put into practice.<sup>208</sup>

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<sup>205</sup> Zarlino's definition reads, *alcune dette Principali, o Subalternanti ... sono quelle, le quali dependono da i principij conosciuti per lume naturale & cognitione sensitiva* (Those called principal, or subordinating ... are those that depend on principles known by natural intelligence and perception of the senses). *Ist.* (1558), 30.

<sup>206</sup> *...douendosi denominare tutte le cose dalla cosa più nobile, più ragioneuolmente diciamo la Musica essere scienza mathematica, che naturale: conciosia che la forma sia più nobile della materia.* (...having to define all things from the noblest thing [of which they partake]...it is more reasonable for us to say music is more of a mathematical science than a natural [science], since form is more noble than matter.) *Ist.* (1558), 31.

<sup>207</sup> *la forma sia più nobile della materia.* Ibid.

<sup>208</sup> *Et si come nelle cose naturali, niuna cosa è perfetta, mentre che è in potenza: ma solamente quando è ridutta in atto; così la Musica non può esser perfetta, se non quando co'l mezo de i naturali, o artificiali istrumenti si farà vdire: la qual cosa non si potrà fare co'l Numero solo, ne con le Voci sole: ma accompagnando & queste & quello insieme...* (And just as in natural things, nothing is perfect while it is theoretical, but only [becomes perfect] when it is put into practice, so music cannot be perfect unless it is heard by means of natural or artificial instruments. Such a thing can be done neither with number nor with voices alone, but by both accompanying each other...) Ibid.

## CHAPTERS 21 THROUGH 30: DEFINITIONS; CATEGORIES OF PROPORTIONS

Zarlino's chapters on mathematical concepts begin with the definition of proportion as the comparison of two things that share an attribute or are closely related.<sup>209</sup> Only proportions found between numbers belonging to the discrete quantity are relevant to music. Zarlino names five ways in which a larger number can contain a smaller number, according to Table 11.

Larger number contains smaller number	Category	Name of proportion
1. more than once of smaller number's entirety	simple	multiple
2. once + aliquot part of smaller		superparticular
3. once + non-aliquot part of smaller		superpartient
4. more than once + aliquot part of smaller	composite	multiple superparticular
5. more than once + non-aliquot part of smaller		multiple superpartient

Table 11. Categories and Names of Proportions.

In Chapter 23, *Quel che sia parte aliquota, & non aliquota* (What Is an Aliquot Part, and a Non-Aliquot [Part]), Zarlino's definition of an "aliquot part" of a larger number agrees with the modern dictionary definition—a number that is contained an exact number of times in a larger number—i.e., a factor of the larger number. A non-aliquot part is contained one or more times within the larger number, but when the larger number is divided by the smaller, a remainder is left. However, in Chapter 25, *Quel che sia Denominatore, & in qual modo si troui; & come di due proposte proportioni si possa conoscere la maggiore, o la minore* (What a Denominator Is, and in What Manner It Is

<sup>209</sup> ... *la Proportione... è la comparatione di due cose insieme, fatta in vn medesimo attributo, ouer predicato vniuoco...ouero...quella certa habitudine, o conuiuenza, che hanno due finite quantità di vn medesimo genere propinquo... Ist.* (1558), 31.

Found, and how of Two Proposed Proportions It Is Possible to Know the Greater or the Smaller), Zarlino uses “aliquot” differently, as a synonym for “quotient.”<sup>210</sup>

In Chapter 24, *Della produzione del genere Moltiplice* (On the Generation of the Multiple Category), Zarlino states that music is concerned with a few simple, finite proportions. Smaller numbers are more comprehensible and agreeable to the intellect; likewise, in music, the ear abhors (*abhorisce*) large distances.<sup>211</sup>

In addition to using different meanings for “aliquot part,” Zarlino gives various definitions of “denominator” in Chapter 25. At first, he defines the denominator of a fraction as its quotient; later on in the chapter, Zarlino assigns the modern dictionary definition to “denominator” as the part of a fraction below the line (as we write fractions today), and notes that the denominator of a fraction whose numerator is 1 indicates the number of parts into which the unit is divided. The reader must ascertain what Zarlino means by *Denominatore* and *aliquota parte* from the context each time. “Denominators,” whether they are quotients or denominators in the modern sense, can be either whole numbers, in which case they are called “simple” numbers (*semplici*); or compound numbers, i.e. whole numbers plus a fraction, in which case they are called “compound”

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<sup>210</sup> *Dovemo auertire, che Denominatore (come vuole Euclide) si chiama quel numero, secondo'l quale si piglia la parte nel suo tutto; & è propriamente detto da alcuni Parte aliquota; & da altri Quotiente: percioche denota quante volte il maggior termine della proportione contenga il minore: & è quello, che è prodotto dalla diuisione del maggior termine, fatta per il minore di qualunque proposta proportione di qual si voglia genere...* (We must inform that “denominator” (as Euclid suggests) is that number [of a proportion] according to which the part is taken in relation to its whole; and it is properly called “aliquot part” by some, and “quotient” by others,<sup>210</sup> because it indicates how many times the greater term of the proportion contains the smaller [term], and is the result of the division of the greater term by the smaller [term] of any possible proportion of any kind... *Ist.* (1558), 34.

<sup>211</sup> *...qualunque cosa, che è più lontana dalla sua origine, è men pura, & men semplice; & dal senso è men compresa, & meno intesa dall'intelletto; si come auiene il contrario quando è più vicina; che allora non solamente la comprende il senso; ma ancora l'intelletto l'apprende.* (...anything that is further from its origin is less pure and less simple, and less comprehensible to the senses, and less understood by the intellect, just as the contrary occurs when it is closer [to its origin]; in that case it is not only comprehended by the senses but also by the intellect.) *Ist.* (1558), 33.

(*composti*). In this and the next five chapters Zarlino explains how the name of each category of proportion (listed in Table 10) is derived from Latin. Diagrams illustrating the various proportions are provided in Chapters 26 through 29.

Chapter 30, *Della natura & proprietà de i nominati Generi* (On the Nature and Properties of the Aforementioned Categories), considers proportions of “greater” vs. “lesser inequality”—what we call improper vs. proper fractions—as they relate to the number 1. Zarlino calls proportions of greater inequality “real and positive” (*Reali & Positiue*), later bestowing them with the attribute of “possession” (*Habito*; see page \_\_\_\_, footnote H). In contrast, proportions of lesser inequality are called “fractional” (*Rationali*) and “negative” (*Priuate*).

Since the operation of dividing a proportion by itself is multiplying the proportion by its inverse, e.g.  $2:1 \div 2:1 = 2:1 \times 1:2$ , the result of such division is 1 (*Equalità*). Zarlino’s diagram at the end of this chapter illustrates that this procedure holds true for any pair of proportion/inverse.

## CHAPTERS 31 THROUGH 40: MATHEMATICAL OPERATIONS AMONG PROPORTIONS

Chapters 31 through 37 present examples and diagrams of mathematical operations that may be performed among proportions: multiplication, addition, subtraction, and division. Chapter 35, *Del partire, o Diuidere le proportioni; & quella che sia Proportionalità* (On the Partition or Division of Proportions and What Proportionality Might Be) includes definitions of the three types of means—arithmetic, geometric, and harmonic—that may be calculated between two proportions. The

calculation of the geometric mean may result in an irrational number, a square root. Chapters 36, 37, and 39 discuss the arithmetic, geometric, and harmonic division of proportions, which Zarlino calls “proportionality.” Figure 35.1, page 431, compares the proportions that result from each kind of division. In Chapter 38, Zarlino describes and provides an example of a method of extracting the square root of a number by numerical means. Chapter 40, *Consideratione sopra quello che si è detto intorno alle Proportioni & Proportionalità* (A Consideration of What Has Been Said about Proportions and Proportionality), further studies the types of proportionalities previously discussed. Zarlino writes that there are two ways of looking at proportionality. The way in which one quantity contains or is contained in another quantity results in the arithmetic proportionality, while the way in which one quantity is measured by another results in the geometric proportionality. Other proportionalities, like the harmonic, are based on the previous two types. The numbers that are used in music are taken from both arithmetic (the discrete quantity) and geometry (the continuous quantity). Musicians consider not only the form—i.e., numbers and proportions—but also the material—i.e., the voices and sound—of consonances. Whereas arithmetic proportionality is concerned with pure numbers, geometric proportionality is concerned with sonorous quantities. All perfect consonances are naturally found in the harmonic division of the Senario.<sup>212</sup> Appendix 6 compares arithmetic, geometric, and harmonic proportionalities.

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<sup>212</sup> *le consonanze chiamate da i pratici Perfette, si trouino naturalmente in esso collocate in harmonica diuisione ... di esso Senario... Ist.* (1558), 53-54.

## CHAPTER 41: HOW MUSIC EXEMPLIFIES ARISTOTELIAN TYPES OF CAUSE

Chapter 41, *Che il Numero non è cagione propinqua & intrinseca delle Proportioni Musicali, ne meno delle Consonanze* (How Number Is Neither an Immediate and Intrinsic Cause of Musical Proportion, nor Even of Consonances [but a Universal Cause]), is an essay on how musical consonance exemplifies the four types of cause defined by Aristotle in *Physics*. These are: material cause, or matter; formal cause, the form or archetype; efficient cause, the agent; and final cause, the goal or result.<sup>213</sup> Zarlino writes that in music, the material cause is the sound, or strings; the formal cause is proportion; the efficient cause is the musician; and the final cause is harmonious playing.<sup>214</sup> The material and the formal cause are extrinsic —do not partake of the nature and essence of a thing--whereas the efficient and the final cause are intrinsic, or essential. Zarlino also distinguishes between primary and remote, or universal causes on the one hand, and secondary and proximate, or particular causes on the other.<sup>215</sup> As one example, he states that the universal cause of health is the Creator, while the particular cause is the physician. In music, the universal and remote cause of the diapason is number, while the particular and proximate cause is the duple proportion. Particular proportion, thus, is the

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<sup>213</sup> See “Physica,” tr. R.P. Hardie and R.K. Gaye in *The Basic Works of Aristotle*, ed. Richard McKeon (New York: Modern Library, 2001), 240-241 (*Physics*, Book 2, Chapter 1, 194<sup>b</sup> line 23 – 195<sup>a</sup> line 2).

<sup>214</sup> *...il propio fine del Musico (come vogliono i Filosofi) ... il cantare con modulatione, oueramente il sonare ogni istrumento con harmonia, secondo i precetti dati nella Musica* (the true goal of the musician, as the philosophers...believe, is to sing with modulation, or to play any instrument harmoniously, according to the precepts given in music), *Ist.* (1558), 54.

<sup>215</sup> *...si può intendere secondo l'ordine compreso dalla ragione...imperoche naturalmente l'Vniuersale è primo, & dipoi il Particolare.* (...it may be interpreted as the order understood by reason...where naturally the universal comes first, and the particular follows.) *Ibid.*

proximate cause of consonance, while number is the universal cause.<sup>216</sup> Table 12

illustrates Zarlino's examples of the Aristotelian types of cause.

Type of Cause	Aristotle's Definition	Zarlino's Example
intrinsic <ul style="list-style-type: none"> <li>formal</li> <li>material</li> </ul>	archetype; form of "what is to be"	numbers and proportions
intrinsic <ul style="list-style-type: none"> <li>material</li> </ul>	matter; potential bearer of form	strings
extrinsic <ul style="list-style-type: none"> <li>efficient</li> <li>final</li> </ul>	agent of change	player
extrinsic <ul style="list-style-type: none"> <li>final</li> </ul>	goal	consonance

Hierarchy of Cause	Zarlino's Examples
primary; universal; remote	of generation, the sun of health, the Creator
second; particular; proximate	of generation, the animal of health, the physician

Table 12. Examples of Types of Cause.

Paraphrasing Aristotle, Zarlino asserts that consonance is proportion.<sup>217</sup>

## CHAPTERS 42 THROUGH 44: FURTHER MATHEMATICAL OPERATIONS;

### CONCLUSION OF PART ONE

In these chapters, Zarlino presents a procedure for reducing a proportion to its lowest terms, the root (*Radice*) of a proportion (Chapter 42); the calculation of the root of

<sup>216</sup> *La proportione adunque è la causa formale, intrinseca & propinqua delle consonanze, & il Numero è la causa vniuersale, estrinseca & remota; & è come il modello della Proportione, per la quale si hanno da regolare & proportionare li corpi sonori, accioche rendino formalmente le consonanze.* (Proportion, then, is the formal cause, intrinsic and proximate to consonances, and number is the universal [cause], extrinsic and remote, and is like the model of proportion, to which sonorous bodies have to be regulated and proportioned so that they may formally render consonances.) *Ist.* (1558), 55.

<sup>217</sup> *Et questo acennò il Filosofo, mentre dichiarando quel che fusse la Consonanza disse, Che ella è ragione de numeri nell'acuto, & nel graue; intendendo della ragione, secondo la quale si vengono a regolare i detti corpi sonori.* (And the Philosopher hinted at this when, declaring what consonance was, he said that it is the ratio of high and low numbers, meaning the rationale according to which such sonorous bodies come to be regulated.) *Ibid.*

the product of several proportions (Chapter 43); and the proof of a mathematical operation through its reversal: for example, the proof of multiplication is division (Chapter 44).

Finally, having reached the conclusion of Part 1 of *Le istituzioni*, Zarlino states that he has presented all the principles of music that are necessary to attain proper knowledge and achieve perfection so that the reader may “amass worthy praise and honorable fruit of his labors.”<sup>218</sup> In fact, based upon an impressive array of authorities, he has given a history of music’s origins, justifications for the study and practice of music, descriptions of how music may be found in the cosmos and in man, and an intensive course in the mathematics of proportions as understood in his day.

Zarlino’s survey of speculative aspects of music is by no means complete in this part of his treatise. For example, he does not define some musical terms, like *melodia* and *harmonia*, reserving these for Chapter 12 of Part 2, which includes definitions of consonance and dissonance based on auditory evidence. The mathematical procedures in Part 1 are applied in Part 2 to operations on consonances and ultimately to that division of the monochord which best supports his ideal tuning system, the syntonic diatonic.

Although Zarlino possessed scientific apparatus, such as astrolabes and clepsydras, he did not present empirical proof of his statements in Part 1. His lack of rigor in accepting the legend of Pythagoras and the hammers as it was handed down

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<sup>218</sup> *Hora parmi, che tutto ciò ch’io hò detto di sopra sia a sufficienza, per mostrar li principij della Musica, i quali se noi non saperemo, non potremo hauer mai buona cognitione delle cose seguenti, ne mai peruenire ad vn perfetto fine; La onde ogn’vno, che desidera di fare acquisto di questa scienza, debbe con ogni suo potere sforzarsi di possederli perfettamente; accioche possa acquistar degna laude, & honoreuole frutto delle sue fatiche.* (Now it seems to me that everything I have said above would be sufficient to demonstrate the principles of music, which, if we were not to know them, we would be able to possess neither good knowledge of the following things, nor ever attain a perfect goal. Therefore, everyone who wishes to acquire this science must strive with all his might to possess [these principles] perfectly, so that he may amass worthy praise and honorable fruit of his labors.) *Ist.* (1558), 57.

perhaps contributed to Zarlino's estrangement from his pupil, Vincenzo Galilei, who did take the initiative to perform the experiment that disproved the legend.

Part 1 stands as a transmission of antique theories of the origin and utility of music and its place in the cosmos as Zarlino saw it. Ultimately, his discussions of number serve as justification for the tuning system he embraces in Part 2. This in turn is the theoretical underpinning for his treatment of counterpoint and mode in the remainder of his treatise, Parts 3 and 4 respectively.

Section II: Translation of *Le istituzioni harmoniche*, Part 1

Priiilegio della Illustrissima Signoria di  
Venetia /

1557 Die 16 Octobris in Rogatis.

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CHE sia concesso a Maestro Padre  
Gioseffo Zarlino da Chioza [*sic*], che niuno  
altro, che egli, ò chi hauerà causa da lui,  
non possa stampare in questa nostra città,  
ne in alcun luogo della nostra Signoria, ne  
altroue stampata in quella vendere l' opera  
titolata Istitutioni harmoniche, latina, ne  
volgare, da lui composta, per lo spacio di  
anni dieci prossimi, sotto tutte le pene  
contenute nella sua supplicatione: essendo  
vbligato di osseruare tutto quello, ch' è  
disposto in materia di Stampe.

Iosephus Tramezinus /

<Ducale Notario>

Privilege of the very illustrious Signoria  
of Venice /

Ordinance of October 16, 1557

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Let it be granted to Maestro Father  
Gioseffo Zarlino of Chioggia, that none  
other than he, or one he has appointed, be  
permitted to publish in this, our city, or  
anywhere in our *Signoria*, or to sell  
elsewhere the work written and published  
here entitled *Istitutioni harmoniche*,  
either in Latin or in the vernacular, for  
the period of the next ten years, subject  
to all the penalties enforceable under his  
application, [all parties] being obliged to  
observe all that is stipulated for published  
material.

Josephus Tramezinus /

<notary of the Doge>

ALLO ILLVSTRISSIMO / ET  
 REVERENDISS. SIGNORE, IL SIG.<sup>OR</sup> /  
 VINCENZO DIEDO / PATRIARCA DI  
 VENEZIA

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Sono stati gli Antichi Sapianti di commun  
 parere, che Tutte le cose; per il desiderio,  
 che hanno di ariurare al loro principio; siano  
 naturalmente inchinate alla propia  
 operatione, & a conseguir la perfettione  
 loro. La onde essendo la Scienza la  
 perfettione dell'Intelletto; & l'Intendere, &  
 il Sapere la propia operatione dell'Huomo;  
 mediante la quale viene a congiungersi al  
 suo Principio: de qui nasce, che ogn'uno  
 naturalmente è tirato alla cognitione delle  
 cose: ne mai si stanca, ne satia, di andare  
 inuestigando le loro cagioni; & di volere  
 intendere gli alti secreti della Natura.

TO HIS MOST ILLUSTRIOUS /  
 AND REVEREND LORDSHIP,  
 SIGNORE / VINCENZO DIEDO /  
 PATRIARCH OF VENICE

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It was the common opinion of the ancient  
 sages that all things, because they desire  
 to return to their origin, possess a natural  
 bent toward their own function, and  
 toward attaining their perfection.  
 Therefore, science being the perfection of  
 the intellect, and understanding and  
 knowledge the characteristic functions of  
 man, by means of which he returns to his  
 source, it follows that everyone is  
 naturally drawn to the understanding of  
 things; neither is one ever tired or  
 satiated of investigating their causes, and  
 of wishing to understand the lofty secrets  
 of nature.

Ne penso, che a questo lo spinga la speranza dell'acquistar la cognitione di molte solamente: ma etiandio di una sola cosa: percioche per conoscerla comprende, che va caminando verso la perfettione; & giudica, che in ciò auanzando tutti gli altri, sia cosa degna di molta lode, & honoreuole. Però stimmo io, che amando gli Huomini di tenere il primo luogo in alcuna faculta [*sic*]; di giorno in giorno, hora aggiungendo vna cosa, & hora vn'altra; per si fatto modo le Scienze, & le Arti siano cresciute; che non è possibile quasi vedere, da qual parte si possa aggiunger loro alcuna cosa di nuouo. Et benche si potrebbe dire, che ciascuna di esse habbia hauuto questa felicità; forse per il guadagno, che gli huomini ne ritranno; tuttavia fin qui mi par di vedere; s'io non m'inganno; che la Musica sia stata poco auenturata:

Nor do I think that [man] is impelled merely by the hope of acquiring knowledge of many things, but of one sole thing, because by knowing it he understands that he is journeying toward perfection and he deems that surpassing all others in it is a praiseworthy and honorable thing. However, I believe that since men desire to hold first place in some faculty, from day to day, now adding one thing, and now another, by this means the sciences and the arts have grown so much that it is almost impossible to see where anything new may be added. And although it could be said that each of these [subjects] may have had this good fortune, perhaps because of the advantage that men have derived from it; nevertheless, it seems to me, if I do not deceive myself, that music has advanced but little.

percioche quantunque si ritrouino molti autori, che hanno scritto molte cose della Scienza, & dell'Arte; nondimeno l'Huomo leggendole, non ne può acquistar quella cognitione, che egli desidera; perche veramente non hanno tocco a sufficienza, ne mostrato cosa alcuna di quelle, che sono di grande importanza. La onde io, che fino da i teneri anni hò sempre hauuto naturale inclinatione alla Musica; hauendo gia vna buona parte della mia età intorno la cognitione di lei consumato; auedutomi di cotal cosa; volsi prouare, s'io poteua in qualche maniera, le cose, che appartengono alla Theorica, & alla Prattica, ritirar verso la loro perfettione; per far cosa grata a tutti coloro, che di tal facultà si diletano.

Therefore, although one may find many authors who have written many things about the science and art [of music], still one cannot acquire the desired knowledge by reading them, because in truth none of them has sufficiently touched upon or demonstrated anything about some matters of great importance. Therefore I, who from a tender age have always had natural inclinations toward music, having already spent a good part of my life achieving knowledge in this field, having become aware of that fact [that Music has advanced little], I have wished to try, if possible, to perfect matters concerning theory and practice, so as to gratify all those who delight in such disciplines.

Et auenga che io conoscessi, che questo era a me troppo graue carico; tuttauia pensai, che se bene non era per ridurle al loro vltimo grado di perfettione; almeno hauerei forse potuto auiar la cosa di maniera, che sarei stato cagione di dar animo ad alcuno spirito nobile, di passare anco più oltra. Il perche hauendomi proposto cotal fine; & hauendo questi anni passati scritto le presenti ISTITVTIONI, le quali insegnano le cose appartenenti all'vna, & all'altra delle nominate parti; stimolato da gli amici miei, che giudicarono potere essere vtili alli Studiosi; mi è paruto di douerle mandare in luce; dedicandole alla Illustriss. & Reuerendiss. S.V. [*sic*]. Et a ciò fare mi sono mosso primieramente; per mostrare in qualche parte, quanto io resti obligato alle amoreuolezze mostratemi da lei:

And although I recognized that this was a very great burden for me, nevertheless I thought that even if they could not be brought to their ultimate degree of perfection, at least I would perhaps have made it possible for someone else's noble spirit to have the courage to pursue them still further. For this reason, having proposed such a goal, and having spent these past years writing the present *STITUTIONI*, which teaches things pertaining to both aforementioned parts [theory and practice], encouraged by my friends, who believed them to be useful to scholars, it seemed to be necessary to bring [*Le istitutioni*] to light, dedicating it to Your Most Illustrious and Reverend Lordship. And for that reason I was moved primarily to show in some measure how much I remain obligated to the kindness you have shown me.

Dapoi; perche se perauentura fusse alcuno di animo tanto maligno; che non hauendo rispetto, ch'io lo faccia con proponimento di giouare altrui; si mouesse a biasimar queste mie fatiche; almeno fusse astretto ad hauer riguardo all'Illustriss. nome di quel Signore, al quale sono state dedicate. Si aggiunge oltra di ciò; che hauendo la singolar prudenza, la giustitia, la religione & la benignità; cose in lei da tutti conosciute, & lodate; parturito in me vna incredibile riueranza, & diuotione; io non haueua altra via, ne modo da poter la dimostrare. Ne si può veramente hauer dubbio delle singolari virtù di V.S. Illustriss. & Reuerendiss.; poi che ne è stato fatto chiara testimonianza da questo sapientissimo Senato; il quale, per molte esperienze, hauendo conosciuto, quanto ella era prudente ne i gouerni della Republica; si nella città, come di fuori, ne i reggimenti<sup>1</sup> di Verona, & di Udine;

And if by chance someone of ill will, disrespectful of my intention to help others, were moved to condemn this work of mine, at least he might be dissuaded by having seen the most illustrious name of that Lord to whom it is dedicated. I must add, furthermore, that your singular prudence, judiciousness, faith, and grace, virtues of yours that are known to and praised by all, have created in me [such] incredible reverence and devotion [that] I have had no other way nor means to be able to express them. One is truly unable to doubt the singular virtues of Your Most Illustrious and Reverend Lordship, now that our most wise Senate has made clear testimony of them, having learned through many experiences how prudent you were in governing the Republic not only inside the city, but also in its provinces of Verona and Udine.

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<sup>1</sup> 1573, added: *di Bergamo* (of Bergamo),

ultimamente ritrouandosi in Padoua di  
 magistrato, essendo seguita la morte del  
 Reuerendiss. Contarino; giudicandola  
 degna di tanto honore, la elesse Patriarca di  
 Venetia. Et quantunque gli honori  
 conseguiti, il più delle volte sogliono  
 mutare gli animi, & li costumi de gli  
 huomini; tuttaua se bene ella è peruenuta a  
 si honorato grado, non è però mutato, o  
 sciemato in lei punto della bontà  
 dell'animo suo; anzi di gran lunga è  
 accresciuto; come si può chiaramente  
 vedere: che incontinente, che ella hebbe  
 conseguito cotal dignità, si riuolse  
 primieramente<sup>2</sup> ad adornare la Chiesa; &  
 dipoi, con grandissima spesa a riparare il  
 Palazzo, che gia incominciaua andare in  
 ruina.

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<sup>2</sup> 1573, added: *con le facultà proprie* (with your own resources).

Ultimately, [after] your having become a  
 magistrate in Padua, following the death  
 of the Most Reverend Contarino,<sup>A</sup> [the  
 Senate] judged you worthy of such honor  
 and elected you Patriarch of Venice.  
 And whenever honors are bestowed,  
 most of the time men's minds and habits  
 change. Yet even though you reached  
 such an honorable station the goodness of  
 your soul neither changed nor  
 diminished; on the contrary, it has even  
 increased to a great extent, as can be  
 clearly seen: so much so that, as soon as  
 you had achieved such grandeur, you  
 turned your attention in the first place to  
 adorn the Church, and then, at great cost,  
 to repair the palace, which had begun to  
 go to ruin.

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<sup>A</sup> Gasparo Contarini (1483-1542), of a patrician family, served the Venetian government in his youth before aligning himself with the Italian movement for Catholic reform. Although Contarini was never ordained, Pope Paul III appointed him a cardinal in 1535.

Ma si come di continuo ella no cessa di rinouare, & adornar la chiesa materiale; cosi di giorno in giorno (il che è segno euidentissimo di religione, & di charità) non resta di souenire, & di solleuar la spirituale; porgendo continuamente aiuto alli Poueri; non tanto a quelli della sua città, quanto anche alli forestieri; & a quelli, che, partendosi dalla infedeltà vengono al Christianesimo: Et come vigilante pastore, & diligente agricoltore, & custode della Vigna del Signore, attende a prouedere, che'l suo gregge non sia da i Lupi offeso: & che da questa Vigna siano leuati li rami non buoni; oueramente gouernati di maniera, che diuengano fruttuosi. Tutte queste cose veramente fanno chiarissima fede al Mondo delle sue rare virtù; le quali mi hanno mosso a dedicarle queste mie fatiche; quali elle si siano. Et se bene il dono è picciolo, risguardi almeno la osseruanza dell'animo mio verso lei, la quale è infinitamente grande.

Just as you never cease to renovate and adorn the material church, you never cease to elevate and sustain its spiritual counterpart (which is clearly a sign of religion and charity), continually offering aid to the poor, not merely to those of your city, but also to foreigners, and to those who, abandoning unbelief, came to Christianity. And like a vigilant shepherd, diligent farmer, and custodian of the vineyards of the Lord, [you] stand guard to ensure that His flock is not attacked by wolves, and that the bad branches are removed from His vineyard so that what remains will bear fruit. All these things truly declare your rare virtues to the world, which have moved me to dedicate my labors, such as they are, to you. And even if the gift is small, at least consider my soul's respect for you, which is infinitely great.

Di V.S. Illustr. & Reuerendiss.<sup>ma</sup> / Seruitore  
affettionatissimo / Gioseffo Zarlino.

Your Most Illustrious and  
Reverend Lordship's / most affectionate  
servant / Gioseffo Zarlino.

A I LETTORI.

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S'io vedrò Lettori miei humanissimi, che queste mie fatiche veramente vi siano care; mi sforzarò di darui, tanto più presto, quanto per me si potrà fare queste medesime Istitutioni fatte in lingua Latina, con le DIMOSTRATIONS Harmoniche in alquanti luoghi di questa Opera nominate, & qualche altra cosa appresso; alle quali non hò ancora (come se dice) posto l'ultima mano. Tra questo mezo leggete con lieto, & sincero animo quello, attorno il quale molti anni, per giuvarui, mi sono affaticato. Et se ritrouarete alcuna cosa, che cosi a pieno non vi satisfaccia; ricordateui, ch'io sono Huomo; & non penso; come soleua dire quel buon vecchio Terentiano; che cosa alcuna, che s'appartenghi all'huomo, sia da me lontana.

To the readers. [1558]

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If I should see, my very human readers, that these labors of mine are truly dear to you, I shall strive to give you, as quickly as I can, these same *Istitutioni* in Latin, with the *Dimostrations harmoniche* that I mentioned in some places in this work, together with some other work to which I have yet to give (as they say) a finishing touch. Meanwhile, with a happy and sincere spirit, read the fruit of my many years of labor dedicated to your use. And should you find something that thus does not fully satisfy you, remember that I am human; and I do not think, as good old Terence<sup>A</sup> used to say, that anything human is far from me.

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<sup>A</sup> Terence (c. 195-159 B.C.E.), a Roman dramatist, wrote six verse comedies that were long regarded as models of pure Latin.

Voglio inferire; che potrebbe essere molto bene, ch'io hauesse in qualche cosa errato: essendo che tutti siamo sottoposti a cotal legge. Et che questo sia vero, lo potrete hora conoscere; che con tutta la diligenza, che si hà vsato nel stampare; non si è potuto fare, che non siano occorsi in alquanti fogli di alcuni libri (ancora che non in tutti) alquanti errori; i quali correggerete allegramente, inanti che incominciate a leggere; Ilche facendo, darete a vedere, quanti sarete humani nel perdonar quelli, che fussero (se ne ritrouarete) di qualche importanza; & non possono esser compresi se non dall'intelletto. Il Numero primo è quello della Facciata dell'Opera; & il secondo quello della Linea.

I wish to imply that it could very well be that I have made some mistakes, since we are all subject to certain laws. And that this is true, you will now be able to ascertain, because with all the diligence that has been used in printing, we could not avoid the occurrence of some errors in some pages of a few books (although not in all), which you may gladly correct before beginning to read. By doing this, you will demonstrate your humanity in forgiving those [mistakes] (if there are any) that might be of any importance and that cannot be understood if not by the intellect. The first number is the number of the page of the work, and the second, [the number] of the line.<sup>B</sup>

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<sup>B</sup> Zarlino's list is reproduced and translated in Table 13, page 100. Locations of the errata are denoted by the chapter, page, and line in which Zarlino's words occur in this translation.

[Zarlino's Location by Page.Line]	[Corresponding Location in This Translation]
4.23. <i>Leggi, si sa</i>	Chapter 1, page 133, line 2. "Read, if one knows" (replaces <i>si fa</i> ).
6.20. <i>l'inuitano</i>	Chapter 2, page 148, line 14. (Third person plural; replaces <i>invita</i> .)
9.5. <i>in lui, &amp; che di essa</i>	Chapter 4, page 170, lines 18-19. (Changed word order from <i>in che lui, &amp; di essa</i> . This change was made in 1573.)
12.5. <i>precor</i>	Chapter 6, page 194, line 13. Precor actually appears on Zarlino's page 12, line 24 after <i>Vos o Calliope</i> ..
14. <i>poni 8. nella figura sopra la parola Terra</i>	Chapter 6, page 210, figure 6.1. "Place [the numeral] 8 in the diagram over the word, 'earth.'"
25. <i>tra i numeri 6 &amp; 4 della figura, leggi Diapente</i>	Chapter 15, page 284, figure 15.1. "Between the numerals 6 and 4 in the diagram, read "diapente" (replaces <i>Diapason</i> ).
26.7. <i>auerrebbe</i>	Chapter 15, page 287, line 10. (Replaces <i>auerebbe</i> .)
30.14. <i>li corpi sonori sono</i>	Chapter 19, page 317, lines 14-15. ( <i>Sonori</i> inserted in 1573.)
33.15. <i>seguendo in infinito</i>	Chapter 24, page 341, line 6. (No apparent difference.)
50.1. <i>dico che primieramente</i>	Chapter 38, page 454, lines 6-7. ( <i>Che</i> added.)
53.27. <i>tra questi:</i>	Chapter 40, page 480, line 5. ( <i>Tra</i> added.)

Table 13. Zarlino's List of Errata (1558).

A I LETTORI.

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Quando diedi in luce le presenti Istitutioni, Studiosi Lettori, hebbi in animo, per commodità di quelli, che non intendono la Lingua Italiana, di por le fuori anco Latine. ilperche incominciai à voler porre in effeto questo mio pensiero: & ne ridussi in essere vna buona parte. Ma auedutomi, che'l tempo ch'io spendeua in cotal cosa, con maggior guadagno poteua impiegare in qualche altra fatica, che sarebbe stato di maggior mia satisfatione, & di maggior vtile à voi altri studiosi di questa nobil Scienza; col darui in luogo di questa qualche altra cosa nuoua: essendo gia esse Istitutioni in luce: lasciando cotale impresa voltai l'animo a ridurre insieme in vn Volume Latino, non solamente le cose Speculatiue, ma etiandio le Pratiche della Musica.

To the readers. [1573]

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When I brought the present *Istitutioni* [*Harmoniche*] to light, studious readers, it was my intention, for the convenience of those who do not understand the Italian language, to publish [this work] in Latin also, which is why I began to put my thoughts into practice and did a good part of it. But, having realized that the time spent in such effort could be made with greater gain in some other labor that would have been more to my satisfaction, and of greater use to other students of this noble science by giving you some other new effort instead of this, since such *Istitutioni* already exist, leaving such enterprise aside, I turned my soul to amassing in a Latin volume not only the speculative, but also the practical [aspects] of music.

La onde fin' hora son ito tanto auanti, ch'io  
 ne hò postò insieme Dodici libri: al qual  
 (percioche arriueranno, come credo, al  
 Numero di Diciotto) se à Dio piacerà,  
 presio presto darò espeditione. Però vi fò  
 sapere, che non aspettiate da me altra cosa  
 Latina, che il detto Volume. & tra questo  
 mezo, che verrà fuori questo mio nuouo  
 parto, vi goderete le presenti Istitutioni, da  
 me in questa vltima impressione corrette,  
 accresciute (oltra l' altre cose, che sono  
 molte) di molti belli secreti nella Pratica;  
 & quasi rinouate.

Hence, until now, I have gone so much  
 further that I put twelve books together,  
 which (since they will number eighteen  
 [volumes], as I believe) God willing, I  
 will dispatch very soon. However, I  
 want you to know that you should not  
 expect any other thing in Latin except  
 said volumes, and in the meantime,  
 before my new labor is completed, you  
 will enjoy the present *Istitutioni*. I have  
 enriched this last edition (beyond many  
 other things) with many beautiful secrets  
 of the practical [aspect of music], and  
 almost written it anew.

Ma (de gratia) volendole leggere, senza  
 hauere impedimento alcuno; prima  
 d'ogn'altra cosa (acciò la sequente Tauola  
 vi possi commodamente seruire, &  
 intendiate le cose per il verso, che vanno,  
 senza alcuno errore) pigliate vn poco di  
 fatica, di accociare li Numeri delle facciate  
 dell'Opera: & dopoi di correggere alcune  
 cose di qualche importanza; le quali  
 immediatamente seguiteranno: che sono  
 incorse nel stampare: percioche delle altre,  
 che sono di poco momento, lascio la cura al  
 vostro sano giudicio. Iddio S. nostro vi dia  
 felicità.

But if you wish to do me the honor of  
 wanting to read them without any  
 impediment, before any other thing, so  
 that the table that follows could be of  
 great use to you, allowing you to  
 understand things from the proper  
 perspective (without committing any  
 error), please take a moment to number  
 the pages of this work and then correct a  
 few things of some importance that were  
 incurred during the printing process,  
 which will immediately follow. I leave  
 the other [mistakes], which are of little  
 moment, to your care and wise judgment.  
 May our holy Lord grant you happiness.

[1] LA PRIMA PARTE / Delle istituzioni  
 armoniche / DI M. GIOSEFFO ZARLINO / DA  
 CHIOGGIA. / Proemio.<sup>1</sup>

The First Part / of the *Istitutioni*  
*Harmoniche* / of Messer Gioseffo  
 Zarlino / of Chioggia / Prologue.

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Molte fiate meco pensando, &  
 riuolgendomi per la mente varie cose, che il  
 sommo Iddio ha per sua benignità donato a  
 mortali; ho compreso chiaramente, che tra  
 le più marauigliose è l'hauer conceduto  
 loro particular gratia di vsar la voce  
 articolata; col mezzo della qual sola fusse  
 l'huomo sopra gli altri animali atto a poter  
 mandar fuori tutti pensieri, che hauesse  
 dentro nell'animo conceputo.

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Many times, thinking to myself and  
 reflecting upon the many things that the  
 supreme God through His benevolence  
 has given to mortals, I have clearly  
 understood that among the most  
 marvelous is His having granted them  
 the unique grace of the use of the  
 spoken voice. By that means alone was  
 man [placed] above the other animals  
 [and made] fit to be able to bring forth  
 all the thoughts that he had conceived  
 within his soul.

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<sup>1</sup> 1573 reads, *PROEMIO / DELLE  
 ISTITVTIONI / HARMONICHE / DEL REV.  
 MESSERE / GIOSEFFO ZARLINO / DA CHIOGGIA.*  
*/ Nelquale si dimostra, in qual maniera la Musica  
 da principio sia stata accresciuta: & si ragiona  
 della diuisione dell'Opera.* (Prologue to the  
 Istitutioni harmoniche of the Reverend Father  
 Gioseffo Zarlino of Chioggia, In which is shown the  
 manner in which music has grown from its  
 beginnings, and the division of the work is  
 explained).

Et non è dubbio, che per essa apertamente si manifesta quanto egli sia dissimile dalla bestie, & di quanto sia loro superiore. Et credo, che si possa dir veramente cotal dono essere stato di grandissima vtilità all'humana generatione: percioche niuna altra cosa, se non il parlare indusse & tirò gli huomini, i quali da principio erano sparsi nelle selue & ne monti, viuendo quasi vita da fiere, a ridursi ad habitare & viuere in compagnia, secondo che alla natura dell'huomo è richiesto, & a fabricar città & castella; & vniti per virtù de buoni ordini conseruasi; & contrattando l'vn con l'altro, porgersi aiuto in ogni lor bisogno. Essendosi per questa via a vicinanza ragunati & congiunti, fu dipoi conosciuto di giorno in giorno per proua, quanta fusse la forza del parlare, ancora che rozzo.

And there is no doubt that through this [ability] he openly manifests how much he differs from and is superior to the beasts. And I believe that it is truly possible to say [that] such a gift has been of the greatest utility to human beings, because nothing if not speech induced and encouraged men, who from the beginning were living almost like wild animals scattered in the forests and the mountains, to adapt themselves to settle and live together, as is required of human nature, to build cities and castles, and [to keep themselves united] by virtue of good rules; and negotiating with each other, to offer each other help for every need. [Mankind] being in this way closely joined and gathered, the power of speech, no matter how rough, was then realized day by day.

Onde alcuni di eleuato ingegno nel parlare cominciorno [*sic*] a mettere in vso alcune maniere ornate & diletteuoli, con belle & illustri sentenze; sforzandosi di auanzar gli altri huomini in quello, che gli huomini<sup>2</sup> restano superiori a gli altri animali. Ne di ciò rimanendo satisfati tentarono di passare ancora più oltra, cercando tutta via di alzarsi a più alto grado di perfettione. Et hauendo per questo effetto aggiunto al parlare l'Harmonia, cominciarono da quella ad inuestigar varij Rithmi et diuersi Metri, li quali con l'harmonia accompagnati porgono grandissimo diletto all'anima nostra. Ritrouata adunque (oltre le altre, che sono molte) vna maniera di compositione, che Hinni chiamauano,

Hence, some [people] of high intelligence began to use some ornate and delightful mannerisms in [their] speech, with beautiful and picturesque sentences, striving to surpass others in this [faculty] that keeps human beings superior to the other animals. Not remaining satisfied with this, they tried to achieve still more, seeking in every way to elevate themselves to a higher degree of perfection. And having by this means added harmony to speech, they began to investigate various rhythms and meters, which, [when] accompanied by harmony, offer immense delight to our souls. Thereafter, having discovered (besides many others things) a type of composition which they called hymns,

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<sup>2</sup> 1573, *gli huomini* reads *gli huomini istessi ...* (human beings themselves).

ritrouorno [*sic*] ancora il Poema Heroico, Tragico, Comico, & Dithirambico: & col numero, col parlare, & con l'harmonia poteuano con quelli cantar le laudi & render Gloria alli Dei:<sup>3</sup> & con questi, secondo che lor piaceua, più facilmente & con maggior forza ritener gli animi sfrenati, & con maggior diletatione muouere i voleri & appetiti de gli huomini, riducendogli a tranquilla & costumata vita. Il che hauendo felicemente conseguito, acquistorno appresso i popoli tale autorità, che furno da molto più tenuti & honorati, che non erano gli altri. Et costoro, che arriuorno a tanto sapere, senza differenza alcuna vennero nominati Musici, Poeti, & Sapienti. Ma intendendosi allora per la Musica vna somma & singlar dottrina, furno [*sic*] i Musici tenuti in gran pregio, & era portata loro vna riuerenza inestimabile.

they also discovered the heroic, tragic, comic, and dithyrambic [types of] poetry, and with rhythm, speech, and harmony were able to sing praises and render glory to the gods. And with these, according to their pleasure, they could more easily and with greater strength control unbridled souls, and with greater pleasure move the cravings and appetites of humans, returning them to a tranquil and civilized life. Having felicitously attained this [condition], they gained such authority in the eyes of the people that they were held in higher esteem than were others. And those people, who came to know so much, were called musicians, poets, and wise men, without any distinction. Since music was seen as an elevated and singular doctrine, musicians were held in high regard, and an inestimable reverence was reserved for them.

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<sup>3</sup> 1573, *alli Dei* reads *a Dio* (to God).

Benche o sia stato per la malignità de tempi, o per la negligenza de gli huomini, che habbiano fatto poca stima non solamente della Musica, ma de gli altri studi ancora; da quella soma altezza, nella quale era collocata, è caduta in infima bassezza; & doue le era fatto incredibile honore, e stata poi riputata si vile & abietta, & si poco stimata, che appena da gli huomini dotti, per quel che ella è,<sup>4</sup> viene ad esser riconosciuta. Et ciò mi par che sia auenuto, per non le esser rimasto ne parte, ne vestigio alcuno di quella veneranda grauità, che anticamente ella era solita di hauere. Onde ciascuno si ha fatto lecito di lacerarla, & con molti indegni modi trattarla pessimamente.

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<sup>4</sup> 1573, *che ella è, viene ad esser* reads *che ella è veramente viene ad esser* (for what it truly is).

However, whether because of the malignancy of the times, or the negligence of men who had placed little value not only on music, but also on other studies, [music] fell from the height to which it had once been assigned to an extreme baseness, and what was once given incredible honor was subsequently reputed [to be] so vile and low, and so little esteemed, that learned men could barely come to recognize it for what it is. And that seems to me to have been caused by its having retained neither part nor vestige of any of that venerable weight which it used to possess in ancient times. Therefore, everyone was allowed to tear it apart, and in many disgraceful ways treat it most poorly.

Nondimeno l'ottimo Iddio, a cui è grato,  
 che la sua infinita potenza, sapienza, &  
 bontà sia magnificata & manifestata da gli  
 huomini con hinni accompagnati da  
 gratiosi & dolci accenti, non li parendo di  
 comportar più, che sia tenuta a vile  
 quell'arte, che serue al culto suo; & che  
 qua giù ne fa cenno di quanta soavità  
 possano essere i canti de gli Angioli, i quali  
 nel cielo stanno a lodare la sua maestà; ne  
 hà conceduto a [2] gratia di far nascere a  
 nostri tempi Adriano Vvillaert, veramente  
 vno di più rari intelletti, che habbia la  
 Musica prattica giamai essercitato:<sup>5</sup> il quale  
 a guisa di nuouo Pithagora essaminando  
 minutamente quello, che in essa puote  
 occorrere, & ritrouandoui infiniti errori,

Nevertheless, the supreme Lord, who  
 appreciates that His infinite power,  
 wisdom, and goodness are glorified and  
 manifested by men through hymns  
 accompanied with graceful and sweet  
 accents, no longer seeming to accept the  
 vilification of an art used for His  
 worship, an art that down here [on earth]  
 hints at the sweetness of the songs of the  
 angels whose role in Heaven is to praise  
 His majesty, has blessed us with the  
 birth in our time of Adriano Willaert,  
 truly one of the most rare intellects that  
 has ever practiced the art of music, who,  
 in the guise of a new Pythagoras,  
 minutely examining its workings and  
 discovering infinite errors,

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<sup>5</sup> 1573, *rari intelletti, che habbia la Musica prattica  
 giamai essercitato* reads *uno di più rari che habbia  
 essercitato la prattica della Musica* (one of the  
 rarest [intellects] who excelled in the practice of  
 music).

ha cominciato a leuargli, & a ridurla verso quell'honore & dignità, che già ella era,<sup>6</sup> & che ragioneuolmente doueria essere;<sup>7</sup> & hà mostrato vn'ordine ragioneuole di componere con elegante maniera ogni musical [*sic*] cantilena, & nelle sue compositioni egli ne hà dato chiarissimo essemplio [*sic*]. Hora perche hò inteso, che vi sono di molti, de quali parte per curiosità, & parte veramente per volere imparare desiderano, che alcuno si muoua a mostrar<sup>8</sup> la via del componer musicalmente con ordine bello, dotto & elegante; io hò preso fatica di scriuer le presenti ISTITVTIONI, raccogliendo diuerse cose da i buoni antichi, & ritrouandone ancora io di nuouo,<sup>9</sup>

has begun to correct them and to return it to the honor and dignity that it once possessed and that it rightfully should; and he has shown a rational method of composing every type of song in an elegant manner, and in his compositions has given the clearest proof of it. Now because I have understood that there are some who, partly out of curiosity and partly out of the desire to learn, wish that someone would show how to compose music in a beautiful, learned, and elegant fashion, I have taken on the burden of writing the present *ISTITUTIONI*, gathering various things from the old masters and also discovering something new,

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<sup>6</sup> 1573, *era* reads *ritenuto* (retained).

<sup>7</sup> 1573, *essere* reads *ritenere* (to retain).

<sup>8</sup> 1573, *mostrar la via* reads *mostrar loro la via* (show them how).

<sup>9</sup> 1573, *ancora io di nuouo* reads *ancora io molte di nuouo* (much that is new).

per far proua, se io potessi per auentura  
 esser atto a soddisfare in qualche parte a  
 cotal desiderio, & all'obligo, che hà  
 l'huomo di giouare a gli altri huomini. Ma  
 vedendo, che si come a chi vuol esser buon  
 pittore, & nella pittura acquistarsi gran  
 fama, non è a bastanza l'adoprar  
 vagamente i colori; se dell'opera, che egli  
 hà fatta, non sa render salda ragione; cosi a  
 colui, che desidera hauer nome di vero  
 Musico, non è bastate, & non apporta  
 molta laude l'hauer vnite le consonanze,  
 quando egli non sappia dar conto di tale  
 vnione; però mi son posto a trattare  
 insiememente di quelle cose, lequali, & alla  
 pratica, & alla speculatiua di questa  
 scienza appartengono, a fin che coloro, che  
 ameranno di essere nel numero di buoni  
 Musici, possano leggendo accuratamente  
 l'opera nostra render ragione de i loro

in order to attempt to satisfy perhaps in  
 some measure that desire and obligation  
 that mankind has to do good unto others.  
 But just as someone who wants to be a  
 good painter, and with his painting  
 acquire great fame for himself, cannot  
 simply make pleasing use of colors, if in  
 the work that he has done he does not  
 know how to use valid reasoning, so too  
 for whoever desires to be called a true  
 musician, it is not enough nor does it  
 bring much praise to have joined some  
 consonances when he does not know how  
 to explain their union. Therefore, I have  
 determined to treat such matters together  
 that pertain to the practical and the  
 speculative [aspects] of this science, so  
 that those who wish to be included in the  
 company of good musicians may, upon  
 accurately reading this work, give  
 account of their compositions.

Et benchè io sappia, che il trattare di questa materia habbia in se molte difficoltà; nondimeno hò buona speranza, che ragionandone con quella breuità, che mi sarà possibile, la mostrerò chiara & facilissima, aprendo tai secreti di essa, che ogn'uno per auentura in gran parte ne potrà rimaner satisfatto. Ma a fin che si habbia facile intelligenza di questo nostro trattato,<sup>10</sup> mi è paruto, che sia ben fatto diuiderlo in più parti, & di tal maniera, che si mostrino le cose, che si hanno da presupporre, prima che si venga ad insegnar la detta scienza.

And although I know that the treatment of this material is very difficult, nevertheless I have high hopes that discussing it in as brief a manner as possible, I will make it clear and very easy, disclosing its secrets, so that anyone who ventures [to study it] will be able in large part to derive satisfaction from it. But in order for our treatise to be easily understood, it appears to me that I would do well to divide it into several parts, in such a manner that may demonstrate the things that need to be known before one begins to teach this science.

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<sup>10</sup> 1573, after *nostro trattato*, the phrase *si proceda con buono & regolato ordine* (proceeds in good and logical order) is inserted.

Et perche al constituer l'ordine de suoni, che nella Musica si contengono, fanno dibisogno gli harmonici interualli, & quanto alla inuentione, & quanto al sito; per le differenze, che accadono tra li ritrouati suoni; però io primieramente ragionerò de i loro principij: conciosia che allora diciamo di veramente conoscer le cose, quando li principij di esse conosciamo. Diuidendo adunque l'opera in Quattro parti, nella prima si ragionerà delli Numeri, delle Proportioni, & delle loro operationi, non lasciando cosa alcuna, quantunque minima, che al Musico s'appartenga.

In addition, because, in order to categorize the sorts of sounds that music contains, one needs [to know] which harmonic intervals have been determined and which exist [in nature] because of the innate differences among the resulting sounds,<sup>A</sup> I will first discuss their principles, inasmuch as then we can speak about truly knowing things when we know the principles of their essence. Therefore, dividing the work into four parts, the first [part] will discuss numbers, their proportions, and their operations, not omitting anything, however minimal, that pertains to the musician.

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<sup>A</sup> According to Zarlino, "intervals that exist in nature" are those governed by the ratios found in the Senario. "Determined intervals" are those that do not arise from permutations of the Senario.

Nella seconda parleremo de i Suoni, mostrando in che modo tutti i loro interualli necessarij all'harmonia ciascuno da per se se accomodi alla sua proportione, & la diuisione del Monochordo in ciascuna specie di harmonia in tutti i generi. Dipoi hauendo mostrati li veri interualli, che si possono adoperare ne i musicali concetti, mostreremo in qual modo ne gli artificiali istrumenti si vengono a commodare [*sic*]; Oltre di questo in qual modo si possa fabricare vn Istrumento, nel quale si contenga ogni genere di harmonia. Nella terza considereremo come, & con quanto bell'ordine le consonanze & dissonanze debbiano esser collocate nelle compositioni de due, & come si adattino in quelle di più voci.

In the second [part] we will speak of sounds, demonstrating how all of the intervals necessary for *Harmonia* accommodate to their proportions, and the division of the monochord in each type of *Harmonia*<sup>B</sup> in all the genera. After having shown the true intervals that may be used in musical compositions, we will demonstrate how they may be accommodated in artificial instruments. Besides this, [we will show] in what way it is possible to construct an instrument in which every genus of *harmonia* is contained.. In the third [part] we will consider how, and with what beautiful order, the consonances and dissonances must be placed in compositions of two voices, and how they can be adapted in those of more voices.

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<sup>B</sup> The first occurrence of the word *Harmonia* in this sentence means “harmony” in general; the second occurrence means mode.

Nella quarta & vltima tratteremo delli  
 Modi altramente da i Musici pratici  
 chiamati Tuoni, et delle loro differenze; &  
 diremo in che modo le harmonie si  
 debbano accommodare alle parole, & le  
 parole si accommodino sotto le figure  
 cantabili.<sup>11</sup>

In the fourth and last [part] we will treat  
 the modes, otherwise called *Tuoni* by  
 practical musicians, and their  
 differences, and we will speak about the  
 way harmonies must accommodate  
 themselves to words, and [how] the  
 words might be fitted to figures of song.

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<sup>11</sup> 1573: From this point until *Si che senza dubbio*  
 (page \_\_\_ below) Zarlino uses a different rationale  
 for his structuring of *Le istituzioni*, which reads:

[P]erò hauendosi principalmente in esso a trattare  
 due cose: cioè le Consonanze, che sono cose  
 naturali, di che si fanno le Cantilene: et esse  
 Cantilene, che sono artificiali: lo diuiderò  
 primieramente in due parti: & nella prima tratterò  
 delle Consonanze; & de quelle cose, che  
 appartengono alla parte Speculatiua di questa  
 scienza: & nel la Seconda ragionerò delle Cantilene,  
 che fanno alla parte pratica: oue intrauiene  
 l'operare, che appartiene all'Arte.

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Therefore, having mainly to treat two things –  
 consonances, which are natural things from  
 which songs are made, and songs themselves,  
 which are artificial – I will divide [the treatise]  
 into two parts. In the first [part] I will treat  
 consonances, and those things that pertain to the  
 speculative part of this science; and in the  
 second [part] I will discuss songs, which belong  
 to the practical part, where the work that pertains  
 to art takes place.

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Et perche qual si voglia cosa, sia naturale, ouero artificiale, è composta di Materia & di Forma: se bene nell'una si considerano cotali Cose diuersamente da quello, che sono considerate nell'altra: però necessariamente tratterò in ciascheduna delle due parti nominate, dell'una & dell'altra: nel modo che sarà conuenevole. Onde diuiderò secondariamente ciascheduna di queste due parti in altre due; dimodo che saranno al numero di Quattro. Et innanzi ogn'altra cosa nella Prima ragionerò de i Numeri & delle Proportioni; che sono la Forma delle Consonanze: poi che nelle cose naturali la Materia (per non essere da se conoscibile) non si può conoscere se non col mezzo della Forma: & nella Seconda tratterò delli Suoni & delle Voci, che sono la loro Materia. Ma a uolere costituire gli ordini de i Suoni & delle Voci, che sono nella Musica contenuti, fanno dibisogno gli harmonici Interualli; & quanto alla inuentione, & quanto al sito; per le differenze, che accadono tra i ritrouati Suoni; però etiandio ragionerò de i loro principij: percioche allora diciamo di ueramente conoscere le cose, quando i loro principij conosciamo. (Zarlino's marginal note: *I. Phy. c. 1* [Aristotle, *Physics*, Book I, Chapter 1])

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And because any object, be it natural or artificial, is composed of Matter and Form, and such objects are considered differently from the viewpoint of Matter than they are considered from the viewpoint of Form, I will have to treat each [object] in each of the two aforementioned ways in an appropriate manner. Therefore, I will further divide each of these two parts into two more so that there will be [a total of] four [parts]. And before everything else, in the first [part] I will explain about the numbers and proportions that are the Form of consonances, since in natural things Matter (not being intrinsically knowable) cannot be known if not through Form. And in the second part I will treat sounds and voices, which are their Matter. But if one wishes to rank the orders of instrumental sounds and vocal sounds that are contained in music, it is necessary to know which harmonic intervals have been determined, and which exist in nature through the innate differences among the resulting sounds. However, I will also explain their principles, inasmuch as we say that we truly know things when we know the principles [behind them].

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Il perche hauendo prima mostrato in che maniera tutti i loro interualli necessarij all'Harmonia, ciascheduno da per se si accomodi alla sua proportione: mostrerò da poi la Diuisione del Monochordo fatta in ciascheduno Genere, di qualunque specie di Harmonia. Et hauendo insegnato li ueri interualli, che si possono adoperare ne i Musicali concetti: insegnerò etiandio in qual modo ne gli artificiali instrumenti si vengono a commodare; & di più, in qual maniera si possa fabricare vn'Instrumento, il quale contenga ogni Genere di Harmonia. e [sic] lascerò di dar notitia di tutti quelli accidenti, che possono occorrere intorno l'una & l'altra di queste due parti Oltra di ciò non essendo la prattica altro, che il ridur la Musica in atto & nel suo fine, col mezzo delle Cantilene: lequali sono cose artificiali; percioche si fanno col mezzo dell'Arte, che è detta del Contrapunto, ò di Comporre, & hanno simigliantemente la Materia & la Forma: come hanno etiandio l'altre cose: però sarà cosa ragionevole, ch'io tratti dell'una & dell'altra.

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Having first shown in what fashion all the intervals necessary to *Harmonia* are individually defined by their proportions, I will then show the division of the monochord made in each [of the] genera, in any type of *Harmonia*. And having taught the true intervals that may be used in [vocal] part-music, I will also teach the manner in which they can be accommodated to artificial instruments, and furthermore, in what way it is possible to construct an instrument that contains all the genera of harmony. (In this context, *Harmonia* takes on the more modern meaning of “music theory.”) Nor will I omit reporting all the incidental points that can occur in relation to each of these two [divisions of my treatise]. Beyond that, as practice is nothing other than the process of bringing music into being and fulfilling its goal by means of songs, which are artificial things, and because [songs] can be known by means of the art known as counterpoint or composition, and likewise possess Matter and Form, as do other things, it will be reasonable for me to deal with one and [then] the other.

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Et perche ogni Artefice, volendo comporre, o fabricare alcuna cosa, apparecchia primieramente la material di che la uuol fare; & dipoi le dà la Forma conueniente; ancora che cotal Forma sia prima d'ogn'altra cosa nella mente di esso Artefice; però nella Terza parte, che sarà la prima della Seconda principale, ragionerò delle Consonanze & de gli Interualli; che sono la Materia delle Cantilene; della quale si conpongono: & dimostrerò come & con qual'ordine debbiano esser collocate nelle Compositioni di due, & come si pongano in quelle di più uoci. Ma nella Quarta & Vltima, che sarà la Seconda della seconda nominata, tratterò delle loro Forme & delle loro differenze; & dirò in che modo l'Harmonii si debbino accommodare alle Parole, & come queste si addattino sotto le Figure cantabili.

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And because each craftsman, wishing to compose or make anything, first prepares the material he wishes to use, and then gives it appropriate form, although that Form is the first thing in the mind of this craftsman, in the third part, which will be the first [section] of the second principal [part] (Part 3) I will explain about consonances and intervals, which are the Matter of which songs are made; and I will demonstrate how and with what rules they must be placed in compositions of two [voices], and how to place them [in works] of more [than two] voices. But in the fourth and last [part], which will be the second [section] of the second aforementioned [principal part] (Part 4), I will treat their Forms and their differences; and I will tell how harmonies must be accommodated to the words, and how these may be adapted to figures of song.

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Si che senza dubbio alcuno colui, che  
hauerà bene apprese tutte queste cose potrà  
meritamente esser posto nel numero de i  
Musici perfetti & honorati.

Ma prima che entriamo a trattar quel, che  
di sopra hauemo proposto, istimo, che non  
possa essere se non di piacere & di  
satisfattione, andar raccontando alcune  
cose; come saria l'origine & certezza della  
Musica, le sue laudi, a che fine ella si  
debba imparare, l'utile che si hà di essa, in  
che modo la douemo vsare, & altre cose  
simili.

All this is so that without a doubt  
anyone who will have learned all these  
things well will merit being placed  
among the ranks of perfect and honored  
musicians. But before we begin to treat  
that which we have proposed above, I  
believe it would be pleasing and  
satisfying to dwell on certain matters,  
such as the origin and certainty of  
music, its praises, the purpose for which  
one learns it, the advantage that one  
derives from it, the ways in which it  
must be used, and other similar things.

[3] Della origine et certezza della Musica. /

Capitolo Primo

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Quantunque Iddio Ottimo Massimo per la sua infinita bontà habbia concesso all'huomo l'essere con le pietre, il crescere con gli arbori, & il sentire commune con gli altri animali; tutta via come ei volesse, che dalla eccellenza della creatura si conoscesse l'onnipotenza sua, lo dottò dell'intelletto, cosa che poco lo disaguagliò da gli Angioli. Et accioche egli sapesse il suo principio & fine esser la su, lo creò con la faccia drizzata al cielo, doue è la sedia di esso Iddio, & questo perche ei non fermasse l'amor suo nelle cose basse & terrene:

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<sup>1</sup> 1573, Zarlino's marginal note: *Psal* 8. (Psalms 8:6.)

<sup>2</sup> 1573, Zarlino's marginal note: *Isa.* 66. (*Isaiah* 66:1).

On the Origins and Certainty of Music /

Chapter 1

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Although the supreme God almighty, in His infinite goodness, granted man existence in common with stones, growth in common with trees, and sensations in common with other animals, since He wished that from the excellence of His creature His own omnipotence would be recognized, He [also] granted him intelligence, something that barely distinguished him from the angels. And so that [man] might know that his beginning and end rested on high, [God] created him with his face turned up to the sky, where the seat of the Lord is, so that he might not fix his love upon base and earthly things,

ma leuasse l'intelletto a contemplar le  
 superiori & celesti, & penetrasse alle  
 occulte & diuine col mezo delle cose che  
 sono, & si comprendono per via de i cinque  
 sentimenti. Et benche in quanto all'essere  
 due soli fussero sufficienti; nondimeno per  
 il ben essere tre di piu ve ne aggiunse:  
 imperoche se per il tatto si conoscono le  
 cose dure & aspre, dalle tenere & polite; &  
 per il gusto si fa la differenza tra i cibi  
 dolci & amari, & d'altri sapori; per questo  
 & per quello si sente la diuersità del freddo  
 & del caldo, del duro & del tenero, del  
 greue [*sic*] & del leggiero, cose che  
 veramente all'esser nostro bastarebbero:

but [instead] might lift his intellect to  
 contemplate the lofty and celestial, and  
 penetrate the occult and divine by means  
 of things that exist and are  
 comprehensible through the five senses.  
 And although two [senses] alone would  
 have been sufficient for existence,  
 nevertheless, for a good life He added  
 three more; so that, if through touch one  
 distinguishes things that are hard and  
 rough from those that are soft and  
 polished, and through taste one senses  
 the difference between sweet and bitter  
 foods and other flavors, through [touch]  
 and [taste] one senses the difference  
 between cold and hot, hard and soft,  
 heavy and light, things that would truly  
 suffice for our existence.

non resta però, ch'al bene essere il vedere, l'vdire, & l'odorare necessarij non siano; per li quali l'huomo viene a rifiutare cio che è cattiuo, & eleggere il buono. Di questi chi vorrà ben esaminare la lor virtù, senza dubbio ritrouerà il vedere, considerato da per se, essere alli corpi di maggior vtilità, e conseguentemente più necessario, che gli altri. Ma ben si conoscerà poi l'vdito esser molto più necessario & migliore, considerandolo per accidente, nelle cose che appartengono all'intelletto: conciosia che se bene per il senso del vedere si conoscono più differenze di cose: essendo che più si estende che l'vdito, nondimeno questo nell'acquisto delle Scienze & giudicio intellettuale più si estende, & molto maggior vtile ne apporta.

It does not follow, however, that sight, hearing and smell, through which man comes to reject that which is bad, and to choose the good, are not necessary for a good life. Of the latter, he who wishes to examine their powers will certainly find sight considered in itself to be of greater utility, and consequently more necessary, than the others. But hearing will be recognized as even more necessary and better, when considering its properties in relation to things that pertain to the intellect. Although even if through the sense of sight more differences between things are known, since it reaches further than hearing, nevertheless [hearing] extends farther and is much more useful in the acquisition of science and in intellectual judgment.

Onde ne segue, che l'vdito veramente sia & più necessario & migliore de gli altri sentimenti; auenga che tutti cinque si chiamino istrumenti dell'intelletto: percioche ogni cosa che vedemo, vdimo, tocchiamo, gustamo, & odoramo si offerisce a lui per il mezo de i sensi & del senso commune;<sup>3</sup> ne di cosa alcuna può hauer cognitione, saluo che per il mezzo di vno di questi cinque; essendo vero, che ogni nostra cognitione da essi habbia l'origine. Dall'vdito adunque, come dal più necessario de gli altri sentimenti, la scienza della Musica hà hauuto la sua origine;

Therefore, it follows that hearing is truly more necessary and better than the other senses. All five [senses] are called instruments of the intellect, because each thing that we see, hear, touch, taste, and smell presents itself to man through the senses and through common sense; nor can anything be known save through one of these five senses, since all of our knowledge originates from them. From hearing, then, as the most necessary of the five senses, the science of music had its origins.

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<sup>3</sup> 1573, Zarlino's marginal note: *1. metaph. c.1* (Aristotle, *Metaphysics*, Chapter 1.)

la cui nobiltà facilmente si può per  
 l'antichità dimostrare: percioche (come  
 dicono Mose,<sup>4</sup> Gioseffo,<sup>5</sup> & Beroso  
 Caldeo<sup>6</sup>) avanti che fusse il diluuiio  
 vniuersale fu al suono de martelli trouata  
 da Iubale della stirpe di Caino: Ma perduta  
 poscia per lo soprauenuto diluuiio, di nuouo  
 fu da Mercurio ritrouata:

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<sup>4</sup> 1573, Zarlino's marginal note: *Gene. 4.* (Genesis 4:21)

<sup>5</sup> 1573, Zarlino's marginal note: *Antiq. l. c. 4*  
 (Josephus Flavius, *Jewish Antiquity*, Book I,  
 Chapter 4.)

<sup>6</sup> 1573, Zarlino's marginal note: *Antiq. lib. 1.*  
 (Berosus of Chaldea, *Babylonian History*, Book 1).

Its nobility can be demonstrated through  
 its antiquity, because (as Moses,  
 Josephus,<sup>A</sup> and Berosus of Chaldea<sup>B</sup> say)  
 before the Flood [music] was discovered  
 in the sound of hammers by Jubal, a  
 descendant of Cain. Although lost  
 because of the Flood, [music] was  
 discovered again by Mercury.

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<sup>A</sup> Josephus Flavius (c. 37-100 C.E.) was a Jewish priest, scholar, and historian. *The Antiquities of the Jews* is among his works.

<sup>B</sup> Berosus was a Chaldean priest who flourished c. 290 B.C.E. His work, including the *Babylonian History* to which Zarlino refers, survives only in fragmentary citations. Among these are an account of creation, a chronology and history of Babylonia and of later Assyria beginning with the "ten kings before the Flood," and the story of the Flood itself.

conciosia che (come vuole Diodoro<sup>7</sup>) egli fu il primo, che osseruò il corso delle stelle, l'armonia del canto, & le proportioni de i numeri; Et dice ancora lui esser stato l'inuentore della Lira con tre chorde; del cui parere è stato anco Luciano; quantunque Lattantio,<sup>8</sup> nel libro che fa della Falsa religione, attribuisca l'inunetione della Lira ad Apollo;

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<sup>7</sup> 1573, Zarlino's marginal note: *Hist. lib. 1* (Diodorus, *Library of History*, I).

<sup>8</sup> 1573, Zarlino's marginal note: *Dial. Deorum* (Lactantius, *Dialogues with God*).

(According to Diodorus<sup>C</sup>) [Mercury] was the first to observe the course of the stars, the harmony of song, and the proportions of numbers, and he is also said to have been the inventor of the three-stringed lyre. Lucian<sup>D</sup> was also of this opinion, although Lactantius,<sup>E</sup> in his book about false religion, attributes the invention of the lyre to Apollo,

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<sup>C</sup> Diodorus (fl. 1st century B.C.E.) was a Greek historian whose universal history, *Bibliotheca historica*, begins with a mythic history of non-Hellenic and Hellenic tribes.

<sup>D</sup> Lucian (120 - c. 180 C.E.) was a Greek rhetorician, pamphleteer, and satirist.

<sup>E</sup> Lucius Caecilius Firmianus Lactantius (c. 240 - c. 320 C.E.) was a Christian apologist and one of the most reprinted of the Latin Church Fathers. His *Divinae institutiones*, a defense of Christian doctrine as a harmonious and logical system, repudiates polytheism and what he terms the deluding superstitions of pagan cults. He also wrote *De moribus persecutorum* (On the Deaths of the Persecutors), which contains blood-curdling descriptions of the fates of the emperors who persecuted Christians. Renaissance humanists referred to Lactantius as the "Christian Cicero."

& Plinio voglia,<sup>9</sup> che l'inuentore della Musica sia stato Anfione. Ma sia a qual modo si voglia, Boecio<sup>10</sup> accostandosi all'opinione di Macrobio,<sup>11</sup> & allontanandosi da Diodoro vuole, che Pitagora<sup>12</sup> sia stato colui, che ritrouo<sup>13</sup> la ragione delle musicali proportioni al suono de martelli: Percioche passando egli appresso vna bottega di fabbri, i quali con diuersi martelli batteuano vn ferro acceso sopra l'incudine, gli peruenne all'orecchie vn certo ordine de suoni, che gli mouea l'udito con diletatione;

and Pliny maintains that the inventor of music was Amphion.<sup>F</sup> Be that as it may, Boethius, in agreement with Macrobius's<sup>G</sup> opinion, maintains that Pythagoras was the one who discovered the rationale for musical proportions in the sound of the hammers, because when [Pythagoras] was walking near a blacksmith shop, where [men] were beating hot iron on an anvil with different hammers, there came to his ears a certain order of sounds which moved his hearing with delight.

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<sup>9</sup>1573, Zarlino's marginal note: *Nat. hist., lib. 7, c. 56.* (Pliny, *Natural History*, Book VII, Chapter 56)

<sup>10</sup> 1573, Zarlino's marginal note: *Musicae li. 1, cap. 10.* (Boethius, *On Music*, Book I, Chapter 10).

<sup>11</sup> 1573, Zarlino's marginal note: *De Sō, lib. 2, cap. 1.* (Macrobius, *Commentary on the Dream of Scipio* Book II, Chapter 1.8)

<sup>12</sup> 1573, inserts & non Platone, come vuol Guidone aretino. Marginal note: *Microlo. lib. 1, c. 20.* (Guido of Arezzo, *Micrologus*, Book I, Chapter 20).

<sup>13</sup> 1573, *ritrouò* replaces *ritrouo*.

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<sup>F</sup> According to Greek mythology, Amphion was the son of Zeus and the nymph Antiope, the queen of Thebes. The god Hermes taught Amphion music and gave him a beautiful golden lyre. Amphion and his twin brother were supposed to have built the walls of Thebes while Amphion played his lyre. The magic of his music caused the stones to move into place of their own accord.

<sup>G</sup> Macrobius was a Latin grammarian and philosopher who flourished c. 400 C.E. His most important work is the *Saturnalia*, the last known example of the long series of symposia headed by the *Symposium* of Plato. In his *Commentary on the Dream of Scipio*, Macrobius relates the legend of Pythagoras and the hammers.

& fermatosi alquanto, cominciò ad  
 inuestigare onde procedesse cotale effetto;  
 & parendogli primieramente, che dalle  
 forze diseguali de gli huomini potesse  
 procedere, fece che coloro, i quali  
 batteuano, cambiassero i martelli: ma non  
 vdeno suono diuerso da quello di primo,  
 giudicò (come era il uero) che la diuersità  
 del peso de martelli fusse cagione. Per la  
 qual cosa hauendo fato pesare ciascuno  
 separatamente, ritrouò tra li numeri delli  
 pesi le ragioni delle consonanze &  
 dell'harmonie; le quali egli poi  
 industriosamente accrebbe in questo modo:

Stopping awhile, [he] began to  
 investigate from whence came such an  
 effect; and believing first that it could  
 derive from the unequal strength of the  
 men who were beating them, he had them  
 change their hammers. Not hearing  
 sounds that were different from before,  
 he judged (correctly) that the difference  
 in the weights of the hammers was the  
 cause. For that reason, having weighed  
 each [hammer] separately, he found  
 among the numerical values of the  
 weights the rationales for the  
 consonances and the harmonies, which  
 he then diligently increased in this  
 manner:

che hauendo fatto chorde di budella di pecore di grossezza vguale, attaccando ad esse li medesimi pesi de martelli, ritrouò le medesime consonanze; tanto più sonore, quanto le chorde per sua natura rendono [4] il suono all'udito più grato. Continuossi quest'harmonia per alquanto spatio di tempo, & dipoi li successori, li quali sapeuano gia li suoi fundamenti esser posti in certi & determinati numeri, più sotilmente facendone proua, a poco a poco la ridussero a tale, che le diedero nome di perfetta & certa scienza. Et rimouendo li falsi, & dimostrando li veri concetti con euidetissime ragioni de numeri & infalibili, ne diedero in iscritto chiarissime regole;

having made strings of sheep's guts of equal lengths, attaching to them weights equal to those of the hammers, he discovered the same consonances – all the more sonorous, because strings by their nature render a sound more pleasing to the listener. This harmony was continued for some period of time, and thereafter his successors, who already knew its fundamentals to lie in exact and determinate numbers, investigated them in greater detail, and slowly brought [harmony] to the level of a perfect and certain science. And eliminating the false and demonstrating the true consonances with the most evident and infallible proofs of number, they provided their very clear rules in writing.

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<sup>14</sup> 1573, Zarlino's marginal note: 2. *Elem. c. 1; 2.* (Aristotle, *Sophistic Refutations*, Book 2, Chapter 1)

come apertamente in tutte le altre scienze vedemo esser auenuto,<sup>15</sup> che li primi inuentori di esse, come chiaramente lo dimostra Aristotele,<sup>14</sup> non ne hebbero mai perfetta cognitione; anzi con quel poco di lume erano mescolate molte tenebre di errori, li quali rimossi da chi li conosceua, in vece loro succedea la verità; si come fece egli intorno alli principij della Filosofia naturale, che adducendo diuerse opinioni di gli antichi filosofi, approuò le buone e vere, rifiutò le false, dichiarò le oscure & male intese, & aggiungendoui la sua opinione & autorità, dimostrò & insegnò la uera scienza della Filosofia naturale.

We have seen it happen in all the other sciences whose first inventors, as Aristotle clearly demonstrates, never had perfect knowledge. On the contrary, with such little light was mixed the vast darkness of errors, which were removed by one who recognized them and then replaced [them] with the truth, just as he [Aristotle] did for the principles of natural philosophy. When bringing together diverse opinions of the ancient philosophers, he approved the good and true, repudiated the false, clarified those that were obscure and poorly understood and, adding his own opinions and authority, demonstrated and taught the true science of natural philosophy.

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<sup>15</sup> *Metaph. cap. 1.* (Aristotle, *Metaphysics*, Chapter 1).

<sup>16</sup> 1573, Zarlino's marginal note: *2. Metaph. com. 16* (Averroes, *Commentary on Aristotle's Metaphysics*, Book II, Commentary 16).

Così della nostra scienza della Musica li  
 posterì mostrando gli errori de passati, &  
 aggiungendoui la loro autorità la fecero  
 talmente chiara & certa, che la  
 connumerorno, & fecero parte delle scienze  
 mathematiche;<sup>17</sup> & questo non per altro,  
 salvo che per la sua certezza: percioche  
 questa con le altre insieme auanza di  
 certezza le altre scienze, & tiene il primo  
 grado di verità, il che dal suo nome si  
 conosce: poi che mathematica è detta da  
 μαθημα parola greca, che in latino  
 significa Disciplina, & nella Italiana nostra  
 lingua<sup>16</sup> importa Scienza, o Sapienza; la  
 quale (si come dice Boecio<sup>18</sup>) altro non è  
 che vna intelligenza;

In the same way, those who came later  
 demonstrating past errors, and adding  
 their authority, made our science of  
 music so clear and certain that they  
 indeed counted it with, and made it part  
 of the mathematical sciences, for no  
 other reason save for its certainty,  
 because together with those  
 [mathematical sciences] it exceeds in  
 certainty the other sciences, and holds the  
 first rank of truth, which is known by its  
 name. “Mathematics” is derived from the  
 Greek word, *mathema*, which in Latin  
 signifies “discipline,” and in our  
 language, Italian, means science or  
 wisdom, which (as Boethius says) is  
 none other than understanding,

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<sup>16</sup> 1573, Zarlino’s marginal note: *2. Metaph. com. 16* (Averroes, *Commentary on Aristotle’s Metaphysics*, Book II, Commentary 16).

<sup>17</sup> 1573, *Italiana nostra lingua* reads *nostra lingua Italiana* (Zarlino’s capitalization).

<sup>18</sup> 1573, Zarlino’s marginal note: *In pemio.Arith.* (Boethius, *On Arithmetic*).

o per dirla piu chiaro, capacità di verità delle cose che sono, & di loro natura non sono mutabili; della qual verità le Mathematiche scienze fanno particolare professione: essendo che considerano le cose, che di lor natura hanno il vero essere. Et sono in tanto differenti da alcune altre scienze, che queste essendo fondate sopra le opinioni di diuersi huomini non hanno in se fermezza alcuna; & quelle hauendo li sentimenti per loro proua, vengono ad hauere ogni certezza: Percioche i mathematici nelle cose essenziali sono d'un'istesso parere, ne ad altro consentono, che a quel, che si può sensatamente capire.

or to put it more clearly, the capacity for truth among the things that are, and which by their nature are immutable; of this truth, the mathematical sciences make particular claim, since they consider things that by their nature have true essence. And they are different from some other sciences in that the latter, being founded upon the opinions of various men, do not possess any certainty in themselves; whereas the former [the mathematical sciences] having the senses as their evidence, come to have full certainty. Hence in essential matters mathematicians share the same opinion and do not affirm anything other than that which can be understood through the senses.

Et è tanta la certezza di dette scienze, che col mezzo de numeri si fa infalibilmente il riuolgimento de cieli, le congiuntioni de i pianeti, il far della Luna, il suo Eclisse, & quello del Sole, & infiniti altri bellissimoi secreti, senza esser tra loro punto di discordia. Resta adunque che la Musica sia & nobile & certissima, essendo parte delle scienze mathematiche.

And such is the certainty of these sciences that through numbers, the revolution of the spheres, the conjunctions of the planets, the path of the moon, its eclipses, and those of the sun, and an infinite number of other very beautiful mysteries are held together infallibly without any disharmony among them. It follows, then, that music is a most noble and certain [discipline], being part of the mathematical sciences.

## Delle laudi della Musica. / Cap. 2.

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Avegna che per l'origine & certezza sua le laudi sue siano chiaramente manifeste, tuttavia quando considero niuna cosa ritrouarsi, la quale con questa non habbia grandissima conuenienza, non posso di lei in tutto con silentio trapassare. Et se ben douerebbe bastar quello, che di essa da tanti Filisofi eccellenti è stato scritto: nondimeno non voglio restare anch'io per debito mio di ragionarne alcune cose: percioche se bene io non diro<sup>1</sup> tutte quelle laudi, che le conuengono, toccherà almeno vna minima particella delle più notabili & eccellenti; & ciò farò con quella breuità, che mi sarà possibile.

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<sup>1</sup> 1573: *diro* reads *dirò*.

On the Praises of Music / Chapter 2<sup>A</sup>

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Although because of its origin and certainty the praises [of music] are clearly manifest, still, when I consider that there is nothing which does not to a great extent relate [to music], I cannot remain silent. And even though what was written about it by many excellent philosophers should suffice, nevertheless I do not wish to shy away from tackling such matters, and although I will not recount all the praises of which it is worthy, I will touch upon, at least, a few of the most notable and excellent, and this I will do with as much brevity as possible.

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<sup>A</sup> Gary Tomlinson's partial translation of this chapter, which appears in *Source Readings in Music History*, vol. 3, 15-21, served as a resource for this translation.

La Musica adunque quanto sia stata celebrata, & tenuta per cosa sacra, ne fanno chiarissima fede gli antichi scritti de Filosofi, & massimamente de Pitagorici: percioche haueano opinione, il Mondo esser composto musicalmente, & i cieli nel girarsi esser cagione di harmonia, & l' Anima nostra con la medesima ragione formata, & per li canti, & per li suoni destarsi, & quasi viuificar le sue virtù. Di modo che da alcuni di essi fu scritto, che la Musica tra le arti liberali tiene il principato, & da alcuni fu detta εγκυκλοπαιδεια, da κυκλος voce greca, che Circolo vuol dire, & παιδεια Disciplina,<sup>2</sup> quasi circolo delle scienze: conciosia che la Musica, si come dice Platone,<sup>3</sup> abbraccia tutte le discipline, come si può conoscere discorrendo;

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<sup>2</sup> 1573, da κυκλος voce greca, che Circolo vuol dire, & παιδεια Disciplina omitted.

<sup>3</sup> 1573: Zarlino's marginal note: *De legib. I* (Plato, *Laws*, 1)

The ancient writings of the philosophers, and especially the Pythagoreans, clearly prove how much music was celebrated and held as a sacred matter. [The Pythagoreans] held the world to be comprised musically, and the revolutions of the heavens to be the cause of harmony, and our very soul [to be] shaped along similar ratios, and awakened by melodies and sounds, and its virtues almost given life. This being the case, some of them wrote that music holds primacy among the liberal arts and some of them called it *encyclopedia*, from the Greek *cyclos*, meaning “circle,” and *paideia*, [meaning] “discipline,” or “circle of sciences;” so that music, as Plato says, embraces all disciplines, as can be known through discourse.

che se cominceremo dalla Grammatica, prima tra le sette arti liberali, ritroueremo esser il vero quel, ch'abbiamo detto; essendo che si ode grande harmonia nell'addattamento & ordine proportionato delle parole, dal quale se'l Grammatico si parte, fa vdire alle orecchie vn dispiaceuol suono del suo contesto: imperoche mal si puote ascoltare, o leggere quella prosa o verso, il quale sia priuo del polito, bello, ornato, sonoro & elegante ordine. Nella Dialettica, chi ben considera & rimira la proportion de i Silogismi, vedrà egli con mirabil contento, & piacere grandissimo dell'udito, mostrarsi il vero grandemente dal falso esser lontano. L'Oratore poi nella sua Oratione vsando gli accenti musici a i tempi debiti, porge marauigliosa diletatione a gli ascoltanti; il che ottimamente conobbe il grande oratore Demostene:

If we begin with grammar, first of the seven liberal arts, we will find what we have said to be true. One hears great harmony in the metrical arrangement and proportionate order of words which, deprived of proper grammatical structures, sound unpleasant to our ears, because one can barely tolerate hearing or reading prose or verse which is without polished, beautiful, ornate, sonorous, and elegant order. In dialectics one who considers and admires the proportion of syllogisms will notice their marvelous harmony and will hear with great pleasure how far truth is distant from falsity. The orator, then, in his speech, using musical accents at the right time, bestows great delight upon his listeners, something which was well known by the great orator Demosthenes,

perciocche tre volte dimandato, qual fusse la principal parte nell'Oratore, tre volte [5] rispose che la pronuntia sopra ogn'altra cosa valeua. Questo ancora conobbe (come dimostra Cicerone<sup>4</sup> & Valerio Massimo<sup>5</sup>) Gaio Gracco huomo di soma eloquenza: imperoche sempre, ch egli hauea a parlare dauanti al popolo, teneua dietro a se vn seruo musico perfettissimo,<sup>6</sup> il quale ascosamente con uno Flauto d'auorio sonando gli daua la misura, cioè la voce, ouero il tuono di pronuntiare in tal modo, che ogni volta che lo vedeua troppo inalzato lo ritiraua, & vedendolo troppo abbassato lo incitaua.

because three times having been asked what was the highest quality of an orator, three times he answered that elocution was worthier than any other thing. This was also known (as Cicero and Valerius Maximus<sup>B</sup> relate) by Gaius Gracchus,<sup>C</sup> a man of the greatest eloquence, because whenever he had to speak in front of people he kept a servant behind him, a highly gifted musician who, unbeknownst to all, by playing his ivory flute would give him the tuning note, that is, the pitch or tone of delivery, in such a way that whenever he saw that he went too high, he would bring him down, and seeing that he went too low, would raise him.

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<sup>4</sup> 1573, Zarlino's marginal note: *De Ora. 3.* (Cicero, *On Oratation*, III)

<sup>5</sup> 1573, Zarlino's marginal note: *Dic. et Fac. lib. 8. c. 10.* (Valerius Maximus, *Nine Books of Memorable Deeds and Sayings*, Book 8, Chapter 10)

<sup>6</sup> 1573, *perfettissimo* omitted.

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<sup>B</sup> Valerius Maximus (fl. c. 20 C.E.). a Roman historian and moralist, wrote *Factorum et dictorum memorabilium libri*, historical anecdotes for the use of rhetoricians.

<sup>C</sup> Gaius Gracchus (c.160-121 B.C.E) was a Roman tribune who enacted agrarian reforms and proposed other measures to lessen the power of the senatorial nobility.

Ma poscia la poesia ben si vede con la musica esser tanto congiunta, che chiunque da questa separar la volesse, restarebbe quasi corpo separato dall'anima. La qual cosa è confermata da Platone nel *Gorgia* dicendo; Che<sup>4</sup> se alcuno da tutta la poesia leuasse il concento & il numero, con la misura insieme, niuna differenza sarebbe da essa al parlare domestico & popolare. Et però si vede, che li poeti hanno vsato grandissima diligenza, & marauiglioso artificio nell'accommodare ne i versi le parole, & dispor li piedi secondo la conuenienza del parlare;

But since poetry is seen to be so well conjoined with music, whoever wished to separate them would find a body separated from its soul. Plato confirms this in *Gorgias*, saying that if poetry were to be deprived of its harmony, number, and measure, it would be no different from common and popular speech. Therefore, one sees that poets have used very great diligence and marvelous artifice in accommodating words to verses and employing feet according to the usage of speech.

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<sup>4</sup> 1573: *che* omitted.

si come per tutto il suo poema hà osseruato  
 Virgilio: percioche a tutte tre le sorti del  
 suo parlare accomoda la propria sonorità  
 del verso con tale artificio, che  
 propriamente pare, che col suono delle  
 parole ponga dauanti a gli occhi le cose,  
 delle quali egli viene a trattare:

Virgil demonstrated this in the same  
 way throughout his poem, because in all  
 three modes of his speech<sup>D</sup> he  
 accommodates the very sonority of the  
 verse with such artifice that it rightly  
 seems that through the sound of words  
 he places before our eyes the things that  
 he comes to discuss.

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<sup>D</sup> In his *Ars grammatica*, the Latin writer  
 Diomedes (fl. fourth century C.E.) differentiated  
 three modes used by speakers in poetry, as  
 follows:

genus activum vel imitativum	only the characters speak
genus enarrativum	only the narrator speaks
genus commune	both the characters and the narrator speak

di modo che doue parla d'amore, si vede artificiosamente hauer scielto alcune parole soavi, dolci, piaceuoli & all'udito sommamente grate; & doue gli sia stato dibisigno cantare vn fatto d'arme, descriuere una pugna nauale. vna fortuna di mare, o simil cose, oue entrano spargimenti di sangue, ire, sdegni, dispiaceri d'animo, & ogni cosa odiosa, hà fatto scielta di parole dure, aspre & dispiaceuoli: di modo che nell'vdirle & proferirle areccano spauento. Et per darne in parte qualche essemplio, egli, nel mostrare la pouertà della capanna di Melibeo,<sup>8</sup> diminuisce quella parola *Tuguri* di vna lettera, quasi mostrando con essa l'effetto presente; si come ancora fece, quando volse manifestare il cordoglio di quella Ninfa, che la gratiosa vista del suo pastore era costretta abbandonare;

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<sup>8</sup> 1573, Zarlino's marginal note: *In Alex.* (Virgil, *Bucolics*, I, 68).

Where he speaks of love one sees his conscious choice of words that are suave, sweet, pleasant, and congenial to the ear, and where he needs to sing of an event of war, [or] describe a naval battle, an event at sea, or similar things concerning bloodshed, anger, disdain, displeasure, and every other odious thing, he chooses words that are hard, dry, and unpleasant, so that they arouse extreme fear in those who hear and speak of them. And to give some partial example, in order to demonstrate the poverty of Melibeo's hut, [Virgil] removes one letter from the word *Tuguri*,<sup>E</sup> as if to show with such action its effect, just as he also did when he wished to manifest the sorrow of the nymph who was forced to abandon the graceful sight of her shepherd,

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<sup>E</sup> *Tuguri* is derived from the Latin *tugurium*, and means a miserable, squalid dwelling.

che in quel verso

Et longum formose vale, vale (inquit)  
Iola,<sup>9</sup> facendo dal pianto, & da sospiri quasi  
interrompere il verso, fa proferir lunga  
quella sillaba, che prima hauea posta breue.  
Dipoi volendo mostrare quanto sia veloce il  
Tempo, lo dimostra col verso composto di  
molti Datili, che sono piedi atti alla  
velocità, & a mostrar vn talle effetto,  
dicendo:

Sed fugit interea fugit irreparabile  
tempus.<sup>10</sup> Lassarò<sup>11</sup> hora di dire, come  
volendo mostrare li Cartaginesi sempre  
nemici & contrarij a Romani, nel  
descriuere il sito di Cartagine, pospose [*sic*]  
a bello studio quella parola, che andaua  
preposta, & disse:

Italiam contra.<sup>12</sup>

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<sup>9</sup> 1573, Zarlino's marginal note: *In Palem*. (Virgil, *Bucolics*, 3, 79)

<sup>10</sup> 1573, Zarlino's marginal note: *Georg. 3* (Virgil, *Georgics*, 3, 284)

<sup>11</sup> 1573, Lassarò reads *Lascierò*.

<sup>12</sup> 1573, Zarlino's marginal note: *Aeneid. 1*.

where, by almost interrupting the verse,  
“and in lingering tones, cried, ‘Farewell,  
farewell, my lovely Iollas,’”<sup>F</sup> through  
weeping and sighing [he] lengthens a  
syllable that was once short. Thereafter  
wishing to show how quickly time  
passes, he demonstrates it through verse  
composed of many dactyls, which are  
feet that proceed quickly, and in order to  
show such an effect, he says, “But time  
meanwhile is flying, flying beyond  
recall.”<sup>G</sup> I will now omit saying how,  
wishing to show Carthaginians as  
perennial enemies of the Romans, while  
describing the site of Carthage, he  
purposely placed second the word that  
was meant to be first and said, “Italy  
against.”

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<sup>F</sup> Translation by H. Rushton Fairclough in Virgil, *Eclogues, Georgics, and Aeneid* (Cambridge: Harvard University Press, 1967), 25.

<sup>G</sup> Translation by Fairclough in *Eclogues, Georgics, and Aeneid*, 175.

Et volendo dimostrare con quanto silentio  
la città de Ilio fusse da Greci assalita, lo  
mostra con vn verso composto di molti  
Spondei, li quali sono piedi per sua<sup>13</sup> natura  
atti alla tardità, & alle cose deboli &  
ociose, dicendo:

Inuadunt urbem somno, vinoque  
sepultam;<sup>14</sup> & infiniti altri, che troppo  
lungo sarebbe il raccontargli in questo  
luogo, de i quali l'opera è piena. Basterà  
hora per vltima conclusione dire, che la  
poesia sarebbe senza leggiandria alcuna, se  
dale parole harmonicamente poste non gli  
fusse data. Oltra di cio lascerò<sup>15</sup> da parte  
dire, quanta simiglianza & vnione con essa  
habbiano l'Arithmetica, & la Geometria;

And wishing to demonstrate how  
silently the city of Troy had been  
assaulted by the Greeks, he showed it  
with a verse composed of many  
spondees, which by nature are feet  
appropriate for slowness and weak and  
lazy things, saying, "They storm the  
city, buried in sleep and wine,"<sup>H</sup> and  
many others of which his work is so full  
that they would be too many to relate in  
this place. It will suffice now to say as  
the ultimate conclusion that poetry  
would be deprived of any grace were it  
not for words harmoniously placed.  
Beyond this I will abandon discussing  
the similarity and union [music] has  
with arithmetic and geometry,

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<sup>13</sup> 1573, *sua* reads *loro*.

<sup>14</sup> 1573, Zarlino's marginal note: *Aeneid*. 2.

<sup>15</sup> 1573, *lascierò* replaces *lascero*.

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<sup>H</sup> Translation by Fairclough in *Eclogues, Georgics, and Aeneid*, 313.

& dirò solamente, che se l'Architetto non hauesse cognitione della Musica; come ben lo dimostra Vitruuio,<sup>16</sup> non saprebbe con ragione fare il temperamento delle machine, & nelli Theatri collocare li uasi, & dispor bene & musicalmente gli edificij. L'Astronomia medesimamente, se non fusse aiutata dalli fondamenti harmonici, non saprebbe gl'influssi buoni & rei. Anzi dirò più, se l'Astronomo non sapesse la concordanza delli sette pianeti, & quando l'uno con l'altro si congiunga, ouero l'vno all'altro si opponga, non predirebbe mai le cose future. La Filosofia ancora, la quale hà per suo proprio il discorre con ragione le cose produtte dalla natura, & possibili a prodursi,

and I will only say that if an architect had no knowledge of music, as Vitruvius<sup>1</sup> well demonstrated, he would be unable to calibrate machines, nor place vases in the theatres, nor arrange buildings well and in musical proportion. Astronomy, in the same way, were it not aided by the fundamentals of harmony, would not recognize good and bad influences. As a matter of fact I will say more; if the astronomer did not know the concordance of the seven planets, and when one enters into conjunction with or is in opposition to the other, he would never be able to predict future things. Even philosophy, which has as its rightful [subject] the rational discourse of things produced or capable of production by nature –

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<sup>16</sup> 1573, Zarlino's marginal note: *De Archi. lib. 1. cap. 1.* (Vitruvius, *On Architecture*, I, 1)

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<sup>1</sup> Marcus Vitruvius Pollio, an architect and engineer who flourished in Rome, during the first century B.C.E., wrote the treatise, *De architectura*, a handbook for Roman architects.

non confessa ella dal primo motore  
 dependere ogni cosa, & esser ordinata con  
 sì mirabil ordine, che ne risulta  
 nell'vniuerso vna tacita harmonia? Ecco,  
 che primieramente le cose graui tengono il  
 luogo basso, le leggiere il soprano, & quelle  
 di men peso, secondo la loro natura,  
 posseggono il luogo di mezzo. E più oltre  
 procedendo, i Filosofi affermano, che i  
 Cieli riuolgendosi fanno harmonia; la quale  
 se bene non vdimmo, questo può auenire o  
 per la loro veloce reuolutione, o per la  
 troppo distanza, ouero per altra cagione a  
 noi occulta. La Medicina da questa non può  
 stare lontana: imperoche se'l medico non  
 hà cognitione della Musica, come saprà  
 egli nelli suoi medicamenti proportionare le  
 cose calide con le frigide, secondo li loro  
 gradi?

does it not confess that everything  
 depends on the prime mover, and that  
 [nature] is ordained with such marvelous  
 order that it produces a silent harmony of  
 the universe? Hence, it follows that,  
 firstly, heavy things maintain a low  
 position, light [things have] a high  
 [position], and those of less weight,  
 according to their nature, hold a medium  
 position. And proceeding further,  
 philosophers affirm that the turning of  
 the heavens produces harmony, although  
 we do not hear it – either because of their  
 swift revolution, or their excessive  
 distance, or for another reason unknown  
 to us. Medicine cannot be far apart [from  
 music], because if the physician has no  
 knowledge of music, how will he know  
 how to balance hot things with cold  
 [things], according to degrees [of  
 strength] in his prescriptions?

& come potrà hauere ottima cognitione de i polsi? liquali il dottissimo Herofilo dispose secondo l'ordine delli numeri musici. Et per salire più alto, la Theologia nostra ponendo nel cielo gli spiriti angelici, diuide quelli in nuoue Chori & tre Hierarchie, come scriue Dionisio Areopagita.<sup>17</sup> Queste sono di continuo presenti al [6] conspetto della Divina maestà, & non cessano di cantare Santo, Santo, Santo, Signore Iddio de gli esserciti, come è scritto in Esaia.<sup>18</sup>

And how will he be able to understand fully [the human] pulse, which the most learned Herophilus<sup>J</sup> measured according to the sequence of musical numbers? And to consider higher matters, our theology, placing the angelic spirits in the sky, divides them into nine choirs and three hierarchies, as Dionysius the Areopagite<sup>K</sup> writes. They are always visible to His Divine Majesty, and never cease singing, “Holy, Holy, Holy, Lord,” in their prayers, as is written in Isaiah.

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<sup>17</sup> 1573, Zarlino's marginal note: *De caelest. hier. ca. 7. 8. & 9.* ((Pseudo-Dionysius, *Celestial Hierarchy*)

<sup>18</sup> 1573, Zarlino's marginal note: *Isa. cap. 6.* (Isaiah 6:3)

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<sup>J</sup> Herophilus (c. 335 – c. 280 B.C.E.), an Alexandrian physician, is often called the father of anatomy.

<sup>K</sup> “Dionysius the Areopagite” refers to Pseudo-Dionysius, a Syrian monk who bore the same name as the Biblical Dionysius the Areopagite who was converted by St. Paul. Pseudo-Dionysius flourished c. 500 C.E. and wrote treatises and letters—including *Celestial Hierarchy*, *Divine Names*, and *Mystical Theology*—that sought to unite Neoplatonic thought with Christian theology and mystical experience.

Et non solo questi, ma li quatro Animal  
 ancora, i quali nel libro delle sue  
 Reuelationi sono descritti da San  
 Giouanni<sup>19</sup> stanno auanti il trono d'Iddio, &  
 cantano l'istesso canto. Stanno poi le  
 ventiquattro vecchi inanzi all'Agnello  
 immaculate, & con suono di Cetere &  
 altissime voci cantano all'altissimo Iddio  
 vn nuouo canto, ilquale è cantato ancora  
 dalle voci de Citaristi citarizzati nelle cetere  
 loro auanti li Quattro animali et  
 ventiquattro vecchi. Di queste et altre quasi  
 infinite cose al proposito nostro n'è piena  
 la divina Scrittura, lequali per breuità  
 trappassaremo, bastando solamente dire per  
 suprema laude della Musica, che senza far  
 mentione alcuna d'altra scienza, ella,  
 secondo la testimontanza de sacri libri, sola  
 si troua nel Paradiso, et è quiui  
 nobilissimamente essercitata.

And not only they, but also the four  
 beasts described by St. John in the Book  
 of Revelation, stand before the throne of  
 God and sing the same song. The  
 twenty-four elders also stand by the  
 immaculate Lamb, and with the sound of  
 the kithara and in very loud voices sing  
 to the supreme Lord a new song.  
 This [song] is sung again by the voices  
 of kitharists strumming on their  
 instruments before the four beasts and  
 the twenty-four elders. Holy Scripture is  
 full of these and almost innumerable  
 other things relevant to our proposition,  
 which for brevity we will pass over,  
 sufficing only to say in supreme praise  
 of music, that without mentioning any  
 other science and according to the  
 testimony of the holy books, [music]  
 alone is to be found in Paradise, where it  
 is most nobly practiced.

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<sup>19</sup> 1573, Zarlino's marginal note: *Apoca. ca. 4.5.14. 5. & 19.* (Revelation 4, 5, 19)

Et si come nella celeste corte, che chiesa  
 triunfante vien detta, cosi nella nostra  
 terrena, che Militante si chiama, non con  
 altro, che con la Musica, si lauda et  
 ringratia il Creatore. Ma lasciamo hormai  
 da parte le cose superiori, et ritorniamo a  
 quelle che sono dalla natura produtte per  
 ornamento del mondo, che ogni cosa  
 vederemo piena di musici concertati.<sup>20</sup> Il  
 Mare primamente hà le Sirene, le quali, se  
 è lecito dar fede a gli scrittori, a nauiganti  
 vdire si fanno di tal sorte, che vinti molte  
 volte dall'harmonia loro, & soprapresi dal  
 sonno, perdono quello, che sopra ogn'altra  
 cosa è carissimo a tutti gli animali.

And just as in the celestial court, which is  
 called the Church Triumphant, so it is in  
 our earthly [court], called [Church]  
 Militant, where the Creator is praised and  
 thanked with nothing other than music.  
 But let us now leave aside heavenly  
 matters and return to those produced by  
 nature to adorn the world, which we will  
 see proves to be full of harmonious  
 music in every aspect. The sea contains  
 the sirens, who, if the writers are to be  
 believed, make sailors hear [songs] that  
 bring such misfortune to those who hear  
 them that, vanquished many times by  
 their harmony and overcome by slumber,  
 they lose what is dearest above any other  
 thing to all creatures.

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<sup>20</sup> 1573: *che ogni cosa vederemo piena di musici ...*  
 reads *che uederemo ogni cosa esser piena di musici.*

Nell’Aria & nella Terra insieme sono gli uccelli, che anchora essi co i loro concerti diletmano e ricreano non pur gli animi lassi & pieni di noiosi pensieri, ma li corpi ancora; percioche il viandante molte volte stanco per il lungo viaggio, ricrea l’animo, riposa il corpo, & si dimentica delle passate fatiche per la soave harmonia di boscarecci canti de gli uccelli di tante varie sorti, che sarebbe impossibile poterle raccontare. Li Fiumi & li Fonti medesimamente dalla natura fabricati soglion dare grato piacere a chiunque ad essi vicino si ritroua; & l’inuita<sup>21</sup> bene spesso per ricrearsi ad accompagnare il suo rustico canto co i loro strepitosi concerti.

Birds are in the air and on the earth as well, and with their harmonies delight and refresh not only souls that are tired and full of cares, but bodies too, so that the wayfarer, often tired from his long travels, refreshes his spirit, rests his body, and forgets his past labors through the sweet harmony of pastoral songs of birds of so many different species that it would be impossible to describe all of them. Similarly created by nature, rivers and springs are known to give well-appreciated pleasure to whomever finds himself in their proximity, and with their noisy harmonies often invite him to refresh himself to the accompaniment of their rustic song.

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<sup>21</sup> 1573: *inuitano* replaces *inuita*.

Tutte queste cose il Dottissimo Virgilio  
 espresse con poche parole, quando disse,<sup>22</sup>  
 che al canto di Sileno, non solo li Fauni, &  
 le altre fiere, ma le dure Quercie ancora,  
 ballauano; saltando quelli, & queste spesso  
 mouendosi con numerosi mouimenti;  
 dinotandoci,<sup>23</sup> che non pure le cose  
 sensibili; ma ancora quelle, che mancano  
 del senso, sono quasi prese & vinte dalli  
 concetti musicali; & fansi di dure & aspre,  
 mansuete & piaceuoli.

The most learned Virgil expressed all  
 these things with few words, when he  
 said that not only the fauns and the other  
 wild beasts, but also the hard oak trees  
 danced to the song of Silenus,<sup>L</sup> the  
 former jumping, and the latter moving  
 continually, thus showing us that not  
 only sensate creatures but even things  
 that lack the ability to sense are as  
 though captivated and overcome by  
 musical harmonies, and transform  
 themselves from hard and harsh to  
 docile and pleasing.

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<sup>22</sup> 1573: Zarlino inserts the following verses:  
*Tum verò in numerum Faunosque, ferasque  
 videres./Ludere: tum rigidas motare cacumina  
 quercus./Nec tantum Phaebo gaudet Parnasia  
 rupes,/Nec tantum Rhodope miratur, & Ismarus  
 Orphea:/Quantum omnis mundus gaudet cantante  
 Sileno.* (Then indeed you might see fauns and fierce  
 beasts sport in measured time, then stiff oaks nod  
 their tops. No such joy has the rock of Parnassus in  
 Phoebus; no such a marvel to Rhodope and Ismarus  
 is Orpheus. / [Translation by H. Rushton  
 Fairclough, *Virgil/Eclogues*, 43-45] So much does  
 the world praise the singing of Silenus. [my  
 translation]) Zarlino then inserts, *Dinotandoci*  
 (declaring to us). Zarlino's marginal note reads, In  
 Sileno (Virgil, *Bucolica*)

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<sup>L</sup> Dionysus's foster father, a creature of the wild,  
 part man and part beast. Silenus, although  
 bibulous, also appeared in legend as a dispenser  
 of homely wisdom.

<sup>23</sup> 1573: *per dimostrarci* replaces *dinotandoci*.

Ma se tanta harmonia si troua nelle cose celesti & terrestri: ouero per dir meglio, se'l mondo dal Creatore fu composto pieno di tanta harmonia, perche douemo<sup>24</sup> credere l'huomo esserne priuo? E se l'Anima del Mondo (come vogliono alcuni) non è altro che Harmonia, potrà esser che l'Anima nostra non sia in noi cagione d'ogni harmonia, & che col corpo non sia harmonicamente congiunta? massimamente hauendo Iddio creato l'huomo alla similitudine del Mondo maggiore, detto da Greci *κοσμος*, cioè ornamento, ouero ornato; & essendo fatto a quella similitudine di minor quantità, a differenza di quello vien chiamato *μικροκοσμος*, cioè piccol mondo: certo che non e cosa ragioneuole.

But if so much harmony is found in celestial and earthly things, or to say it better, if the world made by the Creator is so full of harmony, why should we believe man is deprived of it? And if the world's soul (as some would have it) is nothing other than harmony, could it be that our souls are not the cause of all harmony in us, and that they are not joined harmoniously with our bodies? Especially because God created man in the image of the higher world, called *kosmos*, that is, "ornament" or "ornate," by the Greeks, He made him a smaller semblance of that [higher world]; to distinguish him from it he came to be called *mikrokosmos*. that is, "little world." Thus, [to believe that the soul lacks harmony] would certainly not be a reasonable thing.

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<sup>24</sup> 1573: *dobbiamo* replaces *douemo*.

<sup>25</sup> 1573: *di quello* replaces *del quale*.

Onde Aristotele<sup>26</sup> volendo mostrar il musicale componimento dell'huomo molto ben disse, la parte vegetatiua alla sensitua, & questa alla intellettua hauer la medesima conuenienza, che hà la figura di tre lati a quella di quattro. Certa cosa è adunque, che non si ritroua alcuna cosa buona, che non habbia musicale dispositione; & la Musica veramente, oltre che rallegra l'animo, riduce anche l'huomo alla contemplatione delle cose celesti; & hà tal proprietà, che ogni cosa a cui si aggiunge fa perfetta; & quegli huomini sono veramente felici & beati, che sono dottati di essa, come afferma il Santo Profeta dicendo, Beato è quel popolo, che fa la giubilatione.<sup>27</sup>

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<sup>26</sup> 1573, Zarlino's marginal note: 2. *De Anima. c. 3.* (Aristotle, *On the Soul*, Chapter 3).

<sup>27</sup> 1573, Zarlino's marginal note: *Psal. 88.* (Psalm 88). In the Vulgate, Psalm 88:16 reads, *beatus populus qui scit iubilationem.*

Therefore, Aristotle, wishing to show the musical component of man, said rightly that the vegetative part relates to the sensitive part, and the latter to the intellectual part, in the same proportion that a three-sided figure compares to a four-sided one. It is certain, then, that there is nothing good that does not have a musical disposition. Music, beyond gladdening the spirit, truly leads one to the contemplation of celestial matters, and perfects everything that it touches. Those men who are musically gifted are truly happy and blessed, as the Holy Prophet<sup>M</sup> affirms, saying, "Blessed is the people who make the joyful sound."<sup>N</sup>

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<sup>M</sup>David.

<sup>N</sup>The King James Bible, Psalm 89:15, reads, "Blessed is the people that know the joyful sound."

Per la quale autorità, Hilario Vescouo Pittaiuense dottore catholico, esponendo il Salmo 65. Si mosse a dire, che la Musica è necessaria all'huomo Christiano; Conciosia che nella scienza di essa si ritroua la beatitudine. Onde per questo ho ardimento di dire, che quelli, che non hanno cognitione di questa scienza, sono da esser connumerati tra gl'ignoranti. Anticamente, come dice Isodoro,<sup>28</sup> non era meno vergogna il non sapere la Musica, che le lettere:

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<sup>28</sup> 1573, Zarlino's marginal note: *Lib. 3 Etymol. c. 15* (Isidor of Seville, *Etymology*, Book III, Chapter 15).

On the basis of such authority, Hilary, Bishop of Poitiers and doctor of the Catholic church,<sup>o</sup> expounding on Psalm 65, was moved to say that music is necessary to the Christian, because in its science one finds beatitude. Because of this I dare say that those who have no knowledge of this science are to be numbered among the ignorant. In ancient times, as Isidore<sup>p</sup> said, it was no less shameful not to know music than it was not to know letters.

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<sup>o</sup> St. Hilary, Bishop of Poitiers (c. 315-367 C.E.) wrote about the Trinitarian controversies that rocked the church in his day. Among his writings is a commentary on the Psalms. Although Zarlino refers to Hilary as *dottore catholico*, it was not until 1851 that Pope Pius IX officially named Hilary a doctor of the Catholic church.

<sup>p</sup> Isidore of Seville (c. 560-636 C.E.) was a theologian, archbishop, and encyclopaedist, and last of the Western Latin Fathers. His *Etymologies*, an encyclopaedia of human and divine subjects, was for many centuries one of the most important reference books.

però non è marauiglia, se Hesiodo poeta famosissimo, & antichissimo, come narra Pausania,<sup>29</sup> fu escluso dal certame, come colui, che non hauea mai imparato a sonare la Cetera, ne col suono di quella accompagnare il canto. Così ancora Temistocle, come narra Tullio,<sup>30</sup> rifiutando di sonare la Lira nel conuito, fu men dotto, & men sauiò riputato. Il contrario leggemo,<sup>31</sup> che furno in gran pregio appresso gli antichi Lino, & Orfeo, amendue figliuoli delli Dei: percioche col loro soaue canto (come se dice) non solamente addolciuano gli animi humani: ma le fiere, & gli vcelli ancora;

Therefore, it is no wonder that Hesiod, a most famous and ancient poet, as Pausanias<sup>Q</sup> narrates, was excluded from competition, as he had never learned to play the kithara nor to accompany song with it. Thus also Themistocles,<sup>R</sup> as [Marcus] Tullius [Cicero] said, refusing to play the lyre at the banquet, was held to be less learned and less wise. On the contrary, we will read that Linus and Orpheus, both sons of the gods, were held in great esteem by the ancients, because with their sweet song (it is said) not only human souls were made sweeter, but also [those of] beasts and birds,

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<sup>29</sup> 1573, Zarlino's marginal note: *Lib. 10. Descrip. veteris Grecie* (Pausanias, *Description of Greece*, Book 10).

<sup>30</sup> 1573, Zarlino's marginal note: *Tuscul. quest. lib. I* (Cicero, *Conversations in Tusculum*, I)

<sup>31</sup> 1573, *leggemo* reads *leggiamo*.

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<sup>Q</sup> Pausanias (c. 143 - c. 176 C.E.) was a Greek traveler and geographer whose *Periegesis Hellados* (*Description of Greece*) is an invaluable guide to ancient ruins.

<sup>R</sup> Themistocles (c. 524 - c. 460 B.C.E.) was an Athenian politician and naval strategist who was the creator of Athenian sea power and the chief savior of Greece from subjection to the Persian Empire at the Battle of Salamis in 480 B.C.E.

& quello, che è più marauiglioso da dire,  
 moueano le pietre da i proprij luoghi, & a i  
 fiumi riteneuano il corso. Et questo istesso  
 il Dotto Horatio<sup>32</sup> attribuisce ad Anfione  
 dicendo [7]  
 Dictus & Amphion Thebae conditor arcis  
 / Saxa mouere sono restudinis, & prece  
 blanda / Ducere quo vellet;  
 Da i quali per auentura imparorno li  
 Pithagorici,<sup>33</sup> che con musici suoni  
 inteneriuano gli animi feroci; & Asclepiade  
 medesimamente, che molte volte per questa  
 via racchetò la discordia nata del popolo, &  
 col suono della Tromba restituì l'vdito a i  
 sordi.

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<sup>32</sup> 1573, Zarlino's marginal note: *De Arte poetica*  
 (Horace, *The Art of Poetry*)

<sup>33</sup> 1573, *li Pithagorici* reads *gli antichi Pithagorici*  
 (the ancient Pythagoreans)

<sup>34</sup> 1573, *a temperate & honesta vita alcuni gioueni*  
*dediti al vino & alla lussuria* reads *alcuni gioueni*  
*dediti al vino & alla lussuria a temperate & honesta*  
*vita* (same meaning; words are reversed).

and, what is most astonishing, even  
 stones moved from their places, and  
 rivers changed their course. And the  
 learned Horace attributes the same to  
 Amphion, maintaining, "It was said that  
 Amphion, founder of Thebes, moved  
 stones by the sound of his lyre and drew  
 them where he would by the magic of  
 his entreaty,"<sup>S</sup> from which the  
 Pythagoreans learned by chance that  
 musical sounds soothe angry souls, and  
 Asclepiades<sup>T</sup> too, who many times  
 quieted discord among people in this  
 way, and with the sound of the trumpet  
 restored hearing to the deaf.

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<sup>S</sup> Translation by Edward Henry Blakeney in  
 Quintus Horatius Flaccus, *The Complete Works*  
*of Horace*, Casper J. Kraemer, Jr, ed. (New  
 York: Modern Library, 1936), 410.

<sup>T</sup> Asclepiades (124 - c. 40 B.C.E.), a Greek  
 physician who practiced in Rome, was a pioneer  
 in the humane treatment of mental disorders,  
 using music as one of his therapies.

Parimente Damone Pithagorico ridusse col canto a temperate & honesta vita alcuni gioueni dedici al vino & alla lussuria.<sup>34</sup> Et però ben dissero coloro,<sup>35</sup> che affermauano la Musica esser vna certa legge & regola di modestia. Et dico che<sup>36</sup> Theophrasto ritrouò alcuni Modi musicali da racchetare gli spiriti perturbati. Però meritamente, & sapientemente Diogene Cinico beffaua li Musici de suoi tempi, li quali hauendo le chorde delle loro cetere concordi, haueano l'animo incomposto & discorde, essendo abbandonato dall'harmonia de costumi.

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<sup>35</sup> 1573, *Et però ben differo coloro.* reads *La onde differo ben coloro...*

<sup>36</sup> 1573, *Et dico che* reads *essendoche.*

In the same way, Damon the Pythagorean<sup>U</sup> used song to restore several youths who were given to wine and wantonness to a temperate and honest life. Thus, those who affirmed that music is [governed by] a certain law and rule of modesty were justified. And I add that Theophrastus<sup>V</sup> discovered some musical modes that quieted perturbed spirits. However, Diogenes the Cynic meritoriously and wisely mocked the musicians of his times, who [although] the strings of their kitharas were in tune, yet had untidy and discordant souls, having abandoned the harmony of moderation.

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<sup>U</sup> Damon (fl. fifth century B.C.E.), a Pythagorean philosopher from Syracuse, was proverbial for his willingness to face execution in place of his friend Pythias.

<sup>V</sup>Theophrastus (c. 372 - c. 287 B.C.E.), a Peripatetic philosopher and disciple of Aristotle, succeeded Aristotle as the head of the Lyceum in Athens.

Et se douemo<sup>37</sup> prestar fede alla historia, ci  
 debbe parer quasi nulla quello, ch'abbiamo  
 detto: percioche molto maggior cosa è  
 l'hauere virtù di sanar gl'infermi, che di  
 coreggere la vita di sfrenati gioueni, come  
 ancora leggemo di Senocrate, il quale col  
 suono de gli organi ridusse li pazzi alla  
 pristina sanità; & di Talete di Candia, che  
 col suono della Cetera scacciò la  
 pestilenza. Et noi vedemo hoggidi, che per  
 via della Musica si oprano cose  
 marauigliose:

And if we are to give credence to  
 history, what we have said must seem as  
 nothing, because having the power to  
 cure the sick is a much greater thing  
 than straightening the path of unbridled  
 youth, as again we read in Xenocrates,<sup>w</sup>  
 who with the sound of instruments  
 returned the insane to complete sanity;  
 and of Thaletus of Crete,<sup>x</sup> who with the  
 sound of the kithara drove away  
 pestilence. And we see nowadays that by  
 means of music marvelous things come  
 about,

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<sup>37</sup> 1573, *Et se douemo* reads *Et se dobbiamo*.

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<sup>w</sup> Xenocrates (d. 314 B.C.E.) was at one time head of Plato's Academy. His writings exist today only in fragments. Xenocrates held that in the realm of philosophy, ethics supersedes speculation. He is sometimes considered an Atomist because of his view that matter is composed of indivisible units, and his view on acoustics is that sound perceived as a single entity actually consists of discrete sounds.

<sup>x</sup> According to Boethius, Thaletas of Gortyne in Crete (fl. seventh century B.C.E.), imparted the discipline of musical knowledge to children. Plutarch credited Thaletas with the second establishment of music in Sparta.

imperoche tanta è la forza de i suoni & de i balli contra il veleno delle Tarantole, che in breuissimo tempo risana color, che da esse sono stati morsi: come si vede ogni giorno per esperienza nella Puglia paese abundantissimo de tali animali.<sup>38</sup> Ma senza più testimonij profani, non hauemo<sup>39</sup> noi nelle Sacre lettere, che il profeta Dauid racchetaua lo spirito maligno di Saul con suono della sua Cetera?<sup>40</sup>

because such is the power of sound and dance against the poison of the tarantula, that after a short time those who have been bitten are healed, as one witnesses every day firsthand in Puglia, a country that abounds in these creatures. Notwithstanding further testimony from the secular, does it not say in the Holy Bible that the prophet David contained the evil spirit within Saul with the sound of his kithara?

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<sup>38</sup> 1573, Zarlino's marginal note: *Alexan. ab Alex. lib.2 c.16 Geni. Die.* (Alessandro Alessandri, *Dies geniales [Genial Days]*, Book 2, Chapter 16.

<sup>39</sup> 1573, *hauemo* reads *habbiamo*.

<sup>40</sup> 1573, Zarlino's marginal note: *I. Reg. c. 6.* (1 Samuel 16:23).

Et per questo credo io, che esso regio  
 Profeta ordinasse, che nel Tempio d'Iddio  
 si vsassero li canti & gli harmonici suoni,  
 conoscendo che erano atto a rallegrare gli  
 spiriti, & a ridur gli huomini alla  
 contemplatione delle cose celesti.<sup>41</sup> Li  
 Profeti ancora, (come dice Ambrosio  
 sopra'l Salmo 118.) volendo profetizare  
 dimandauano, ch'vno perito del suono si  
 mettesse<sup>42</sup> a sonare; accioche inuitati da  
 quella dolcezza gli fusse infusa la gratia  
 spirituale.

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<sup>41</sup> 1573, Zarlino's marginal note: *I. Paral. c. 15* (2 Chronicles 7:6.)

<sup>42</sup> 1573, *mettesse* reads *ponesse*.

And because of this I believe that this  
 royal prophet ordained that songs and  
 harmonious sounds were to be used in  
 the Temple of the Lord, knowing that  
 they were able to refresh spirits and  
 bring men to the contemplation of  
 celestial things. In his commentary on  
 Psalm 118, Ambrose held that the  
 prophets, wishing to foretell the future,  
 requested that a gifted musician start to  
 play so that, moved by such sweetness,  
 they would be infused with spiritual  
 grace.

Però Eliseo non volse profetizare al Re d'Israele quel, che douesse fare per l'acquisto delle acque, accioche gli esserciti non morissero di sete;<sup>43</sup> se prima non gli fu menato al suo conspetto vn Musico, il quale cantasse; & cantando egli fu dello Spirito diuino ispirato, & predisse il tutto. Ma passiamo più oltra: percioche non mancano gli essempij. Timotheo (si come insieme con molti altri narra il Gran Basilio<sup>44</sup>) con la Musica incitaua il Re Alessandro al combattere; & quello medesimo essendo incitato riuocaua.

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<sup>43</sup> 1573, Zarlino's marginal note: *4. Reg. c.3. (2 Kings 3:9-19)*.

<sup>44</sup> 1573, Zarlino's marginal note: *Homil. 54. Ad Adolescentes* (St. Basil the Great, *Homilies to Adolescents*).

Moreover, Elisha refused to prophesy to the king of Israel on what he had to do to obtain water so that his troops would not die of thirst until he [Elisha] was presented with a musician whose singing would evoke the divine spirit, enabling him to predict everything. But let us continue further because there is no lack of examples. Timotheus (as, among many others, Basil the Great<sup>Y</sup> said) used music to exhort King Alexander to fight, and in the same way, [when the king was] being [over]excited, [Timotheus] urged [him] to retreat.<sup>Z</sup>

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<sup>Y</sup> St. Basil the Great (329-379 C.E.), an early Church father, wrote works on monasticism, theology, and canon law.

<sup>Z</sup> Timotheus of Miletus (c. 446 - c. 357 B.C.E.) was an innovative Greek poet and musician. Boethius credits Timotheus with adding a string to the lyre. Timotheus supposedly sang a particular *nomos*, or air, whose every element contributed to its warlike character, and spurred King Alexander to take up arms and exclaim that "this was the kind of song worthy of a king" (Palisca, *Humanism*, 92).

Narra Aristotele<sup>45</sup> nel libro della natura degli animali, che li Cerui per il canto de cacciatore sono presi, & della Sampogna pastorale, & del canto ancora molto si dilettono; il che conferma Plinio<sup>46</sup> nella sua naturale historia. Et per non mi distendere più sopra di questo, solamente dirò di conoscere alcuni i quali hanno veduto de i Cerui, che fermando il lor corso se ne stauano attenti ad ascoltare il suono della Lira, & del Leuto; & medesimamente si vede ogni giorno gli vcelli vinti & ingannati dall'harmonia, il più delle volte restare presi dall'vcellatore.

In his book on the nature of animals, Aristotle states that deer are captivated by the song of the hunter, and that they are also much delighted by shepherds' bagpipes and by song; this is confirmed by Pliny in his natural history. And so as not to discuss this matter further, I will say only that I know some who have seen deer stopped in their tracks to stand at attention and listen to the sound of the lyre and the lute; and similarly, every day one sees birds vanquished and deceived by harmony, ensnared most of the time by the bird-catcher.

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<sup>45</sup> 1573, Zarlino's marginal note: *Lib. 9.c.5.* (Aristotle, *On the Nature of Animals*, Book 9, Chapter 5).

<sup>46</sup> 1573, Zarlino's marginal note: *Lib. 8.c.32.* (Pliny, *Natural History*, Book 8, Chapter 32).

Narra etiando Plinio,<sup>47</sup> che la Musica  
 campò Arione dalla morte, che  
 precipitandosi nel mare, fu portato dal  
 Delfino nel lito di Tenaro isola. Ma  
 lasciamo stare hormai molti altri essempli,  
 che potremmo addurre, & diciamo vn poco  
 del buon Socrate maestro di Platone, che  
 già vecchio & pieno di sapienza volse  
 imparare a sonar la cetera, & il vecchio  
 Chirone tra le prime arti che insegnasse ad  
 Achille nella tenera età, fu la Musica; &  
 volse, che le sanguinolenti sue mani, prima  
 che s'imbrattassero del sangue Troiano,  
 sonassero la Cetera.

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<sup>47</sup> 1573, Zarlino's marginal note: *Nat. hist., lib. cap.*  
 8 (Pliny, *Natural History*, Chapter 8).

Pliny also says that music rescued Arion  
 from death: having thrown himself into  
 the sea, [Arion] was carried by a dolphin  
 to the bank of the island of Taenarum.<sup>AA</sup>  
 But let us now leave aside many other  
 examples that we might adduce, and  
 speak about the good Socrates, Plato's  
 teacher, who, already old and full of  
 wisdom, wanted to learn to play the  
 kithara, and of old Chiron, who taught  
 music among the very first arts to  
 Achilles [when Achilles was] at a tender  
 age. [Chiron] wished [Achilles] to bloody  
 his hands playing the kithara before  
 soiling them with Trojan blood.

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<sup>AA</sup> Greek legend relates that when Arion, a  
 renowned musician, was returning to his home in  
 Corinth from a competition in Sicily, he was  
 overcome by sailors on his ship who wished to  
 kill him and steal his prize. Offered the choice of  
 death on the ship at the hands of the sailors or  
 being thrown into the sea, Arion opted to cast  
 himself into the water. Before doing so, he sang  
 a hymn to Apollo. The dolphins that lived in the  
 sea were so moved by Arion's music that one of  
 them carried him safely to shore. Access to Hades  
 was possible through a cave on Taenarum.  
 Taenarum is actually a peninsula in southern  
 Greece

Platone<sup>48</sup> & Aristotele<sup>49</sup> non comportano,  
 che l'huomo bene istituito sia senza  
 Musica: anzi persuadono con molte ragioni  
 tale scienza douersi imparare; & mostrano  
 la forza della Musica esser in noi  
 grandissima; & perciò uogliono, che dalla  
 fanciullezza vi si dia opera: conciosia che è  
 sufficiente a indurre in noi vn nuouo habito  
 & buono, & vn costume tale, che ne guida  
 & conduce alla virtù, & rende l'animo più  
 capace di felicità; & il seuerissimo Licurgo  
 Re de Lacedemonij tra le sue seuerissime  
 leggi lodò, & sommamente approuò la  
 Musica; percioche molto ben conosceua,  
 che all'huomo era necessaria molto, & di  
 giouamento grandissimo nelle cose della  
 Guerra;

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<sup>48</sup>1573, Zarlino's marginal note: *De Legibus*. 3  
 (Plato, *Laws*, 3)

<sup>49</sup> 1573, Zarlino's marginal note: *Polic. c.3*.  
 (Aristotle, *Politics*, Chapter 3).

Plato and Aristotle hold that a man  
 cannot be well educated without music;  
 rather, they argue for many reasons that  
 this science be learned, and demonstrate  
 the power of music to be very great  
 within us. For this reason they want it to  
 be practiced from childhood, because it  
 suffices to induce new and good habits  
 in us such as those that guide and lead us  
 to virtue and render the spirit more  
 capable of happiness. The most severe  
 Lycurgus,<sup>BB</sup> king of Lacedaemon,  
 praised and highly approved of music in  
 his very strict laws because he knew  
 well that it was most necessary to  
 mankind and granted great benefit in  
 matters of war.

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<sup>BB</sup> Lycurgus (c. 390 - c. 324 B.C.E.), an Athenian  
 statesman and orator, was noted for his efficient  
 financial administration and vigorous  
 prosecution of officials charged with corruption.

di modo che i loro esserciti (come narra Valerio<sup>50</sup>) non vsauano di andar mai a combattere, se prima non erano ben riscaldati & inanimati dal suono di Pifferi. Osseruasi ancora tal costume alli tempi nostri; percioche di due esserciti l'uno non assalirebbe l'inimico, se non inuitato dal suono delle Trombe & de Tamburi, ouero da alcun'altra sorte de musicale istrumenti. Et benche, oltre li narrati, non manchino infiniti altri essempli, dalli quali si potrebbe maggiormente conoscere la dignità, & eccellenza della Musica; nondimeno, per non andar più in lungo, gli lassaremo, essendo a bastanza quello, che fin hora si è ragionato.

Thus, their armies (as Valerius Maximus relates) never used to go into combat if they had not first been enflamed and inspired by the sound of fifes. This custom is still observed in our times, because one army does not attack the enemy if not encouraged by the sound of trumpets and drums, or some other kind of musical instrument. And although in addition to what has already been said many other examples are not lacking from which one can better learn of the dignity and excellence of music, nevertheless, for the sake of brevity, we will leave them aside, since what has been already discussed is sufficient.

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<sup>50</sup>1573, Zarlino's marginal note: *Dict. Fact. lib.2.ca.1.* (Valerius Maximus, *Nine Books of Memorable Deeds and Sayings*, Book II, Chapter 1).

[8] A che fine la Musica si debba imparare.

/ Cap. 3.

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Ma perche di sopra si è detto, che l'huomo bene istituito non debbe esser senza Musica; però douendola imparare, auanti che piu oltra passiamo, voglio che veggiamo qual fine egli si debba proporre, poi che intorno a ciò sono stati diuersi pareri; il che veduto, vederemo ancora l'vtile, che dalla Musica ne viene, & in qual maniera la douemo<sup>1</sup> vsare.

Incominciando adunque dal primo dico, che sono stati alcuni, li quali hanno hauuto parere, che la Musica si douesse imparare per dar solazzo & diletatione all'vdito; non per altra ragione, se non per far diuenir perfetto questo senso, nel modo che diuenta perfetto il vedere, quando con diletatione & piacere riguarda vna cosa bella & proportionata:

To What End Music Must be Learned /

Chapter 3

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Since we have said above that a well-educated man must not do without music, therefore, as he has to learn it, before we go any further I want us to see what goal he must set for himself, because several opinions have been expressed on this matter. Having done that, we will also see the benefit that derives from music and in what manner music must be used.

Therefore, to begin with the first proposition, I say that there have been some who believed that music was to be learned to give solace and delight to the hearing, for no other reason than to perfect this sense just as sight is perfected when one takes pleasure and delight in seeing a beautiful and proportionate thing.

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<sup>1</sup> 1573, *douemo* reads *dobbiamo*.

Ma in vero non si debbe imparare a questo fine; imperoche è cosa da volgari & da meccanici: essendo che queste cose non hanno in se parte alcuna di virtuoso (ancora che acchetando l'animo habbiano del diletteuole) & sono cose da huomini grossi, li quali non cercano se non di soddisfare al senso, & a questo solo fine attendono. Altri poi voleuano, che ella s'imparasse, non ad altro fine, se non per esser posta tra le discipline liberali, nelle quali solamente i nobili si essercitauano; & per che dispone l'animo alla virtù, & regola le sue passioni, con auezzarlo a rallegrarsi, & a dolersi virtuosamente, disponendolo alli buoni costumi, non altramente di quello, che fa la Ginnastica il corpo a qualche buona dispositione & habitudine; & anche a fine di potere con tal mezzo peruenire alla speculatione diuersi sorti di harmonia: poi che per essa l'intelletto conosce la natura delle musicali consonanze.

But in truth, one must not learn with this goal [in mind] because that would be for common people and laborers, since these [goals] have nothing virtuous in themselves (even though by calming the spirit they bring delight) and belong to uncouth individuals whose only goal is to achieve sensual satisfaction. Then, others wanted music to be learned for no other reason than its being one of the liberal arts which were only practiced by the nobility and because it predisposes the soul to virtue, regulates its passions, accustoms it to feel joy and pain with grace, predisposing it [the soul] to good manners in the same way that gymnastics trains the body to such good dispositions and habits. [They also believed that music had to be learned] in order to be able through it to examine different types of harmony, since in this way the intellect recognizes the nature of musical consonances.

Et quantunque questo fine habbia  
 dell'honesto, non è però a bastanza:  
 imperoche colui il quale impara la Musica,  
 non solo l'impara per acquistar la  
 perfettione dell'intelletto; ma per potere,  
 quando cessa dalle cure & negocij si del  
 corpo, come dell'animo; cioè quando è in  
 ocio, & fuori delle cottidiane occupationi,  
 passare il tempo, & trattenersi  
 virtuosamente; accioche rettamente &  
 lodeuolmente viuendo lontano dalla  
 pigritia, per tal mezzo douenti<sup>2</sup> prudente, &  
 trappassi poi a fare cose migliori & più  
 lodeuoli. Il qual fine non solo è degno di  
 laude & honesto<sup>3</sup>, ma è il vero fine;  
 percioche non fu ritrouata la Musica, ouero  
 ordinata ad altro fine, se non a quello,  
 ch'habbiamo mostrato di sopra;

And although this goal may be honest, it  
 is not, however, enough, because he who  
 learns music not only learns it to acquire  
 perfection of the intellect, but once the  
 cares and entanglements of the body and  
 the soul cease, that is, when he is idle and  
 free of daily affairs, to be able to pass the  
 time and entertain himself virtuously, so  
 that living correctly and in praiseworthy  
 fashion far from laziness, by such means  
 he may become prudent and then begin  
 to do better and more praiseworthy  
 things. This goal is not only  
 praiseworthy and honest, but is the true  
 goal, because music was not discovered  
 or ordained for any other purpose than  
 what we have shown above,

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<sup>2</sup> 1573, *douenti* reads *diuenti*.

<sup>3</sup> 1573, *laude & honesto* reads *laude & è honesto*.

si come nella sua *Politica* il Filosofo<sup>4</sup> lo manifesta, adducendo & raccontando molte autorità di Homero. Onde meritamente gli antichi la collocorno nell'ordine di quelli trattenimenti, che serueno a gli huomini liberi, & tra le discipline lodeuoli, & non tra le necessarie, si come è l'Arithmetica; ne anche tra le vtili, come sono alcune, le quali sono per l'acquisto solamente de beni esteriori, che sono li denari, & l'vtile della famiglia; ne tra alcune altre, le quali serueno alla sanità del corpo, & alla fortezza, come la Ginnastica; che è un'arte appartenente alle cose, che giouano a far sano & forte il corpo, come è fare alla lotta, lanciare il palo, & altre cose, che appartengono all'essercitio della guerra.

as the Philosopher demonstrates in his *Politics*, drawing from and citing many of Homer's works. Hence the ancients meritoriously placed it in the ranks of those entertainments that serve free men, and among the praiseworthy disciplines and not among the necessary [disciplines] like arithmetic. Neither [is it] among the utilitarian [disciplines], as are some that are solely for the acquisition of external goods such as money and the benefit of the family, nor among others that serve the health and strength of the body, such as gymnastics, which is an art pertaining to things that help make the body healthy and strong, as are wrestling, hurling the javelin, and other things that pertain to the waging of war.

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<sup>4</sup> 1573. Zarlino's marginal note: *Lib. 8. c. 5* (Aristotle, *Politics*, Book 8, Chapter 5)

Si debbe adunque imparar la Musica, non come necessaria: ma come liberale & honesta; accioche col suo mezzo possiamo peruenire ad vn'habito buono & virtuoso, che ne conduca nella via de buoni costumi; facendone caminare ad altre scienze più vtili, & più necessarie; & ne faccia trappassare il tempo virtuosamente: & questo debbe essere la principale, o vltima intentione, che dire la vogliamo. Ma in qual modo habbia possanza d'indur nuoui costumi, & muouer l'animo a diuerse passioni, ne ragionaremo in altro luogo.

Therefore, one must learn music not as a necessity, but as [something] liberal and honest, so that through it we can acquire good and virtuous habits that guide [us] to a life of good manners, helping us move toward other more useful and necessary sciences. What we mean to say is that its main or ultimate goal must be to help us pass the time virtuously. But we will discuss elsewhere the manner in which [music] may have the power to change behavior and move the soul to diverse passions.

Dell'vtile che si ha della Musica, & dello studio che vi douemo porre, & in qual modo vsarla. / Cap. 4.

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Grande è veramente l'vtile, che dalla Musica si piglia, quando la vsiamo temperatamente: imperoche è cosa manifesta, che non pur l'huomo, ilquale è capace di ragione: ma anche molti de gli altri animali, che di essa mancano, si comprende, che pigliano diletatione & piacere: percioche diletlandosi et rallegrandosi ogn'animale della proportione & temperamento delle cose; & ritrouandosi nelle harmonie tali qualità, ne segue immediatamente il piacere & la diletatione a tutti li viuenti commune. Et è in vero cosa ragioneuole; poi che la natura consiste in tale proportione & temperamento, che ogni simile si diletta del suo simile, & quello appetisce.

On the Uses of Music, and On How It Must Be Studied, and In What Way to Use It / Chapter 4

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The utility that we derive from music when we use it moderately is truly great, since it is obvious that not only man, who is capable of reason, but also many other animals that lack [reason] derive delight and pleasure [from music]. Because each animal experiences delight and joy from the proportion and temperament of things, and because such qualities can be found in harmonies, pleasure and delight common to all living things immediately ensue. And it is in truth a reasonable thing, since nature consists of such proportion and temperament that every creature takes delight in and desires its own kind.

Di ciò ne danno chiarissimo indicio li fanciulli a pena nati, che presi dalla dolcezza del canto delle voci delle loro nutrici, non solo dopo il lungo pianto si racchetano, ma si rendono allegri, facendo anche [9] spesse volte alcuni gesti festuoli. Et è a noi la Musica tanto naturale, & in tal modo a noi congiunta, che vedemo ciascuno in vn certo modo volerne dare qualche giudizio, ancora che imperfettamente. Per la qual cosa si potrebbe dire, colui non essere composto con harmonia, il quale non piglia diletto della Musica; percioche (si come habbiamo detto) se ogni diletatione & piacere nasce dalla similitudine, è necessario, che colui, il quale non hà piacere dell'harmonia, in vn certo modo ella non si troui in che lui, & di essa<sup>1</sup> sia ignorante.

The clearest indication of this comes from newborn babies who, taken by the sweetness of the songs of the voices of their nurses, not only become quiet after a long crying spell, but become cheerful, oftentimes also making happy gestures. And music is to us so natural, and joined to us in such a manner that we observe everyone wanting in some way to form his own judgment about it, albeit imperfectly. For this reason it might be said that he who does not take delight in music is not a harmonious person, because (as we have already said) if every delight and pleasure is born of similarity it necessarily follows that he who does not take pleasure in harmony, in a certain way does not possess and is ignorant of [harmony] itself.

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<sup>1</sup> 1573, *non si troui in che lui, & di essa* reads *non si troui in lui, & che di essa*.

Et se bene si vorrà esaminare la cosa, si ritrouerà costui esser di bassissimo ingegno, & senza punto di giudicio; & si potrebbe dire, che la natura gli hauesse mancato, non gli hauendo proportionatamente formato l'organo: essendo<sup>2</sup> che quella parte, la quale è per mezzo il ceruello, & è più vicina all'orecchia, quando è proportionatamente composta, serue ad vn certo modo al giudicio dell'harmonia, dalla quale l'huomo, come da cosa simile, è preso & vinto, & in essa molto si compiace: Ma se auiene che priua di tal proportione, molto meno di ciascun'altro di essa prende diletto; & è in tal modo atto alle cose speculatiue & ingegnose, come l'Asino alla Lira.<sup>3</sup>

And if we want to examine this matter well, we will find that person to be of the lowest intelligence and with no judgment at all, and we could say that nature did not serve him well, not having shaped proportionately the body part which, placed in the center of the brain and closest to the ear, if proportionately composed, serves in a certain way to judge harmony, by which man, because of a natural affinity, is captivated and conquered, and in which he finds much solace. But if it happens that such proportion is missing, he will take much less delight in it than anyone else. He will thus be predisposed to speculative and ingenuous things, as the jackass who plays the lyre.

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<sup>2</sup> 1573, *essendo* reads *poiche*.

<sup>3</sup> 1573, *si dice in prouerbio* ([as] the proverb relates), inserted.

Et se vogliamo in ciò seguire l'opinione degli Astrologi, diremo, che nel suo nascimento Mercurio gli sia stato inimico, si come è fauoreuole a coloro, li quali non pur dell'harmonia si diletmano: ma non si sdegnano, per alleuiamento delle loro fatiche, essi medesimi cantare & sonare, ricreandosi lo spirito, & riacquistandogli le smarite forze. Et però bene hà ordinato la natura, che hauendo in noi, mediante lo spirito, congiunto insieme (come vogliono i Platonici) il corpo & l'Anima; a ciascun di loro, essendo deboli & infermi, hà proueduto di oportuni rimedij: impero che il Corpo<sup>4</sup> languido & infermo si viene a risanare co rimedij, che li porge la Medicina; & lo Spirito afflito & debole da gli spiriti aerie, & dalli suoni & canti, che gli sono proportionate rimedij:

And if we wish to follow the opinion of the astrologers in this matter, we will say that at [this man's] birth Mercury had been his enemy just as he is favorable, instead, to those who not only take delight in harmony but in order to alleviate their labors are not above singing and playing in order to refresh their spirits and regain their lost strength. And therefore it is good that nature ordained that our body and soul are joined together by means of the spirit (as the Platonists believe). To each of them [the body and the soul], when weak and infirm, it has provided opportune remedies, because the languishing and sick body is cured with the remedies that medicine offers, and the afflicted and weak soul [is cured] by the spirits of the air and the sounds and songs that are its appropriate remedies.

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<sup>4</sup> 1573, *impero che il Corpo* reads *imperoche essendo il Corpo*.

l'Anima poi, rinchiusa<sup>5</sup> in questo corporeo carcere, si consola per via de gli alti & diuini misterij della sacra Theologia. Tale vtile adunque ne apporta la Musica, & di piu; che scacciando la noia, che si piglia per le fatiche, ne rende allegri, & l'allegrezza raddoppia & conserva.<sup>6</sup> Noi vedemo li Soldati andare ad assalire l'inimico molto più ferocemente, incitati dal suono delle Trombe & de Tamburi; & non pur essi, ma li Caualli ancora muouersi con grande empito. Questa eccita l'animo, muoue gli affetti, mitiga & accheta la furia, fa passare il tempo virtuosamente, & hà possanza di generare in noi vn'habito di buoni costumi; massimamente quando con li debiti modi & temperatamente è vsata:

The soul then, encased in this bodily prison, is consoled by the exalted and divine mysteries of sacred theology. Music thus brings such usefulness and more, because by driving away the boredom that is brought about by fatigue it makes one cheerful, and doubles and conserves joy. We notice soldiers besiege the enemy much more ferociously [when] incited by the sound of trumpets and drums; not only [soldiers], but horses are also moved with great alacrity. This [music] arouses the soul, moves the affections, mitigates and calms anger, makes time pass virtuously, and has power to generate in us the habit of good manners, most especially when it is used in proper and temperate fashion.

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<sup>5</sup> 1573, è *recreato* (is refreshed) inserted.

<sup>6</sup> 1573, *l'allegrezza raddoppia & conserva* reads, *raddoppia l'allegrezza et la conserva*.

imperoche essendo l'vfficio proprio della  
 Musica il dilettere, non dishonestamente,  
 ma honestamente quella douemo  
 vsare;accioche non c'intrauenga quello, che  
 suole intrauenir a coloro, che  
 smisuratamente beuono il Vino; li quali poi  
 riscaldati, nuoceno a se stessi, et facendo  
 mille pazzie muoueno a riso chiunque li  
 vede: Non per che la natura del Vino sia  
 tanto maligna, che quando temperatamente  
 si beua, operi nell'huomo simil effetto: ma  
 si mostra tale a colui, che lo beue  
 auidamente: conciosia che tutte le cose  
 sono buone, quando temperatamente si  
 vsano a quel fine, che sono state ritrouate  
 & ordinate: ma quando sono  
 intemperatamente vsate, & non secondo il  
 debito fine, nuoceno, & sono pernitiouse.  
 Di modo che potemo tenere questo per  
 vero, che non pur le cose naturali: ma ogni  
 arte, & ogni scienza possono essere buone  
 & cattie, secondo che sono vsate:

Because the proper office of music is to  
 delight, we must not use it dishonestly,  
 but honestly, so that we do not fall victim  
 to what happens to those who drink far  
 too much wine; having become inflamed,  
 they harm themselves and, committing a  
 thousand follies, move whoever sees  
 them to laughter. Not that the nature of  
 wine is so malignant that when one  
 drinks it temperately, such an effect  
 occurs in man, but it becomes evident in  
 those who drink avidly. All things are  
 good when they are used moderately for  
 the purpose for which they were intended  
 and ordained, but when they are used  
 immoderately and not according to their  
 goal, they are harmful and pernicious.  
 We can hold as truth that not only natural  
 things but every art and science can be  
 good and bad according to how it is used.

buone dico, quando sono indirizzate a quel fine, al quale sono state ordinate; & cattive, quando da quel fine si allontanano.

Essendo adunque nato l'huomo a cose molto più eccellenti, che non è il Cantare, o sonare di Lira, o altre sorti d'istrumenti per soddisfare solamente al senso dell'vdito, male *vsa*<sup>7</sup> la sua natura, & deuisa dal proprio fine, poco curandosi di dare il cibo all'intelletto; il quale sempre desidera sapere & intendere nuove cose. Non debbe adunque l'huomo solamente imparar l'arte della Musica; & ritrarsi dall'altre scienze, abbandonando il suo fine; che sarebbe gran pazzia: ma debbe impararla a quel fine, al quale è stata ordinata; Ne debbe spendere il tempo solamente in essa:

And I say [art and science are] good when they are addressed to the end to which they were ordained, and bad when they are estranged [from that end].

Since, therefore, man was born to do more excellent things than sing, or play the lyre or other kinds of instruments, he abuses his nature and deviates from his own goal when he only satisfies his sense of hearing, paying little attention to feeding the intellect, which always yearns to know and understand new things. Thus, man must not learn solely the art of music while withdrawing from the other sciences, abandoning his larger goal. This would be great insanity; he must learn [music] toward the end to which it was ordained. Nor must he spend time only on [music],

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<sup>7</sup> 1573, *male vsa* reads, *vsa male*.

ma debbe accompagnarla con lo studio della speculatiua; accioche da quella aiutato,<sup>8</sup> possa venire in maggior cognitione delle cose, che all'vso di essa appartengono; & mediante quest'vso possa ridurre in atto quello, che per lungo studio speculando hà inuestigato: imperoche accompagnata in tal modo porta vtile ad ogni scienze, & ad ogni arte, come altre volte habbiamo veduto.<sup>9</sup> Et se facesse altramente, non gli sarebbe tal cosa di molta vtilità, ne di molta Gloria; anzi se gli attribuirebbe a vitio: conciosia che l'essercitarsi continouamente in essa senza alcun'altro studio, induce sonnolenza & pigritia; & rende gli animi molli & effeminate: la qual cosa conoscendo gli antichi, volsero, che lo studio della Musica alla Ginnastica fusse congiunto:

but must accompany it with the study of theory so that, aided by that, he may come to know of things that pertain to its use, and through this use be able to put into practice what he investigated through long, speculative study. Accompanied in such fashion, music brings benefit to each science and each art, as we have seen elsewhere. And if man did otherwise [music] would not be a useful thing to him, nor would it grant him much glory. On the contrary, it would be considered as his vice, because practicing it continuously with no other study induces sleepiness and laziness and makes souls weak and effeminate. The ancients, knowing this, wanted the study of music to be conjoined with that of gymnastics.

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<sup>8</sup> 1573, *da quella aiutato* reads, *aiutato da quella*.

<sup>9</sup> 1573, Zarlino's footnote: *Sopra, c. 2.* (above, Chapter 2).

ne voleuano, che si potesse dar opera  
 all'vna senza l'altra; & questo faceuano,  
 accioche per il darsi troppo alla Musica,  
 l'animo non venisse a farsi vile; & dando  
 opera solamente alla Ginnastica, gli animi  
 non diuenissero oltra modo feroci, crudeli,  
 & inhumani: ma da questi due essercitij  
 insieme aggiunte si rendessero humani,  
 modesti, & temperate. Et a far ciò si  
 mossero con ragione, che chiara- **[10]**  
 mente si può vedere, che coloro i quali  
 nella giouentù,<sup>10</sup> lassati<sup>11</sup> li studij delle cose  
 di maggiore importanza,

They did not want one to be practiced  
 without the other, and they did this so  
 that the human soul would not become  
 cowardly by giving itself entirely to  
 music, and would not become overly  
 ferocious, cruel, and inhumane by giving  
 itself solely to gymnastics. But from the  
 practice of these two disciplines [music  
 and gymnastics] joined together, people  
 would thus be rendered humane, modest,  
 and temperate. And they were right in  
 doing this, because one can clearly see  
 that those who in their youth abandoned  
 the study of matters of major  
 importance.

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<sup>10</sup> 1573: *loro* added after *giouentù*.

<sup>11</sup> 1573, *lassati* reads *lasciati*.

si sono dati solamente a conuersare co  
gl'Istrioni, & co parasiti, stando sempre  
nelle schuole di giuochi, di balli, & di salti,  
sonando la Lira & il Leuto, & cantando  
canzoni meno che honeste, sono molli,  
effeminate, & senza alcuno buon costume.  
Impero che la Musica in tal modo vsata,  
rende gli animi de giouani mal composti,  
come bene lo dimostrò Ouidio dicendo;  
Eneruant animos citharae, cantusque  
lyraeque, / Et vox, & numeris brachia mota  
suis.<sup>12</sup>

Ne di altro fanno ragionare che di tali  
cose: ne altro che dishoneste parole dalla  
loro sporca bocca si sentono vscire.

and gave themselves solely to converse  
with histrions and parasites, always  
dwelling in schools of gambling,  
dancing, and acrobatics, playing the lyre  
and the lute, and singing less-than-  
honest songs, are weak, effeminate, and  
lack good manners. Music used in such  
a manner dissipates the souls of young  
men, as Ovid well demonstrated, saying,  
“Zithers and songs and lyres enervate  
the mind, and the voice and limbs [are]  
moved by their rhythms.”<sup>A</sup> Neither can  
they reason about matters other than  
these, nor can anything other than  
dishonest words be heard from their  
dirty mouths.

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<sup>12</sup> 1573, Zarlino's marginal note: *De Remed. lib. 2.*  
(Ovid, *The Art of Love*, Book 2).

<sup>13</sup> 1573, *essi* reads *essere*.

<sup>14</sup> 1573, *non* omitted.

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<sup>A</sup> My translation.

Per il contrario poi, sono alcuni, li quali per tale studio non solo molli & effeminate: ma importuni, dispiaceuoli, superbi, pertinaci, & inhumani diuentano; di modo che vedendosi ad vn certo termine arriuati, stimandosi sopra d'ogn'altro eccellenti, si gloriano, si essaltano, si lodano, & vituperando gli altri, per parere essi<sup>13</sup> pieni di sapienza & di giudicio, stanno con la maggior riputatione & superbia del mondo: ne mai se non con grande instantia di prieghi, & con laudi molto maggiori che a loro non<sup>14</sup> conuengono, si possono ridurre a mostrare vn poco del loro sapere. Per la qual cosa di tutti questi Tigelij si verifica il detto di Horatio, il quale dice;

On the contrary, then, there are some who by such study become not only weak and effeminate but also bothersome, unpleasant, haughty, obstinate, and inhumane. Imagining themselves having arrived at a certain station [in life], and deeming themselves above all other worthy fellows, they glorify, exalt, and praise themselves, and slander others so as to appear full of wisdom and good judgment and claim the highest reputation and haughtiness in the world. Only after insistent pleas, and praises much greater than they deserve, do they deign to show a little of their knowledge. For this reason, what Horace said about all these Tigelliuses<sup>B</sup> rings true:

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<sup>B</sup> Marcus Tigellius Hermogenes, a renowned singer, was an influential friend of Julius Caesar. Generous to the flute-girls and mountebanks that swarmed the Roman streets, he exhausted his inherited wealth on luxuries.

Omnibus hoc vitium est cantoribus, inter  
amicos, / Vt nunquàm inducant animum  
cantare rogati, / Iniussi nunquàm  
desistant.<sup>15</sup>

A tali faceui dibisogno, che li lor padri<sup>16</sup>  
più presto haessero fatto insegnare  
qualch'altro mestiero, quantunque vile, che  
forse non sarebbero caduti in tali errori, et  
harebbero acquistate migliori creanze.  
Tutto questo hò voluto dire, accioche  
quelli, che dell'arte della Musica vogliono  
fare professione, s'innamorino della  
scienza, & diano opera allo studio della  
speculatiua: percioche non dubito, che  
congiungendo insieme queste cose, non  
habbiano da diuentare virtuosi, honesti, &  
costumati: et in tal modo veranno ad  
imitare gli antichi;

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<sup>15</sup> 1573, Zarlino's marginal note: *Scr. lib. 1. Sat. 3*  
(Horace, *Satires*, Book 1, 3).

<sup>16</sup> 1573, *li lor padri* reads *i padri loro*.

“All singers have this fault: if asked to  
sing among their friends they are never  
so inclined; if unasked, they never leave  
off.”<sup>C</sup> These people would have been  
better served if their parents had taught  
them another trade, however lowly,  
earlier in life. This way, perhaps they  
would not have fallen into such error,  
and would have acquired better  
manners. All this I have wanted to say  
so that those who wish to make the art of  
music their profession may become  
enamored with its science and devote  
themselves to the study of theory,  
because I do not doubt that joining these  
things together would make them  
virtuous, honest, and well-mannered.  
And in such a way they will come to  
imitate the ancients,

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<sup>C</sup> Translation by Fairclough in *The Complete  
Works of Horace*, 33.

li quali (come si è detto) accompagnauano la Musica con la Ginnastica: percioche cosi ella sarà potente di ridurre ciascuno nella diritta via de i buoni costumi. Ne alcuno debbe credere, che quello ch'io hò detto dell'arte della Musica, l'habbia detto, ne per vituperarlo, ne coloro che in tal maniera si essercitano;<sup>17</sup> cosa che giamai non mi è caduto nell'animo: ma più tosto l'hò detto, accioche congiunta in tal modo, & ad altre honoreuoli scienze piene di seuerità, la difendiamo dalli vagabondi & otiose ruffianesmi de bagatellieri, & la riponiamo nel suo vero luogo; si che ella non habbia da seruire a coloro che sono dediti solamente alle voluttà: ma sia per vso delli studiosi delle buone scienze, & di coloro che seguitano le uirtù, costumatamente & ciuilmente viuendo.

who (as has been said) accompanied music with gymnastics, so that [music] will have the power to direct everyone to the straight path of good manners. No one should believe that what I have said about the art of music was meant to slander it, nor to slander those who practice it in such a manner. This has never entered my mind, but rather, I have spoken so that we may defend [music], conjoined in such manner with other honorable and rigorous sciences, from the vagabond and lazy ruffianism of triflers, and put it in its true place so that it may not have to serve those who are dedicated only to pure pleasure, but that it may be of use to students of the true sciences, and to those who follow virtue, living in a civilized and well-mannered fashion.

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<sup>17</sup> 1573, *l'habbia detto, ne per vituperarlo, ne coloro che in tal maniera si essercitano* reads *l'abbia detto per vituperarlo, ne anche per dir male di coloro che in tal maniera.*

Quello che sia Musica in vniuersale, &  
della sua Divisione. / Cap 5.

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Daremo adunque principio ad vno cosi  
honesto & honoreuole studio, vedendo  
prima quello che sia Musica, & dipoi di  
quante sorti si truoua, assegnando a  
ciascuna sorte la sua definitione; & questo  
faremo per non deuiare dal buon ordine,  
che hanno tenuto gli antichi; li quali  
voleuano, Che ogni ragionamento di  
qualunque cosa, che ragioneuolmente si  
faccia, debba incominciare dalla  
definitione, accioche s'intenda quello, di  
che si ha da disputare.

What Music Is in General, and  
Concerning Its Divisions / Chapter 5

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We will thus begin such an honest and  
honorable study, seeing first what music  
is, and thereafter how many categories  
[of music] there are, assigning a  
definition to each category. This we will  
do so as not to deviate from the good  
order maintained by the ancients who  
wished every reasonable discussion of  
any matter to begin with a definition, so  
that one may understand what is to be  
discussed.

Però in vniuersale parlando dico, che Musica non è altro che Harmonia; & potremo dire, che ella sia quella lite & amicitia, che poneua Empedocle, dalla quale voleua, che si generassero tutte le cose, cioè vna discordante concordia, come sarebbe a dire, Concordia di varie cose, le quali si possino congiungere insieme. Ma perche questa parola Musica hà diuerse significationi, & la ragion vuole, che ogni cosa, che porta seco molti significati, prima debba esser diuisa, che definita (massimamente volendo dichiarare ogni sua parte) però noi primamente la diuideremo dicendo; la Musica essere di due sorti, Animastica, & Organica.

Thus, generally speaking, I say that music is nothing other than harmony; and we could say it lies in that [tension between] enmity and friendship established by Empedocles<sup>A</sup> as the source of all things, that is, a discordant concord, a concord of different things that may be joined together. But because the word “music” has different meanings, and it is reasonable to say that everything that contains multiple meanings must be categorized before being defined, so that each of its parts can be clearly identified, we will first divide Music into two categories: Animastic and Organic.

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<sup>A</sup> Empedocles (c. 490-430 B.C.E.), a Greek philosopher, statesman, poet, religious teacher, and physiologist, believed that all matter was composed of four essential ingredients, fire, air, water, and earth, and that nothing either comes into being or is destroyed but that things are merely transformed, depending on the ratio of basic substances to one another. Two forces, Love and Strife, interact to bring together and to separate the four substances. Strife makes each of these elements withdraw from the others; Love makes them mingle together.

L'vna è harmonia, che nasce dalla compositione di varie cose congiunte insieme in un corpo; auenga che tra loro siano discrepanti; come è la misura de i quattro Elementi, ouero di altre qualità in vn corpo animato. L'altra è harmonia, che può nascere da varij istrumenti. Et questa di nuouo partiremo in due: percioche si ritrouano due sorti d'istrumenti, cioè Naturali & Artificiali. Li naturali sono quelle parti che concorrono alla formatione delle voci; come sono la Gola, il Palato, la Lingua, le Labbra, li Denti, e finalmente il Polmone, dalla natura formate.

The former is a harmony that arises from the combination of various things joined together in one body regardless of their discrepancies, such as the measure of the four elements, or of other qualities in a living body. The latter is a harmony that arises from various instruments. And this [organic music] we will divide again into two [categories] because there are two sorts of instruments, natural and artificial. The natural [instruments] are those [anatomical] parts that join together in the production of the voice: they are the throat, the palate, the tongue, the lips, the teeth, and finally the lungs, all formed by nature.

Le qual parti essendo mosse dalla Voluntà, & dal mouimento di esse nascendone il suono, & dal suono il Parlare; nasce poi la Modulatione, ouero il Cantare: [11] & cosi per il mouimento del corpo, per la ragione del suono, & per le parole accommodate al Canto, si fa perfetta l'harmonia, & nasce la Musica detta Harmonica, o Naturale. Gli istrumenti arteficiali sono inuentioni humane, & deriuano dall'Arte, & formano la Musica arteficiata, che è quella harmonia, che nasce da simili istrumenti; & questa si fa in tre modi: percioche o nasce da istrumenti, che rendon suono con fiato naturale, o arteficiato; come Organi, Pifferi, Trombe, & simili; ouero da istrumenti da chorde, ove non fa dibisogno fiato; come Cetere, Lire, Leuti, Arpichordi, Dolcimeli, & simili; li quali dalle dita, & dalle penne sono percossi; ouero si sonano con archetti.

These parts being moved by the will, and sound arising from their movement, and from sound, speech: thus melody or song is born. And so from the movement of the body, by reason of sound, and through words accommodated to song, harmony becomes perfect, and harmonic or natural music is born. Artificial instruments are human inventions derived from art, thus making artificial music, which is the harmony arising from similar instruments. This is produced in three ways, because it either arises from instruments that make sounds by means of wind naturally or artificially, such as organs, fifes, trumpets, and so on, or from string instruments, which do not need wind, like kitharas, lyres, lutes, harpsichords, dulcimers, and so on. The latter are struck by fingers or plectra, or are played with bows.

Nasce vltimamente da istrumenti da battere; come Tamburi; Cembali, Taballi, Campane, & altri simili, che di legno concauo & di pelle di animali sopra tirrate, & di metallo si fanno; quando da qual si voglia cosa siano percossi. Di modo che l'arteficiata si troua di tre sorti, Da fiato, Da chorde, & Da battere; & la Naturale di Quattro, Piana, Misurata, Rithmica, & Metrica; benche queste Quattro ancora si possano attribuire all'arteficiata, per le ragioni ch'altroue diremo. Dell'Animastica poi faremo similmente due parti, ponendo nella prima la Mondana, & nella seconda la Humana; come nella sottoposta diuisione<sup>1</sup> appare.

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<sup>1</sup> 1573, *diuisione appare* reads *diuisione il tutto appare*.

Finally, [artificial music] is produced by percussion instruments, like drums, cymbals, woodblocks, bells, and so on, made of hollow wood, their tops covered by animal skins, or metal, when they are struck by any given object. In this way, artificial music can be divided into three categories: winds, strings, and percussion; and natural [music] into four [categories]: plainsong, measured, rhythmical, and metrical, although these four may still be part of artificial [music], for reasons that I will explain elsewhere. We will similarly divide Animastic music into two categories, calling the first, "cosmic,"<sup>B</sup> and the second, "human," as shown in the following diagram.

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<sup>B</sup> Palisca translates *Musica mondana* as "music of the cosmos" (Palisca, *Humanism*, passim).

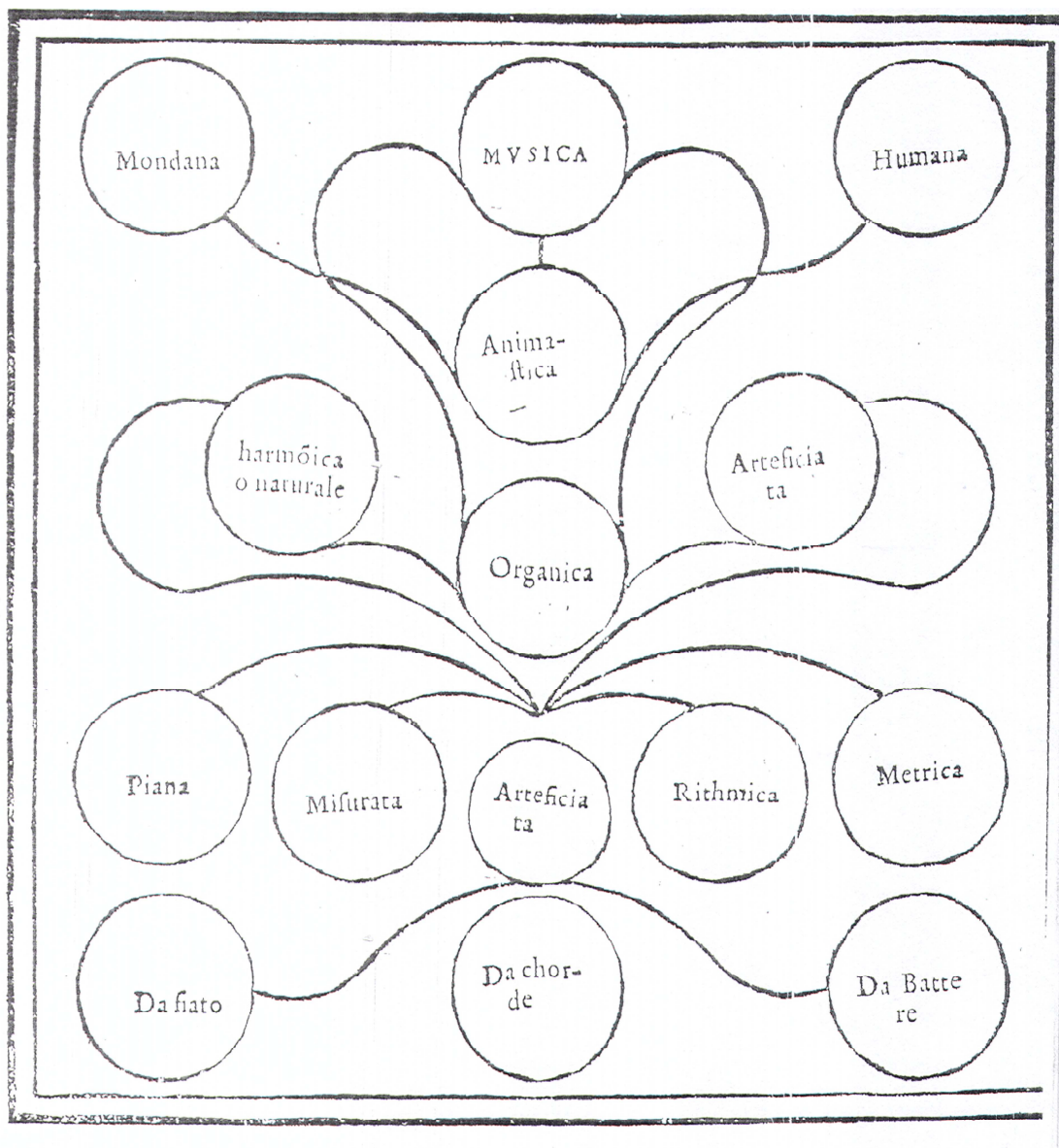


Figure 5.1. Categories of Music (1558).<sup>c</sup>

<sup>c</sup> Zarlino, *Ist.* (1558), 11.

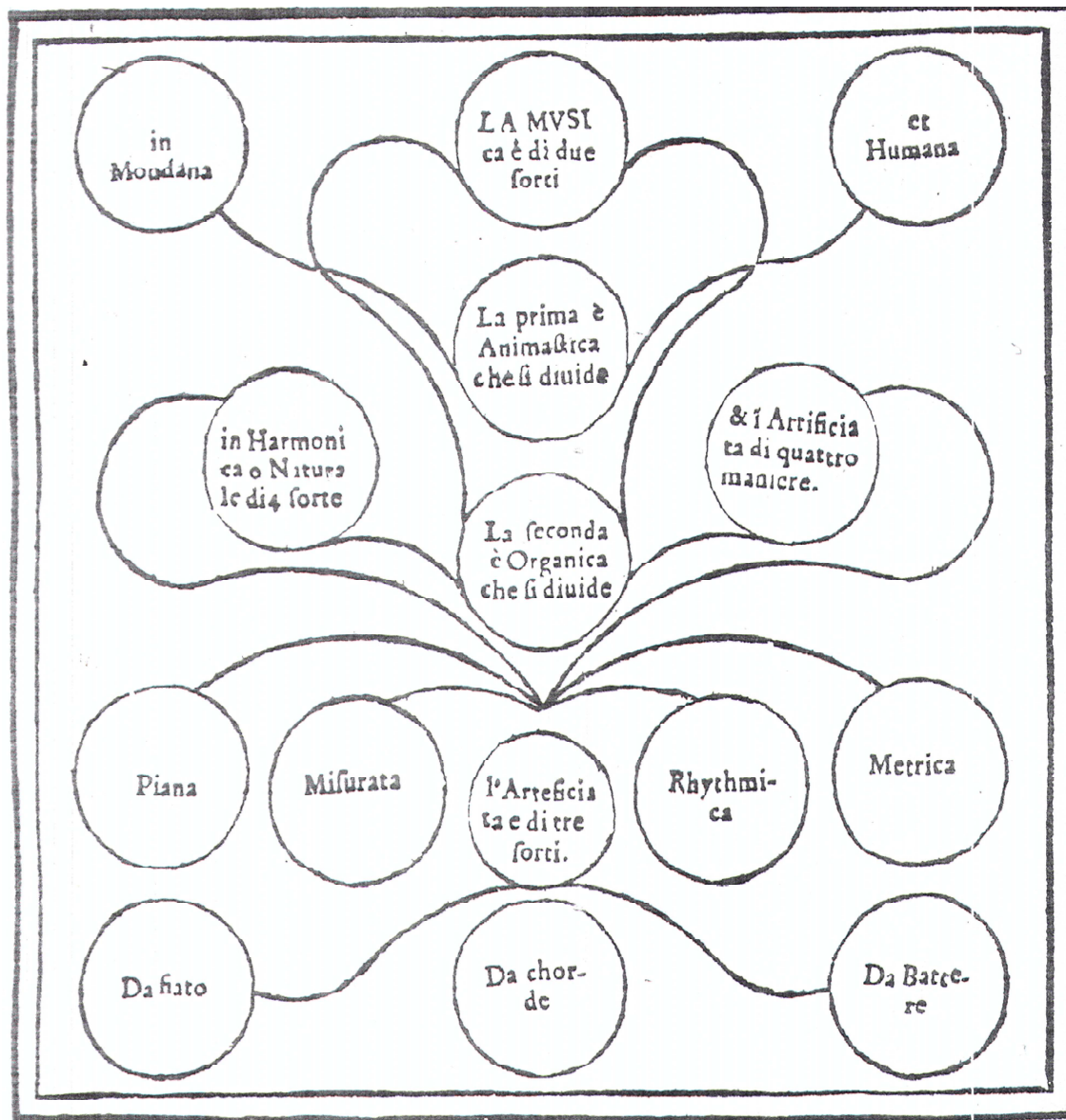


Figure 5.2. Categories of music (1573).<sup>D</sup>

<sup>D</sup> Zarlino, *Ist.* (1573), 15.

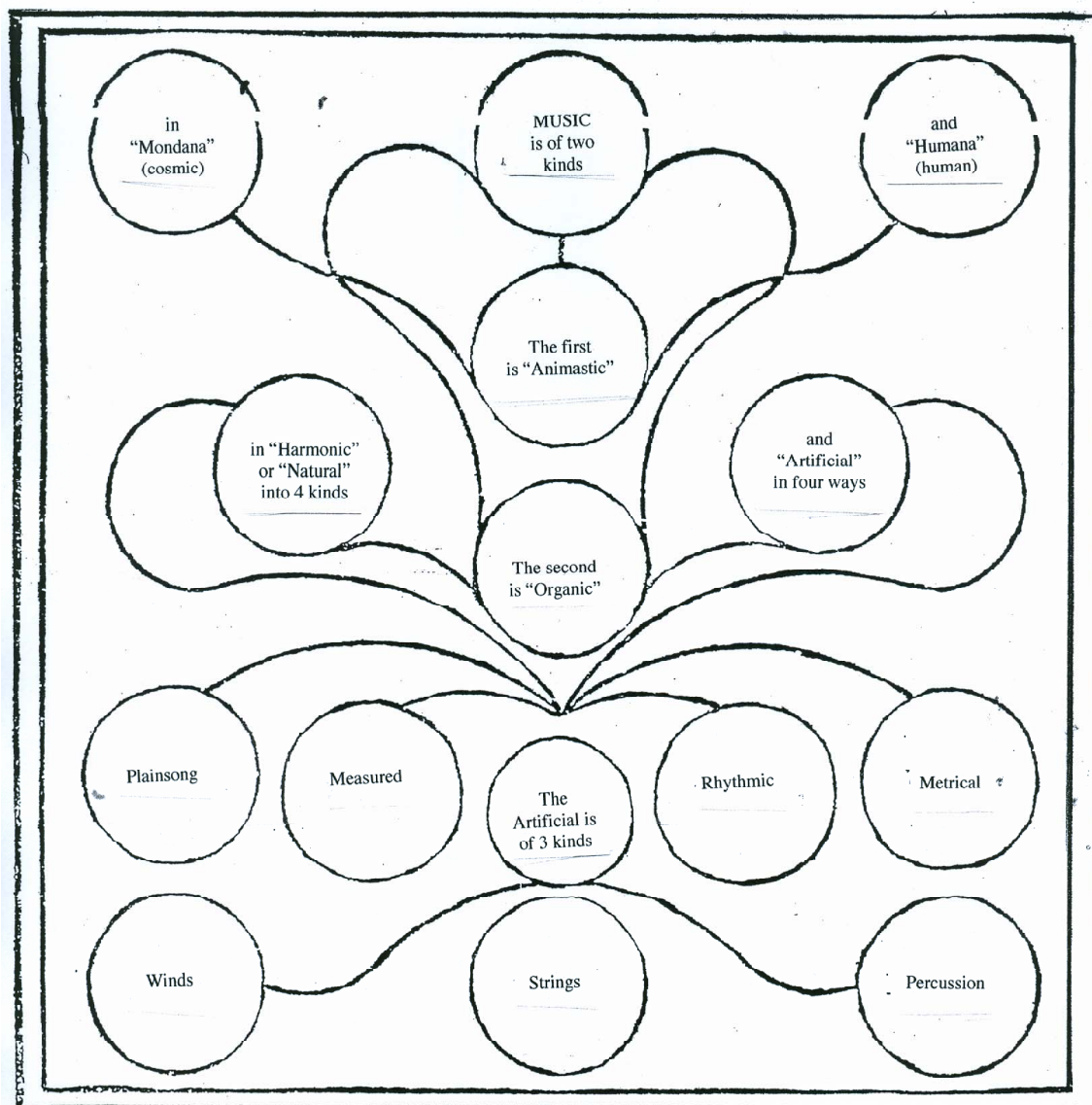


Figure 5.3. Categories of music (1573) – English translation.

Et quantunque alcuni habbiano fatto  
differenza tra la Musica, che nasce da  
istrumenti da fiato, nominandola Organica,  
da quella, che nasce dalle chorde & senza  
fiato, chiamandola Rithmica, nondimeno io  
l'vna & l'altra hò voluto chiamare  
indifferentemente Arteficiata, Prima:  
percioche non è di molta importanza il  
nominarle più ad vno modo, che ad  
vn'altro; & poi per seruare il significato  
della parola Organo, donde vien questo  
nome Organico, che comprende in  
vniversale tutte le sorti d'istrumenti  
arteficiali; & oltra di questo per fuggir  
l'equiuocatione: conciosia che dicendoli  
Rithmica, si potrebbe intendere, non solo di  
quella harmonia, che nasce da gli  
istrumenti arteficiati da chorde; ma anco di  
quella, che dalla Prosa ben composta  
risulta. Ma vediamo quel che sia ciascun  
membro della sopraustrata divisione.

And although some have differentiated  
between music that is produced by wind  
instruments, naming it "organic," and  
that which is produced by string  
instruments that do not use wind, naming  
it "rhythmic," nonetheless I have wished  
to call the one and the other "artificial,"  
without differentiating between them.  
First, because it is not of great  
importance to name them one way rather  
than another; and second, in order to  
maintain the meaning of the word  
"organ," whence comes the term  
"organic," which includes all sorts of  
artificial instruments; and then, too, [it  
helps] to avoid misunderstanding, since  
by calling it "rhythmic," in fact, one  
might intend not only the harmony that  
comes from the artificial string  
instruments, but also [the harmony] that  
springs from well-crafted prose. But let  
us now examine what each member of  
the aforementioned divisions might be.

[12] Della Musica mondana. / Cap. 6.

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Ripigliando adunque la Musica animastica diremo, che ella è di due sorti, Mondana, & Humana. La Mondana è quell'harmonia, che non solo si conosce essere tra quelle cose, che si veggono & conoscono nel cielo: ma nel legamento de gli Elementi, & nella varietà de i tempi ancora si comprende. Dico che si veggono & conoscono nel cielo, dal Riuolgimento, dalle Distanze, & dalle Parti delle sphere celesti; & da gli Aspetti, dalla Natura, & dal Sito de i sette pianeti; che sono la Luna, Mercurio, Venere, il Sole, Marte, Giove, & Saturno:

On Cosmic Music<sup>A</sup> / Chapter 6

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Returning, then, to animastic music, we will say that it is of two kinds: cosmic and human. Cosmic music is the harmony that is not only known to exist between the things that we see and know in the heavens, but can also be grasped from the connections among the elements and from the changing of the seasons. I say that such things are seen and known in the heavens, from the revolution, the distances, and the constellations of the celestial spheres; and from the aspects, the nature, and the location of the seven planets, which are the Moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn.

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<sup>A</sup> See Chapter 5, note B.

imperoche è stata opinione di molti Filosofi antichi, & massimamente di Pithagora, che vn riuolgimento di si gran machina con si veloce mouimento, non trappassi senza mandar fuori qualche suono; la quale opinione, quantunque da Aristotele<sup>1</sup> sia riprobata, è nondimeno fauorita da Cicerone nel lib. 6. della Rep. doue rispondendo il maggior Scipione Africano al minore, che gli haueua dimandato; Che suono è questo si grande & si dolce, che empie gli orecchi miei? Dice;

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<sup>1</sup> 1573, Zarlino's marginal note: 2, *Celi. c.* (Aristotle, *On Heaven* Book 2).

Many of the ancient philosophers, especially Pythagoras, were of the opinion that the quick revolution of so great a machine with such rapid movement does not occur without emitting some sound. This opinion, although criticized by Aristotle, was nevertheless championed by Cicero in Book 6 of his *On the Republic*, where Scipius Africanus the Elder,<sup>B</sup> responding to [Scipius Africanus] the Younger,<sup>C</sup> who had asked, "What is this sound, so great and so sweet, that fills my ears?" says,

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<sup>B</sup> Scipius Africanus the Elder (236 - 184/183 B.C.E.) was a Roman general whose victory over the Carthaginian leader Hannibal ended the Second Punic War.

<sup>C</sup> Scipius Africanus the Younger (185/184 - 129 B.C.E.), a Roman general, was famous both for his exploits during the Third Punic War and for his subjugation of Spain. As can be seen from the dates of his birth and death and the dates of Scipius the Elder, a conversation between these two generals could not have taken place. As Scipius the Younger was adopted by Publius Scipius, a son of Scipius the Elder, it is possible that a dialogue between the latter two generals may have occurred.

Questo è quello, che congiunto per inequali interualli, nondimeno distinti per compartita proportione, è fatto dal sospingere & dal muouere di essi circoli; il quali temperando le cose acute con le graui, equalmente fa diuersi concenti; Perche non si possono fare si gran mouimenti con silentio, & la Natura porta, che gli estremi dall'vna parte grauemente, & dall'altra acutamente suonino. Per la qual cosa quel sommo corso del cielo stellato, il cui riuolgimento è più veloce, si muoue con acuto & più forte suono; & questo lunare & infimo con grauissimo. Questo dice Tullio, seguendo il parer di Platone;<sup>2</sup> il quale per mostrare, che da tale riuolgimento nasca l'harmonia, finge che a ciascuna sphaera soprasieda vna Sirena: Percioche Sirena non vuol significare altro che Cantatrice a Dio.

“This is [the sound] which, joined by unequal yet proportionate intervals, is produced by the impetus and movement of these circles, which [movement] tempering high things with low, results in different consonances, because such large movements cannot be made in silence, and nature provides that sound issues from the extremes of one low and one high part. For this reason the higher path of the starry heavens, whose revolution is faster, moves with high pitch and stronger sound, whereas the lunar and deep [path moves] with very low [sound]. So says Cicero, in accordance with Plato’s opinion. Plato, in order to show that harmony arises from such revolution, pretends that a Siren sits on each sphere, since “Siren” means nothing other than “songstress to God.”

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<sup>2</sup> 1573, Zarlino’s marginal note: *De Rep. 10* (Cicero, *De republica* [*On the Republic*], Book 10).

Et medesimamente Hesiodo nella sua Theogonia accennando questo istesso, chiamò οὐρανία l'ottava Musa, che è appropriata all'ottava sphaera, da οὐρανός, col qual nome da i Greci vien nominato il Cielo. Et per mostrare, che la Nona sphaera fusse quella, che partorisce la grande & concondevole unità de suoni, la nominò κάλλιπη, che viene a significare di Ottima voce: volendo mostrar per questo l'harmonia, che risulta da tutte quell'altre sphaere; come si vede accennato dal Poeta<sup>3</sup> quando disse; Vos o Calliope precor aspirate cananti; inuocando solamente Calliope nel numero del più, come la principale, & come quella al cui solo volere si muoueno, & si girano tutte l'altre.

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<sup>3</sup> 1573, Zarlino's marginal note: *Aeneid*, 9 (Virgil, *Aeneid*).

And similarly, Hesiod, referring to this matter in his *Theogonia*, called the eighth muse, who rules over the eighth sphere, *Urania*, from *Uranos*, by which name heaven was called by the Greeks. And in order to demonstrate that the ninth sphere was the one that gave birth to the great and consonant unity of sounds, [Hesiod] named it *Kalliope*, which signifies "optimal voice," wishing to demonstrate through this [word] the harmony that results from all the other spheres, as hinted by the Poet [Virgil] when he said, "Do thou, O Calliope, I pray, inspire me while I sing,"<sup>D</sup> invoking only Calliope above all as the most important [of all the sirens] and the one by whose will alone all of the other [spheres] move and revolve.

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<sup>D</sup> Translation by Fairclough in *Eclogues, Georgics, and Aeneid*, 149.

Et tanto ebbero gli antichi questa opinione per vera, che nelli sacrificij loro vsauano Musicali istrumenti, & cantauano alcuni Hinni composti di sonori versi, i quali conteneuano due parti, l'vna delle quali nominauano στροφή & l'altra ἀντιστροφή per mostrare li diuersi giri fatti dalle sphere celesti: percioche per l'vna intendeuano il moto, che fa la sphaera delle stelle fisse dall'Oriente in Occidente; & per l'altra li mouimenti diuersi, che fanno l'altre sphere de pianeti procedendo al contrario, dall'Occidente in Oriente. Et con tali istrumenti ancora accompagnauano li corpi de lor morti alla sepoltura: percioche erano di parere, che dopo la morte l'anime ritornassero alla origine della dolcezza della Musica, cioè al cielo.

The ancients were so convinced of the truth of this opinion that they used musical instruments to accompany their sacrifices, and sang some hymns composed of sonorous verses that contained two parts, one of which was named *strophe* and the other *antistrophe* to demonstrate the different movements made by the celestial spheres. They considered the one to be the motion that the sphere of the fixed stars makes from east to west, and the other to be the different movements that the other spheres of the planets make in the opposite [direction], from west to east. And with such instruments they also accompanied the bodies of their dead to the grave, because they believed that after death souls would return to the origin of the sweetness of music, which is heaven.

Tal costume osseuarono gia gli Hebrei anticamente nella morte de loro parenti, di che ne hauemo chiarissima testimonianza nell'Euangelio,<sup>4</sup> nel quale è descritta la risuscitatione della figliuola del prencipe della Sinagoga, doue erano musicali istrumenti, a sonatori de i quali comando il Signor nostro, che più non sonassero. Et faceuano questo (come dice Ambrosio<sup>5</sup>) per osseruare l'vsanza de i loro antichi; liquali in cotal modo inuitauano li circostanti a piangere con esso loro. Molti ancora haueano opinione, che in questa vita ogni anima fusse vinta per la Musica; et che se bene era nel carcere corporeo rinchiusa, ricordandosi & essendo consapeuole della Musica del cielo; si domenticasse [*sic*] ogni dura & noiosa fatica.

In ancient times the Hebrews already observed such customs upon the death of their relatives. This is clearly witnessed in the Gospels, which describe the resuscitation of the young daughter of the chief priest of the synagogue, when musicians stopped playing their instruments upon the command of our Lord. And they did this (as Ambrose says) in order to observe the customs of their ancestors, who in this way used to invite bystanders to cry with them. Many also believed that in this life every soul was conquered by music, and that although it was held captive in a corporeal prison, by remembering and being aware of the music of the spheres, it would forget all hard and tiresome labor.

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<sup>4</sup> 1573, Zarlino's marginal note: *Matth. c. 9* (Matthew 9:23)

Ma se ciò ne paresse strano, hauemo  
 dell'harmonia del cielo il testimonio delle  
 Sacre lettere, doue il Signore parla a  
 Giobbe<sup>6</sup> dicendo; Chi narrerà le ragioni o  
 voci de Cieli? Et chi farà dormire il loro  
 concerto? Et se mi fusse dimandato; onde  
 proceda, che tanto grande & si dolce suono  
 non sia vdito da noi; altro non saprei  
 rispondere, che quello, che dice Cicerone  
 nel luogo di sopra allegato; Che gli orecchi  
 nostri ripieni di tanta harmonia sono sordi;  
 si come per essempro auiene a gli habitatori  
 di quei luoghi doue il Nilo da monti  
 altissimi precipita, detti Catadupa; i quali  
 per la grandezza del rimbombo mancano  
 del senso dell'vdito.

But if this seems strange, we have  
 testimony of the harmony of the spheres  
 in Holy Scripture, where the Lord  
 speaks to Job, saying, "Who will tell of  
 the reasons or voices of the heavens?  
 And who will put their harmony to  
 rest?" And if I were asked why such  
 great and sweet sound cannot be heard  
 by us, I could not respond with any other  
 words than those of Cicero in the  
 aforementioned work. Our ears, he says,  
 [although] filled with so much harmony,  
 are deaf, just like [the ears] of the  
 inhabitants of those places where the  
 Nile precipitously descends from very  
 high mountains, the Catadupa. These  
 people, because of the loudness of the  
 thunder, lack the sense of hearing.

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<sup>5</sup> 1573, Zarlino's marginal note: *Super Lucam ca. 8. lib. 6.* (St. Ambrose: *Commentary on the Gospel according to St. Luke*).

<sup>6</sup> 1573, Zarlino's marginal note: *Iob.c. 38.* (Job 38:33).

Ouero che si come l'occhio nostro non puo fissare lo sguardo nella luce del Sole, restando da i suoi raggi vinta la nostra luce; cosi gli orecchi nostri non possono capire la dolcezza dell'harmonia celeste, per l'eccellenza et grandezza sua. Ma ogni ragione ne persuade a credere almeno, che il mondo sia composto con harmonia; [13] si perche (come vuol Platone<sup>7</sup>) l'anima di esso è harmonia; si anche perche li cieli sono girati intorno dalle loro intelligenze con harmonia: come si comprende da i loro riuolgimenti; liquali sono l'uno dell'altro proportionatamente più tardi, o più veloci. Si conosce anchora tale harmonia dalle distanze delle sphere celesti:

Similarly, just as our eye is unable to fix its gaze on the light of the sun because our sight is overcome by its rays, our ears are unable to understand the sweetness of celestial harmony, because of its excellence and grandeur. But every reason persuades us to believe at least that the world is the embodiment of harmony, both because (as Plato says) its own soul is harmony, and also because the heavens revolve by their own intelligence in harmonic fashion, as can be understood by their revolutions, which are proportionately slower or faster. We are also familiar with such harmony from the distances between celestial spheres.

percioche sono distanti tra loro (come piace a molti) in harmonica proportione; laquale, benche non venga misurata dal senso, è nondimeno misurata dalla ragione: imperoche li Pithagorici (come dimostra Plinio<sup>8</sup>) misurando la distanza de cieli, & li loro interualli, poneuano dalla Terra alla prima Sphera lunare essere lo spatium di 12600 stadij; & questo diceuano essere l'interuallo del tuono; auegna che questo (secondo il mio parere) sia fuori d'ogni ragione: conciosia che non può essere, che quelle cose lequali per lor natura sono immobili, si come è la Terra, siano atte a generare l'harmonia; hauendo li suoni (come vuol Boetio<sup>9</sup>) il loro principio dal mouimento.

The distances among them (as many like to believe) are in harmonic proportion, which, although not measured by the senses, is nonetheless measured by means of reason, because the Pythagoreans (as Pliny shows), measuring the distance of the heavens and the spacing [of the heavenly bodies], placed the distance between Earth and the first lunar sphere at 12,600 *stadia*. This they said to be the interval of a tone, although in my opinion this appears unreasonable, because it is impossible that things immobile by nature, as the Earth, can generate harmony, since sounds (as Boethius says) have their origin in movement.

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<sup>7</sup> 1573, Zarlino's marginal note: *In Timeo*. (Plato, *Timaeus*).

<sup>8</sup> 1573, Zarlino's marginal note: *Natu. hist. lib.2.c.22*. (Pliny, *Natural History* Book 2, Chapter 22).

<sup>9</sup> 1573, Zarlino's marginal note: *Musicae libro. 4.c.1*. (Boethius, *On Music*, Book 4, Chapter 1).

Dipoi andauano ponendo dalla sphaera della Luna a quella di Mercurio l'interuallo d'un Semituono maggiore; & da Mercurio a Venere quello del minore; e da Venere al Sole il Tuono, & il minor semituono; & questa diceuano esser distante dalla terra per tre tuoni, & un semituono; il qual spatio è nominato Diapente. Et dalla Luna al Sole poneuano la distanza di due tuoni, & uno semituono; li quali costituiscono lo spatio della Diatesseron. Ritornando poi al principiato ordine, dissero, il Sole esser lontano da Marte per la medesima distanza, che è la Luna dalla terra; & da Marte a Giove essere l'interuallo del semituono minore; & da questo a Saturno lo spatio del semituono maggiore: dal quale per fino all'ultimo cielo, oue sono li segni celesti, posero lo spatio del minor semituono.

Next, they reckoned the interval of a major semitone [to be the distance] from the sphere of the Moon to that of Mercury, and from Mercury to Venus a minor semitone, and from Venus to the Sun a tone plus a minor semitone. And Venus was said to be distant from the Earth by three tones plus a semitone, whose interval is named diapente. And from the Moon to the Sun they reckoned the distance [to be] two tones and a semitone, which [together] constitutes the interval of a diatesseron. Returning then to this order, they said the Sun was as distant from Mars as the Moon was from the Earth, and [the distance] from Mars to Jupiter was the interval of a minor semitone, and from Jupiter to Saturn a major semitone. From [Saturn] to the farthest heaven, where the signs of the zodiac lie, they placed the interval of a minor semitone.

Per la qual cosa dall'ultimo cielo alla sphaera del Sole si comprende esser lo spatium, o intervallo della Diatessaron; & dalla terra all'ultimo cielo lo spatium di cinque tuoni, & due minori semituoni, cioè la Diapason. Chi vorrà poi esaminare li cieli nelle sue parti, secondo che con gran diligenza hà fatto Tolomeo,<sup>10</sup> ritrouerà (comparate insieme le dodici parti del Zodiaco, nelle quali sono li dodici segni celesti) le consonanze musicali, cioè la Diatessaron, la Diapente, la Diapason, & le altre per ordine; et nelli moti fatti verso l'Oriente & l'Occidente potrà conoscere esser collocati li suoni grauissimi; & in quelli, che si fanno nel mezzo del cielo gli acutissimi.

For this reason, from the farthest heaven to the sphere of the Sun one understands the distance or interval to be the diatessaron, and from the Earth to the farthest heaven the distance of five tones and two minor semitones, which is the diapason. Whoever wishes then to examine the heavens in their parts, as Ptolemy did with great diligence, will discover (having compared the twelve parts of the zodiac in which are the twelve celestial signs) the musical consonances: the diatessaron, the diapente, the diapason, and the others in order. In the motions from east to west he will recognize the location of the very deep sounds and in the motions occurring in the middle of the heavens, the very high [sounds].

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<sup>10</sup> 1573, Zarlino's marginal note: *Harmo. libro 3 c. 9* (Ptolemy, *Harmonics*, Book 3, Chapter 9).

Nelle altitudini<sup>11</sup> poi ritrouerà il Diatonico, il Chromatico, & l'Enharmonico genere. Similmente nelle latitudini<sup>12</sup> li Tropi, o Modi, che vogliamo nominarli; & nelle faccie della Luna, secondo gli varij aspetti col Sole, esser le congiuntioni delli Tetrachordi. Ma non solo dalle predette cose si può conoscere cotale harmonia; ma dalli varij aspetti de i sette Pianeti ancora; dalla natura, & dalla positione, o sito loro.

In the distances of the planets from the earth he will then discover the diatonic, the chromatic, and the enharmonic genera. Likewise, in the diameters of the planetary orbits [he will discover] the tropes, or modes, as we may wish to name them, and in the phases of the Moon, according to its various aspects with the Sun, the conjunctions of the tetrachords. Not only by the preceding things can such harmony be known, but also by the various aspects of the seven planets, by their natures, and by their locations or positions.

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<sup>11</sup> 1573, *altitudini* reads *altezze*; thus Zarlino refers to the distances of the planets from the earth.

<sup>12</sup> 1573, *latitudini* reads *larghezze*. Therefore, in this context *latitudini* means “width” and refers to the diameter of each planetary orbit

Da gli aspetti,<sup>13</sup> si come dal Trino, dal Quadrato, dal Sestile, dalle congiuntioni, & dalle oppositioni; li quali fanno nelle cose inferiori, secondo i loro influssi buoni, & rei, vna tale & tanta diuersità di harmonia di cose, che è impossibile di poterla esplicare. Dalla natura poi, conciosia che essendone alcuno (come vogliono gli Astrologi) di natura trista & maligna; da quelli, che buoni & benigni sono, in tal modo vengono ad esser temperate; che ne risulta poi tale harmonia; che apporta gran commodo & vtile a mortali. Et questa si comprende ancora dal Sito, ouero dalla Positione loro; conciosia che sono tra loro in tal modo collocati, quasi nel modo che sono collocate le virtù tra gli vitij.

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<sup>13</sup> 1573, *aspetti, si come reads aspetti prima si come.*

Their aspects, such as trine, quadrate, sestile, their conjunctions, and their oppositions<sup>E</sup> cause such great diversity of harmony in earthly matters according to their good and evil influences that no explanation can be proffered. By their nature then, whatever may be sad and malignant (as the astrologers say), comes to be tempered by that which is good and benevolent, in such a way as to produce the harmony that brings great benefit and usefulness to mortals. And this [harmony] can be further grasped by the site or position [of the heavenly bodies], because their placement reflects the positioning of virtues among vices.

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<sup>E</sup> In astrology, two celestial bodies are considered to be in trine when they are 120 degrees apart, quadrate when 90 degrees apart, sestile when 60 degrees apart, conjunction when in very close proximity, and opposition when 180 degrees apart.

Onde si come questi, che sono estremi, si riducono ad vn'habito virtuoso, per via di vno mezzo conueniente; cosi quelli pianeti, che sono di natura maligni, si riducono alla temperanza per via di vn'altro pianeta posto nel mezo loro, che sia di natura benigna. Però si vede, che essendo Saturno & Marte posti nel luogo soprano di natura maligni, cotal malignità da Giove posto tra l'vno & l'altro, & dal Sole posto sotto di Marte con vna certa harmonia è temperate; si che non lassano operare a i loro influssi cattiuu nelle cose inferiori quel maligno effetto, che potrebbeno operare non vi essendo tale interpositione.

And just as the latter, in their extreme nature, become virtuous habits through the appropriate intermediary, so those planets which are of malignant nature are tempered by a benign planet placed in their midst. Therefore, one sees that although Saturn and Mars are placed at the highest level of malignancy, such malignancy is tempered by a certain harmony when Jupiter is placed between them, and when the Sun is placed below Mars. [Jupiter and the Sun] do not allow [Saturn and Mars] to exercise those malignant influences on earthly matters that would arise if such interposition were not to occur.

Et hanno i loro influssi si gran possanza sopra li corpi inferiori, che mentre li due primi nominati pianeti si ritrouano hauere il dominio dell'anno; allora si disciolge l'armonia de i quattro Elementi: percioche si corrompe l'aria de tal maniera, che genera nel mondo pestilenza vniuersale. Vogliono ancora, che i due luminari maggiori, che sono il Sole & la Luna, facino corrispondente harmonia di beniuolenza tra gli huomini, quando nel nascimento dell'vno quello si ritroua essere in Saggitario, & questa nel Montone; & nel nascimento dell'altro il Sole sia nel Montone, & la Luna nel Saggitario. Simil harmonia dicono ancora farsi, quando nel loro nascimento hanno hauuto vn medesimo segno, ouero di simile natura, ouero vn medesimo pianeta, o di natura simile in ascendente: ouero che due benigni pianeti col medesimo aspetto habbiano riguardato l'angolo dell'oriente.

And their influences have such great power over earthly bodies that when [Saturn and Mars] are given the dominion of the year, the harmony of the four elements is dislodged, because the air is corrupted in such a manner that a universal pestilence is generated. It is also said that the two major luminaries, the Sun and the Moon, bring correspondent harmonious congeniality between people when one is born with the Sun in Sagittarius and the Moon in Aries, and another is born with the Sun in Aries and the Moon in Sagittarius. Furthermore, similar harmony is shown [among people who] were born under the same sign or [a sign of] similar nature, or with the same planet or [a planet of] similar nature in ascendance, or with two benign planets possessing the same aspect placed in the eastern part of the natal chart.

Questo istesso dicono auenire, quando  
 Venere si ritroua nella medesima casa della  
 loro natiuità, o nel medesimo grado.  
 Hauendo adunque hauuto riguardo a tutte  
 le sopradette opinioni, & essendo (si come  
 affermarono alcuni<sup>14</sup>) il [14] Mondo  
 l'organo d'Iddio, nella dichiarazione della  
 Musica mondana hò detto, che è harmonia,  
 la quale si scorge tra quelle cose, che si  
 veggono, & conoscono nel cielo. Et  
 soggiunsi, che anche nel legamento de gli  
 Elementi si comprende:

The same thing is said to occur when  
 Venus is found in the same house that  
 coincides with another person's birth  
 sign or at the same degree. Having thus  
 paid due attention to all the  
 aforementioned opinions, and seeing that  
 (as some affirm) the world is the  
 instrument of God, in the explanation of  
 cosmic music I have said that harmony is  
 that which is perceived among those  
 things that are seen and known in the  
 heavens. And I added that one also  
 understands [harmony] from the  
 connection between the elements,

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<sup>14</sup> 1573, *si come affermarono alcuni* reads *si come afferma Mercurio Trismegisto* (as Mercurius Trismegitus confirms). Zarlino adds this marginal note: *Pimandro Ser.10.* (Mercurius Trismegistus, *Hermetica*). "Mercurius Trismegitus" refers to the purported author of the *Hermetica*, a collection of Greek texts on theology, philosophy, and the occult, now considered to have originated between the first and third centuries C.E. and assembled into the *Corpus Hermeticum* during the Renaissance.

conciosia che essendo stati creati dal grande Architetto Iddio (si come creò ancora tutte l'altre cose) in Numero, in Peso, & in Misura,<sup>15</sup> da ciascuna di queste tre cose si può comprendere tale harmonia; & prima dal Numero, mediante le qualità passibili, che sono Quattro & non più, cioè la Siccità, la Frigidità, la Humidità, & la Calidità, che si ritrouano in essi: conciosiache<sup>16</sup> a ciascuno di loro principalmente vna di esse qualità è appropriata; si come la siccità alla terra, la frigidità all'acqua, l'humidità all'aria, & la calidità al fuoco; Ancora che la siccità secondariamente si attribuisca al fuoco, la calidità all'aria, l'humidità all'acqua, & la frigidità alla terra;

which were created by God, the Great Architect (just as He created everything else) in number, weight, and measure. Thus, from each of these three qualities such harmony can be grasped: first, by number, by means of their innate qualities, which are four and no more: dryness, cold, wetness, and heat, because each of these qualities is mainly appropriated by one of [the elements], that is, dryness by earth, cold by water, wetness by air, and heat by fire. Although dryness is attributed secondarily to fire, warmth to air, wetness to water, and cold to earth,

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<sup>15</sup> 1573, Zarlino's marginal note: *Sap. 11* (Book of Wisdom 11:21). The verse reads, *sed omnia menura et numero et pondere disposuisti* (But you have disposed all things by measure and number and weight).

<sup>16</sup> 1573, *conciosiache* reads *imperoche*.

per le quali non ostante, che tra loro essi  
 elementi siano contrarij, restano  
 nondimeno in vno mezano elemento,  
 secondo vna qualità concordi & vniti:  
 essendo che ad ogn'vno di loro (come  
 hauemo veduto) due ne sono appropriate  
 [*sic*], per mezo delle quali mirabilmente  
 insieme si congiungono, & in tal modo; che  
 si come due numeri Quadrati conuengono  
 in vno mezano numero proportionate, cosi  
 due di essi elementi in vno mezano si  
 congiungono, Conciosia che al modo che  
 il Quaternario, & Nouenario numeri  
 quadrati si conuengono nel Senario, il  
 quale supera il Quaternario di quella  
 quantità, che esso è superato dal  
 Nouenario; in tal modo il Fuoco &  
 l'Acqua, che sono in due qualità contrarij,  
 in vno mezano elemento si congiungono:

notwithstanding the opposition of these  
 qualities, they nevertheless remain  
 concordant and unified in a mean  
 element. Since (as we have seen) two  
 [qualities] are bestowed upon each  
 [element], by means of [these qualities]  
 they are miraculously conjoined in this  
 way. Just as two square numbers are  
 joined in a number that is in mean  
 proportion, two of these elements are  
 conjoined in a mean [element]. Thus, the  
 square numbers four and nine converge  
 in six, which is greater than four by the  
 same proportion that [six] is superseded  
 by nine.<sup>F</sup> In the same way fire and  
 water, which possess two contrary  
 qualities, are conjoined by a mean  
 element.

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<sup>F</sup> In the sequence 4:6:9,  $6-4=2$ ; 2 is half of 4.  $9-6=3$ ; 3 is half of 6. 6 is the harmonic mean between 4 and 9. For a definition of harmonic mean, see Appendix 6, page 530..

Impero che essendo il Fuoco per sua natura caldo & secco, & l'Acqua fredda & humida, nell'Aria calda & humida mirabilmente con grande proportione s'accompagnano; il quale se bene dall'Acqua per il calido si scompagna, seco poi per l'humido si unisce. Et se l'humido dell'Acqua ripugna al secco della Terra, il frigido non resta però d'vnirli insieme. Di modo che sono con tanto marauiglioso ordine insieme vniti, che tra essi non si ritroua più disparità, che si ritroui tra due mezani numeri proportionate, collocati nel mezzo di due numeri Cubi; come nel sottoposto esempio si può chiaramente vedere.

Because fire is by nature hot and dry, and water cold and wet, in air, heat and wetness are marvelously conjoined in wonderful proportion; therefore, although [air] is separated from water by heat, it is united [to water] by wetness. And if the wetness of water is repulsed by the dryness of earth, cold, however, does not cease to unite them together. Thus, they are joined with such marvelous order that one can find no more disparity between them than can be found between two numbers in mean proportion placed in the middle of two cubic numbers, as can be clearly seen in the following example:

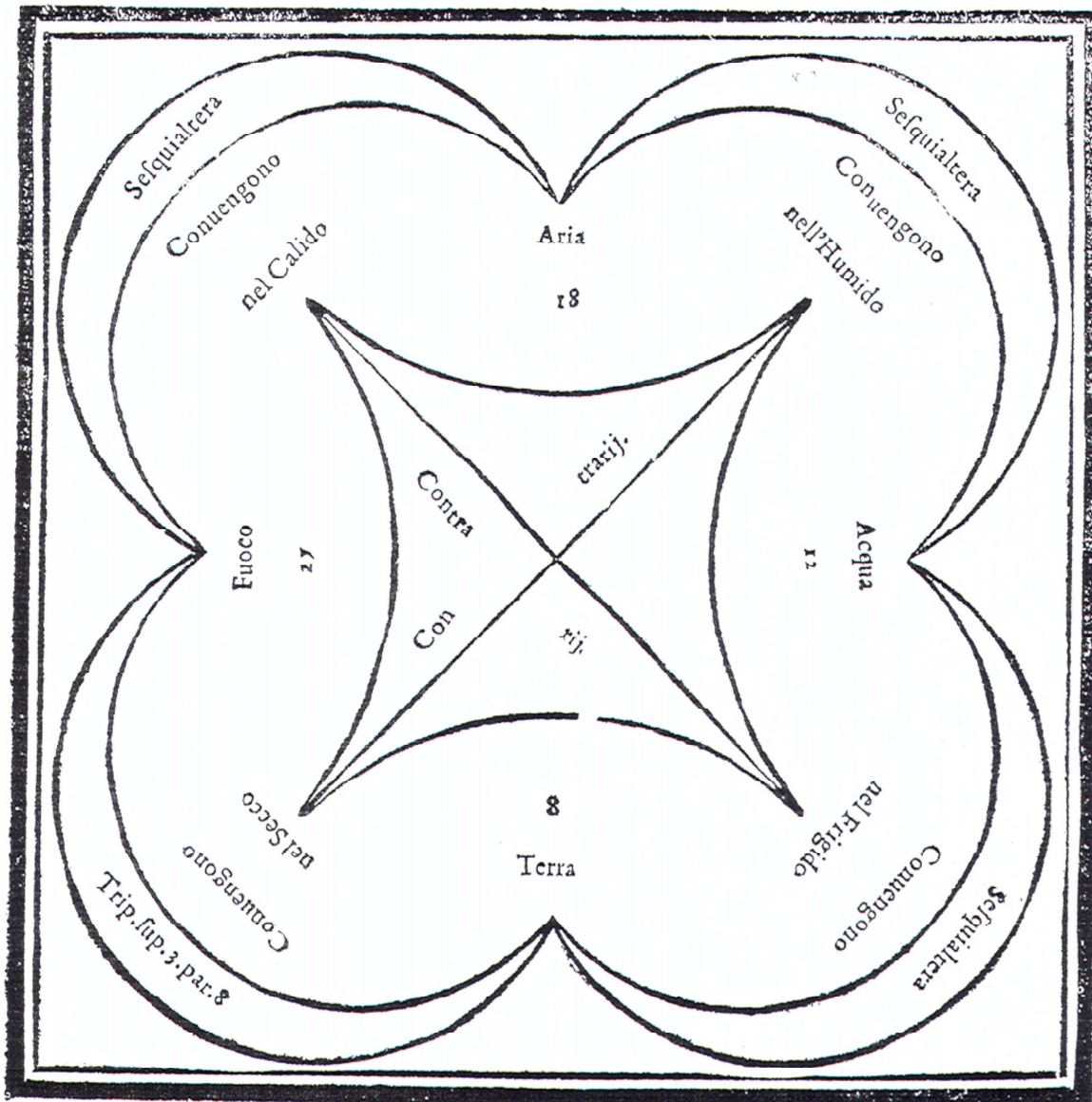


Figure 6.1. Convergences of the Four Elements.<sup>17</sup>

<sup>17</sup> Zarlino, *Ist.* (1558), 14.

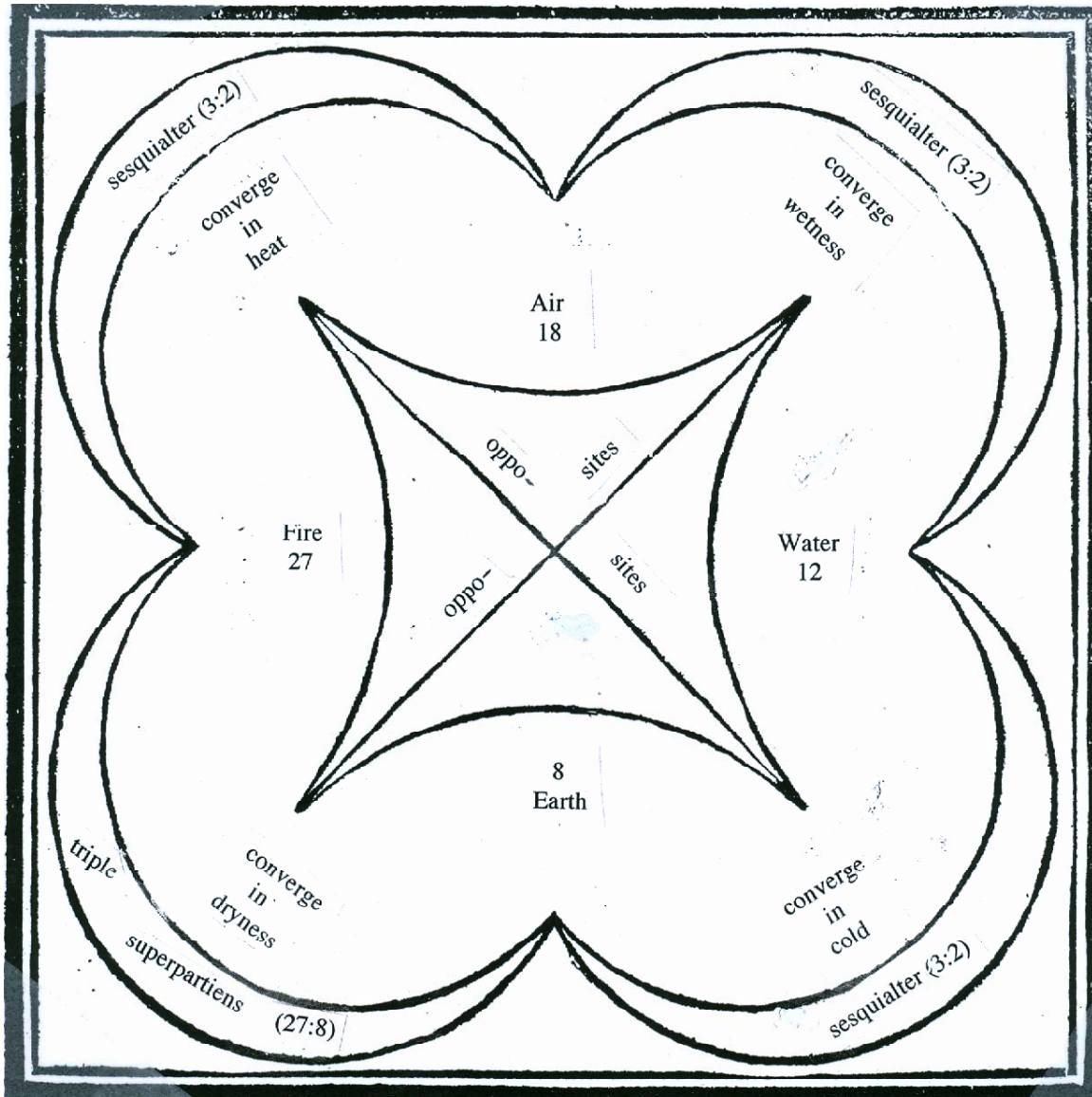


Figure 6.2. Convergences of the Four Elements (English translation).

[15] Tal legamento fatto con harmonia  
 esplicò ancora Boetio dicendo;<sup>18</sup>  
 Tu numeris elementa ligas, vt frigora  
 flammis / Arida conueniant liquidis, ne  
 purior ignis / Euolet, aut mersas deducant  
 pondera terras. / Tu triplicis mediam  
 naturae concta mouentem / Connectens  
 animam, per consona membra resoluis. Et  
 in vn'altro luogo;<sup>19</sup>  
 Haec Concordia temperat aequis /  
 Elementa modis, vt pugnancia / Vicibus  
 cedant humida ficcis / Iungantq; fidem  
 frigora flammis. / Pendulus ignis surgat in  
 altim, / Terraeq; graues pondere sidant.

Such a bond made by harmony was also  
 explained by Boethius, who said, “You  
 bind the elements in harmony so that  
 cold and heat, dry and wet are joined,  
 and the purer fire does not fly up  
 through the air, nor the earth sink  
 beneath the weight of water. / You  
 release the world-soul throughout the  
 harmonious parts of the universe as your  
 surrogate, threefold in its operations, to  
 give motion to all things.”<sup>G</sup> And in  
 another place: “Concord rules the  
 elements with fair restraint: moist things  
 yield place to dry, cold and hot combine  
 in friendship; flickering fire rises on  
 high, and gross earth sinks down.”<sup>H</sup>

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<sup>18</sup> 1573, Zarlino’s marginal note: *De Conf. libr. 3, & Met. 9.* (Boethius, *The Consolation of Philosophy*)

<sup>19</sup> *Li.4.met.6* (Boethius, *The Consolation of Philosophy*)

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<sup>G</sup> Translation by Richard Green in Boethius, *The Consolation of Philosophy*, 60.

<sup>H</sup> Translation by Richard Green in Boethius, *The Consolation of Philosophy*, 97.

Ma chi vorrà dal peso loro comprendere  
 ancora la Mondana harmonia la potrà  
 conoscere: percioche essendo l'vno  
 dell'altro più graue, o più leggiero, sono di  
 tal modo insieme concatennati & legati,  
 che con vna certa harmonia la  
 circonferenza di ciascuno  
 proportionatamente è lontana dal centro del  
 Mondo. Noi vedemo che quelli, che sono  
 per lor natura graui, sono tirati all'insù da  
 quelli, che sono per loro natura leggieri; &  
 li graui tirano all'ingiù li leggieri in tal  
 maniera, che niuno di loro va fuori del suo  
 propio luogo. Et in tal guisa stanno insieme  
 vniti & serrati, che tra loro non si troua per  
 alcun tempo, quantunque breue, in alcuna  
 parte in Vacuo; il quale la Natura  
 grandemente abhorisce.

But he who wishes to understand the  
 harmony of the cosmos will be able to  
 grasp it from the weight [of the  
 elements], since although one [element]  
 is heavier or lighter than another, they  
 are linked and tied together, as the  
 distance of each is harmoniously placed  
 in proportional distance from the center  
 of the world. We see that those  
 [elements] that are heavy by nature are  
 pulled up by those that are light by  
 nature, and the heavy [ones] pull down  
 the lighter in such a way that none of  
 them departs from its proper place. And  
 they are united and locked together in  
 such guise that one finds that at no time,  
 however brief, is there anywhere among  
 them a vacuum, which Nature greatly  
 abhors.

Et sono poi in tal modo collocati, che la Terra, la quale per sua natura è semplicemente graue, & il Fuoco, che è semplicemente leggiero, sono quelli, che posseggono gli vltimi luoghi. La Terra tien l'infimo luogo: percioche ogni graue tende al basso; & il Fuoco stà nel supremo: conciosia che ogni cosa leggiera tende a tal luogo. Ma perche li mezi ritengono la natura de i loro estremi, però hà ordinato bene il Creatore, che essendo l'Acqua & l'Aria, secondo vn certo rispetto graui & leggieri, douessero tenere il luogo mezano, l'Acqua accompagnandosi alla Terra come più graue; & l'Aria al Fuoco, come più leggero; accioche ciascuno si accompagnasse a quello, che era di natura a lui piu simile.

And they are then placed in such a way that earth, which by its nature is simply heavy, and fire, which is simply light, possess the extremes. Earth holds the lowest place, because all heavy things tend downward, and fire stays at the highest [place], because every light thing tends toward such a place. But because the means retain the nature of their extremes, the Creator rightly ordained that since water and air possess both a heavy and a light aspect they must hold the middle place; water accompanied by earth as the heavier, and air [accompanied] by fire as the lighter, so that each would be accompanied by that which had a nature more similar to itself.

Il qual ordine & legamento leggiadramente  
 Ouidio espresse dicendo.<sup>20</sup> Ignea conuexi  
 vis, & fine pondere coeli / Emicuit,  
 summaq; locum sibi legit in arce. /  
 Proximus est aer illi leuitate locoq;./  
 Densior his tellus elementaq; grandia traxit,  
 / Et praessa est grauitate sui, circumfluis  
 humor / Vltima possedit, solidumq;  
 coercuit orbem. Ma se più sotilmente  
 ancora vorremo esaminare la cosa,  
 ritrouaremo l'armonia mondana nella loro  
 misura & quantità, mediante la  
 tramutatione delle parti, che fa dall'vno  
 nell'altro, si come mostra il Filosofo:<sup>21</sup>

Ovid expresses this order and  
 connection in a lovely way, saying, "The  
 fiery weightless element that forms  
 heaven's vault leaped up and made place  
 for itself upon the topmost height. Next  
 came the air in lightness and in place.  
 The earth was heavier than these, and  
 drawing with it the grosser elements,  
 sank to the bottom by its own weight.  
 The streaming water took the last place  
 of all, and held the solid land confined in  
 its embrace."<sup>1</sup> But if we wish to  
 examine the matter more subtly, we will  
 discover the harmony of the world in its  
 measure and quantity, by means of the  
 transformation of the parts that turn one  
 element into another, as the Philosopher  
 shows.

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<sup>20</sup> 1573, Zarlino's marginal note: *Metamor. Lib. 1*  
 (Ovid, *Metamorphoses*, Book 1)

<sup>21</sup> 1573, Zarlino's marginal note: *De Generat. lib. 2*  
 (Aristotle, *On Generation*, Book 2).

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<sup>1</sup> Translation by Frank Justus Miller in Ovid,  
*Metamorphoses* (London: William Heinemann,  
 1916), 5.

conciosiache cosi si trammuta vna parte di  
 terre in acqua, & vna parte di acqua in aria,  
 come si trammuta vna parte di aria in  
 fuoco. Et cosi come si trammuta vna parte  
 di fuoco in aria, & vna parte di aria in  
 acqua, cosi si trammuta vna parte di acqua  
 in terra: essendo che trammutandosi la terra  
 in acqua, si viene a far tale trammutatione  
 in proportione Decupla. Di modo che  
 quando si trammuta un pugno di terra in  
 acqua, si genera (come dicono i Filosofi)  
 dieci pugni di acqua; & quando si  
 trammuta tale acqua in aria, viene a fare  
 cento pugni di aria, per la qual cosa  
 trammutandosi tutto questo in fuoco, viene  
 a multiplicare in mille pugni di fuoco. Così  
 per il contrario, mille pugni di fuoco si  
 conuerteno in cento di aria, & questi in  
 dieci di acqua, & dieci di acqua in vno di  
 terra;

In the way that one part of earth is  
 transformed into water, and one part of  
 water into air, so is one part of air  
 transformed into fire. And in the way  
 that one part of fire is transformed into  
 air, and one part of air into water, so is  
 one part of water transformed into earth.  
 When earth is transformed into water,  
 such transformation occurs in tenfold  
 proportion, so that when a handful of  
 earth is transformed into water, it  
 generates (as the philosophers say) ten  
 handfuls of water, and when such water  
 is transformed into air, it makes one  
 hundred handfuls of air, which,  
 transformed into fire, come to be  
 multiplied into a thousand handfuls of  
 fire. Thus, on the contrary, a thousand  
 handfuls of fire are converted into a  
 hundred [handfuls] of air, and these into  
 ten of water, and ten of water into one of  
 earth.

& questo auiene dalla rarità & spessezza, che si ritroua più in vno, che in vn'altro elemento: Percioche quanto piu s'auicinano al cielo, & sono lontani dal centro del mondo, tanto più sono rari; & quanto più s'auicinano a questo, tanto più sono spessi. Onde quando da questo si volesse giudicare la loro misura, si protrebbe dire, che la quantità del fuoco fusse in proportione Decupla con quella dell'aria; et quella dell'aria, con quella dell'acqua medesimamente in proportione decupla; & cosi la quantità dell'acqua con tutta la quantità della terra nella medesima proportione. Et si protrebbe anche dire (poi che gli Elementi sono corpi d'vno istesso genere, & il tutto con le parti conuiene in vna istessa natura, et in vna ragione istessa) che la proportione, che si ritroua tra la quantità della sphaera del fuoco, & tutta la massa della terra, sia quella, che sua tra il numero Millenario & l'vnitate.

And this happens because of the rarity and density that is found in one more than in another element, because the closer they are to the sky and distant from the center of the earth, the thinner they are, whereas the closer they are to the center of the earth, the denser they are. Therefore, when one wants to judge their measure from this [information], one could say that the quantity of fire is in tenfold proportion to [that of] air, and that of air to water is similarly in tenfold proportion, and thus the quantity of water is in the same proportion with all the quantity of earth. And furthermore, one could say (by the same logic, because the elements are bodies of one and the same kind, and the whole is related to its parts in similar nature) that the proportion that is found between the sphere of fire and all the mass of the earth is one thousand to one.

A questo modo adunque, dal mouimento, dalle [16] distanze, & dalle parti del cielo; & similmente da gli aspetti, dalla natura, & dal sito de i sette pianetti; & dal numero etiandio, dal peso, & dalla misura de i quattro elementi, venimo alla cognitione dell'harmonia Mondana. Conciosia che la concordanza & l'harmonia loro partorisca l'armonia de i tempi, che si conosce prima ne gli Anni, per la mutatione della Primavera nella State: & di questa nell'Autunno: similmente dell'Autunno nel Verno; & del Verno nella Primavera.

In this way then, from the movement, the distances, and the parts of the sky, and similarly from the aspects, the nature and the location of the seven planets, and also from the number, the weight, and the measure of the four elements, we come to know the harmony of the cosmos. Whence from their concord and harmony springs the harmony of the seasons that is seen first in the year through the change from spring into summer, and [then] from summer into fall, [and] similarly from autumn into winter, and from winter into spring.

Et dipoi nelli Mesi per il crescere & sciemare regolatamente, che fa la Luna; & finalmente ne i Giorni per il cambieuoale apparir della luce, et delle tenebre; dalla quale harmonia nasce la diuersità di fiori, & di frutti:<sup>22</sup> Percioche, si come afferma Platone,<sup>23</sup> quando il caldo col freddo, & il secco con l'humido proportionatamente s'vniscono; dall'harmonia di queste qualità ne risulta l'anno a ciascun viuente vtilissimo, pieno di varie sorti di fiori odoriferi, & di frutti ottimi; ne alcun'altra sorte di piante, o di animali viene a patire offesa.

And furthermore, [it is seen] in the months through the regular waxing and waning of the Moon, and finally [it is seen] in the days through the alternating appearance of light and darkness, from whose harmony arises the diversity of flowers and fruits. As Plato affirms, when heat is proportionately unified with cold and dryness with wetness, from the harmony of such qualities there results the [new] year so useful to every living being, filled with various kinds of fragrant flowers and excellent fruit, and no sort of plant or animal comes to bear any suffering from [these qualities].

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<sup>22</sup> 1573, Zarlino inserts the following: *Il perche Ouidio in questo proposito dice: Poma dat Autumnus: Formosa est messibus aestas: / Ver praebet flores: igne leuatur hyems.* (Ovid states the reason in this proposition: “Autumn brings fruit: summer is fair with harvest: spring gives flowers: winter is relieved by fire.” {translation by J. H. Mozley in Ovid, *The Art of Love and Other Poems*, 191}). Zarlino’s marginal note reads, *De Remed.l.* (Ovid: *The Art of Love*).

<sup>23</sup> 1573, Zarlino’s marginal note: *In Symposio.* (Plato, *Symposium*).

Si come all'opposito auiene, che dalla discordanza & distemperamento loro si generano pestilenza, sterilità, infirmità, & ogni cosa a gli huomini, alle bestie, & alle piante nociua. Et veramente la Natura hà seguito vn bello & ottimo ordine, facendo che quel che il Verno restringe & rinchiude, Primavera lo apra, & mandi fuori; & quel che la State secca, l'Autunno finalmente maturi. Di maniera che si vede l'vn tempo all'altro porgere aiuto; & di Quattro tempi harmonicamente disposti farsi vn corpo solo. Questa tale harmonia ben fu conosciuta da Mercurio, et da Terpandro;

Similarly, the opposite happens when from their discordance and disorder pestilence, sterility, infirmity, and all [other] things harmful to men, beasts, and plants occur. And truly nature has followed a beautiful and optimal order, so that what winter restrains and confines, spring opens and sends forth, and that what summer dries, autumn finally matures. In this way one sees each season bestow help upon another, and the four seasons harmonically arrange themselves into one single body. This harmony was well known to Mercury and Terpander.<sup>J</sup>

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<sup>J</sup> Terpander (c. 647 B.C.E.), a Greek poet and musician, was proverbially famous as a singer to the accompaniment of the seven-stringed instrument kithara, which he was said to have invented.

conciosia che l'vno hauendo ritrouata la Lira, oueramente la Cetera, pose in essa Quattro chorde ad imitatione della Musica mundana (come dice Boetio<sup>24</sup> & Macrobio<sup>25</sup>) la quale si scorge ne i Quattro Elementi, ouero nella varietà de i quattro tempi dell'anno; & l'altro la ordinò con sette chorde alla similitudine de i sette Pianeti. Fu poi il numero delle Quattro chorde nominato Quadrichordo, ouer Tetrachordo, che tanto vuol dire, quanto di Quattro chorde. Et quello di sette Eptachordo, che vuol dire di sette chorde.

The former, having invented the lyre or the kithara, placed its four strings in imitation of the music of the cosmos (as Boethius and Macrobius<sup>K</sup> say), which is perceived in the four elements, or in the variety of the four seasons of the year. The latter created the seven-stringed [lyre] in the image of the seven planets. The number of the four strings then [caused the four-stringed lyre] to be named “Quadrichord” or “Tetrachord,” which is tantamount to saying, with four strings. And the other is called “Heptachord,” which refers to its seven strings.

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<sup>24</sup> 1573, Zarlino's marginal note: *Musicae libro l. ca. 20*. (Boethius, *On Music*, Book I, Chapter 20).

<sup>25</sup> 1573, Zarlino's marginal note: *Satur. lib. 1. cap. 19* (Macrobius, *Saturnalia*, Book I, Chapter 19).

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<sup>K</sup> Ambrosius Theodosius Macrobius (c. 400 C.E.), was a Latin grammarian and philosopher whose most important work is the *Saturnalia*, the last known example of the long series of symposia headed by the *Symposium* of Plato. The *Saturnalia* purports to give an account of discussions in private houses on the day before the *Saturnalia* and on three days of that festival. Macrobius also wrote a commentary on Cicero's “*Somnium Scipionis*” (“The Dream of Scipio”) from the *De Republica*

Ma il primo fu da i Musici di maniera riceuuto & abbracciato, che le quindecim chorde comprese nel Sistema Massimo, furono accresciute secondo il numero delle chorde del predetto Tetrachordo, anchora che si ritrouino distanti l'una dall'altra sotto diuerse proportioni. Et questo basti quanto alla dichiarazione della Musica mondana.

But the former was received and embraced by musicians in such a manner that the fifteen pitches comprising the Greater Perfect System were compiled according to the number of pitches of the aforementioned Tetrachord, although they remain distant from one another in different proportions. Let this suffice for the discussion of cosmic music.

## Della Musica humana. / Cap. 7.

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La Musica humana poi<sup>1</sup> è quell'harmonia, che può esser intesa da ciascuno, che si riuolga alla contemplatione di se stesso: imperoche quella cosa, la quale mescola col corpo la viuacità incorporea della ragione, non è altro, che vn certo adattamento & temperamento, come di voci graui & acute; il quale faccia quasi vna consonanza. Questa è quella, che congiunge tra se le parti dell'Anima, & tiene vnita la parte rationale con la irrationale; & è quella, che mescola gli elementi, ouer le qualità loro nel corpo humano con ragioneuole proportione.

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<sup>1</sup> 1573: *poi* omitted.

## On Human Music / Chapter 7

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Human music is the harmony that can be understood by anyone who turns to self-contemplation, because that which blends the incorporeal brilliance of reason with the body is none other than a certain adaptability and tuning, as of low and high voices, as if they were to make a consonance. This is what joins the parts of the soul within itself and holds the rational and irrational parts together, and blends the elements, or their qualities, in the human body in rational proportion.

Onde principalmente si de<sup>2</sup> auertire, ch'io hò detto, che può esser intesa da ciascuno, che si riuolga alla contemplatione di se stesso; accioche non si credesse, che la Musica humana fusse, o si chiamasse quell'ordine, che osserua la Natura nella generatione de nostri corpi. La quale (come dicono li Medici, & anche lo conferma Agostino<sup>3</sup>) poi che nella matrice della donna ritroua il seme humano, corrompendolo per lo spatio di sei giorni lo conuerte in latte; ilquale in noue giorni trasforma in sangue; & in termine di dodici dì ne produce vna massa di carne senza forma: Ma a poco a poco introducendouela, in diciotto giorni la fa diuenire humana:

Thus, primarily, we must remember that I said that [human music] can be grasped by anyone who turns to self-contemplation. Therefore, one should not think that the order Nature observes in the creation of our bodies is or is called human music. [Nature] (as doctors say, and Augustine confirms), after it finds human seed in a woman's womb, corrupting it for six days, converts it into milk, which in nine days transforms into blood, and at the end of twelve more [days] produces from it a shapeless mass of flesh, which little by little becomes human in eighteen days.

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<sup>2</sup> 1573, *de* reads *deue* (must).

<sup>3</sup> 1573, Zarlino's marginal note: *Lib. 83. quest. questio. 56.* (St. Augustine, *De diversis quaestionibus* {*Eighty-three Different Questions*}, Question 56.

di modo che essendo in quarantacinque giorni compita la generatione, l'Onnipotente Iddio le infonde l'Anima intellettiua.<sup>4</sup> Et veramente questo mirabilissimo ordine ha in se contento & harmonia, considerate la distanza di un numero all'altro: si come è chiaro da vedere, che dal primo al secondo si ritroua la forma della consonanza Diapente; & da questo al terzo quella della Diatessaron; & dal terzo all'ultimo quella della medesima Diapente. Et di nuouo dal primo al terzo, & dal secondo all'ultimo la forma della Diapason; & dal primo all'ultimo chiaramente si scorge quella della Diapasondiapente; come più facilmente nella figura si vede:

Thus, having accomplished the generative process in forty-five days,<sup>A</sup> the Almighty God infuses it with intelligence. And truly this miraculous order possesses consonance and harmony, when one considers the distance from one number to another. As one can see clearly, from the first to the second [6:9] the form of the consonance of the diapente is found, and from this to the third [9:12], that of the diatesseron, and from the third to the last [12:18], that of the same diapente. And again from the first to the third [6:12], and the second to the last [9:18], the interval of the diapason [is found], and from the first to the last [6:18] clearly the diapason diapente is discerned, as one can see more easily from the diagram.

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<sup>4</sup> 1573, adds: *Onde di questo habbiamo: Sex in lacte dies, tres sunt in sanguine terni, / Bis seni carnem, ter seni membra figurant.* (of which there are six [days] of milk, three times three turns to blood / Twice six flesh, three times six limbs are formed.)

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<sup>A</sup> The math is as follows:  
6 + 9 + 12 + 18 = 45.

[17]

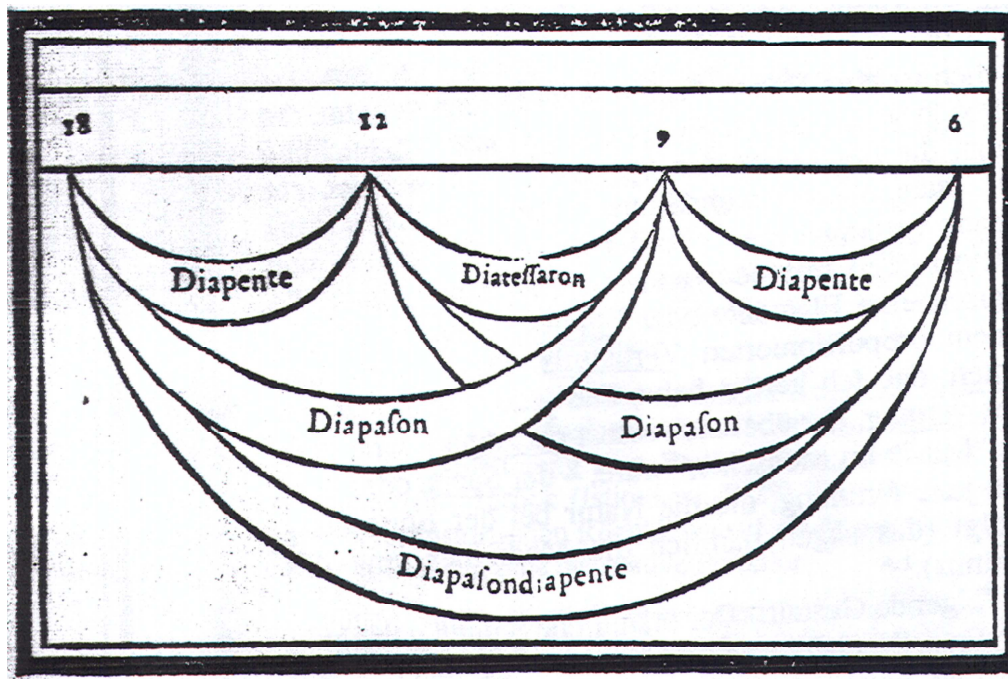


Figure 7.1. Relationships Between Days After Human Conception and Consonances.<sup>5</sup>

Ma questa non chiamerò io Musica humana, la qual diremo, che si possa conoscere da tre cose, cioè dal Corpo, dall'Anima, & dal Congiungimento dell'vno & dell'altra. Dal corpo, si come nelle cose che crescono, ne gli humori, & nelle humane operationi. Nelle cose che crescono noi veggiamo ciascun viuento quasi con vna certa harmonia cambiare il suo stato:

But I shall not call human music [that which has been mentioned above, but rather] that which may be defined by three things: the body, the soul, and the conjoining of one with the other. [We can recognize it] in the body. as in all things that grow, in the humors, and in human functions. In things that grow we see each living being changing its state as if with a certain harmony.

<sup>5</sup> Zarlino, *Ist.* (1558), 17.

Gli huomini diuentano di fanciulli vecchi,  
 & di piccoli grandi; Le piante di humide,  
 verdi & tenere, si fanno aride, secche, &  
 dure. Et ben che [17] ogni giorno si  
 veggano, & le habbiamo auanti<sup>6</sup> gli occhi,  
 nondimeno non si può veder tal mutatione:  
 si come ancora nella Musica non si puo  
 vdire lo spatio, che si troua dalla voce acuta  
 a quella che è grave, quando si canta:  
 conciosia che solamente si possa<sup>7</sup>  
 intendere, & non vdire. Ne gli humori;  
 come vedemo nel temperamento di tutti  
 quattro gli Elementi nel corpo humano.

Men grow from childhood to old age, and  
 from small to big; moist, green, and  
 tender plants become dry, barren, and  
 hard. And although we see them before  
 our eyes every day, nevertheless we are  
 unable to see such changes, just as in  
 music one cannot hear the space that  
 exists between high and low pitches  
 when one sings, yet one can recognize it  
 without being able to hear it. [We know  
 it] in the humors, as we see in the balance  
 of all four elements in the human body.

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<sup>6</sup> 1573, *auanti* reads *inanti* (before).

<sup>7</sup> 1573, *possa* reads *può*.

Et nelle humane operationi la conoscemo,<sup>8</sup>  
 nell'animal rationale, cioè nell'huomo:  
 imperoche in tal modo è retto & gouernato  
 dalla ragione, che passando per i debiti  
 mezi nel suo operare, conduce le sue cose  
 con vna certa harmonia a perfetto fine.  
 Conosci ancora tal harmonia dall'Anima,  
 cioè dalle sue parti, che sono l'Intelletto, li  
 Sentimenti & l'Habito: Imperoche,  
 secondo Tolomeo,<sup>9</sup> corrispondeno alle  
 ragioni di tre consonanze, cioè della  
 Diapason, della Diapente, & della  
 Diatesseron: conciosia che la parte  
 intellettuale corrisponda alla Diapason, che  
 hà sette interualli, & sette sono le sue  
 Specie; onde in essa si ritrouano sette cose,  
 cioè la Mente, l'Imaginatione, la Memoria,  
 la Cogitatione, l'Opinione, la Ragione, & la  
 Scienza.

And we know it in human actions, in the  
 rational animal, namely, man, because he  
 is supported and ruled by reason in such  
 a way that performing his necessary  
 functions, he conducts his affairs with a  
 certain harmony to a perfect end. Such  
 harmony may also be known by the soul,  
 namely, from its parts, which are  
 intellect, feelings and character. Because  
 according to Ptolemy, they correspond to  
 the structures of three consonances,  
 which are the diapason, the diapente, and  
 the diatesseron. it follows that the  
 intellectual part corresponds to the  
 diapason, which contains seven intervals  
 and has seven species, in which are found  
 seven things, which are mind,  
 imagination, memory, thought, opinion,  
 reason, and knowledge.

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<sup>8</sup> 1573, *conoscemo* reads *conosciamo*.

<sup>9</sup> 1573, Zarlino's marginal note: *Harmo.libro 3.c.5*  
 (Ptolemy, *Harmonics*, Book 3, Chapter 5).

Alla Diapente, la quale ha quattro Specie & quattro interualli, corrisponde la sensitua in quattro cose, nel Vedere, nell'Vdire, nell'Odorare, & nel Gustare: conciosia<sup>10</sup> che il Toccare sia commune a ciascun de i nominati quattro sentimenti, & massimamente al Gusto. Ma alla Diatesseron, la qual si fa di tre interualli & contiene tre Specie corrisponde la parte habituale, nell'Augumento, nella Summità, & nel Decrescimento. Similmente se noi vorremo che le parti dell'Anima siano la sede della Ragione, dell'Ira, & della Cupidità; ritrouaremo nella prima sette cose corrispondenti a gli interualli & alle specie della Diapason, cioè l'Acutezza, l'Ingegno, la Diligenza, il Consiglio, la Sapienza, la Prudenza, & l'Esperienza.

The diapente, which contains four species and four intervals, corresponds to four of the senses, sight, hearing, smell, and taste, given that [the sense of] touch is common to each of the aforementioned senses, especially taste. But to the diatesseron, which is composed of three intervals and contains three species, corresponds character, in its growth, summit, and decline. Similarly, if we want the parts of the soul to be the source of reason, anger, and cupidity, we will discover in the first [i.e., reason] seven qualities corresponding to the intervals and to the species of the diapason, which are perspicacity, ingenuity, diligence, guidance, wisdom, prudence, and experience.

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<sup>10</sup> 1573, *conciosia* reads *essendo*.

Nella seconda ritrouaremo quattro cose, che corresponderanno alle specie & a gli interualli della Diapente, cioè Mansuetudine o Temperanza d'animo, Animosità, Fortezza, & Tolleranza. Nella terza tre cose corrispondenti a gli interualli & alle specie della Diatessaron, cioè Sobrietà o Temperanza, Continenza, & Rispetto. Oltre di ciò si considera ancora tale harmonia nelle potenze di essa anima, si come nell'Ira, nella Ragione; & nelle Virtù; come sarebbe dire nella Iustitia & nella Fortezza: percioche queste cose tra loro si vengono a temperare nel modo che nei suoni della consonanza si contempera il suono graue con l'acuto.

In the second [i.e., anger] we will discover four qualities, which will correspond to the species and intervals of the diapente, namely humility or temperance of the soul, animosity, fortitude, and tolerance. In the third [i.e., cupidity, we will discover] three qualities corresponding to the intervals and species of the diatessaron, which are sobriety or temperance, forbearance, and respect. Beyond all this we can see even more harmony in the power of that soul, as in [the interaction of] anger and reason; and in the virtues, namely, in justice and fortitude, because these things come to mitigate each other in the way that low and high pitches mitigate each other in the sounds of consonance.

Si conosce vltimamente tale harmonia dal congiungimento dell'Anima col Corpo, per la naturale amicitia, mediante la quale il corpo con l'anima è legato, non già con legami corporei, ma (come vogliono i Platonici) con lo spirito, il quale è incorporeo, come al cap. 4. di sopra vedemmo.<sup>11</sup> Questo è quel legame, dal qual risulta ogni humana harmonia, & è quello, che congiunge le diuerse qualità de gli elementi in vn composto, cioè nel corpo humano, seguendo l'opinione de Filosofi; i quali concordemente affermano, che i corpi humani sono composti di Terra, Acqua, Aria, & Fuoco; & dicono la carne generarsi della temperatura di tutti li quattro elementi insieme; li Nerui di terra & di fuoco; & finalmente le ossa di acqua & di terra.

One ultimately knows such harmony from the joining of the soul with the body, by the natural kinship through which the body is joined to the soul, not with physical connections, but (as the Platonists believe) with the spirit, which is incorporeal, as we have already seen in Chapter 4, above. This is the connection from which results all human harmony, and which joins the different qualities of the elements in a composite, namely, the human body, according to the opinion of the philosophers. They unanimously affirm that human bodies are composed of earth, water, air, and fire, and say that flesh is generated from the mixture of all four elements together: the nerves from earth and fire, and lastly the bones from water and earth.

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<sup>11</sup> 1573, *come al cap. 4. di sopra vedemmo* reads *come di sopra vedemmo*. Zarlino's marginal note: *Cap. 4.*

Ma se questo ne paresse strano, ragioneuolmente non potemo negare, che non siano composti almeno delle qualità elementali, mediante li quattro humori, che in ogni corpo si ritrouano; come è la Malinconia, la Flegma, il Sangue, & la Colera: li quali benche l'vno all'altro siano contrarij; nondimeno nel misto, o composto, che voglia- [18] mo dire, stanno harmonicamente vniti. Anzi se per patir freddi, & souerchi caldi; ouer per troppo mangiare, ò per altra cagione facemo<sup>12</sup> violenza ad vno de gli humori, in istante ne segue il distemperamento, & l'infirmità del corpo; ne egli prima si risana, se essi non sono ridutti alla pristina proportione & Concordia; la quale non potrebbe essere, quando non vi fusse quel legamento, che di sopra hò detto, della natura spirituale con la corporale, & della rationale con la irrationale.

But if this seems strange, we cannot reasonably deny that they are composed at least of elemental qualities, by means of the four humors that are found in each body, which are the melancholic, the phlegmatic, the sanguine, and the choleric. Although [the four humors] are contrary to one another, they are harmoniously united in their mixture or composition. Thus, whether suffering from cold, or excessive heat, or overeating, or for another reason one of the humors is violated, imbalance and infirmity of the body follow instantaneously. Nor will man heal before [such humors] are returned to pristine proportion and concord, which could not occur unless there were that connection between the spiritual and corporeal nature, and between the rational and the irrational, that I have previously discussed.

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<sup>12</sup> 1573, *facemo* reads *faciamo*.

Questa Concordia harmonica adunque della natura spirituale con la corporale, & della rationale con la irrationale, è quella, che costituisce la Musica humana: percioche mentre l'Anima quasi con ragion de i numeri perseuera di stare vnita col corpo, il corpo ritiene col nome l'essere animato; & non essendo per altro accidente impedito, hà potestà di far ciò che vuole: doue disciogliendosi l'harmonia, egli si corrompe, & perdendo col nome l'esser animato, resta nelle tenebre, & l'Anima vola all'immortalità. Et ben fu detto quasi con ragion de i numeri; conciosiache gli antichi hebbero vna strana opinione, che quando vno si annegaua, oueramente era ucciso, l'anima sua non poteua mai andare al luogo deputato, fin che non haueua finito il musical numero; col quale dal suo nascimento era stata congiunta al corpo.

Thus, this harmonious concord of spiritual with physical nature, and of rational with irrational, is what constitutes human music. While the soul perseveres to maintain its unity with the body as though by means of numerical harmony, the body retains its living essence in its name. Not encountering any obstacle along its way, [the body] is free to do as it wishes. Once the harmony is undone, the body is corrupted, and losing its living essence along with its name, it remains in darkness, and the soul flies to immortality. And it was rightly said in accordance with the numerical connection [of body and soul], since the ancients had the strange opinion that when one drowned, or was killed, one's soul could never reach its designated place until it had achieved its musical number, to which it was joined to its body at birth.

Et perche haueano per fermo, che tal numero non si potesse trappassare, però tali accidenti chiamarono Fato, ouer Corso fatale. Questa opinione tocca il Poeta<sup>13</sup> introducendo Deifobo, il quale fu ucciso da i Greci, dir queste parole;<sup>14</sup> Explebo numerum, reddarque tenebris. Ma perche queste cose s'appartengono più alli ragionamenti della Filosofia, che a quelli della Musica, lascerò di parlarne più oltre, contentandomi di hauerne detto queste poche, & dimostrato la varietà della Musica animastica; della quale, come di quella, che nulla o poco fa al nostro proposito, non ne farò più mentione.

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<sup>13</sup> 1573, Zarlino's marginal note: *Aeneid.6.* (Virgil, *Aeneid*, Book 6).

<sup>14</sup> 1573, *Questa opinione tocca il Poeta introducendo Deifobo, il quale fu ucciso da i Greci, dir queste parole* reads *Onde. il Poeta introducendo Deifobo, il quale fu ucciso da i Greci, tocca questa opinione con le seguenti parole.*

And because it was their firm opinion that such a number could not be surpassed, they called such accidents “fate,” or “fatal course.” The Poet touched on this opinion when introducing Deiphobus,<sup>B</sup> who was killed by the Greeks, saying these words: “I will complete the number and return to the darkness.”<sup>C</sup> But because such matters belong more to the realm of philosophy than to that of music, I will refrain from addressing them further, contenting myself with having said these few things. Having demonstrated the variety of animastic music—something that pertains very little, if at all, to our subject—I will make no further mention of it.

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<sup>B</sup> In Greek legend, Deiphobus was a brother of Paris, who was married to Helen of Troy. When Paris was slain, Helen married Deiphobus, whom she betrayed to Menelaus when Troy was subsequently captured.

<sup>C</sup> My translation.

Della Musica piana, & misurata; o  
vogliamo dire Canto fermo, & figurato. /  
Cap. 8

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Resta hora di andare dichiarando il secondo  
membro principale, che noi facemmo della  
Musica; il quale era la Organica, diuisa in  
Harmonica o Naturale, & in Artificiata;  
ciascuna delle quali diuidemmo in Piana,  
Misurata, Rithmica, & Metrica.

Ripigliando adunque queste vltime parti  
dico, che la Musica Piana si dimanda  
quell'harmonia, che nasce da vna semplice  
& eguale prolatione nella cantilena, la  
quale si fa senza variatione alcuna di  
tempo, dimostrato con alcuni Caratteri, o  
figure semplici, che Note li musici pratici  
chiamano;

On Plainsong, and Measured Music. or  
what we call *canto fermo* and [*canto*]  
*figurato* / Chapter 8

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It now remains to address the second  
principal component that we identified  
in music, which is Organic,<sup>A</sup> divided  
into Harmonic or Natural, and Artificial,  
each of which we divided into  
plainsong, measured [music], rhythmic,  
and metrical.<sup>B</sup> Reviewing again this last  
part, I say that plainsong refers to the  
harmony that arises from a simple song  
with pitches of equal lengths, performed  
without any variation of time, shown  
with some characters, or simple figures,  
which practicing musicians call notes.

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<sup>A</sup> In Chapter 5, Zarlino defines Organic music as music that is produced by humans: either vocally (Harmonic or Natural) or by instruments (Artificial).

<sup>B</sup> See Figure 5.1, page 187.

imperoche in essa si pone il tempo intero & indiuisibile, & da i Musici volgarmente è chiamato Canto piano, ouero Canto fermo; ilquale è molto vsato da i Religiosi nelli diuini vfficij. Musica misurata dico essere l'armonia, che nasce da vna variata prolotione di tempo nella cantilena, dimostrato per alcuni Caratteri, o figure al modo sopra detto, le quali di nome, essentia, forma, quantità, & qualità sono differenti; & non si accrescono, ne si diminuiscono: ma si cantano con misura di tempo, secondo che descritte si trouano. Et questa communemente si chiama Canto figurato, dalle figure o note, che si trouano in esso di forma & quantità diuersa, le quali ne fanno crescere & minuire il tempo nella cantilena, secondo la loro valuta, che tardità, o velocità di tempo ne rapresentano.

Since in [this type of melody each unit of] time is complete and undivided, musicians commonly call it “plainsong” or *canto fermo*, which is often used by religious in their divine offices. I call measured music the music that arises from a variety of note values in the song, shown by several characters or figures in the manner described above, whose names, essences, forms, quantities, and qualities are different. [The notes] neither speed up nor slow down, but are performed according to whatever unit of time they indicate. And this is commonly known as *canto figurato* because of its figures or notes that come in different shapes and quantities, which make the speed of the melody increase and decrease according to their values, which represent length or brevity of time.

Ma Figura, o Nota che dire vogliamo, si nel canto fermo, come nel figurato, dico essere un segno, che posto sopra alcune linee & spatij, ci rapresenta il suono o la voce, & la velocità & tardità del tempo, che bisogna vsare nella cantilena; delle quai cose tratteremo poi<sup>1</sup> nella Terza parte, quando ragioneremo intorno la materia del Contrapunto, cioè delle Compositioni delle cantilene. Et perche la Musica piana & Misurata, non solo da istrumenti naturali, ma da artificiali ancora può nascere; però nella diuisione della Musica organica, dalla harmonica, o naturale, & dalla artificciata l'hò fatta discendere.

But I say that the figure or note, whichever we call it, whether in plainsong or measured music, is a sign placed on certain lines and spaces that represents sound or pitch and the shortness or length of time which must be used in the melody. This shall be treated in the third part [of *Le istituzioni harmoniche*], when we discuss the material of counterpoint, that is, compositions of [several] melodies. And because plainsong and measured music can be produced not only from natural but also from artificial instruments, in my classification of organic music I have derived it from [both] harmonic or natural, and artificial [music].

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<sup>1</sup> 1573: *poi* omitted.

[19] Della Musica Rithmica, & della  
Metrica. / Cap. 9

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Musica Rithmica diremo esser quella harmonia, che si sente nel verso, ouero nella prosa per la quantità delle Sillabe & per il suono delle parole, quando insieme bene & acconciamente si compongono; La scienza della quale consiste nel giudicare, se nella prosa, o nel verso sia conueneuole consonanza tra parola & parola, cioè se le sillabe dell'vna, bene o male con le sillabe dell'altra si congiungono. Questo tal giuditio non si può fare, se prima in atto non si riduce, & si faccia vdire col mezo de naturali istrumenti: percioche non le lettere, ma gli elementi delle lettere sono quelli, che producono tale conueneuole consonanza;

On Rhythmic and Metrical Music /  
Chapter 9

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We will call “rhythmic music” the harmony that is perceived in poetry or prose by the number of syllables and the sound of the words, when they fit together well and are composed in good style. Its science consists of judging, whether in prose or in verse, if there is suitable consonance from one word to the next, that is, if the syllables of one [word] are conjoined well or badly with the syllables of another. Such judgment cannot be made until [the words are] first pronounced and made audible by natural instruments, because it is not the letters, but their elements that produce such pleasing consonance.

li quali (secondo li Grammatici, & secondo Boetio<sup>1</sup> ancora<sup>2</sup>) altro non sono, che la pronuntia di esse lettere, che sono con diuerse forme figurate, ritrouate<sup>3</sup> per commodità di esprimere il concetto, senza parole pronunciate. Onde nella general diuisione della Musica organica; dalla harmonica, o naturale gli<sup>4</sup> hò fatto trar la sua origine. Potemo<sup>5</sup> adunque hora conoscere la differenza, che è tra questa & l'altra specie di Musica, che Metrica si chiama; il cui propio è di saper giudicare ne i versi la quantità delle sillabe,

These [elements] (according to the grammarians as well as Boethius) are none other than the pronunciation of the letters, which are represented by different shapes, invented so as to express a concept without speaking. In the general division of organic music, I have traced its origins from harmonic or natural [music]. Thus, we now will be able to understand the difference that exists between this [i.e., rhythmic] and the other species of music, which is called metrical [music]. Our goal is to know how to determine the length of the syllables in its verses,

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<sup>1</sup> 1573, Zarlino's marginal note: *De interp. lib. 1. Aediti.2.* (Boethius, *On Aristotle's "On Interpretation,"* book 1, 2<sup>nd</sup>. edition.)

<sup>2</sup> 1573, *ancora* omitted.

<sup>3</sup> 1573, *ritrouate* reads *ritrouato*.

<sup>4</sup> 1573, *dalla harmonica, o naturale gli hò fatto...* reads *della Harmonica o Naturale le hò fatto....*

<sup>5</sup> 1573, *Potemo* reads *Possiamo*.

cioè se siano lunghe o breui, mediante le  
 quali si conoscano i piedi, & quali siano, &  
 la loro determinata sede: Conciosiacche la  
 diuersità de i piedi, come di due, di tre, di  
 quattro, o di più sillabe, costituisce la  
 Musica metrica; La quale se  
 medesimamente volemo dichiarare, non è  
 altro che l'harmonia, che nasce dal verso  
 per la quantità delle sillabe; la  
 compositione delle quali costituisce diuersi  
 piedi, come sono il Pirrichio, l'Iambo, lo  
 Spondeo, il Trocheo, il Tribracho,  
 l'Anapestio, il Dattilo, il Proceleumatico,  
 & altri che nelle Poesie si ritrouano; Li  
 quali, secondo la loro determinata sede nel  
 verso, posti harmonicamente insieme,  
 porgono all'udito grandissima diletatione.  
 Et per le medesime ragioni ch'abbiamo  
 detto della Rithmica,

that is, if they are long or short,  
 identifying the feet and what they are,  
 and their specific place, because the  
 diversity of feet, whether consisting of  
 two, three, four, or more syllables,  
 constitutes metrical music. This, if we  
 wish to analyze it further, is nothing  
 other than the harmony born from the  
 verse through the length of syllables, the  
 composition of which constitutes diverse  
 feet, as, for example, pyrrhic, iambic,  
 spondaic, trochaic, tribrachic, anapestic,  
 dactylic, proceleusmatic,<sup>A</sup> and others  
 that are found in poetry. According to  
 their specific place in the verse, when  
 placed harmoniously together, [poetic  
 feet] can bestow great delight upon the  
 listener. And for the same reasons that  
 we have given for rhythmic [music],

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<sup>6</sup> 1573, *Li* reads *i*.

---

<sup>A</sup> A proceleusmatic foot is a metrical foot of four short syllables.

la Metrica anchora dalla medesima  
 harmonica, o naturale discende: imperoche  
 la lunghezza, o brevità delle sillabe si  
 conosce, o misura dal suono della voce, la  
 cui lunghezza o brevità importi tempo,  
 conosciuto per il moto. Si che non dalle  
 lettere, ma dal suono delle voci viene a  
 nascere la Musica Metrica: percioche  
 accompagnandolo col suono de gli<sup>7</sup>  
 artificiali istrumenti si forma il Metro,  
 come anticamente faceuano li Poeti lirici,  
 che al suono della Lira, o della Cetera  
 cantauano i loro versi; onde parimente li  
 Poeti & i Versi da loro cantati vengono  
 chiamati Lirici. Et perche da principio essi  
 andauano a poco a poco cercando di  
 accompagnare i versi con harmonia al  
 suono della Lira o della Cetera,<sup>8</sup>

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<sup>7</sup> 1573, *gli* omitted.

<sup>8</sup> 1573, *al suono della Lira o della Cetera*, reads *al suono delli già nominati istrumenti: però...* (instruments already mentioned; therefore,...)

metrical [music] also descends from the  
 same harmonic or natural [music],  
 because the length or brevity of the  
 syllables is known and measured by the  
 sound of the voice, the length or brevity  
 of which implies time, known through  
 movement. Metrical music does not  
 arise from letters, but from the sound of  
 voices, because [when] accompanied by  
 the sound of artificial instruments, it  
 forms meter, as the lyric poets did in  
 ancient times, singing their verses to the  
 sound of the lyre or the kithara. Thus  
 poets and their verses alike came to be  
 called lyric by virtue of their songs.  
 And because from the beginning they  
 gradually sought to accompany their  
 verses in harmony with the sound of the  
 lyre or the kithara,

---

<sup>B</sup> In the sense of rhythm.

è stata opinione de molti, che i detti Poeti  
 trouassero le Legi [*sic*] o regole de i versi,  
 le quali Metriche addimandauano. Per  
 concludere adunque dico, che la Rithmica  
 & la Metrica parimente discende dalla  
 naturale: Ma perche (come vuole  
 Agostino<sup>9</sup>) percuottendo noi alcuno  
 istrumento con quella velocità ò tardità, che  
 noi proferimo alcuna parola, potemo<sup>10</sup>  
 conoscere dal mouimento gli istessi tempi  
 lunghi & breui, cioè li numeri istessi, che  
 nelle parole si conosce;<sup>11</sup> però non fu  
 inconueniente dire, che queste due sorti di  
 Musica, si possano anco attribuire  
 all'artificiata:

many held the opinion that the  
 aforementioned poets discovered the  
 laws or rules of verses that they called  
 metric. In conclusion, then, I say that  
 rhythmic and metrical [music] equally  
 stem from natural [music], because (as  
 Augustine states) striking any  
 instrument with the same speed or  
 slowness that we employ in uttering any  
 word, we may learn from this movement  
 the same long and short values, that is,  
 the numbers themselves, which are  
 known to exist in words. Therefore, it is  
 not incorrect to say that these two types  
 of music can also be attributed to  
 artificial [music],

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<sup>9</sup> 1573, Zarlino's marginal note: *Musices libro I.c.I.*  
 (St. Augustine, *On Music*, Book I, Chapter 1.)

<sup>10</sup> 1573, *potemo* reads *potiamo*.

<sup>11</sup> 1573, *conosce* reads *conoscono*.

conciosia che ogni giorno vdiamo farsi questo con diuersi istrumenti, al suono de quali ottimamente si accommodano varie sorti di versi, secondo il numero che si comprende nel suono nato da loro. E ben vero, che tra quella che deriuua dalle voci, & quella che deriuua dalli suoni si ritrouerà tal differenza, che l'vna Rithmica, o Metrica naturale si potrà dire, & l'altra Rithmica o Metrica artificiata. Queste due sorti di Musica (percioche al presente molto più alli Poeti & Oratori, che al Musico, appartengono sapere) lasceremo da parte, ragionando solamente della Piana & della Misurata, non pretermittendo, come è il mio principale proposito, alcuna cosa, che sia degna di annotatione.

because every day we hear it produced by different instruments, to whose sound various sorts of verses are best accommodated, according to the number that is understood in the sound that arises from them. It is quite true that between the [music] that derives from voices and that which derives from [instruments] such a difference can be found that the former may be called natural rhythmic or metrical [music] and the latter may be called artificial rhythmic or metrical [music]. We shall leave aside these two kinds of music (because at present their knowledge pertains to poets and orators much more than it does to the musician), discussing only plainsong and measured music, without omitting anything that may be worthy of comment, as is my main purpose.

Quello che sia Musica in particolare, &  
perche sia cosi detta. / Cap. 10

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Fatta la diuisione della Musica (hauendola  
prima dichiarita in vniuersale) & veduto  
quello, che sia ciascuna sua parte  
separatamente; resta hora (douendosi  
ragionar solamente della Istrumentale)  
veder prima quello, che ella sia. Dico  
adunque, che la Musica istrumentale è  
harmonia, la quale nasce da i suoni & dalle  
voci;

What Music is in Particular, and why it  
is Thus Called / Chapter 10

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Having made the division of music,  
(having first spoken of [music] in  
general) and considered each of its parts  
separately, there remains for us (while  
we are specifically discussing  
instrumental [music]) to see first what it  
may be. I say, therefore, that  
instrumental music is the harmony that  
arises from sounds and pitches [of  
instruments].<sup>A</sup>

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<sup>A</sup> In this context, “instrumental music” refers to both vocal and instrumental music; the “instruments” referred to in brackets are the sounds and pitches produced by natural (voices) and artificial instruments.

la cui cognitione in che consista facilmente  
dalla sua definitione potremo sapere:  
imperoche ella è scienza speculatiua [20]  
mathematica, maestra di tutte le cantilene,  
la quale col senso & con la ragione  
considera li suoni &<sup>1</sup> le voci, li numeri, le  
proportioni, & le loro differenze; & ordina  
le voci graui & acute con certi termini  
proportionati ne i debiti luoghi. Ne si  
marauigli alcuno, ch'io habbia detto la  
Musica essere scienza speculatiua:  
percioche tengo, che sia possibile, che vno  
possa quella possedere nell'intelletto;  
ancora che non l'esserciti con li naturali o  
artificiali istrumenti. Ma perche ella sia  
cosi detta, & donde deriui il suo nome, non  
è cosa facile da sapere:

We can easily grasp from its definition  
the knowledge of its content, because it is  
a speculative mathematical science,  
master of all melody, which considers,  
with sense and reason, sounds and  
pitches, numbers, proportions, and their  
differences, and orders low and high  
pitches with certain boundaries  
proportionate to their proper places. No  
one should be suprised that I have called  
music a speculative science, because I  
consider it possible that one may possess  
it intellectually, despite not practicing it  
with natural or artificial instruments. But  
it is not an easy thing to know why it  
should be so called and from whence its  
name derives,

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<sup>1</sup> 1573, & omitted.

conciosia che alcuni hanno hauuto  
 opinione, che ella habbia origine dal verbo  
 greco Μαιεσθαι; & altri (tra i quali è  
 Platone nel Cratilo) da μωσθαι, cioè dal  
 cercare, o inuestigare; come di sopra si è  
 mostrato. Et alcuni hanno hauuto parere,  
 che sia detta da μου voce Egittia, o  
 Caldea, & da ηχοζ voce Greca; che l'vna  
 vuol significare Acqua, & l'altra Suono;  
 quasi per il suono delle acque ritrouata:  
 della quale opinione fu Giouanni  
 Boccaccio ne i libri della Geneologia delli  
 Dei.<sup>2</sup>

because some held the opinion that it  
 originates from the Greek verb  
*maiesthai*, and others (among them,  
 Plato, in *Cratylus*) from *mosthai*, that is,  
 to search or investigate, as was shown  
 above. And others have thought that it  
 may derive from the Egyptian or  
 Chaldean word, *mon*, and from the  
 Greek word, *echos*, the former  
 signifying water, and the latter, sound,  
 as if found in the sound of water, an  
 opinion voiced by Giovanni Boccaccio  
 in his books on the genealogy of the  
 gods.

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<sup>2</sup> 1573, Zarlino's marginal note: *Lib.I.c.2.*  
 (Boccaccio, *Genealogy of the Gods*, Ibook 1,  
 Chapter 2.)

Et in vero non mi dispiace: perciocche è concorde alla opinione di Varrone, il qual vuole, che in tre modi naschi la Musica; o dal suono delle acque; o per ripercussione dell'aria; o dalla voce: ancorache Agostino dica altramente.<sup>3</sup> Alcuni altri istimarono, che così fusse detta: perche appresso l'acque fu ritrouata, & non per il suono delle acque; mossi per auentura da questo, che Pan dio de pastori fu il primo (come narra Plinio<sup>4</sup>) che della sua Siringa conuersa in canna appresso Ladone fiume di Arcadia, fece la Sampogna pastorale; il che afferma il Poeta<sup>5</sup> dicendo; Pan primus calamos cera coniungere plures / Instituit.

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<sup>3</sup> 1573, Zarlino's marginal note: *De Doct. Chri.lib.2 c. 17. & De Ordi II, 14.* (Augustine, *On Christian Doctrine*, Book II, Chapter 17 and *On Order*, Bok 2 II, Chapter 14).

<sup>4</sup> 1573, Zarlino's marginal note: *Natu. hist. lib.7.c.56.* (Pliny, *Natural History*, Book VII, Chapter 56).

<sup>5</sup> 1573, Zarlino's marginal note: *In Alexi* (Virgil, *Bucolics*).

And in truth I do not disagree, because it is consistent with the opinion of Varro,<sup>B</sup> who holds that music arose in three ways: from the sound of water, or by vibration of the air, or from the voice, although Augustine states otherwise. Some others held that this was said because [music] was found near water, and not from the sound of water. Pan, god of shepherds, was the first (as Pliny says) to make a shepherd's pipe from his Syrix, converted to reed, near Ladon, the river of Arcadia.<sup>C</sup> The Poet confirms this, saying, "Pan it was who first taught man to make many reeds one with wax."<sup>D</sup>

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<sup>B</sup> Marcus Terentius Varro (116-27 B.C.E.), a Roman scholar and satirist, wrote over 600 books on a wide range of subjects, including agriculture, astronomy, education, geography, jurisprudence, linguistics, and politics.

<sup>C</sup> Syrix was a nymph who turned herself into a reed to escape Pan. He then made her into a pipe. (Ovid, *Metamorphoses*)

<sup>D</sup> Translation by Fairclough in Virgil *Eclogues, Georgics, and Aeneid*, 13.

Et quantunque queste opinioni siano buone,  
tuttauia quello che a me par più  
ragioneuole, et più me piace è l'opinione di  
Platone,<sup>6</sup> che ella sia nominata dalle Muse,  
alle quali (come dice Agostino<sup>7</sup>) è  
conceduto vna certa onnipotenza di  
cantare: & vogliono li Poeti, che siano  
figliuole di Gioue & di Memoria; & dicono  
bene: percioche se l'huomo non ritiene<sup>8</sup> li  
suoni & gli interualli delle voci musicali  
nella memoria, non fa<sup>9</sup> profitto alcuno; &  
questo auiene: perche non si possono a via  
alcuna scriuere:

And however good these opinions may  
be, nevertheless the one that appears to  
me more reasonable and more pleasing  
is the opinion of Plato, that it was named  
for the muses, to whom (as Augustine  
says) was conceded a certain  
omnipotence of song. The poets feel  
that [the muses] were daughters of  
Jupiter and Memoria, and they are  
correct, because if man did not retain the  
sounds and the intervals of musical  
pitches in his memory, no one would  
profit, and this would happen because  
they were unable to be written down in  
any way.

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<sup>6</sup> 1573, Zarlino's marginal note: *In Alcibiade.I*  
(Plato, *Alcibiades I*).

<sup>7</sup> 1573, Zarlino's marginal note: *Musicae libro I.c.I.*  
(Augustine, *On Music*, Book I, Chapter 1).<sup>8</sup> 1573,  
*ritiene* reads *ritene*.

<sup>9</sup> 1573, *fa* reads *fu*.

tanto più, che ogni scienza, & ogni disciplina (come vuole Quintiliano<sup>10</sup>) consiste nella memoria: conciosia che in vano ci è insegnato, quando quello che noi ascoltiamo dalle menti nostre si parte. Et perche habbiamo detto la Musica essere scienza speculatiua, però auanti che più oltra passiamo, vederemo (hauendo consideratione del fine) come anche la possiamo dimandare Prattica.

[Music], so much more than every science and every discipline (as Quintilian says), consists of memory, because if what we listen to leaves our minds, it is taught to us in vain. And since we have said that music is a speculative science, before we spend any more time, let us see (keeping our goal in mind) how we may also call it practical.

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<sup>10</sup> 1573, Zarlino's marginal note: *Institu. orat. lib. 11 cap. 2* (Quintilian, *On Oratory*, Book 11, Chapter 2).

Divisione della Musica in Speculatiua & in  
Prattica; per la quale si pone la differenza  
tra il Musico & il Cantore. / Cap. 11

Division of Music into Speculative and  
Practical; Through Which one  
Differentiates between the Musician and  
the Performer / Chapter 11

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Intraviene nella Musica quello, che suole  
intrauenire in alcuna dell'altre scienze:  
conciosiache diuidendosi in due parti, l'vna  
Theorica, o Speculatiua, & l'altra Prattica  
vien detta. Quella il cui fine consiste nella  
cognitione solamente della verità delle cose  
intese dall'intelletto (il che è propio di  
ciascuna scienza) è detta Speculatiua;  
l'altra che dall'essercitio solamente  
dipende, vien nominata Prattica. La prima,  
come vuol Tolomeo,<sup>1</sup> fu ritrouata per  
accrescimento della scienza, imperoche per  
il suo mezo potemo ritrouar nuoue cose, &  
darle augumento:

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What usually occurs in any of the other  
sciences occurs in music because, being  
divided into two parts, one comes to be  
called theoretical or speculative, and the  
other, practical. That whose goal  
consists solely of understanding the truth  
of things grasped by the intellect (which  
is appropriate to each science) is called  
speculative; the other, which depends  
solely on practice, is named practical.  
The first, as Ptolemy holds, was  
discovered through the progress of  
science, because [through science] we are  
able to discover new things and further  
enrich them.

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<sup>1</sup> 1573, Zarlino's marginal note: *Almag. lib 1. cap. 1*  
(Ptolemy, *Almagest*, Book 1, Chapter 1).

Ma la Pratica solamente è per l'operare; come disegnare, descriuere, & fabricare con le mani le cose occorrenti. Questa alla prima non altramente si sottomette, di quello che fa l'appetito alla ragione, & è il douere: conciosia che ogni arte, & ogni scienza naturalmente ha per più nobile la ragione con la quale si opera, che l'istesso operare. Onde hauendo noi dall'Animo il sapere, & dal Corpo, come suo ministro, l'opera; è cosa manifesta, che l'animo vincendo & superando di nobiltà il corpo, quanto alle operationi sia ancora più nobile: tanto più, che se le mani non operassero quello, che dalla ragione gli è commandato, vanamente & senza frutto alcuno si affaticarebbero. Si che non è dubbio, che nella scienza della Musica è più degna la cognitione della ragione, che l'operare.

But practice is aimed solely at execution, as are drawing, describing, and creating necessary things with one's hands. The latter is inferior to the former in the same way that the appetite is inferior to reason, and this must be so because each art and each science naturally holds as more noble the intellect that produces work than the process of work itself. Therefore, since knowledge comes to us from our soul and practice follows from the body as its deputy, it is manifest that the soul conquering and superseding the body in nobility is even more noble than its operations, so much so, that if one's hands were not to work as reason commands them to do, they would exhaust themselves in vain and fruitlessly. There is no doubt that in the science of music cognition is worthier than execution.

Et quantunque la speculatione da per se non habbia dibisogno dell'opera; tuttauia non può lo speculatiuo produrre cosa alcuna in atto, che habbia ritrouato nuouamente, senza l'aiuto dell'artefice, ouero dell'istrumento: percioche tale speculatione se bene ella non fusse vana, parrebbe nondimeno senza frutto, quando non si riducesse all'vltimo suo fine, che consiste nell'essercitio de naturali & artificiali istrumenti, col mezo de i quali ella viene a conseguirlo: si come ancora l'artefice senza l'aiuto della ragione mai potrebbe condurre l'opera sua a perfettione alcuna. Et per questo nella Musica (considerandola nella sua vltima perfettione) queste due parti sono tanto insieme congiunte, che per le assegnate ragioni non si possono separare l'vna dall'altra.

And although speculation alone has no need for practice, nevertheless the speculative cannot put anything that it has newly discovered into practice without the help of the player or the instrument; because, even if such speculation were not in vain, it would nonetheless appear fruitless if it were not reduced to its final goal, which consists of the playing of natural or artificial instruments, through which such goal is achieved, just as the player without the help of reason could never execute his work with any perfection. Hence, these two parts are so joined together in music (considering it in its ultimate perfection) that, for the aforesaid reasons, it is impossible to separate one from the other.

Et se pure le volessimo separare, da questo si conoscerà [21] lo Speculatiuo esser differente dal Prattico, che quello sempre piglia il nome dalla scienza, & vien detto Musico: & questo non dalla scienza, ma dall'operare, come dal Comporre è detto Compositore; dal Cantare è detto Cantore; & dal Sonare vien chiamato Sonatore. Ma piu espressamente si comprende da quelli, che essercitano l'opere musicali da mano, li quali dall'opera, cioè dall'istrumento, & non dalla scienza prendono il nome; come l'Organista dall'Organo, il Citerista dalla Cetera, il Lirico dalla Lira; & similmente ogn'altro, secondo la sorte dell'istrumento ch'ei suona. Et però chi vorrà bene essaminar la cosa, ritrouerà tanto essere la differenza dell'vno dall'altro, quanto è il loro vfficio, & il loro fine diuerso.

And even if we wished to separate them, we would be able to distinguish the theorist from the performer in that the former always derives his name from the science and comes to be called musician, and the latter [derives his name] not from the science, but from [its] execution: namely, from composition [he] is called composer; from singing, singer; and from playing, player. But more specifically, this is apparent from those who execute musical works with their hands; they take their name from the work they do, that is, from the instrument, and not from the science, as the organist [does] from the organ, the kitharist from the kithara, the lyrist from the lyre, and the rest similarly, according to the kind of instrument played. However, he who wishes to examine this matter closely will discover that one is as different from the other as the difference between practice and goal.

Onde volendo sapere quello che sia l'vno & l'altro diremo; Musico esser colui, che nella Musica è perito, & hà facultà di giudicare, non per il suono: ma per ragione quello, che in tale scienza si contiene. Il quale se alle cose appartenenti alla pratica darà opera, farà la sua scienza più perfetta. & Musico perfetto si potrà chiamare. Ma il Pratico, o Compositore, o Cantore, o Sonatore, che egli sia, diremo esser colui, che li precetti del Musico con lungo essercitio apprende, & li manda ad effetto con la voce, o col mezo di qualunque artificiale istrumento. Di sorte che pratico si può dire<sup>2</sup> ogni compositore, il quale non per ragione & per scienza: ma per lungo vso sappia comporre ogni musical cantilena;

Thus, wishing to know which is one and which is the other, we will say that a musician is he who is skilled in music and has the ability to judge, not by the sound, but by the logic belonging to such science. He who puts everything that pertains [to music] into practice will further perfect his science and will be able to call himself a perfect musician. But we will say that the practitioner, or composer, or singer, or player is someone who learns the precepts of the musician by long practice, and actualizes them through his voice or any artificial instrument. It follows that one may call any composer who knows how to compose any musical work not through the use of reason or science, but through repeated practice, a practitioner,

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<sup>2</sup> 1573 *prattico si può dire* omitted.

& ogni sonatore di qual si voglia sorte di istrumento musicale, che sappia sonare solamente per lungo vso, & giudicio di orecchio: ancora che a tale vso l'vno & l'altro non sia peruenuto senza'l mezo di qualche cognitione.<sup>3</sup> Et la velocità delle mani, della lingua, & ogni mouimento, & altro accidente, che si ritroua di bello nel sonatore, o cantore, si debbe attribuire all'vso, & non alla scienza: conciosiache consistendo essa nella sola cognitione; se fusse altramente seguirebbe, che colui, che hauesse maggior cognitione della scienza, fusse anche più atto ad essercitarla; di che in effetto si vede il contrario.

as well as any player of a musical instrument who is able to play only because of repeated practice and guidance by the ear, even though such [ability to play] is not reached without the means of knowledge. And the speed of the hands, of the tongue, and of every movement, and any other occurrence that is found to be beautiful in the player or singer must be attributed to practice, and not to science, because science consists solely of knowledge. If [the situation] were different it would follow that he who might have higher knowledge of science would also be more apt to put it into practice, whereas. in effect, one sees the opposite.

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<sup>3</sup> 1573, *prattico si può dire* added after *cognitione*.

Hora hauendo veduto la differenza, che si ritroua tra l'vno & l'altro, esser l'istessa, che è tra l'artefice & l'istrumento; il quale essendo retto & gouernato dall'artefice, è tanto men degno di lui, quanto chi regge è più nobile della cosa retta; potremo quasi dire, il Musico esser più degno del Compositore, del Cantore, o Sonatore, quanto costui è più nobile & degno dell'istrumento. Ma non dico però, che'l compositore, & alcuno che esserciti li naturali, o artificiali istrumenti sia, o debba esser priuo di questo nome, pur che egli sappia & intenda quello, che operi; & del tutto renda conueneuol ragione: perche a simil persona, non solo di Compositore, di Cantore, o di Sonatore: ma di Musico ancora il nome si conuiene.

Now, having seen that the difference found between one and the other is the same that exists between player and the instrument, which, being held and operated by the player, is so much less worthy than [the player] – just as he who holds [an object] is much more noble than the object [he holds] – we might be able to say that the musician is worthier than the composer, the singer, or the player, just as [the player] is more noble and worthy than his instrument. But I do not say that the composer, or anyone who plays natural or artificial instruments, is or should be deprived of this name [i.e., musician], on condition that he knows and understands what he is executing and provides proper rationale for the entire matter, because to such a person the name of musician is also appropriate, and not only that of composer, singer, or player.

Anzi se con vn sol nome lo douessimo chiamare, lo chiameremo Musico perfetto: percioche dando opera, & essercitandosi nell'vna, & l'altra delle nominate, costui possederà perfettamente la Musica; della quale desidero, & spero che faranno acquisto coloro, i quali vorranno osseruare li nostri precetti.

On the contrary, if we were to call him just one name, we would call him a perfect musician, because by practicing and exerting himself in one and the other named disciplines he would master music perfectly. I hope that those who wish to observe our precepts will achieve this [appellation of perfect musician].

Quanto sia necessario il Numero nelle cose; & che cosa sia Numero; & se l'Vnità è numero. / Cap. 12

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Ma perche di sopra si è detto, che la Musica è scienza, che considera li Numeri, & le proportioni; però parmi che hora sia tempo di cominciare a ragionar di tal cose, massimamente che dalla prima origine del mondo (si come manifestamente si vede, et lo affermano i Filosofi) tutte le cose create da Dio furono da lui col Numero ordinate: anzi esso Numero fu il principale esemplare nella mente di esso fattore. Onde è necessario che tutte le cose, le quali sono separatamente, ouero insieme, siano dal numero comprese, & al numero sottoposte: imperoche tanto è egli necessario; che se fusse tolto via, prima si distruggerebbe il tutto,

How Necessary Number Is in Things, and What Number Is, and Whether One Is a Number / Chapter 12

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But because it has been said above that music is a science that considers numbers and proportions, it seems to me that now is the time to begin to discuss such matters, especially since at the very beginning of the world (as it is manifestly seen and affirmed by philosophers) all things created by God were ordained by Him with number; if anything, number was the principal exemplar in the mind of its Maker. Therefore, it is necessary that all things, whether they be separate or together, be comprehended through and subject to number, because [number] is so necessary that if it were taken away, first everything would destroy itself

& dipoi si leuarebbe all'huomo (come vuol Platone<sup>1</sup>) la prudenza, & il sapere: conciosiache di niuna cosa, che egli hauesse nell'intelletto, ouero nella memoria, potrebbe rendere ragione; & le arti si perderebbono, ne più faria bisogno di parlare o scrivere alcuna cosa della Musica; percioche del tutto la ragione di essa si annullarebbe, non hauendo ella maggior fermezza, che quella de i numeri. Il Numero acuisse l'ingegno, conferma la memoria, indirizza l'intelletto alle speculationi, & conserua nel proprio essere tutte le cose. Che più? Iddio benedetto lo donò all'huomo, come istrumento necessario ad ogni sua ragione & discorso.

and then (as Plato believes) man would lose all prudence and knowledge, so that he would no longer be able to make sense of anything intellect or memory might possess, and the arts would be lost. It would no longer be necessary to speak or write anything about music, because its reason for being would altogether disappear, [music] not having any firm grounding other than in number. Number sharpens ingenuity, confirms memory, draws the intellect to speculation, and contains all things in itself. What more? The good Lord bestowed it upon man as a necessary instrument of all his reason and discourse.

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<sup>1</sup> 1573, Zarlino's marginal note: *In Epinomide* (*Epinomis*). Scholars generally agree that *Epinomis*, an addition or appendix to Plato's *Laws-nomoi* in Greek—was not written by Plato. For further information, see Leonardo Tarán, *Academica: Plato, Philip of Opus, and the Pseudo-Platonic Epinomis* (Philadelphia: American Philosophical Society, 1972).

Nelle Sacre lettere vn'infito numero di secreti mirabilissimi & diuini col mezo de i numeri si uengono a discoprire, della cognitione & intelligenza de i quali (come piace ad Agostino) senza l'aiuto de numeri noi certamente saremmo priui. Il Saluator nostro, come si uede nell'Euangelio in molti luoghi, gli osseruò, & le ceremonie della Legge scritta, tutte per numero si comprendono. Di modo che, come dice ancora Agostino,<sup>2</sup> nella Scrittura in più luoghi si [22] ritrouano li Numeri, & la Musica esser posti honoreuolmente. Onde non è da marauigliarsi, se i Pitagorici istimauano, che nelli numeri fusse vn non so che di diuino. Si che per quello che detto habbiamo, et per quello che dir si potrebbe discorrendo con l'intelletto, il numero è sommamente necessario.

In Holy Scripture there is an infinite number of most marvelous and divine secrets that come to be unveiled through numbers, the knowledge and intelligence of which (as Augustine likes to think) we would be deprived without the help of numbers. Our Savior observed them, as we see in many places in the Gospels, and the ceremonies of the written Law are all comprehended through number. For this reason, as Augustine further states, numbers and music are positioned honorably in several places in the Scriptures. Hence, we should not be surprised that the Pythagoreans deemed numbers to be in some way divine. Because of what we have said and what we could say in our discourse about the intellect, number is highly necessary.

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<sup>2</sup> 1573, *come dice ancora Agostino reads come dice il detto Santo dottore* (as the sainted doctor says). Zarlino's marginal note: *De Doct. Chri. li.2. cap.16.* (Augustine, *On Christian Doctrine*, Book 2, Chapter 16.

Et benchè molti l'habbiano diffinito;  
 nondimeno Euclide Megarense,<sup>3</sup> parmi che  
 ottimamente l'habbia descritto dicendo; il  
 Numero essere moltitudine composta di più  
 unità. La quale vnità ben che non sia  
 numero, tuttauia è del numero principio, &  
 da essa ogni cosa, o semplice, o composta,  
 o corporale, o spirituale che sia, vien detta  
 Vna: Percioche si come non si può dire  
 cosa alcuna Bianca se non per la  
 bianchezza, così non si può dire alcuna  
 cosa vna se non per la vnità; la quale è  
 talmente contenuta dalla cosa che è, che  
 tanto quella si conserua nell'esser proprio,  
 quanto contiene in se la Vnità: Et  
 all'opposito, quando resta di essere vna,  
 allora manca del suo essere.

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<sup>3</sup> 1573, Zarlino's marginal note: *Element. libro 7. Def.1.* (Euclid, *Elements*, Book 7, Definition 1).

And although many defined it, it seems  
 to me that Euclid of Megara<sup>A</sup> described  
 it very well, saying that number is a  
 multitude composed of many Ones.  
 Although One is not a number, it is the  
 very beginning of number, and  
 everything simple or compound,  
 whether corporeal or spiritual, is said to  
 be One. Therefore, just as nothing can  
 be called white if not for whiteness, in  
 the same way nothing can be called One  
 if not for the "One" which is so  
 contained in the thing that it is, that its  
 essence is conserved in its being to the  
 extent that it contains Unity in itself.  
 And on the contrary, when it ceases to  
 be One, it lacks its essence.

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<sup>A</sup> In Zarlino's time, Euclid of Megara and Euclid of Alexandria were thought to have been one and the same person. Euclid of Megara (fl. c. 400 B.C.E.) was a philosopher and at one time a pupil of Socrates. Euclid of Alexandria (c. 325 – c. 265 B.C.E.) was the mathematician and author of *Elements*.

Et in ciò la Vnità è niente differente dal Punto, che è vn minimo indiuisibile nella linea: conciosia che si come quando è mosso (secondo che vogliono alcuni) egli fa la linea, & non per questo è detto Quanto, ma si bene di essa Quantità principio;<sup>4</sup> cosi non è la Vnità numero,<sup>5</sup> ancora che di esso sia principio. Et si come il fine non è, ne si può dire, se non rispetto del principio, cosi il principio non può essere, se non hà relatione al fine. Et perciò è da notare, che non vien detto principio, se non per ragione del fine; ne fine se non per rispetto del principio:

And thus One is no different from the point, which is the minimum indivisible part of a line, because when [the point] is moved (as some people say) it creates a line. And for this reason it is not called quantity, but the beginning of quantity itself. In the same way, One is not a number, but rather, the beginning [of number]. And just as the end does not exist, nor can it be named, if not in relation to the beginning, in the same way the beginning cannot exist if it bears no relation to the end. And therefore it is to be noted that it cannot be called beginning if not for its end, nor end, if not in relation to its beginning.

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<sup>4</sup> 1573, *ma si bene di essa Quantità principio* reads *ma si bene principio di essa Quantità*.

<sup>5</sup> 1573, *cosi non è la Vnità numero* reads *cosi la Vnità non è numero*.

di modo che dal principio al fine non si potendo venire,<sup>6</sup> se non per il mezo; sarà necessario, che ogni cosa accioche sia intera & tutta, contenga in se principio, mezo, & fine; i quali tutti sono contenuti nel numero Ternario, detto dal Filosofo<sup>7</sup> per tal ragione Perfetto. Onde mancando l'Vnità del mezo & del fine, non si può dire, che sia numero, ma principio solamente di quei numeri, che sono con ordine naturale disposti, percioche la natural dispositione de numeri è tale. 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. ordine che si può continuare in infinito, aggiungendoui la vnità,

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<sup>6</sup> 1573, *di modo che dal principio al fine non si potendo venire* reads *di modo che non si potendo venire dal principio al fine*.

<sup>7</sup> 1573, Zarlino's marginal note: *I. De Coelo, cap. 1.* (Aristotle, *On Heaven*, Book I, Chapter 1.)

It follows that, since one cannot go from the beginning to the end if not through the middle, it will be necessary that for each thing to be whole and complete it must contain in itself beginning, middle, and end, which are all contained in the Ternario,<sup>B</sup> for this reason said by the Philosopher to be perfect. Therefore, since One lacks the middle and the end, we cannot say that it is a number, but only the beginning of those numbers that are arranged in a natural order, since the natural disposition of numbers is the following: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10, an order that can be continued ad infinitum [by] adding One,

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<sup>B</sup> In their first occurrences in this treatise, the terms Binario (the number two), Ternario (the number three), Quaternario (the number four), and Quinario (the number five), appear as Zarlino has them in order to create a context for the Senario (the number six). Subsequently, these numbers will be rendered as numerals.

la quale, percioche da essa hà principio ogni quantità, sia continua, ò discreta, si chiama Genitrice, cio è principio, origine, & misura commune d'ogni numero: conciosia che ciascun numero contenga in se più volte la vnità: si come per essemplio, il Binario, che segue immediatamente dopò essa, non vien formato se non per la congiuntione di due vnità; dalle quali ne risulta esse Binario primo numero & pari; & a questo aggiunta poi la vnità, si forma il Ternario primo numero impare; dal quale con la vnità appresso si fa il Quaternario, detto Numero parimenti pari; & da questo & dalla vnità è prodotto il Quinario, detto Numero incomposto, & così gli altri di diuerse specie, procedendo in infinito.

which, since all quantities, continuous or discrete, spring from it, is called the generator—that is, the root, origin, and common measure of every number.

Therefore, each number contains Unity in itself several times. For example, 2, which immediately follows it, cannot be formed if not for the conjunction of two Ones, from which this 2 results as the first even number. By adding one to it, 3 is formed, [the] first odd number. When one is added to this, 4, called evenly even,<sup>c</sup> results; and from this plus one, 5, called a prime number, is produced, and similarly the other [numbers] of diverse kinds, proceeding ad infinitum.

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<sup>c</sup> In this context, “evenly even” means “power of two.”

Delle varie specie de Numeri.<sup>1</sup> / Cap. 13Of the Various Species of Numbers /  
Chapter 13

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Lungo sarebbe, & fuori di proposito, il voler raccontare di vna in vna le varie sorti de numeri, & volerne di ciascuna dire quello, che ella sia: ma perche dal Musico ne sono considerate alcune specie, dirò solamente di quelle, che fanno al proposito nostro, lassando da parte le altre, come inutili a questa scienza. Diremo adunque le specie de numeri, le quali fa dibisogno sapere per l'intelligenza di questo Trattato, & al Musico appartenenti esser diece [*sic*], cioe numeri Pari, Impari, Parimente pari, Primi & incomposti, Composti, Contrase primi Tra loro composti, o Communicanti, Quadrati, Cubi, & Perfetti,

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It would take a long time and would be beside the point to recount one-by-one the various kinds of numbers and to explain what each is; but because [only] some species of them are considered by the musician, I will only speak of those that are relevant to our purpose, omitting the others that are not useful to this science. We shall say, then, that there are ten species of numbers that need to be considered for the argument of this treatise and pertain to the musician. They are: even, odd, evenly even, prime and incomposite, composite, pairs of mutually prime numbers, pairs of numbers with common factors, squares, cubes, and perfect numbers.

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<sup>1</sup> 1573, & che nel Senario si trouano le forme di tutte le Consonanze semplici (and that in the Senario one finds the forms of all the simple consonances) added to title.

de i quali li Pari sono quelli, che si possono diuidere in due parti equali; come 2. 4. 6. 8. 10. & altri simili: Ma gli Impari sono quelli, che non possono esser diuisi in due parti equali, anzi di necessità l'vna parte supera l'altra per la vnità; & sono questi 3. 5. 7. 9. 11. & gli altri. Li Parimente pari sono quelli, che hanno le parti, che si possono diuidere in due parti equali, fino à tanto che si peruenga alla vnità; dalla quale incominciorno ad hauere il loro essere, continuando in doppia proportione in infinito; come 2. 4. 8. 16. 32. 64. & gli altri. Li numeri Primi & incomposti sono quelli, i quali non possono esser numerati o diuisi da altro numero, che dall'vnità; come 2. 3. 5. 7. 11. 13. 17. 19. & altri simili: Ma li Composti sono quelli, che da altri numeri sono numerati & diuisi; & sono 4. 6. 8. 9. 10. 12. & gli altri procedendo in infinito.

Even [numbers] are those that can be divided into two equal parts, such as 2, 4, 6, 8, 10, and other similar [numbers]. But odd [numbers] are those that cannot be divided into two equal parts. [When divided into two parts,] one part is necessarily larger than the other by one, and these [numbers] are 3, 5, 7, 9, 11, and the others. Evenly even [numbers] are those whose parts can be further divided into two equal parts until 1 is reached, from which their essence begins, continuing to double to infinity, such as 2, 4, 8, 16, 32, 64 and the others. Prime and incomposite numbers are those that cannot be factored or divided by any other number except 1, such as 2, 3, 5, 7, 11, 13, 17, 19, and other similar [numbers]; but composite [numbers] are those that can be factored and divided by other numbers, and are 4, 6, 8, 9, 10, 12 and the others ad infinitum.

Li Contrase primi sono quelli, che non possono essere misurati o diuisi se non dall'vnità, misura commune d'ogni numero; come 9. & 10. che sono numeri composti, ma insieme comparati si dicono Contrase primi: perche non hanno altra misura commune tra loro, che li misuri o diuida, che la vnità. Et questi si trouano di tre sorti: percioche ouer sono l'vno & l'altro composti; come li gia mostrati: ouero l'vno & l'altro primi; come 13. & 17. ouero l'vno composto & l'altro primo; come 12. & 19. Tra lor composti, o Communicanti si chiamano quelli, che sono misurati, o diuisi da altro numero, che dalla vnità; & niun di loro è all'altro primo;

Pairs of mutually prime numbers are those that cannot be factored or divided by anything other than 1, the common measure of all numbers, for example, 9 and 10, which are compound numbers, but when compared to one another, are seen to be prime with respect to each other because they do not have any factor in common that can divide them except 1. And these [pairs of numbers with no common factors] can be found in three categories. Either they are both compound, as I have already demonstrated, or both prime, like 13 and 17, or one is compound and the other prime, like 12 and 19. Mutually composite, or [numbers] with common factors, are those, neither of which is prime, that can be factored or divided by a number other than 1.

& si ritrouano di tre sorti: ouer che sono tutti pari; come 4. & 6. ouer che sono tutti impari; come 9. & 15. ouer che sono [23] pari & impari; come 6. & 9. Quadrati sono quelli, che nascono dalla moltiplicatione di vno minor numero in se stesso moltiplicato; come 4. 9. & 16. i quali nascono dal 2. 3. & 4. che sono Radici quadrate di tali numeri: Ma li Cubi sono quelli, che nascono dalla moltiplicatione di qualunque numero in se stesso, & dal prodotto ancora per tal numero moltiplicato; come 8. 27. 64. & simili; i quali nascono per la moltiplicatione del 2. 3. & 4. in se, che Radici Cube de tali numeri si chiamano; & li prodotti ancora moltiplicati per essi: come saria moltiplicando il 2. in se, produce 4. il quale moltiplicato col 2. ancora, ne nasce 8. detto Numero Cubo, del quale il 2. è la radice.

And they can be found in three categories: they can either both be even, like 4 and 6, or both odd, like 9 and 15, or even and odd, such as 6 and 9. Squares are those that result from the multiplication of one smaller number by itself, like 4, 9, and 16, which result from 2, 3, and 4, the square roots of these numbers. But cubes are those that result from the multiplication of a number by itself and by further multiplying the product by that same number, as 8, 27, 64, and similar [numbers]; they result from the [successive] multiplication of 2, 3, and 4. These are called the cube roots of such numbers, which are produced when [the cube roots] are multiplied twice by themselves. If 2 is multiplied by itself, 4 is produced. If [4] is multiplied again by 2, 8 results, the aforementioned cube, of which 2 is the [cube] root.

Ma li numeri Perfetti sono quelli, che sono integrati dalle loro parti, & sono numeri Pari, & composti, terminati sempre nel 6. ouero nell'8;<sup>2</sup> come 6. 28. 496. & gli altri: conciosia che tolte le parti loro, & insieme aggiunte, rendono di punto il suo tutto. Come quelle del Senario, che sono 1. 2. & 3. le quali interamente lo diuidono: l'vnità prima in sei parti, il binario dipoi in tre, & il ternario in due parti; le qual parti sommate insieme rendono interamente esso Senario. Questo [*sic*] sono adunque le specie de i numeri al Musico necessarie: imperoche la cognitione loro serue nella Musica alla inuestigatione delle passioni del proprio soggetto, il quale è il Numero harmonico, ouer sonoro, contenuto nel primo numero perfetto, il quale è il Senario, si come vederemo:

But the perfect numbers are those that are sums of their factors, and they are even and compound numbers, always ending with 6 or 8, like 6, 28, 496 and so on, such that their factors when added together produce their entirety exactly. As we can see in the Senario, its factors 1, 2, and 3, divide it entirely: first, One into six parts, then 2 into three [parts], and 3 into two parts. These parts added together wholly yield this Senario. These are, then, the kinds of numbers that are necessary to the musician, because their understanding serves in music to investigate the characteristics of its proper subject, which is harmonic or sounding number, contained in the first perfect number, the Senario, as we shall see.

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<sup>2</sup>1573, 8 reads *Ottinario*.

Nel quale numero sono contenute tutte le forme delle semplici consonanze, possibili da ritrovarsi, atte a produr le harmonie & le melodie: Imperoche la Diapason; la quale nasce<sup>3</sup> dalla proportione Dupla, vera forma di tal consonanza; è contenuta tra questi termini 2 & 1. Et tal proportione il Musico piglia per il tutto diuisibile in molte parti. Dipoi la Diapente è contenuta tra questi termini 3. & 2. nella Sesquialtera proportione: La Diatessaron tra 4. & 3. continenti la Sesquiterza proportione. Et queste sono le due parti maggiori, che nascono dalla diuisione della Dupla, ouero della Diapason.

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<sup>3</sup> 1573, *La quale nasce* reads *la quale prima nasce* (that [is the first to] arise).

In this number are contained all the possible forms of the simple consonances that produce harmonies and melodies, because the diapason, the first [consonance] that arises from the duple proportion, and the true form of that consonance, is contained between the numbers 2 and 1. The musician takes this proportion as a whole, divisible in many parts. Next, the diapente is contained between the numbers 3 and 2 in the sesquialter proportion;<sup>A</sup> the diatesseron [is contained] between 4 and 3, the sesquitercial proportion. And these are the two largest parts that result from the division of the duple proportion, or diapason.

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<sup>A</sup> Latin names for proportions have been anglicized whenever possible. These proportions are defined as follows:  
 Sesquialter – A ratio of one and a half to one; expressed in integers, the ratio 3:2.  
 Sesquitercial – A ratio of one and one-third to one; in integers, 4:3.  
 Sesquiquartal – A ratio of one and one-fourth to one; in integers, 5:4.  
 Sesquiquintal – A ratio of one and one-fifth to one; in integers, 6:5.

Il Ditono poi è contenuto tra 5. & 4. nella Sesquiquarta proportione; & il Semiditono nella Sesquiquinta tra 6. & 5. Et queste due parti nascono dalla diuisione della Sesquialtera, ouero della Diapente. Et perche tutte queste sono parti della Diapason, ouero della Dupla, & nascono per la diuisione harmonica; però io le chiamo semplici & elementali: conciosia che ogni consonanza, ouero interuallo quantunque minimo, che sia minore della Diapason, nasce non per aggiuntione di molti interualli posti insieme: ma si bene per la diuisione di essa Diapason: & le altre che sono maggiori, si compongono di essa & di vna delle nominate parti; ouero di molte Diapason insieme aggiunte; ouero di due parti, come le loro denominationi ce lo manifestano:

The ditone is then contained between 5 and 4 in the sesquiquartal proportion, and the semiditone from the sesquiquintal proportion between 6 and 5. And these two parts arise from the division of the sesquialter, or diapente. And because all these are parts of the diapason, or the duple proportion, and arise by harmonic division, I call them simple and elementary. Thus each consonance or interval, however small, that is smaller than the diapason, arises not by addition of many intervals put together, but rather by the division of this diapason, and the others, that are larger [than the diapason] and are composed of [the diapason] plus one of the aforementioned parts, or of many diapasons added together, or of two parts, as their names indicate.

Imperocche della Diapason & della Diapente poste insieme, si compone la Diapason diapente, contenuta dalla proportione Tripla, tra 3 & 1. La Disdiapason composta di due Diapason, è contenuta dalla proportione Quadrupla tra 4. & 1. L'Essachordo maggiore & anco il minore, nascono dalla congiuntione della Diatessaron col Ditono, o Semiditono: ma lassando hora di dire più di queste & delle altre, vn'altra fiata più diffusamente ne ragionaremo. Dalle cose adunque che habbiamo detto, potemo comprendere, per qual cagione il gran Profeta Mose,<sup>5</sup> nel descriuere la grande & marauigliosa fabrica del mondo, eleggesse il numero Senario; non hauendo Iddio nelle sue operationi mai hauuto dibisogno di tempo:

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<sup>4</sup> 1573, Zarlino adds, *si come diligentemente habbiamo dimostrato il tutto nel Secondo Ragionamento delle nostre Dimostrazioni Harmoniche* (as I have duly demonstrated in the second rationale of our *Dimostrazioni Harmoniche*).

<sup>5</sup>1573, Zarlino's marginal note: *Genesis. cap. 1* (1 Genesis).

The diapason diapente, consisting of the triple proportion between 3 and 1, is composed by the diapason and diapente placed together. The disdiapason, composed of two diapasons, is contained in the quadruple proportion between 4 and 1. The major and minor sixth arise from the addition of the diatesseron with the ditone, or semiditone, but for now we shall set aside these and other matters and shall discuss them at length at another time. From the things we have said, we are able to understand why the great prophet Moses, when describing the great and marvelous creation of the world, chose the Senario,<sup>B</sup> since God in His operations never had any need for time.

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<sup>C</sup> This sentence alludes to the description in Genesis 1:1-31 of God's creation of the world in six days

perciocche, come colui, che d'ogni scienza era perfetto maestro, conoscendo per opera del Spirito diuino l'harmonia, che in tal numero era rinchiusa; & che dalle cose visibili & apparenti<sup>6</sup> conoscemo le inuisibili d'Iddio, la sua onnipotenza, & la diuinità sua; volse col mezo di tal numero in vn tratto esprimere & insieme mostrare la perfettione dell'opera, & in essa la rinchiusa harmonia, conseruatrice dell'esser suo, senza la quale a patto alcuno non durarebbe: ma del tutto, o si annullarebbe, oueramente ritornando le cose nel loro primo essere (se lecito è così dire) di nuouo si vederebbe la confusione dell'antico Chaos.

Therefore, [Moses], who was the perfect master of every science, knowing the harmony that was contained in this number through the intervention of the Holy Spirit, and knowing that from visible and apparent things we can understand God's invisible [characteristics], His omnipotence, and divinity, wished to express and demonstrate in one stroke the perfection of the work by means of such number, and the harmony contained in it, guardian of its essence, without which it would not by any means last under any condition, but would either be annulled or, returning things to their first essence (if it is permissible to say this), the confusion of ancient Chaos would be seen again.

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<sup>6</sup>1573, Zarlino's marginal note: *Roma. c. 2* (2 Romans).

Volsse adunque il Santo Profeta manifestare il magisterio & l'opera perfetta del Signore fatta senza tempo alcuno col mezo del Senario, dal qual numero quante cose si della natura, come ancora dell'arte siano comprese, da quello che segue lo potremo conoscere.

Therefore, the Holy Prophet wished to show the majesty and the perfect work the Lord made without regard for time by means of the Senario. The many things of nature as well as of art that are comprised of this number will be understandable from what follows.

Che dal numero Senario si comprendeno  
[sic] molte cose della natura & dell'arte. /  
Cap. 14

How Many Things of Nature and Art  
may be Understood Through the Senario  
/ Chapter 14

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Incominciando adunque dalle cose  
superiori naturali,<sup>1</sup> noi la su nel Zodiaco di  
dodici segni sempre ne veggiamo sei alzati  
sopra lo nostro Hemispherio, rimanendo gli  
altri sei nell'altro di sotto a noi ascosi.  
Sono ancora sei errori de i sei<sup>2</sup> Pianeti  
discorrenti per la larghezza di esso  
Zodiaco, che scorreno hora di quà, & hora  
di là dalla Eclittica;<sup>3</sup> come Saturno, Giove,  
Marte, Venere, Mercurio, & la Luna. Sei li  
circoli posti nel cielo: come [24] Artico,  
Antartico, due Tropici; cioè quello del  
Cancro, & quello del Capricorno,  
l'Equinottiale, & l'Eclittica.

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Beginning with natural things in the  
heavens, we always see six of the twelve  
signs of the Zodiac risen above our  
hemisphere, while the other six remain  
hidden beneath our perception. Six are  
also the paths of the six planets, Saturn,  
Jupiter, Mars, Venus, Mercury, and the  
Moon, distributed in the vast expanse of  
this Zodiac, that wander here and there  
along the ecliptic. Six are the circles  
positioned in the sky: the Arctic;  
Antarctic; two Tropics, that of Cancer  
and that of Capricorn; the Equinox; and  
the Ecliptic.

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<sup>1</sup> 1573, dico: che se noi affissaremo il nostro  
intelletto a contemplar le cose, che si trouano (I say  
that if we affix our intellect upon contemplating the  
things that are found) inserted.

<sup>2</sup> 1573, Sono ancora sei errori de i sei reads  
Ritrouaremo etianio, che Sei sono (furthermore,  
we will find that they are six).

<sup>3</sup> 1573, dalla Ecclitica reads dalla detta Ecclitica  
(of the said Ecliptic).

Et di quà giù sono sei<sup>4</sup> sostantiali qualità de gli Elementi, Acuità, Rarità, & Moto: & li loro oppositi, Ottusità, Densità, & Quiete. Sei gli officij naturali, senza li quali cosa alcuna non hà l'essere; come Grandezza, Colore, Figura, Interuallo, Stato, & Moto. Sei specie ancora delli moti, Generatione, Corruptione, Accrescimento, Diminutione, Alteratione, & Mutatione di luogo. Et sei, secondo Platone,<sup>5</sup> le differenze delli Siti, ouero positioni: Sù, Giù, Auanti, Indietro, Destro, & Sinistro. Sei linee conchiudono la Piramide triangolare; & sei superficie la figura Quadrata solida.

And down here [on earth] six are the substantial qualities of the elements: acuity, rarity, and motion; and their opposites, obtuseness, density, and stillness. Six are the natural attributes, without which nothing exists: size, color, shape, proportion, state, and motion. Furthermore, six [are] the species of motion: generation, corruption, increase, decrease, alteration, and change of location. And six, according to Plato, are the differences in sites or positions: up, down, before, behind, right, and left. Six lines constitute the triangular pyramid, and six surfaces, the cube.

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<sup>4</sup> 1573, *Et di quà giù sono sei* reads *Et di quà giù reitrouaremo, che sono sei* (And down here, we will repeat, six are...).

<sup>5</sup> 1573, Zarlino's marginal note: *la Timeo* (Plato, *Timaeus*).

Sei triangoli equilateri maggiori contiene<sup>6</sup>  
 la figura circolare, dinotandoci<sup>7</sup> la sua  
 perfettione: & sei volte la circonferenza di  
 qualunque circolo<sup>8</sup> è misurata per il dritto  
 da quella misura, che si misura dal centro  
 alla circonferenza istessa; & de qui<sup>9</sup> nasce,  
 che molti chiamano Sesto quello  
 istrumento geometrico, che da molti altri è  
 addimandato Compasso. Sei gli<sup>10</sup> gradi  
 dell'huomo Essentia, Vita, Moto, Senso,  
 Memoria, & Intelletto. Sei le sue età,  
 Infantia, Pueritia, Adolescendia,  
 Giouenezza, Vecchiezza, & Decrepità;

Six equilateral triangles are contained in  
 the same circle, thereby denoting its  
 perfection Six times the measure of the  
 distance from the center of any circle to  
 the circumference itself obtains the  
 measure of the circumference,<sup>A</sup> from  
 which it follows that many call “sextant”  
 the geometric instrument that many  
 others call “compass.” Six are the  
 aspects of man: essence, life, movement,  
 sense, memory, and intellect. Six are his  
 ages: infancy, childhood, adolescence,  
 youth, old age, and decrepitude.

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<sup>6</sup> 1573, *maggiori contiene la figura* reads *i cui lati sono al Semidiametro del loro cerchio eguali sono contenuti nella figura* (whose sides are equal to the radius of the circle that contains them).

<sup>7</sup> 1573, *dinotandoci* reads *onde per dinotarci*.

<sup>8</sup> 1573 *la circonferenza di qualunque circolo* reads *la sua circonferenza di punto* (a point on its circumference).

<sup>9</sup> 1573, *di qui* reads *il perche* (because).

<sup>10</sup> 1573, *Sei gli* reads *Sei sono i* (six are the).

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<sup>A</sup> The formula for the circumference of a circle is  $2\pi$ , or approximately 6.283 times its radius, which is greater than the Senario.

Et sei l'Etadi del mondo, le quali, secondo alcuni, corrispondeno al Senario; dal qual numero Lattantio Firmiano<sup>11</sup> prese l'occasione del suo errore dicendo, che il mondo non hauea a durare più de sei milla anni, ponendo che vn giorno del Signore siano mille anni, adducendo per testimonianza quello, che dice il Salmo,<sup>12</sup> Mille anni auanti gli occhi tuoi sono come il giorno passato. Et per non commemorare tutto quello, che si potrebbe, per non andare in lungo; dirò solamente, che sei sono appresso li Filosofi quelli, che chiamano Trascendenti; come l'Ente, l'Vno, il Vero, il Buono, Alcuna cosa, ouero Qualche cosa, & la Cosa:

And six are the ages of the world, which, according to some, correspond to the Senario, from which number Firmianus Lactantius took inspiration for his mistake, saying that the world was not to last longer than six thousand years, taking a day to the Lord to be a thousand years, citing the testimony that is in the Psalm: a thousand years before your eyes are like the passing of a day. And in order not to acknowledge all that may be possible, nor to go on at length, I will only say that six are the qualities that the philosophers call transcendent: entity, the one, the truth, the good, anything or whatever thing, and the thing [itself];

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<sup>11</sup> 1573, Zarlino's marginal note: *De Diuino premio. lib. 7. c.14* (Lactantius, *Divine Institutions* I, Book 7, Chapter 14).

<sup>12</sup> 1573, Zarlino's marginal note: *Psal. 89* (Psalms 90:4).

& sei appresso i Logici li Modi delle propositioni; cioè Vero, Falso, Possibile, Impossibile, Necessario, & Contingente. Per la perfettione di tal numero, volse il grande Orfeo (come narra Platone<sup>13</sup>) che gli Hinni si hauessero a terminare nella Sesta generatione: conciosia che si pensò, che delle cose create non si potesse cantare più oltre; essendo in tal numero terminata ogni perfettione. Onde li Poeti ancora volsero, che il Verso del Poema Heroico; come quello, che più d'ogn'altro giudicorno<sup>14</sup> perfetto; terminasse nel sesto piede. Non è adunque marauiglia, se da alcuni vien detto Segnacolo del mondo; poi che si come esso mondo non hà di superfluo cosa alcuna, ne gli mancano le cose necessarie; così questo numero hà hauuto tal temperamento, che ne per progressionem si estende, ne per contratta diminutione si rimette:

and according to the logicians, six are the modes of proposition: truth, falsity, possibility, impossibility, the necessary, and the contingent. Because of the perfection of this number, the great Orpheus (as Plato tells us) wanted hymns to end in the sixth stanza, since he thought that one could sing nothing further about creation, being that all perfection ends in this number.

Therefore, the poets also deemed that the verse of the heroic poem, judged perfect above all others, should end on the sixth foot. It is no wonder that some call it "sign of the world," because just as this world contains nothing superfluous, nor lacks any necessary thing, so has this number such a nature that it neither expands nor contracts,

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<sup>13</sup> 1573, Zarlino's marginal note: *In philebo* (Plato, *Philebus*).

<sup>14</sup> 1573, *giudicorno* reads *giudicarono*.

ma tenendo vna certa mediocrità, non è superfluo, ne è per sua natura diminuito: per la qual cosa egli hà ottenuto il nome non solo di Perfetto; ma di Imitatore della virtù. Questo è detto numero Analogo, cioè proportionato, dalla sua reintegrazione per le sue parti, nel modo, che di sopra hò mostrato: perciocche quelle generano tal numero, che è simile al suo genitore. Oltra di questo è detto numero Circolare: conciosia che moltiplicato in se stesso, il prodotto da tale moltiplicatione, è terminato nel Senario; & questo ancora per esso Senario moltiplicato (se bene si procedesse in infinito) il prodotto è terminato in esso.<sup>15</sup>

but keeping a certain middle ground, it is not superfluous, nor is its nature diminished, for which reason it has acquired the description not only of perfect, but of imitator of virtue. This is called “analogous” or “proportioned” number, because of its [ability to be] reproduced by its factors, in the manner that I have demonstrated above, because these [factors] generate the same number that is like its factors. Beyond this, it is called a “circular” number because, when multiplied by itself, the product of such multiplication ends in the Senario, and again, when multiplied by this Senario (even if one proceeds to infinity), the product ends in [the Senario].

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<sup>15</sup> 1573, *esso* reads *esso Senario* (this Senario).

Tutto questo hò voluto dire, per dimostrare, che hauendo la Natura mirabilmente rinchiuso molte cose nel numero Senario,<sup>16</sup> hà voluto ancora co l'istesso numero abbracciarne la maggior parte di quelle, che si ritrouano nella Musica: conciosia che primieramente (come si vederà altre volte) Sei sono le specie delle uoci musicali, tra le quali è contenuto ogni concento musicale, cioè Vnisono, Equisone, Consone, Emmele, Dissone, & Ecmele. Sono dipoi sei quelle, che i Prattici addimadano [*sic*] consonanze, cioè cinque semplici & elementali, che sono, come di sopra hò mostrato,<sup>17</sup> la Diapason, la Diapente, la Diatessaron, il Ditono, il Semiditono, & vno principio di esse, il quale chiamano Vnisono:

All this I have wished to say in order to demonstrate that Nature, having marvelously included many things in this Senario, wished again with this same number to embrace a large part of what can be found in music, because first of all (as will be seen elsewhere) six are the types of musical intervals among which every musical harmony is contained: unison, equisone, concord, *emmele*, discord, and *ekmele*.<sup>B</sup> Six, then, are those [intervals] that the practitioners call consonances – i.e., five [that are] simple and elemental, which are, as I showed above, diapason, diapente, diatessaron, ditone, and semiditone, and one source of them, which they call unison,

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<sup>16</sup> 1573, *nel numero Senario* reads *in questo numero* (in this number).

<sup>17</sup> 1573, Zarlino's marginal note: *Cap. 13.* (Chapter 13).

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<sup>B</sup>The six combinations of voices to which Zarlino refers—unison, equisone (octaves and multiple octaves), consone (fifths, fourths, and octave(s) plus a fifth or a fourth), emmele (those imperfect consonances defined by superparticular ratios, i.e., major and minor thirds), dissone (dissonances) and ekmele (non-musical intervals)—are the six types of combinations of tones recognized by Ptolemy.

ancora che questo si nomini Consonanza impropriamente; come altre volte vederemo. Oltre di questo si ritrovauano appresso gli antichi Musici sei specie di harmonia poste in vso, cioè la Doria, la Frigia, la Lidia, la Mistalidia, o Lochrense, la Eolia, & la Iastia, ouero Ionica:& appresso gli moderni sei Modi principali nella Musica detti Autentici, & sei non principali detti Plagali. Lungo sarebbe il uoler raccontare di vna in vna tutte quelle cose, che sono terminate nel numero Senario; ma contentandoci per hora di quello, che è stato detto, verremo alle sue proprietà; per esser necessarie al nostro proposito.

although the latter was improperly named a consonance, as we will see elsewhere. Beyond this were found, according to the ancient musicians, six species of *Harmonia* in use: Dorian, Phrygian, Lydian, Mixolydian or Lochrian, Aeolian, and Iastian or Ionian; and according to the moderns, six principal modes in music called authentic, and six non-principal [modes] called plagal. It would take a long time to enumerate one by one all those things that come together in the Senario, but being content for now with what has been said, we will come to its properties, since they are important to our argument.

[25] Delle Proprietà del numero Senario, & delle sue parti; & come in esse si ritroua ogni consonanza musicale. / Cap. 15

Of the Properties of the Senario, and of Its Parts, and How Every Musical Consonance Can Be Found in Them. / Chapter 15

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Ancorache molte siano le proprietà del numero Senario, nondimeno per non andar troppo in lungo racconterò solamente quelle, che fanno al proposito; & la prima sarà, che egli è tra i numeri perfetti il primo; & contiene in se parti, che sono proportionate tra loro in tal modo; che pigliandone due qual si voglino,<sup>1</sup> hanno tal relatione, che ne danno la ragione, o forma di vna delle proportioni delle musicali consonanze, o semplice, o composta che ella sia; come si può vedere nella sottoposta figura.

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Although there are many properties of the Senario, nevertheless, so as not to go on too long, I will only discuss the ones that are pertinent. First is [the fact that the Senario] is first among the perfect numbers and contains in itself parts that are proportionate among themselves in such a way that if one were to take [any] two given [parts], their ratio would form one of the proportions of musical consonance, be it simple or compound, as one can see in the figure below.

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<sup>1</sup> 1573, *voglino* reads *vogliono*.

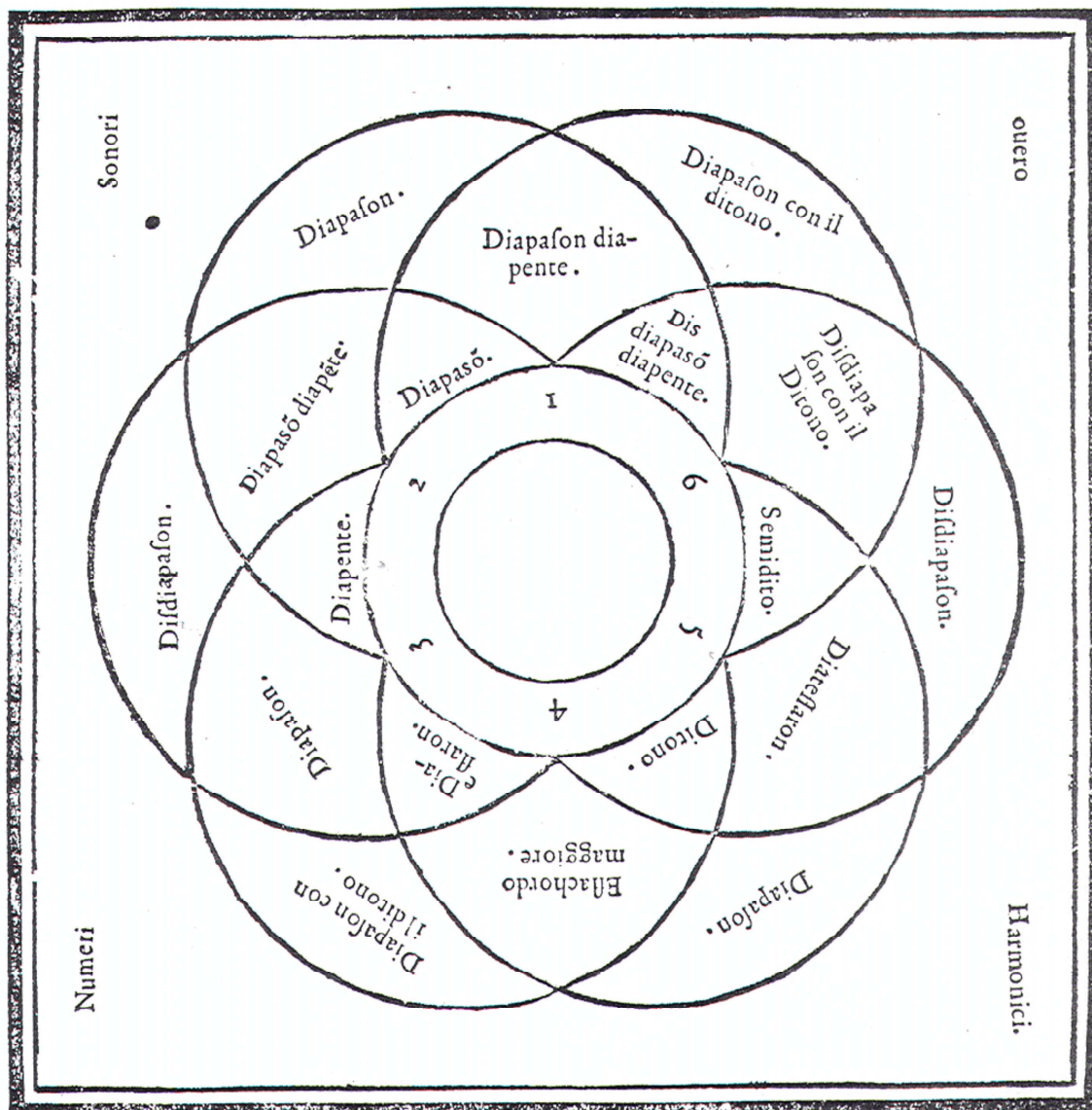


Figure 15.1. Intervals Generated By the Senario.

Sono ancora le sue parti in tal modo collocate & ordinate, che le forme di ciascuna delle due maggiori semplici consonanze, le quali da i Musici vengono chiamate Perfette; essendo contenute tra le parti del Ternario, sono in due parti divise in armonica proporzionalità, da un mezzo termine: conciosia che ritrovandosi prima la Diapason nella forma, & proporzione che è tra 2. & 1. senza alcuno mezzo, è divisa<sup>2</sup> tra il 4. & il 2. in due parti divise, cioè in due consonanze, dal Ternario; nella Diatessaron primamente, che si ritrova tra 4. & 3. & nella Diapente collocata tra il 3. & il 2.

Its parts are also placed and ordered in such a way that the forms of each of the two principal simple consonances, called perfect by musicians, being contained among the parts of the Ternario, are divided into two parts in harmonic proportion by a medial term. Because the diapason is found first in the form and proportion that exists between 2 and 1, without any medial term, it is then divided into two parts between 4 and 2, that is, into two consonances, by the number three: the diatessaron first, which is found between 4 and 3, and the diapente, found between 3 and 2.

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<sup>2</sup> 1573, *tra il 4. & il 2. in due parti divise, cioè in due consonanze, dal Ternario reads, dal Ternario posto tra il 4. & il 2. in due parti divise, cioè in due consonanze.*

Questa poi si ritroua tra 6. & 4. diuisa dal  
 5. in due parti consonanti; cioè in vn  
 Ditono contenuto tra 5. & 4; & in vn  
 Semiditono contenuto tra 6. [26] & 5.<sup>3</sup>  
 Vedesi oltre di questo l'Essachordo  
 maggiore, contenuto in tal ordine tra questi  
 termini 5. & 3. ilquale dico esser  
 consonanza composta della Diatessaron &  
 del Ditono: perchioche è contenuto tra  
 termini, che sono mediati dal 4. come nella  
 mostrata figure si può vedere.

This, moreover, is found between 6 and  
 4, divided by 5 into two consonant parts,  
 that is, into a ditone, contained between  
 5 and 4, and a semiditone, contained  
 between 6 and 5. In addition to this, the  
 major sixth can be seen, contained in  
 such order between the terms 5 and 3,  
 which I say to be a consonance  
 composed of the diatessaron and the  
 ditone, because it is contained between  
 the terms that are mediated by 4 as can  
 be seen in the above figure.

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<sup>3</sup> 1573, *Ho detto, che sono diuise in due parti in  
 Harmonica proportionalità: non gia quanto  
 all'ordine delle Proportioni: che ueramente è  
 Arithmetico: ma si bene quanto alla proportione  
 delle parti, mediante il termine mezano. Percioche  
 sono di tanta quantità & proportione: di quanta  
 sono quelle, che da vn mezano termine o diuisore  
 harmonico sono fatte: a ben che con ordine  
 contrario: come più a basso uederemo al suo luogo*  
 (I have said that they are divided into two parts in  
 harmonic proportion, not according to the order of  
 proportions, which really is arithmetic, but  
 according to the proportion of its parts, mediated by  
 the middle term, because they are of such quantity  
 and proportion that they are given harmonic  
 division by a medial term or divisor, albeit in  
 reverse order, as we will further see in a place  
 below) inserted.

Et sono queste parti in tal modo ordinate, che quando si pigliassero sei chorde in qual si voglia istrumento, tirate sotto la ragione de i mostrati numeri, & si percuotessero insieme; ne i suoni, che nascerebbero dalle predette chorde, non solo non si vdirebbe alcuna discrepanza; ma da essi ne vscirebbe vna tale harmonia, che l'vdito ne pigliarebbe sommo piacere: & il contrario auerebbe quando tal ordine in parte alcuna fusse mutato. Hanno oltra di ciò queste parti vna tal propietà che moltiplicate l'vna per l'altra in quanti modi è possibile, & posti li prodotti in ordine; si trouerà senza dubbio alcuno tra loro harmonica relatione, comparando il maggiore al minore più propinquo.

And these parts are ordered in such a way that if one were to take six strings of any instrument derived according to the numbers shown and strike them together, not only would one be unable to hear any discrepancy in the intervals that would arise from the aforementioned tones, but such a harmony would be produced from them that the listener would take great pleasure [from them], and the contrary would occur if this order were altered in any way. Beyond this, these parts have such a property that by multiplying one by the other in as many ways as possible, and placing their products in order, one will doubtlessly find a harmonic relationship among them, comparing the greater to the lesser [part].

Al qual ordine se aggiungeremo il quadrato di ciascuna parte, cioè li prodotti della sua multiplicatione, ponendoli nel predetto ordine al suo<sup>4</sup> luogo, secondo che sono collocati in naturale disposizione; non solo haueremo la ragione di qualunque consonanza, atta alle harmonie & melodie; ma le ragioni delle Dissonanze ancora; o vogliam dire forme de gli interualli Dissoni;<sup>5</sup> che sono i Tuoni, & i Semituoni maggiori & minori; differenze delle sopradette consonanze: percioche essi dimostrano quanto l'una supera, ouero è superata dall'altra.<sup>6</sup> Et queste differenze non pur sono vtili; ma necessarie ancora nelle modulationi, come vederemo;<sup>7</sup>

To such order, if we add the square of each part, that is, the products of its multiplication [by itself], putting them in the aforementioned order in their place, according to their natural disposition, not only will we have the explanation for any consonance proper to harmonies and melodies, but also the reasons for dissonances, that is to say, the ratios of the dissonant intervals, which are the major and minor tones and semitones – differences between the aforementioned consonances – because they demonstrate how one is greater than or surpassed by the other. And these differences are not merely useful, but also necessary for modulations, as we shall see.

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<sup>4</sup> 1573, *suo* reads *loro*.

<sup>5</sup> 1573, *Dissoni* reads *Dissonanti*.

<sup>6</sup> 1573, *si come da quello, che nel Primo libro delle Dimostrazioni hò dichiarato, si può comprendere* (as if one can understand it from that, as I said in the first book of *Dimostrazioni* [*harmoniche*]) inserted.

<sup>7</sup> 1573, *al suo luogo* (in its place) inserted.

Il che nella sottoposta<sup>8</sup> figura si può vedere  
il tutto per ordine.

All this, placed in order, can be seen in  
the figure below.

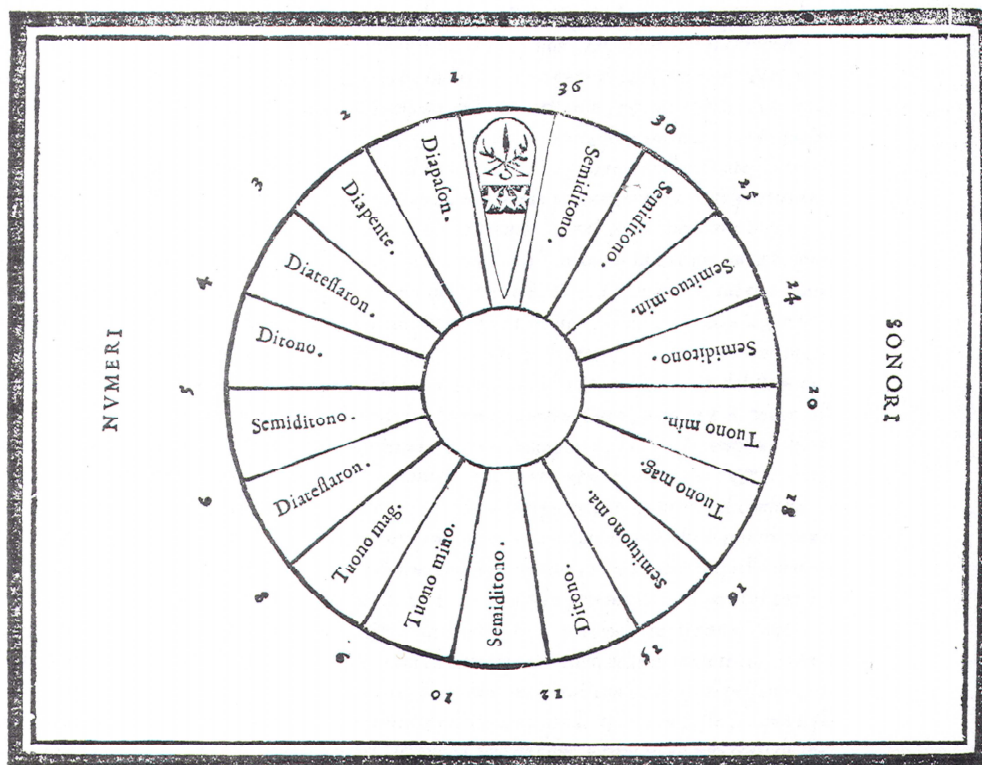


Figure 15.2. Intervals Generated By Multiplication.<sup>A</sup>

<sup>8</sup> 1573, *sottoposta* omitted.

<sup>A</sup> Zarlino generates the numbers on the circumference of Figure 15.2 by multiplying the elements of the Senario with each other thus:

$2 \times 2 = 4$	$3 \times 3 = 9$	$4 \times 4 = 16$	$5 \times 5 = 25$
$2 \times 3 = 6$	$3 \times 4 = 12$	$4 \times 5 = 20$	$5 \times 6 = 30$
$2 \times 4 = 8$	$3 \times 5 = 15$	$4 \times 6 = 24$	
$2 \times 5 = 10$	$3 \times 6 = 18$		$6 \times 6 = 36$
$2 \times 6 = 12$			

He arranges the products in ascending order, counterclockwise. The intervals corresponding to the ratios of adjacent products are indicated in the sector framed by the two products.

Queste sono adunque le proprietà del numero Senario, & delle sue parti, le quali è impossibile di poter ritrouare in altro numero, che sia di esso minore, o maggiore.

These are, thus, the properties of the Senario and of its parts, which are impossible to find in any other number, be it smaller or greater.

[27] Quel che sia Consonanza semplice, e Composta; & che nel Senario si ritrouano le forme di tutte le semplici consonanze; & onde habbia origine l'Essachordo minore. / Cap. 16.

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Benche alcuni siano in dubbio, se l'Essachordo si habbia da porre nel numero delle consonanze; per esser la sua proportione contenuta nel genere Superpartiente, il quale (come dicono) non è atto a produrle; nondimeno per essere interuallo fin hora approuato & riceuuto per consonante da i Musici, l'hò posto io ancora nel numero di esse. Ma perche ho detto, che l'Essachordo è consonanza composta; però vederemo al presente quello, che si debba intendere per interuallo semplice, o composto.

What Simple and Compound Consonances Are; and How the Forms of All the Simple Consonances may be Found in the Senario; and from Whence the Minor Sixth Originates / Chapter 16

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Although some may doubt whether the sixth should be placed among the number of consonances, since its proportion is contained in the superpartient<sup>A</sup> category, which (as they say) is not apt to produce them, nonetheless, as an interval approved and received until now as consonant by musicians, I have placed it among their number. But because I have said that the sixth is a compound consonance, we will now explain what should be called a simple or compound interval.

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<sup>A</sup> A superpartient ratio is a ratio in which the greater term exceeds the smaller term by more than one; the ratio 5:3 falls into this category.

Dico adunque che Consonanza, ouer Interuallo composto intendo io quello, del quale li minimi termini della sua proportione si troueranno in tal modo l'un dall'altro distanti, che potranno da vno, o più mezani termini esser mediati & diuisi; di modo che di vna proportione, due o più ne potremo hauere.<sup>1</sup>

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<sup>1</sup> 1573, Zarlino reverses the presentation of his definitions of compound and simple intervals. *Consonanza, ouer Interuallo composto intendo io quello, del quale li minimi termini della sua proportione si troueranno in tal modo l'un dall'altro distanti, che potranno da vno, o più mezani termini esser mediati & diuisi; di modo che di vna proportione, due o più ne potremo hauere* reads *Consonanza o Interuallo semplice è quello, che pigliati li minimi termini della sua proportione, in tal modo sono ordinati, che non possono riceuere tra loro alcun termine mezano, che diuida tal proportione in più parti: essendo che sono sempre l'vn dall'altro distanti per l'Vnità* (a simple consonance or interval is one whose minimal terms of proportion are ordered in such fashion that they cannot receive any medial term between them that divides such proportion into more parts, since the distance between them is always 1).

I say, then, that what I mean by a compound consonance or interval is one whose minimal terms of proportion will be so distant from one another that they can be mediated and divided by one or more intermediate terms so that from one proportion we shall be able to derive two or more.<sup>B</sup>

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<sup>B</sup> Zarlino's definition of a compound consonance as a superpartient proportion is not the definition used today – a consonance whose higher pitch is more than an octave above its lower pitch.

Così all'incontro, Consonanza, o Interuallo semplice dico esser quello, che pigliati li minimi termini della sua proportione, in tal modo saranno ordinati, che non potranno riceuere tra essi alcun termine mezano, che diuida tal proportione in più parti: essendo che saranno sempre l'un dall'altro distanti per l'unità.<sup>2</sup> Onde hò detto che l'Essachordo maggiore è consonanza composta: percioche li minimi termini della sua proportione, che sono 5. & 3. sono capaci d'un mezano termine, che è il 4; come hò mostrato di sopra;

Thus, on the contrary, I call a simple consonance or interval one whose minimal terms of proportion will be ordered in such fashion that they cannot have any middle term that divides this proportion into more parts, since the distance between them will always be 1.<sup>B</sup> Therefore, I have called the major sixth a compound consonance because the minimal terms of its proportion, which are 5 and 3, contain a medial term, which is 4, as I demonstrated above.

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<sup>2</sup> 1573, *Così all'incontro, Consonanza, o Interuallo semplice dico esser quello, che pigliati li minimi termini della sua proportione, in tal modo saranno ordinati, che non potranno riceuere tra essi alcun termine mezano, che diuida tal proportione in più parti: essendo che saranno sempre l'un dall'altro distanti per l'unità* reads *Così all'incontro Consonanza ouero Interuallo composto intendo io quello, del quale li minimi termini della sua proportione si trouano in tal modo l'un dall'altro distanti, che possono da vno o più mezani termini esser mediati & diuisi; di modo che di vna proportione, due o più ne potiamo hauere* (Thus, on the contrary, I intend a compound consonance or interval to be one whose minimal terms of proportion are distant from each other in such fashion that they are mediated and divided by one or more middle terms so that from one proportion, two or more may be obtained).

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<sup>B</sup> Both a duple and a superparticular proportion fit Zarlino's description.

& la Diapente dico esser consonanza semplice: percioche<sup>3</sup> li minimi termini della sua proportione, che sono 3 & 2, non possono riceuere alcun mezano<sup>4</sup> termine tra loro, che diuida quella in più parti: conciosia che<sup>5</sup> sono distanti l'vn dall'altro per l'vnità. Bisogna però auertire, che in tre modi si può dire, che le consonanze siano composte; come di sopra ancora fu detto; Prima quando si compongono di due parti della Diapason, le quali insieme aggiunte, non reintegrano essa Diapason;

And I call the diapente a simple consonance because the minimal terms of its proportion, which are 3 and 2, cannot receive any medial term between them that would divide it into more parts, because they are distant from one another by 1. I must caution, however, that it can be said that consonances are compound in three senses, as was already stated above: first, when they are composed of two parts of the diapason which, added together, do not restore the diapason itself;

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<sup>2</sup> 1573, *percioche* reads *essendo che*.

<sup>3</sup> 1573, *alcun mezano* reads *altro* (other)

<sup>4</sup> 1573, *conciosia che* reads *per esser*.

<sup>6</sup> 1573, *mentre* reads *quando*.

<sup>7</sup> 1573, *in vltimo* reads *vltimamente*.

<sup>8</sup> 1573, *di più Diapason* reads *dalla Diapason & di vna delle sue parti; vltimamente quando piu Diapason sono poste insieme* (of the diapason and one of its parts; ultimately, when several diapasons are put together..)

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<sup>c</sup> Zarlino's definitions of compound consonances in the senses that they are "composed of the diapason and one of its parts; and...when they are composed of several diapasons" correspond to the definition of compound consonance in the modern sense.

Dipoi mentre<sup>6</sup> si compongono della Diapason, & di vna delle sue parti; & in vltimo<sup>7</sup> quando si compongono di più Diapason.<sup>8</sup> Nel primo modo si considera l'Essachordo nominato, il quale<sup>9</sup> si compone della Diatessaron, & del Ditono; come si scorge tra i minimi termini della sua proportionione, che sono 5 & 3, i quali per il 4 sono mediati; come qui si vede<sup>10</sup> 5. 4. 3. Al quale aggiungerò il minore Essachordo, che nasce dalla congiuntione della Diatessaron al<sup>11</sup> Semiditono. li cui minimi termini contenuti nel genere Superpartiente dalla proportionione Supertripartientequinta, possono da vn termine mezano esser mediati;

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<sup>9</sup> 1573, *il quale* reads *che*.

<sup>10</sup> 1573, *mediati; come qui si vede* reads *in tal modo tramezati* (mediated in such a manner).

<sup>11</sup> 1573, *al* reads *col*.

then, when they are composed of the diapason and one of its parts; and lastly, when they are composed of several diapasons.<sup>C</sup> The [major] sixth, which is composed of the diatessaron and the ditone, is considered to belong to the first category,<sup>D</sup> as one perceives that the minimal terms of its proportion, which are 5 and 3, are mediated by 4; as is evident [in the sequence] 5, 4, 3. To this, I will add the minor sixth, which arises from the conjunction of the diatessaron with the semiditone, whose minimal terms, contained within the superpartient genus in the super-tripartient-quintal proportion [8:5], can be mediated by a medial term.

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<sup>D</sup> The second and third categories are discussed in Chapter 15, page 289.

Imperochè ritrouandosi tal proportione tra 8 & 5. tai termini sono capaci di vn mezano termine harmonico, che è il 6; il quale la diuide in due proportioni minori; cioè in vna Sesquiterza, & in vna Sesquiquinta; come qui si vede 8. 6. 5.<sup>12</sup> Di modo che tal consonanza per questa ragione possiamo chiamare composta; la quale fin hora da i Musici è stata abbracciata, & posta nel numero delle altre. Et benche essa tra le parti del Senario non si troui in atto,<sup>13</sup> si troua nondimeno in potenza: conciosiache dalle parti contenute tra esso piglia la sua forma;<sup>14</sup>

Because such proportion is to be found between 8 and 5, [these terms] can contain a medial harmonic term, 6, which divides it into two smaller proportions, that is, into a sesquitercial and a sesquiquintal [proportion]; as we see here [in the sequence] 8, 6, 5. For this reason, we can call such a consonance “compound,” which until now has been embraced by musicians and placed among the others. Although [the minor sixth] is not found in the parts of the Senario in actuality, it is found nevertheless in its potential, because it takes its form from the parts contained within it,

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<sup>12</sup> 1573, *due proportioni minori; cioè in vna Sesquiterza, & in vna Sesquiquinta; come qui si vede 8. 6. 5.* reads *in questa maniera 8. 6. 5. in due proportioni minori; cioè in vna Sesquiterza & in vna Sesquiquinta.*

<sup>13</sup> 1573, *essa tra le parti del Senario non si troui in atto* reads *la sua forma non si troui in atto tra le parti del Senario.*

<sup>14</sup> 1573, *dalle parti contenute tra esso piglia la sua forma* reads *ueramente la piglia dalle parti contenute tra esso* (really takes it from the parts contained within itself).

cioè dalla Diatessaron & dal Semiditono:  
 perche di queste due consonanze si  
 compone: la onde tra'l primo numero  
 Cubo, il quale è 8. viene ad hauer in atto la  
 sua forma.<sup>15</sup> Ma nel secondo modo si  
 considera la Diapasondiapente, la qual si  
 compone della Diapason, aggiuntoui la  
 Diapente: percioche i minimi termini della  
 sua proportione, che sono 3 & 1. sono  
 diuisi naturalmente in vna Dupla, & in vna  
 Sesquialtera; che sono le porportioni [*sic*]  
 continenti tal consonanze;<sup>16</sup> come qui si  
 vedeno. 3. 2. 1. Così nel terzo modo  
 potremo porre la Disdiapason:

that is, from the diatessaron and the  
 semiditone, because it is composed of  
 these two consonances, so that within the  
 first cubic number, 8, it comes to  
 actualize its form. But in the second  
 category one considers the diapason  
 diapente, which is composed of the  
 diapason, to which is added the diapente,  
 because the minimal terms of its  
 proportion, which are 3 and 1, are  
 naturally divided into a dupla and a  
 sesquialtera, which are the proportions  
 containing such consonances, as we see  
 [in the sequence] 3, 2, 1. Likewise, we  
 will be able to place the disdiapason in  
 the third category,

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<sup>15</sup> 1573, *hauer in atto la sua forma* reads *hauerla in atto*.

<sup>16</sup> 1573, *che sono le porportioni continenti tal consonanze* reads *che sono proportioni, le quali contengono tali consonanze*.

imperoche li minimi termini della sua  
 proportione; che sono 4 & 1. sono capaci di  
 vn termine mezano; il quale diuide quella  
 in due Duple in Geometrica  
 proportionalità; come vedemo nel 4. 2. 1.  
 Ancorache potemo<sup>17</sup> considerare tal  
 consonanza esser composta della Diapason,  
 della Diapente, & della Diatessaron:  
 percioche tai termini sono capaci di due  
 termini<sup>18</sup> mezani, li quali la diuideno in tre  
 parti continenti le proportioni delle  
 nominate consonanze; come si vede nel 4.  
 3. 2. 1. Nondimeno douemo<sup>19</sup> auertire, che  
 quantunque tali consonanze si possano  
 considerare composte in tanti modi;

because the minimal terms of its  
 proportion, which are 4 and 1, can  
 contain a medial term, which divides it  
 into two dupla in geometric proportion,  
 as we see in [the sequence] 4, 2, 1.  
 Although we can consider this type of  
 consonance to be composed of the  
 diapason, the diapente, and the  
 diatessaron, because such terms can hold  
 two medial figures which divide it into  
 three parts containing the proportions of  
 the aforementioned consonances, as is  
 seen in [the sequence] 4, 3, 2, 1,  
 nevertheless, we must caution that  
 although such consonances may be  
 considered to be composed in several  
 ways,

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<sup>17</sup> 1573, *potemo* reads *potiamo*.

<sup>18</sup> 1573, *termini* omitted.

<sup>19</sup> 1573, *douemo* reads *dobbiamo*.

io propriamente & veramente addimando<sup>20</sup> quelle esser composte, le quali si compongono della Diapason, & di alcuna delle sue parti, secondo l'vno de i due vltimi modi mostrati di sopra: Ma quelle che si considerano composte nel primo modo, tali chiamo impropriamente, & ad vn certo modo composte: imperoche per esser minori della Diapason, si vedono quasi esser semplici & elementali; il che non intrauiene nelle altre, per la ragione che dirò altroue. Et perche è impossibile di poter ritrouare nuoue consonanze, le quali siano semplici, dalle cinque mostrate in fuori, che sono la Diapason, la Diapente, la [28] Diatessaron, il Ditono, & il Semiditono; dalle quali ogn'altra consonanza si compone;

I really and truly insist that those be called compound, which are composed of the diapason and of any of its parts, according to one of the two last methods shown above. But those that are considered as compound in the first way, I call them such improperly and in a certain way compound; because as they are smaller than the diapason they are seen almost to be simple and elemental. This does not occur with the other [compound consonances], for the reason that I will explain elsewhere. And because it is impossible to discover new simple consonances from the five shown before – the diapason, diapente, diatessaron, ditone, and semiditone – from which every other consonance is composed,

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<sup>20</sup> 1573, *addimando* reads *chiamo*.

però dico & concludo,<sup>21</sup> che nel Senario,  
 cioè tra le sue parti, si ritroua ogni semplice  
 musical consonanza in atto,<sup>22</sup> & le  
 composte ancora<sup>23</sup> in potenza; dalle quali  
 nasce ogni buona & perfetta harmonia:  
 intendendo però delle forme, o proportioni,  
 & non delli suoni. Ma accioche più  
 facilmente possiamo esser capaci di quello  
 ch'io hò detto, verrò a ragionar prima delle  
 cose, che fanno dibisogno alla cognitione  
 delle proportioni, & dipoi vederemo, come  
 si mettono in opera: imperoche senza la  
 loro cognitione, sarebbe impossibile di  
 potere hauer notitia alcuna della Musica.

I say and conclude that in the Senario,  
 that is, among its parts, one finds every  
 simple consonance in actuality, and also  
 the compound [consonances] in  
 potentiality, from which arise each good  
 and perfect harmony, meaning, however,  
 [that they are derived] from the forms,  
 or proportions, and not from the sounds.  
 But so that we may be more easily  
 aware of what I have said, I will discuss  
 first those things for which knowledge  
 of proportions is necessary, and then we  
 will see how they are put to use, because  
 without knowledge of [proportions], it  
 would be impossible to extract any  
 information about music.

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<sup>21</sup> 1573, *che di sopra hò anco detto* (which I said above) inserted.

<sup>22</sup> 1573, *ogni semplice musical consonanza in atto* reads in *atto ogni semplice musical consonanza*.

<sup>23</sup> 1573, *le composte ancora* reads *anco le Composte*.

Della quantità continua & della discreta. /

Of the Continuous and the Discrete

Cap. 17

Quantity / Chapter 17

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Le consonanze musicali nel moltiplicarle, o per dir meglio nel numerarle, ritengono quasi quell'ordine, che si troua ne i numeri posti auanti al Denario, et con naturale ordine collocati; oltri il quale non si vede che si aggiunga nuouo numero: ma si bene appare, che quelli vengano ad esser replicati: conciosia che si come dopo il Denario segue l'Vndenario, & dopo questo il Duodenario, & similmente gli altri per ordine; Nel medesimo modo ancora dopo la Diapason, & la Diapente, le quali nel suo ordine naturale<sup>1</sup> si pongono senza alcun mezo, tutte l'altre consonanze si vanno replicando secondo l'ordine mostrato, quasi in infinito:

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Musical consonances when multiplied, or to say it better, [when] enumerated, retain an order almost like that which is found in the numbers before 10, arranged in their natural order. Beyond [10], it is impossible to add a new number, but it does appear that those [numbers] come to be replicated, because just as 10 is followed by 11, and after this, 12, and similarly, the others in order, in the same fashion, after the diapason and the diapente, which in their natural order are placed with nothing in between, all the other consonances are replicated according to the demonstrated order, almost ad infinitum;

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<sup>1</sup> 1573, *suo ordine naturale* reads *loro naturale ordine* (their natural order).

perciocche posta prima la Diatessaron dopo le due nominate, immediatamente se le aggiunge il Ditono; di poi il Semiditono; & a questo di nuouo si aggiunge la Diatessaron; & con tal ordine sempre si vanno replicando, & moltiplicando. Et ancora che in tal modo si potesse procedere in infinito, quando fusse bisogno, come è manifesto;<sup>2</sup> nondimeno la Musica non riceue l'infinito: perciocche di esso non si hà, ne si può hauere scienza alcuna; & l'intelletto non è capace di esso; di modo che se gli occorre di voler sapere la ragione di alcuna cosa, si serue solo di vna determinata quantità, & con tal mezo comprende, & sa il vero di ciò che ricerca.

Hence, the diatessaron, placed first after the aforementioned [consonances], is immediately followed by the ditone, then the semiditone,<sup>A</sup> and to this the diatessaron is added again, and in such order they are always replicated and multiplied. And even though in such a way one could proceed ad infinitum when necessary, as shown, nevertheless music does not contain the infinite, because no science possesses it, nor is able to possess it, nor is the intellect capable of [possessing] it; so if it happens that one wants to know the reason for anything, one need only avail oneself of a determinate quantity, and through such means comprehend and know the truth of what one seeks.

<sup>2</sup> 1573, *come è manifesto* omitted.

<sup>A</sup> Here Zarlino describes a series that builds intervals on top of one another in the sequence P8 P5 P4 M3 m3 P4 M3 m3... repeating the intervals P4 M3 m3 ad infinitum as illustrated:



Ma cadendo necessariamente sotto'l  
 numero tutte le cose; & raccogliendosi<sup>3</sup> [*sic*]  
 (essendo vna o più) sotto questo nome di  
 Quantità; la quale per la sua eccellenza i  
 Filosofi hanno giudicata pari, & insieme  
 eterna co la Sostanza; però  
 immediatamente la diuisero in due parti,  
 cioè in Continoua, & in Discreta. La  
 Continoua nominorno quella, le cui parti  
 sono congiunte ad vn termine commune;  
 come la Linea, la Superficie, il Corpo; &  
 oltre di queste il Tempo, & il Luogo; &  
 tutte quelle cose, che si attribuiscono alla  
 Grandezza. La Discreta dissero esser  
 quella, le cui parti non sono congiunte ad  
 alcun termine commune; ma restano  
 distinte & separate; come è il Numero, il  
 Parlare, vna Gregge, vn Popolo, vn Monte  
 di grano, ouer di altro, alle quali cose  
 conuiene il nome di Moltitudine:

But since all things necessarily are  
 subject to number and gather themselves  
 (whether one or more) under this name of  
 “quantity,” which for its excellence  
 philosophers deemed equal to and ever  
 together with substance, [quantity] was  
 immediately divided into two categories,  
 namely, [the] continuous and [the]  
 discrete. They called [the] continuous  
 [quantity the category] whose members  
 are joined at a common boundary, as a  
 line, a surface, a body; and besides these,  
 time, place, and all those things of which  
 size is an attribute. They said the  
 discrete [quantity] to be that whose  
 members are not connected at a common  
 boundary, but remain distinct and  
 separate, as is number, speech, a herd, a  
 population, a pile of wheat or other  
 [entity], all things to which the name of  
 multitude is appropriate,

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<sup>3</sup> 1573, *raccogliendosi* reads *raccogliendosi*.

conciosia che molte parti separate si compongono ne i loro estremi; come si vede nel Numero, che incominciando dall'Vnità, sotto la quale non vi è altro numero minore, moltiplicata in infinito senza ritrouare impedimento alcuno viene a procreare gli altri numeri. Di modo che la sua natura è molto conforme al genere Moltiplice nelle propotioni: percioche considerata ne i numeri, è finita in qual si voglia numero; ma si rende infinita per l'accrescimento; conciosia che si possa moltiplicare in infinito; come vederemo ancora nel Moltiplice, il quale è finito nelle sue specie; ancora che si possino estendere in infinito.

because many separate members are contained between their extremes, as one sees in number, which, starting from 1, below which there is no smaller number, when multiplied ad infinitum, generates other numbers without any impediment. Thus, its nature is very consistent with the multiple category of proportions, because considered among the numbers, [it] is finite in any given number, but it becomes infinite by addition, because it can be multiplied to infinity, as we will see again in the multiple [genus], whose species are finite, even though they can be extended to infinity.

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<sup>4</sup> 1573, *La Continoua poi che incomincia* reads *Ma La Continoua, che incomincia*.

La Continoua poi che incomincia<sup>4</sup> da vna finita quantità, riceue vna infinita diuisione, perdendo la quantità della misura nel crescere delle parti, & moltiplicandole nel diminuire:<sup>5</sup>percioche se vna linea lunga sedici piedi si diuidesse in otto, & questi in quattro, & cosi sempre si diuidesse il restante in due parti; si trouerebbe quella infinitamente esser diminuita, & moltiplicato in infinito il numero delle parti.

The continuous [quantity], since it begins with a finite quantity, accepts an infinity of divisions, losing the quantity of measure in the growth of its parts, and multiplying [the number of parts], diminishes [the size of each]; For example, if a line 16 feet long is divided by 8, and then by 4, and in this way the remainder is always divided into two parts, one would find [the divisions of the line] to become infinitely smaller, and the number of parts [into which the line is] multiplied to become infinitely greater.

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<sup>5</sup> 1573, *ritiene la natura del Genere superparticolare* (retains the nature of the superparticular genera) added.

<sup>6</sup> 1573, *il genere Superparticolare* reads *il nominato genere* (the aforementioned category).

<sup>7</sup> 1573, *percioche* reads *ilquale* (which).

Tal natura serua il genere Superparticolare<sup>6</sup>  
 nelle proportioni: percioche<sup>7</sup> quanto più  
 procede a maggiori numeri continouando  
 l'ordine naturale, tanto più si dimostra  
 diminuito, per esser sempre di minor  
 quantità la differenza de i termini, che  
 contengono le sue specie; che essendo esse  
 infinite,<sup>8</sup> ciascuna specie<sup>9</sup> da se si ritroua  
 esser finita.

Such a nature serves the superparticular  
 genus of proportions, because the more  
 [each of its terms] proceeds toward larger  
 numbers, continuing [in] the natural  
 order, the more the difference between its  
 terms is shown to be diminished.  
 [Although] becoming infinite, each of its  
 species is found to be finite.

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<sup>8</sup> 1573, *per esser sempre di minor quantità la differenza de i termini, che contengono le sue specie; che essendo esse infinite reads nella sue specie; le quali se bene sono infinite* (in its species, which, however, are infinite).

<sup>9</sup> 1573, *specie* reads *però* (however).

## Del soggetto della Musica. / Cap. 18

## On the Subject of Music. / Chapter 18

Et perche nella quantita Discreta detta di Moltitudine stanno alcune cose per se stesse; come il numero 1. 2. 3. 4. & gli altri; & alcune sono dette per relatione; come il Duplo, il Triplo, il Quadruplo; & gli altri simili; però ogni numero, il quale stà da per se, ne per l'esser suo hà dibisogno d'altro aggiunto, è detto Semplice; & di lui l'Arithmetica ne hà consideratione. Quello poi,<sup>1</sup> che non può esser da se, percioche all'esser suo hà dibisogno [29] d'vn altro, è detto numero Relato; & di tal numero si serue il Musico nelle sue speculationi.

And in the discrete quantity said to be proper to multitude there are some things [that exist] by themselves, as the numbers 1, 2, 3, 4, and so on, and some [that are] defined by relationships, as the double, triple, quadruple, and other similar [proportions]. Each number that stands by itself [and] by its essence has no need of the addition of another number is called simple, and arithmetic considers this topic. That, then, which cannot stand by itself, because in its essence it needs another, is called a relative number, and the musician utilizes such number in his speculations.

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<sup>1</sup> 1573, *poi* reads *veramente* (in truth).

Così ancora<sup>2</sup> nella quantità Continua detta di Grandezza sono alcune cose di perpetua quiete; come la Terra, la Linea, la Superficie, il Triangolo, il Quadrato, & ogni corpo mathematico; & altre di continuo movimento,<sup>3</sup> come il corpi celesti. Delle prime se ne tratta nella Geometria; delle seconde, che sono sempre girate, ne fa professione l'Astronomia: di modo che dalla diversità delle cose diversamente considerate nasce la varietà delle scienze, & la diversità de i Soggetti; conciosia che si come l'Arithmetico considera principalmente il Numero, così il Numero è il Soggetto della sua scienza.

Then, too, among [things that embody] the continuous quantity called size, some are said to be things of perpetual repose, like the Earth, the line, the surface, the triangle, the square, and every mathematical body, and others [are said to be things] of continuous movement, such as the celestial bodies. Geometry treats the first [category of the continuous quantity]; astronomy treats the second [category, whose members] are always moving; so that from the diversity of the different things considered, the variety of the sciences emerges, as well as the diversity of its subjects, because just as the arithmetician considers number above all, so is number the subject of its science.

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<sup>2</sup> 1573, *Così ancora* reads *ma* (but).

<sup>3</sup> 1573, *mouimento* reads *sono girate*, & *hanno in se stesse il mouimento* (turn and move by themselves).

Et perche i Musici, nel voler ritrouar le ragioni d'ogni musicale interuallo, si serueno de i corpi sonori, & del Numero relato, per conoscere le distanze, che si trouano tra suono & suono, & tra voce & voce; & per sapere quanto l'vna dall'altra sia differente per il graue & per l'acuto, mettendo insieme queste due parti, cioè il Numero, & il Suono; & facendo vn composto dicono, che il Soggetto della Musica è il Numero sonoro. Et benche Auicenna<sup>4</sup> dica, che'l suo Soggetto siano li Tuoni & li Tempi; nondimeno considerata la cosa in se, ritrouaremo tutto esser vno; cioè riferirsi li Tempi al Numero, & li Tuoni al Suono.

And because musicians, wishing to find the rationale of every musical interval, use sounding bodies and relative numbers to know the distances found between sound and sound, and between voice and voice, and to know how the one differs from the other in lowness and highness, putting together these two parts, number and sound, and making a compound, they say that the subject of music is sonorous number. And although Avicenna<sup>A</sup> says that [the] subjects [of music are] pitches and rhythms, nevertheless, considering [music] in itself, we will discover all to be one, that is, rhythms to be related to number, and pitches to sound.

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<sup>4</sup> 1573, Zarlino's marginal note: *Suffici. lib. 1. cap. 8.* (Avicenna, *Sufficientia*, Book 1, Chapter 8).

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<sup>A</sup> Avicenna (980-1037), a Persian philosopher and physician, was particularly noted for his contributions in the fields of Aristotelian philosophy and medicine. He wrote about music in his *Kitab al-shifa* (The Book of Healing).

## Quello che sia Numero sonoro. / Cap. 19

## What Sonorous Number Is / Chapter 19

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Havemo adunque da sapere, che alcuni, volendo dar notitia di questo numero, hanno detto, che il Numero sonoro non è altro, che il numero delle parti d'un Corpo sonoro,<sup>1</sup> come sarebbe di vna chorda, la quale pigliando ragione di quantità discreta, ne fa certi della quantità del suono da lei prodotto. La qual descrizione,<sup>2</sup> ancora che ad alcuno potrebbe parer buona; nondimeno, secondo il mio giudizio, mi par che sia tronca & imperfetta: percioche le Voci, che sono principalmente considerate dal Musico; & non sono lontane dal Numero sonoro, hauendo proportione tra loro; non caderebbero sotto tal descrizione: conciosia che elle habbiano origine da i corpi animati & humani, cioè dall'huomo;

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We should know, therefore, that in an effort to explain [sonorous] number, some have said that this is none other than the number of the parts of a sounding body, like a string that, being taken as a discrete quantity, defines the quantity of the sound that it produces. Such a description, although it may appear good to some, nevertheless, in my judgment, appears to be incomplete and imperfect, because vocal sounds, which are principally considered by the musician and are not far from sonorous numbers, standing in proportion to one another, would not fall under such a description, because they originate from animate and human bodies, that is, from man.

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<sup>1</sup> 1573, *il quale, come dichiarai nella Terza definizione del Primo delle Dimostrazioni*, è (which, as I said in the third definition of the first [part] of *Dimostrazioni [harmoniche]*, is) inserted.

<sup>2</sup> 1573, *La qual descrizione* reads *Questa definizione* (this definition).

& è pur ragioneuole, che tutte le cose considerate in una scienza; ancora che da per se non si considerino; ma si bene in ordine al Soggetto, ad esso Soggetto si riduchino; come è ancora ragioneuole, che la definitione si conuenga con la cosa definita. Et benche l'huomo sia corpo, questo non basta: ma si ricerca ancora che sia sonoro.<sup>3</sup> Onde bisogna che habbia tre conditioni; prima, che sia polito; dipoi, che sia duro; vltimamente, che sia largo: le quali conditioni non sò come in esso tutte ritrouar si possino. Ma poniamo,<sup>4</sup> che l'huomo habbia tutte queste conditioni;

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<sup>3</sup> 1573, *Et benche l'huomo sia corpo, questo non basta: ma si ricerca ancora che sia sonoro* reads *Et benche l'huomo habbia il corpo misurato da tre distanze, che sono altezza, larghezza & profondità; come sono gli altri corpi; tuttauia questo non basta: ma si ricerca ancora che'l sia Sonoro* (and although man's body is measured in three dimensions, height, width, and depth, as are other bodies, nevertheless this is not enough, but it has also been found to be sonorous).

<sup>4</sup> 1573, *poniamo* reads *possino*. *Ma poniamo, che il corpo dell'huomo* (but it is possible that man's body)

And it is indeed reasonable that all things [be] considered as a science, even if they are not so considered in themselves but are related to that subject, because it is again reasonable that the definition fit the thing defined. And although man is a body, this is not enough, since one is looking for [a body] that is also sonorous. Hence, three conditions should be met: first, that it be clean; then, that it be hard; finally, that it be long. I doubt that all these conditions can be found in [man].<sup>A</sup> But let us suppose that man were to possess all these conditions.

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<sup>A</sup> The monochord possesses the three conditions named by Zarlino. It is not obstructed, therefore clean; it is a box that resonates, therefore hard; and it is long.

non per questo si potrà hauer<sup>5</sup> cognitione della quantità delle voci per via dell'huomo:<sup>6</sup> percioche le parti doue nascono non sono in tal modo sottoposte al sentimento, che si possa hauer di loro alcuna determinata misura. Ma chi dicesse, che le Voci si applicano a i suoni che nascono dalle chorde; & che per tal modo si viene ad hauer la ragione delle loro proportioni; & che con questo mezo istesso si vengono à ridurre sotto la detta descrittione; costui direbbe cio impropriamente: percioche li suoni si applicano alle voci, accioche di esse si habbia vera & determinata ragione, & non per il contrario.

This would still not permit the apprehension of the proportions of vocal sounds to be known by means of man[’s hearing these sounds], because the parts from which they arise are not subject to the senses in such fashion that one might obtain any determinate measure of them. But whoever says that vocal sounds can be applied to the sounds that arise from strings, and that in such fashion one derives the reason of their proportions, and that through this very means [such proportions] come to be reduced under said description, speaks improperly, because instrumental sounds are applied to vocal sounds so that we would have a true and determinate understanding of them, and not the contrary.

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<sup>5</sup> 1573, *col suo mezo* (in this manner) inserted.

<sup>6</sup> 1573, *per via dell'huomo* omitted.

Parmi adunque che meglio sarebbe dire, che'l Numero sonoro è Numero relato alle voci, & a i suoni; il quale si ritroua artificiosamente in vn corpo sonoro, si come in alcuna chorda, la qual riceuendo la ragione di alcun numero nelle sue parti, ne fa certi della quantità del suono prodotto da essa, & della quantità delle voci, riferendo, ouero applicando essi suoni ad esse voci: Et questo dico, quando tal numero si considerasse vniuersalmente in ciascuno interuallo: Ma quando si considerasse particolarmente in quelli interualli solamente, che sono consonanti; si potrebbe dire, che fusse la ragione delle proportioni, le quali sono le forme delle consonanze, considerate primieramente nella Musica;

It seems to me, then, that it would be better to say that sonorous number is number that is related to vocal and instrumental sounds. This number is artificially revealed in a sounding body, such as in any string, which, containing the ratio of any number in its parts, makes clear the quantity of the sounds that it produces, and the quantity of the vocal sounds, referring or applying such [instrumental] sounds to these vocal sounds. And I say this when such a number for each interval is considered universally. But when only those particular intervals that are consonant are considered, one could say that it [sonorous number] is the rationale of the proportions that are the forms of the consonances considered above all in music,

come sono le mostrate di sopra, contenute tra le parti del numero Senario, che si ritrouano con artificio nelle parti di vn corpo sonoro, & relato al sopradetto modo. Et perche le differenze, che si trouano tra le voci & tra i suoni graui & acuti, non si conoscono, se non co'l mezo de i corpi sonori; però considerando li Musici tal cosa, elessero vna chorda, fatta di metallo, o d'altra materia, che rendesse suono; la qual fusse equale ad vn modo da ogni parte, come quella dalla quale (essendo d'ogn'altro corpo sonoro men mutabile, & meno in ogni parte variabile) poteuano hauere la certezza di tutto quello, che cercauano. Essi hauendo opinione,<sup>7</sup> che tanto fusse la quantità del suono della chorda, quanto era il numero delle parti considerato in essa;<sup>8</sup>

as are the ones shown above, contained within the parts of the Senario, found artificially in the parts of a sounding body and related in the aforementioned way. And because the differences that are found among low and high vocal and instrumental sounds are not known if not through sounding bodies, musicians, bearing this in mind, chose a string made of metal or another material that produced sound. Such a [string] was to be equal in all parts, so that [musicians] could derive the certainty of all that they were seeking from it (since a [string] is less mutable and less variable [in] each part than any other sounding body).<sup>B</sup> Having the opinion that the quantity of sound of the string was proportional to the number of its parts that was considered,

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<sup>7</sup> 1573, *Essi hauendo opinione* reads *hauendo opinione certa* (holding the firm opinion).

<sup>8</sup> 1573, *ilperche* (for that reason) inserted.

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<sup>B</sup> Zarlino is constructing a monochord.

conosciuta la sua lunghezza, & quantità secondo il numero delle sue parti misurate, subito poteuano far<sup>9</sup> giuditio delle distanze, che si trouano esser tra gli suoni graui & gli acuti, o per il contrario; & conoscere la proportione di ciascuno interuallo. Et [30] questo<sup>10</sup> non fecero fuor di proposito, come dalla esperienza potemo vedere: percioche se noi tiraremo<sup>11</sup> vna chorda di qual si voglia lunghezza sopra vna superficie piana; & la diuideremo con la ragione in due parti equali;

[once] its length and quantity were known according to the number of its measured parts, they could immediately estimate the distances found between low and high sounds, or vice versa, and know the proportion of each interval. And this they did not decide at random, as we can see from experience, because if we pull a string of any length on a flat surface and divide it precisely into two equal parts,

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<sup>9</sup> 1573, *poteuano far* reads *faceuano*.

<sup>10</sup> 1573, *è quello, che dimanda il Musico inanzi che dimostri le cose della Musica, che li sia concesso da colue, ilquale vuole imparare. Ma se per caso cotal cosa, che è posta da lui per vno delli suoi Principij: come nella Prima dimanda del Terzo delle Dimostrazioni dichaiarai: gli fusse negata; non potrebbe a patto alcuno fare la Dimostrazione. Et ciò* (is that which the musician demands before he demonstrates the things about music as a concession from those who want to learn about it. But if by chance what he holds as one of his principles, as I declared in the first question of the third [part] of *Dimostrazioni [harmoniche]* is denied to him, he would be unable to make such demonstration under any circumstances. And this) inserted.

fatta la comparatione del tutto di essa ad vna parte,<sup>12</sup> conosceremo manifestamente, li suoni prodotti da queste (hauendole insieme percosse) esser l'vno dall'altro distanti per vna Diapason, in Dupla proportione; come nella Seconda parte vederemo. Onde in cotal modo diuisa ancora in più parti, & comparato il tutto a due, tre, quattro, o più di esse, potremo sempre conoscer variate distanze, & vdire variati suoni, nati da quelle, secondo la diuersità delle parti al suo tutto; & potremo insiememente conoscere, il Tutto esser cagione del suono graue, & le parti, quanto più saranno minori, esser cagione de i suoni acuti.

comparing its entirety to one of its parts, we will know manifestly [that] the sounds produced by these parts (once they are struck together) are distant from each other by a diapason, in duple proportion, as we will see in Part Two [of *Le institutione harmoniche*]. Hence, [if the whole is] divided again into more parts in such fashion, and the whole compared with two, three, four, or more of [its parts], we will always be able to know various distances, and hear various sounds arisen from them, according to the differences of the parts from the whole. At the same time we will know the whole to be the cause of the low sound, and the parts, when they are smaller, to be the cause of the high sounds.

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<sup>11</sup> 1573, *tiraremo* reads *tirando* (taking).

<sup>12</sup> 1573, *due parti equali*; *fatta la comparatione del tutto di essa ad vna parte* reads *tre parti equali*; *fatta la comparatione di vna di essa all'altre due* (three equal parts, when we compare one of these [parts] to the other two).

Con questo mezo, & per tal via adunque, come più sicura, secondo'l consiglio di Tolomeo,<sup>13</sup> aggiunta la ragione al senso, li Musici vanno primieramente inuestigando le ragioni delle consonanze, & poi di ciascun'altro Interuallo, & ogni differenza, che si troua tra li suoni graui & acuti, & hauendo rispetto alle Voci, & a i Suoni, che sono la materia di ciascuno interuallo musicale: & alli numeri & proportioni, le quali (come altre volte hò detto) sono la loro forma, aggiungendo queste due cose insieme dissero, il Numero sonoro esser il vero Soggetto della Musica, & non il Corpo sonoro:

In this fashion, and through such method held more securely to Ptolemy's advice, once reason is added to sense, musicians come first to investigate the reasons for consonance, and then for every other interval, and each difference that is found between low and high sounds, and paying respect to the vocal and instrumental sounds that are the material of each musical interval, and to the numbers and proportions, which (as I have said elsewhere) are their form. Adding these two things together, [the ancients] declared sonorous number and not sounding body to be the true subject of music,

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<sup>13</sup> 1573, Zarlino's marginal note: *Harmo. libro. I.c.8* (Ptolemy, *Harmonics*, Book I, Chapter 8)..

percioche se bene tutti li corpi<sup>14</sup> sono atti  
alla productione de i suoni, non sono però  
atti alla generatione della Consonanza; se  
non quando tra loro sono proportionati, &  
contenuti sotto alcuna terminata forma;  
cioè sotto la ragione de i Numeri  
harmonici.

because although all bodies are able to  
produce sounds, they are not, however,  
predisposed to the generation of  
consonance, unless they are  
proportionate among themselves, and  
contained under any finite system,  
namely, under the rule of harmonic  
numbers.

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<sup>14</sup> 1573, *corpi* reads *Corpi sonori* (sounding bodies).

Per qual cagione la Musica sia detta  
subalternata all'Arithmetica, & mezzana tra  
la mathematica, & la naturale. / Cap. 20

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Ma perche la scienza della Musica piglia  
(come hauemo potuto vedere)<sup>1</sup>  
dall'Arithmetica i Numeri, & dalla  
Geometria le Quantità misurabili, cioè li  
Corpi sonori; però per tal modo<sup>2</sup> si fa alle  
due nominate Scienze soggetta, & si  
chiama scienza subalternata. Onde è da  
sapere, che di due sorti sono le scienze:  
percioche sono alcune dette Principali, o  
Subalternanti, & alcune Non principali, o  
Subalternate. Le prime sono quelle, le  
quali dependono da i principij conosciuti  
per lume naturale & cognitione sensitua;  
come l'Arithmetica & la Geometria;

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<sup>1</sup> 1573, (*come hauemo potuto vedere*) reads *in prestantia* (as it appears).

<sup>2</sup> 1573, *per tal modo* omitted.

Why Music is Said to Be Subordinate to  
Arithmetic, and Placed Between  
Mathematics and Natural [Science] /  
Chapter 20

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Because the science of music (as we  
have been able to see) takes numbers  
from arithmetic, and measurable  
quantities, that is, sounding bodies, from  
geometry, it is subject to the two named  
sciences and is called a subordinate  
science. Thus, we should know that  
there are two kinds of sciences; some are  
called principal, or subordinating, and  
some secondary, or subordinate. The  
first are those that depend on principles  
known by the natural powers of human  
reason<sup>A</sup> and perception through the  
senses, like arithmetic and geometry,

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<sup>A</sup> *lume naturale* (in Latin, *lumen naturale*), is defined in medieval philosophy as “natural powers of human reason,” as opposed to *lumen divinum*, reasoning stemming from heavenly revelation. For further discussion, see Zarlino, *Theorie des Tonsystems*, 206, note C.

le quali hanno alcuni principij conosciuti per la cognitione d'alcuni termini acquistati per via de i sensi; come dire, che la Linea sia lunghezza senza larghezza; che è vn principio propio della Geometria: & che il Numero sia moltitudine composta di più vnità: & è propio principio dell'Arithmetica; oltre li principij communi, che sono quelli, che dicono; Il tutto esser maggior della parte; La parte esser minore del suo tutto, & molti altri, de i quali l'Arithmetico, & il Geometra cauano le sue conclusioni. Le seconde poi<sup>3</sup> sono quelle, che oltre li propij principij acquistati per il mezo de i sensi, ne hanno alcuni altri, che procedono da i principij conosciuti nell'vna delle scienze superiori & principali; & sono dette Subalternate alle prime; come la Prospettua alla Geometria:

which possess some principles [that are] known through the recognition of features acquired through the senses, as in the assertion that the line possesses length without width, which is a principle proper to geometry, and that number is a multiplicity composed of several unities, which is a principle proper to arithmetic. Furthermore, there exist common principles, which are the ones that declare the whole to be greater than its parts, the part to be less than its whole, and many others from which both the arithmetician and geometrician derive their conclusions. The second, then, are those that, beyond their own principles acquired by means of the senses, possess some others that stem from principles known from one of the superior principal sciences and are said to be subordinate to the first, like perspective [is] to geometry.

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<sup>3</sup> 1573, *Le seconde poi* reads *Ma le seconde* (But the second).

conciosia che oltra li proprij principij ne ha alcuni altri, che sono noti & approuati nella scienza à lei superiore, che è la Geometria. Et è di tal natura la non principale & subalternata; che piglia dalla principale l'istesso soggetto: ma per sua differenza vi aggiunge l'accidente: percioche se fusse altramente, non vi sarebbe tra l'vna & l'altra alcuna differenza di soggetto: come si vede della Prospettua, che piglia per soggetto la Linea per se; della quale si serue anche la Geometria, & vi aggiunge per l'accidente la Visualità; & cosi la Linea visuale viene ad esser il suo soggetto.

Beyond its own principles there are some others, known and recognized in science as being derived from its superior, which is geometry. And the non-principal and subordinate [science] is of such a nature that it takes from the principal [science] the same subject, but its difference resides in the addition of an accident,<sup>B</sup> because otherwise there would be no difference in subject between one and the other. One sees this in perspective, which takes as its subject line itself, which also serves geometry, and adds the accident of visibility, and thus the visible line comes to be its subject.

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<sup>B</sup> “Accident” in this context is used in the Aristotelian sense, i.e., as a nonessential property of an entity. In Zarlino’s example, “line” is the entity. “Visibility” is the property of the line that renders it the subject of perspective. A line need not be visible to be a line.

Il medesimo intrauiene ancora nella Musica, che hauendo con l'Arithmetica per commune soggetto il Numero, aggiungendo a questo per sua differenza la Sonorità, si fa<sup>4</sup> ad essa Arithmetica subalternata, tenendo il Numero sonoro per suo soggetto. Ne solamente ha la Musica li suoi propij principij: ma ne piglia ancora de gli altri dall'Arithmetica, per li mezi delle sue demonstrationi: percioche<sup>5</sup> per essi hauemo poi<sup>6</sup> la vera cognitione della scienza. E ben vero, che tal principij & mezi non sono tutte le conclusioni, che nell'Arithmetica si ritrouano:

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<sup>4</sup> 1573, *si fa* reads & *si fà* (and became).

<sup>5</sup> 1573, *percioche* reads *accioche*.

<sup>6</sup> 1573, *hauemo poi* reads *habbiamo*.

The same occurs also in music, which, sharing in common with arithmetic the subject of number and adding sonority to this as its diversifying [element], becomes subordinate to arithmetic, holding sonorous number as its subject. Not only does music possess its own principles, but it also derives others from arithmetic, by means of its demonstrations,<sup>C</sup> because through them we have true knowledge of [this] science. It is quite true that such principles and means are not all the conclusions that are found in arithmetic,

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<sup>C</sup> "Demonstrations" is used here in the Euclidean sense of "mathematical proofs."

ma solamente vna parte di esse,<sup>7</sup> le quali al Musico fanno dibisogno, & sono di Relatione, cioè delle proportioni; & questo per mostrare le passioni de i Numeri sonori, il che fa ancora<sup>8</sup> al nostro proposito. Onde ancor noi pigliaremo quelle conclusioni solamente, che ci faranno dibisogno, & le applicaremo al Suono, ouero alla Voce, che dal Naturale (come dimostra il Filosofo<sup>9</sup>) sono considerate: & hauerò ardimento di dire, che la Musica non solo alla Mathematica, ma alla Naturale ancora<sup>10</sup> sia subalternata; non in quanto alla parte de i Numeri: ma si bene in quanto alla parte del Suono, che è naturale; dalquale nasce ogni modulatione, [31] ogni consonanza, ogni harmonia, & ogni melodia:

but are only a part of them that are necessary to the musician, which are ratios, that is, proportions, so that [he may] address the characteristics of sonorous numbers that pertain to our proposition. Hence we, too, shall take only those conclusions that we need and apply them to instrumental sound, or to the voice, which are considered to belong to nature (as the Philosopher shows). I will maintain that music is subordinate not only to mathematics, but also to natural [science], not with respect to its numeric aspect, but in its sonorous aspect, which is natural, and from which arises every modulation, every consonance, every harmony, and every melody.

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<sup>7</sup> 1573, *di esse* omitted.

<sup>8</sup> 1573, *il che fa ancora* reads *secondo* (according to).

<sup>9</sup> 1573, Zarlino's marginal note: *2. De Anima. cap. 8* (Aristotle, *On the Soul*, Book 2, Chapter 8).

<sup>10</sup> 1573, *ma alla Naturale ancora* reads *ma etiandio alla Naturale*.

la qual cosa è confermata anche da Auicenna dicendo;<sup>11</sup> che la Musica hà li suoi principij dalla scienza naturale, & da quella de i numeri. Et si come nelle cose naturali, niuna cosa è perfetta, mentre che è in potenza: ma solamente quando è ridutta in atto; cosi la Musica non può esser perfetta, se non quando co'l mezo de i naturali, o artificiali istrumenti si farà vdire: la qual cosa non si potrà fare co'l Numero solo, ne con le Voci sole: ma accompagnando &<sup>12</sup> queste & quello insieme; massimamente essendo il Numero inseparabile dalla consonanza. Per questo adunque sarà manifesto, che la Musica non si potrà dire ne semplicemente mathematica, ne semplicemente naturale; ma si bene parte naturale, & parte mathematica, & consequentemente mezana tra l'una & l'altra.

This is also confirmed by Avicenna, who says that music derives its principles from natural science and from [the science] of numbers. And just as in nature, nothing is perfect while it is in potential, but only [becomes perfect] when it is put into action, so music cannot be perfect unless it is heard by means of natural or artificial instruments. Such a thing can be done neither with number nor with voices alone, but by both accompanying each other, especially because number is inseparable from consonance. Thus, by this means it will be clear that music cannot be said to be either simply mathematical, or simply [belonging to] natural [science], but partly [belonging to] natural [science] and partly mathematical, and consequently somewhere between them.

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<sup>11</sup> 1573, Zarlino's marginal note: *Suffic. lib. 8. cap. 8* (Avicenna, *Sufficiencia*, Book 8, Chapter 8); *dicendo* reads *il qual dice*.

<sup>12</sup> 1573, & omitted.

Ma<sup>13</sup> perche dalla scienza naturale il Musico hà la ragione della materia della Consonanze, che sono i Suoni & le Voci, & dalla Mathematica hà la ragione della sua forma; cioè della sua proportione; però douendosi denominare tutte le cose dalla cosa più nobile, più ragioneuolmente diciamo la Musica essere scienza mathematica, che naturale: conciosia che la forma sia più nobile della materia.

But because the musician makes sense of the material of consonance, which are instrumental and vocal sounds, through natural science; and through mathematics he makes sense of its form, that is, of its proportion; therefore, having to define everything through the noblest thing [of which it partakes], it is more reasonable for us to say that that music is more of a mathematical science than a natural [science], because form is nobler than matter.

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<sup>13</sup> 1573, *Ma* reads *Et*.

Quel che sia Proportione, & della sua  
diuisione. / Cap. 21

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Le Suoni & le Voci adunque tra loro  
proportionati, li quali senza alcun dubbio  
hanno l'esser da cose naturali, generano &  
in atto fanno vdire la Consonanza,  
gouernatrice d'ogni modulatione, per il cui  
mezo si peruiene all'vso delle Melodie, nel  
quale consiste tutta la perfettione della  
Musica. E ben vero, che alla sua  
generatione concorrono (come altre volte  
vederemo) due suoni dissimili, i quali  
secondo la forma & la ragione de gli  
harmonici numeri, proportionatamente  
siano distanti l'vn dall'altro per il graue, &  
per l'acuto. Ma si hà da sapere, che tutte  
quelle cose, dalle quali può nascer suono;  
come sono Chorde, Nerui, Aere respirato,  
& altre cose simili, il Musico chiama  
Distanza;

What Proportion Is, and On Its Divisions  
/ Chapter 21

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Thus, instrumental and vocal sounds –  
themselves relying on proportions,  
which without a doubt derive their  
existence from natural things – generate  
and make audible consonance, ruler of  
all modulation, by means of which one  
arrives at the usage of melodies where  
all the perfection of music resides. It is  
quite true that two dissimilar sounds  
which, according to the form and reason  
of harmonic numbers, are  
proportionately distant from each other  
in depth and height, concur in its  
generation (as we shall see in other  
places). But we must know that all  
those things from which sound may  
arise, such as strings, sinews, breathed  
air, and other similar things, the  
musician calls distance;

& la Forma, o Ragione de i Numeri, che si  
 caua dalla misura delle chorde sonore,  
 chiama Proportione. Ma la Proportione  
 immediatamente si diuide in due parti, cioè  
 in Commune, & in Propia. La prima è la  
 comparatione di due cose insieme, fatta in  
 vn medesimo attributo, ouer predicato  
 vniuoco; come comparando Gioseffo &  
 Francesco in bianchezza, ouero in altra  
 qualità, nella quale si conuenghino. La  
 seconda (come vuole Euclide) è quella  
 certa habitudine, o conuuenienza, che hanno  
 due finite quantità di vn medesimo genere  
 propinquo, siano equali, ouero ineguali tra  
 loro.

and he calls the form or ratio of numbers  
 extracted from the measure of sonorous  
 strings, proportion. But proportion is  
 immediately divided into two parts, i.e.,  
 shared and individual. The first is the  
 comparison of two things drawn  
 according to a shared attribute or  
 predicate signifying one thing, as in  
 comparing Joseph to Francis in their  
 whiteness, or any other quality that they  
 may share. The second (as Euclid  
 suggests) is a certain relationship  
 between two finite quantities of the same  
 or a closely related category, be they  
 equal or unequal among themselves.

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<sup>1</sup> 1573, *Ma la Proportione* reads *la quale*.

<sup>2</sup> 1573, *si* omitted.

<sup>3</sup> 1573, Zarlino's marginal note: *Element. lib. 5. Def. 5* (Euclid, *Elements*, Book 5, Definition 5).

Et si è<sup>4</sup> detto di un medesimo genere propinquo: percioche non si può dir con ragione, vna Linea esser maggiore, o minore, ouero equale ad vna Superficie, ne ad vn Corpo; ne il Tempo esser maggiore, o minore, ouero equale ad vn Luogo: ma si bene vna Linea esser maggiore, o minore, ouero equale ad vn'altra; & così vn Corpo ad vn'altro corpo; & altri simili: Percioche (come ne<sup>5</sup> insegna il Filosofo<sup>6</sup>) la comparatione si debbe far solamente nelle cose, che hanno vna sola significatione, & che sono di vno istesso genere, propinquo; & non in quelle, che hanno più significati, & sono di generi diuersi, ouero assolutamente di vn sol genere remoto.

And I say of the same type, because one cannot reasonably say that a line is longer, shorter, or equal to a surface, nor to a body; nor can time be longer, shorter, or equal to a place, but it is true that a line can be longer, shorter, or equal to another [line], and in the same way, a body to another body, and other similar [comparisons can be made]; because (as the Philosopher teaches) comparison must be made only between things that have solely one meaning and belong to the same category or to a closely related [category], and not between those [things] that have more meanings and [belong to] different categories, or [to] one totally remote category.

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<sup>4</sup> 1573, *si è* reads *ho*.

<sup>5</sup> 1573, *ne* omitted.

<sup>6</sup> 1573, Zarlino's marginal note: *7. Phy. c. 1. summae. 4* (Aristotle, *Physics*, Book 7, Chapter 1, Summary 4).

Ne si ritroua solamente la Proportione nelle sopradette quantità: ma nelli Pesi, nelle Misure, & (come vuol Platone<sup>7</sup>) nelle Potenze, & nelli Suoni, come vederemo; la qual proportione, mai si ritroua in alcuna cosa, se non in quanto l'vna è eguale, o maggiore, o minore dell'altra: conciosia che il propio della Quantità è l'esser detta Equale ouero Ineguale. Et si ritroua tal proportione primieramente nella Quantità, & successiuamente dipoi nell'altre cose nominate. Lascierò hora di parlare della Commune: percioche non fa punto al nostro proposito, & di nuouo diuiderò la Propia nella Rationale, & nella Irrationale: & dirò<sup>8</sup> la Rationale esser quella, che da numeri, i quali contengono, o sono contenuti piglia la sua denominatione;

Nor do we find proportion to be solely in the abovementioned quantities, but in weights, in measures, and (as Plato says) in powers and in sounds, as we shall see, whose proportion is only found when one [quantity] is equal to, or greater or smaller than another, because that is the property of quantity, whose essence is said to be equal or unequal. And such proportion is first to be found in quantity, and in the other things named in succession [above] as well. I will now leave aside the discussion of the shared, because it is not relevant to our proposition, and again I will divide the particular into the rational and irrational, and I shall define the rational as that which takes its definition from numbers which contain or are contained in themselves:

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<sup>7</sup> 1573, Zarlino's marginal note: *In Timeo* (Plato, *Timaeus*).

<sup>8</sup> 1573, *prima* inserted.

come dal 2. che essendo comparato alla Vnità, nella ragione del contenere, è denominata la Dupla proportione: Onde simili quantità sono dette commensurabili, & communicanti: percioche l'vna, & l'altra sempre da vna commune misura può esser misurata. La irrationale poi è quella, che per niun numero rationale si può denominare; come quella del Diametro & del Lato del Quadrato: imperoche non si può dare alcuna misura commune, che sia certa, & che misuri interamente l'vno & l'altro; & perciò sono dette Quantità incomensurabili.

for example, 2 compared to 1, because [2] contains [1], is called the duple proportion. Therefore, similar quantities are called commensurate and comparable because they can always be measured against each other by a common measure. The irrational [proportion], then, is that to which a rational number cannot be assigned, as that of the diameter<sup>A</sup> and the side of the square, because no common measure can be given that is certain,<sup>B</sup> and that completely measures both; and therefore they are called incommensurate quantities.

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<sup>A</sup> As is clear from his diagram (Figure 21.1), what Zarlino calls the *Diametro* of the square is really the square's diagonal.

<sup>B</sup> The value of the diagonal of any square is a multiple of the square root of 2, which is irrational.

[32]

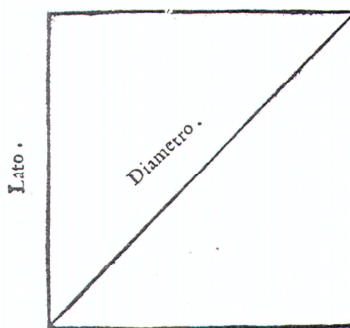


Figure 21.1. “Diameter” of the Square.

Douemo<sup>9</sup> però auertire, che ogni proportione, che si ritroua ne i numeri, che sono quantità discreta, si ritroua anco nella continua: essendo che tutti li numeri sono commensurabili & communicanti: perche almeno sono numerati dall’Vnità; il che non auiene nella continua, nella quale si ritrouano infinite ragioni, che nella discreta non si ritrouano; & questo perche ciascuna proportione, la qual si ritroua in vn genere di quantità continua, [32] si troua anco in vn’altro;

We must caution, however, that every proportion found among numbers that are discrete quantities is also found among the continuous [quantities], since all the numbers are commensurate and comparable, because the minimum [of the discrete quantity] is numbered from one. This does not occur in the continuous, where [an] infinite [number of] relationships are found that are not found in the discrete [proportion]; and this [is] because each proportion that is found in one genus of continuous quantity is also found in another;

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<sup>9</sup> 1573, *Douemo* reads *Dobbiamo*.

la onde si come due rette linee l'vna con l'altra si conuengono; cosi ancora si conuengono due Superficie, due Corpi, due Tempi, due Luoghi, due Suoni, & altre simili: ma non intrauene il medesimo ne i Numeri, o Quantità discreta. Doue è manifesto, che le proportioni nella continua sono di maggiore astrattione, che quelle, le quali nella discreta si ritrouano: conciosia che ogni proportione Arithmetica è rationale; ma le Geometriche sono rationali, & irrationali. Ma perche le Irrationali non fanno al nostro proposito, le lassero da parte, & pigliarò le Rationali, che si diuidono medesimamente nella proportione di equalità, & in quella di inequalità.

whence, just as two straight lines relate to each other, so do two surfaces, two bodies, two times, two places, two sounds, and other similar [things] relate, but the same thing does not occur with numbers or discrete quantities. Whence it is clear that the proportions of continuous [quantity] are of greater abstraction than those of discrete [quantity], because each arithmetic proportion is rational, but geometric [proportions] are [both] rational and irrational. But because the irrational are not relevant to our purpose, I will leave them aside, and consider the rational, which can be divided similarly into proportions of equality and inequality.

Dico adunque che la proportionione di Equalità è quella, la qual si troua tra due quantità, che sono tra loro equali; come 1 ad 1: 2 a 2: 3 a 3. & seguentemente gli altri; o due suoni, o due linee, o due superficie, o due corpi tra loro equali; la qual veramente non fa al nostro proposito, essendo naturalmente indiuisibile: percioche nelli suoi estremi non si ritroua differenza alcuna; & non si può dire, che l'una quantità sia maggior dell'altra; & questo auiene perche la Equalità, o simiglianza appresso del Musico non partorisce alcuna consonanza. La proportionione d'Inequalità poi, che è quella, della quale io intendo ragionare, è quando due quantità l'vna maggior dell'altra, sono poste in comparatione, di modo che l'vna contenga, o sia contenuta dall'altra; come il Binario comparato all'Vnità, o per il contrario.

So I say that the proportion of equality is that which is found between two equal quantities, as 1 to 1, 2 to 2, 3 to 3, and the others that follow; or two equal sounds, or lines, or surfaces, or bodies. This truly does not pertain to our purpose, [these proportions] being naturally indivisible, because one can find no difference in their extremes, and one cannot say that one quantity is greater than another. This occurs because equality or similarity does not produce any consonance for the musician. The proportion of inequality, then, which is what I intend to explain, occurs when two quantities, one greater than the other, are placed in comparison, in such a way that one contains or is contained in another, as 2 compared to 1, or vice versa.

Et questa medesimamente si diuide in due parti, cioè in quella di Maggiore inequalità, & in quella di Minore: percioche quando si compara il maggior numero al minore, se'l maggiore contiene esso minore semplicemente, senza hauerne altra consideratione, allora nasce quella di maggiore inequalità: ma comparando il minore al maggiore, se'l minore, senza hauer altro riguardo, è contenuto dal maggiore, allora nasce quella di minore inequalità.

And this similarly is divided into two types, that is, into greater and lesser inequality, because when the larger number is compared with the smaller, if the larger contains this smaller simply, without the smaller being repeated, then the greater inequality results.<sup>D</sup> But comparing the smaller with the larger, if the smaller, without being repeated, is contained in the larger, then the lesser inequality results.<sup>E</sup>

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<sup>D</sup> e.g., 3:2.

<sup>E</sup> e.g., 2:3.

In quanti modi si compara l'vna Quantità  
all'altra. / Cap. 22

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Il contenere l'vn l'altro, & l'esser  
contenuto non sempre si piglia  
semplicemente, ma si bene in altro modo.  
Onde considerate tal comparatione più  
minutamente, da ciascuno di essi generi ne  
nascono altri cinque: percioche il maggior  
numero si può comparare al minore in  
cinque modi & non più; & così per il  
contrario, il minore al maggiore: conciosia  
che nella proportione di maggiore  
inequalità, il maggior numero contiene in  
se il minore più d'una volta interamente:  
ouero vna volta solamente, & di più vna  
parte di esso minore, detta parte Aliquota;

In How Many Ways One Quantity May  
Be Compared with Another / Chapter 22

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Containment and being contained one by  
the other is not always taken simply, but  
also in another way. Thus, considering  
such comparison more minutely, from  
each of these genera [of inequalities]  
five others arise, because the larger  
number can be compared with the  
smaller in five and only five ways, and  
the same for its opposite [the  
comparison between the smaller and the  
larger]. In proportions of greater  
inequality, the larger number contains  
the smaller in itself more than once in its  
entirety, or only once plus a smaller part  
of the smaller [number], called an  
aliquot part;<sup>A</sup>

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<sup>A</sup> An aliquot part of a number is a factor, i.e. a number contained an exact number of times in a larger number; e.g., 6 is an aliquot part of 12.

ouero contiene il minore vna sola volta, et di più vna parte di esso, chiamata parte Non aliquota. Contiene anco il maggior numero il minore più di vna volta, & di più vna parte di esso aliquota, oueramente lo contiene più volte, & di più vna parte non aliquota. Dal primo modo hà origine quel genere di proportione, che si dice Multiplice; dal secondo quello che si chiama Superparticolare; & dal terzo quello che è nominato Superpartiente. Et sono detti generi semplici:

or it contains the smaller [number] only once, plus a part of itself, called [a] non-aliquot part.<sup>B</sup> The larger number may also contain the smaller [number] more than once, plus an aliquot part of [the larger number]; or it may contain [the smaller number] multiple times plus a non-aliquot part [of the smaller number]. From the first type [of inequality] originates the genus of proportion that is called multiple;<sup>F</sup> from the second, that which is called superparticular;<sup>G</sup> and from the third, that which is named superpartient;<sup>H</sup> and they are called simple genera.

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<sup>B</sup> A non-aliquot part is a number contained in a larger number, which when acting as a divisor of the larger number, yields a remainder, e.g. 7 is a non-aliquot part of 12.

<sup>F</sup> See note A.

<sup>G</sup> e.g., 3:2.

<sup>H</sup> e.g., any of the proportions in notes B through D.

perciocche dal quarto modo se ne genera vn'altro detto Multiplice superparticolare; & dal quinto et vltimo nasce quello, che si addimanda Multiplice superpartiente; i quali generi dal primo, & da gli altri due seguenti si compongono; come dal nome di ciascuno da per se si comprende; & sono detti Composti. Nella proportionione di Minore inequalità poi,<sup>1</sup> il minor numero simigliantemente è contenuto dal maggiore in cinque modi, et non più;

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<sup>1</sup> 1573, *poi* omitted.

From the fourth type [of inequality] another [genus] is produced called multiple superparticular, and from the multiple superpartient, and from the fifth and last arises that which is called multiple superpartient, [both of] which genera are composed of the first and from the two that follow it, as can be understood from the name of each; [these genera] are called composite.<sup>1</sup> Furthermore, in the proportion of lesser inequalities, the smaller number is similarly contained in the larger in five and only five ways.

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<sup>1</sup> This organization of proportions into five genera can be understood from the following chart:

Proportion	Genus	Example
Simple	Multiple	2:1
	Superparticular	3:2
	Superpartient	5:3
Composite	Multiple superparticular	5:2
	Multiple superpartient	8:3

Mathematical formulas for the five genera of proportion can be found in Appendix 6, page 531..

& così si hanno cinque altri generi, chiamati di minore inequalità; & sono denominati da i propri nomi delli sopradetti, aggiuntoui solamente per lor differenza questa particella Sub, che significa Sotto, & sono nominati Submultiplice, Subsuperparticolare, Subsuperpartiente, Submultiplice superparticolare, & Submultiplice superpartiente; de i quali i tre primi si chiamano medesimamente semplici: ma gli altri due sono detti composti. Et non essendo questi cinque ultimi generi atti alla generatione delle consonanze musicali, come nella seconda parte vederemo, però non ne ragionerò altramente più di essi.

Thus we have five other genera, called lesser inequalities, and they are defined by the proper names of those mentioned above, adding only the prefix *sub-*, which means “under,” to differentiate them, and they are called submultiple, subsuperparticular, subsuperpartient, submultiple superparticular, and submultiple superpartient. Of these the first three are similarly called simple, but the other two are called composite. And since these five latter genera are not predisposed to the production of musical consonances, as we will see in the second part [of *Le istituzioni armoniche*], I shall not discuss them further.

[33] Quel che sia parte aliquota, & non aliquota. / Cap. 23

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Dovemo auertire,<sup>1</sup> che li Mathematici nominano Parte aliquota quella quantità, la qual presa quante volte si può in qualunque<sup>2</sup> quantità maggiore, rende di punto l'intero del suo tutto: Onde il Binario è detto parte aliquota del Senario, imperoche preso tre volte rende di punto il suo tutto, che è il 6. Questa dal Campano<sup>3</sup> è detta parte Moltiplicatiua; perche interamente numera & misura il suo Tutto.

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<sup>1</sup> 1573, *Dovemo auertire* reads *Dobbiamo prima d'ogn'altra cosa auertire* (we must first, before anything else, caution).

<sup>2</sup> 1573, *qualunque quantità* reads *qual si voglia quantità* (whatever quantity one wishes.)

<sup>3</sup> 1573, Zarlino's marginal note: *In Def. 1. lib 5. Element. Eucl.* (In Definition 1, Book 5, Euclid's *Elements*).

What Is an Aliquot Part, and a Non-Aliquot [Part] / Chapter 23

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We must caution that mathematicians call an aliquot part that quantity, which taken as many times as possible in whatever larger quantity, perfectly divides the whole of which it is a part. Thus, 2 is said to be an aliquot part of the Senario, because when it is taken three times, it produces the whole [Senario], which is 6. Campanus<sup>A</sup> calls this a multiplicative part, because it completely enumerates and measures its whole.

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<sup>A</sup> Johannes Campanus (Campanus of Novara, 1220-1296) was chaplain to Pope Urban IV as well as a mathematician and astronomer. His Latin translation of Euclid's *Elements* was first printed in 1482.

La Parte non aliquota poi dimandano quella, che tolta quante volte si può, non rende di punto il suo tutto; ma si bene<sup>4</sup> rende più o meno; Si come il Binario è detto parte non aliquota del 5. percioche preso due volte, rende 4; & preso tre volte, rende 6: Onde tal parte dal medesimo Campano è nominata Aggregatiua: conciosia che aggiunta ad vn'altra quantità rende il suo tutto; si come aggiunto il 4 con l'vnità rende il 5. Et questa non propriamente [*sic*], ma si bene impropriamente, è chiamata parte.

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<sup>4</sup> 1573, *si bene* omitted.

The non-aliquot part, then, is called that [part] which, when removed as many times as possible, does not leave its entirety as a remainder, but leaves more or less [than itself]. Thus, 2 is called a non-aliquot part of 5, because [when] taken twice, 4 results, and taken three times, 6 results. Thus, the same Campanus calls such a part aggregative, because adding it to another quantity yields the whole [quantity], as when 1 is added to 4, 5 is produced. And this [non-aliquot part] is called not properly, but improperly, [a] part [of 5].<sup>B</sup>

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<sup>B</sup> Zarlino says that 4 is not “properly” called a part of 5 because 4 is not a factor of 5.

Della produzione del genere Multiplice. /  
Cap. 24

On the Production of the Multiple Genus  
/ Chapter 24

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Ancora che i detti cinque vltimi generi delle proportioni di maggiore inequalità (come habbiamo veduto di sopra)<sup>1</sup> siano finiti; non è però da pensare, che le loro specie siano finite: percioche à guisa de i numeri (seguendo in infinito il naturale ordine loro) infinitamente si possono accrescere. Et quantunque tali specie possino essere infinite; nondimeno la Musica si contenta di vna particella, che sia finita, & più vicina alla semplicità: & non riceue l'Infinito: ma conciosia che qualunque cosa, che è più lontana dalla sua origine, è men pura, & men semplice;<sup>2</sup>

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Even though the aforementioned five categories of proportions of greater inequality are finite (as we have seen earlier), one must not, however, think that their species are finite, because just like numbers (following their natural order to infinity) they can grow infinitely. And although such species might be infinite, nevertheless music contents itself with a small part that is finite, and closer to simplicity, and does not partake of the infinite, because anything that is further from its origin is less pure and less simple,

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*come habbiamo veduto di sopra*) omitted.

<sup>2</sup> 1573, & non riceue l'Infinito: ma conciosia che qualunque cosa, che è più lontana dalla sua origine, è men pura, & men semplice reads *acciò possa dar buon canto di quello, che opera: percioche troppo bene fa il Musico; che è qualunque cosa, che è più lontana dalla sua origine, è men pura, & men semplice* (Too much is asked of the musician [to consider] anything that is further from its origin, because [it] is less pure and less simple).

& dal senso è men compresa, & meno intesa dall'intelletto; si come<sup>3</sup> auiene il contrario<sup>4</sup> quando è più vicina; che<sup>5</sup> allora non solamente la comprende il senso; ma ancora l'intelletto l'apprende. Onde<sup>6</sup> si vede ne i numeri, che quanto più sono lontani dall'Unità, la quale è semplice; tanto sono men semplici, & men puri, & meno dal senso compresi, & meno intesi dall'intelletto: Ma<sup>7</sup> per il contrario, quanto più sono vicini, tanto più semplici si ritrouano; & a i sentimenti, & all'intelletto sono più noti: percioche partecipano di tal semplicità.<sup>8</sup>

and less comprehensible to the senses, and less understood by the intellect, just as the contrary occurs when it is closer [to its origin]; in that case it is not only understood by the senses but also by the intellect. Thus, one sees in numbers that the further they are from 1, which is simple, the less simple, less pure, and less comprehensible to the senses and to the intellect they are. But on the contrary, the closer they are [to 1], the simpler they are found to be; and they are better known to the senses and the intellect because they partake of such simplicity.

---

<sup>3</sup> 1573, *si come* reads *il che* (which).

<sup>4</sup> 1573, *che* (which) inserted.

<sup>5</sup> 1573, *che* omitted. <sup>1</sup>

<sup>6</sup> 1573, *Onde* reads *cosi sa* (thus is known).

<sup>7</sup> 1573, *Ma* reads &.

<sup>8</sup> 1573, & *conosce etiandio, che* (and know furthermore, that) inserted.

Il medesimo intrauiene de gli estremi  
suoni, o voci di qualunque consonanza,<sup>9</sup>  
che quanto più sono l'vno all'altro vicini,  
& vniti; tanto più sono intelligibili: ma<sup>10</sup> se  
auiene che nell'acuto, ouer nel graue  
troppo si estendano; il senso l'abhorisce;<sup>11</sup>  
ne può hauer così presta cognitione di  
essa:<sup>12</sup> conciosia che<sup>13</sup> ne dalli naturali, ne  
da gli artificiali istrumenti tanta distanza, se  
non difficilmente è compresa. Et  
quantunque verso l'acuto, & verso il graue  
molto si potessero estendere; nondimeno<sup>14</sup>  
non potrebbero proceder più oltre; se non  
tanto quanto dalla natura & dall'arte<sup>15</sup> fusse  
permesso.

The same thing happens among the  
extremes of sounds or pitches of any  
consonance, where the closer and the  
more united one [pitch] is to another, the  
more intelligible they are, but if the high  
or low [pitches] happen to be too far  
apart, the ear abhors it, being unable to  
grasp [the consonance] so quickly,  
because neither natural nor artificial  
instruments can grasp such distance  
without difficulty. And although [the  
pitches] might be able to be extended a  
great deal higher and lower, nevertheless  
they could not go further than the extent  
permitted by nature and art.

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<sup>9</sup> 1573, *ouero Interuallo* (or interval) inserted.

<sup>10</sup> 1573, *ma* reads &.

<sup>11</sup> 1573, *estendano*; *il senso l'abhorisce* reads *distendino*; *il senso cotal cosa abhorisce* (extends; the senses abhor such a thing).

<sup>12</sup> 1573, *essa* reads *essi* (them).

<sup>13</sup> 1573, *conciosia che* reads *essendo che* (since).

<sup>14</sup> 1573, *estendere*; *nondimeno* reads *distendere*; *tuttauia* (same meaning).

<sup>15</sup> 1573, *li* inserted.

Ma perche tutti gli harmonici suoni, li quali sono rationali; cioè hanno tra loro determinato & rationale interuallo, o proportione; necessariamente sono sottoposti alla ragione del numero; percioche i loro estremi comparati l'vno all'altro necessariamente cadeno<sup>16</sup> sotto la ragione di vna delle specie de i nominati generi; però hauendo fin qui ragionato intorno ad essi, verrò hora a ragionare del modo, che si generano le loro specie. Onde<sup>17</sup> incominciando dal primo, il quale è più semplice d'ogn'altro, detto Moltiplice;<sup>18</sup> potremo hauer cognitione di tutte le sue specie, co'l dispor prima il naturale ordine de i Numeri, incominciando dall'Vnità, & procedendo in infinito, se fusse bisogno; & dipoi far la comparatione del Binario, Ternario, Quaternario, & de gli altri numeri per ordine ad essa Vnità;

But all harmonious sounds which are rational—that is, have a determinate and rational interval or proportion between them—are necessarily subject to the rule of number. For that reason, their extremes compared with one another necessarily fall under the ratio of one of the types of the aforementioned categories. Thus, having discussed such matters so far, I will now discuss the way in which their species are generated. Whence, beginning with the first [genus], called [the] multiple [genus], which is simpler than any other, we will be able to derive knowledge of all its species by examining first the natural order of numbers, beginning with 1, and proceeding to infinity if necessary; and then draw the comparison of 2, 3, 4, and the other numbers in order.

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<sup>16</sup> 1573, *cadeno* reads *cadono*.

<sup>17</sup> 1573, *Onde* reads *La onde*.

<sup>18</sup> 1573, *che* inserted.

& così facendo ritroveremo in ciascuna relatione varie specie di proportioni: conciosia che comparando'l Binario all'vnità, tal proportione si chiamerà Dupla, per il suo Denominatore; che è il 2. Dipoi comparando il Ternario, nascerà vna proportione, che si nominerà Tripla, medesimamente dal suo Denominatore, che è il 3. & così seguendo per ordine: di modo che facendo sempre la comparatione di ciascun numero alla vnità, haueremo in tal modo le specie del primo genere detto Multiplice; come sono le sottoposte.<sup>19</sup>

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<sup>19</sup> 1573, *come sono le sottoposte reads che sono poste nello esempio* (as are shown in the example).

Doing so, we will discover in each relation various species of proportion; for example, when comparing 2 with 1, such proportion will be called duple because of its value, which is 2.<sup>A</sup> Furthermore, comparing 3 [to 1], a proportion will arise that will be called triple, similarly because of its value, which is 3; and in this way following [the numbers] in order, so that always making the comparison of each number with 1, we will have [produced] in this fashion the types of the first genus, called multiple, as shown below.

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<sup>A</sup> Zarlino uses *Denominatore* in several ways in this treatise. Here, *Denominatore* means “name;” to put it in a mathematical context, I have therefore translated it as “value.” “Denominator,” its mathematical cognate, does not make sense in this context, as the duple proportion can only be expressed as the fraction 2/1, and the triple proportion, 3/1, whose numerators are 2 and 3, respectively. In the next chapter, Zarlino uses the cognate of “denominator,” “the part of a fraction below the line.”

[34]

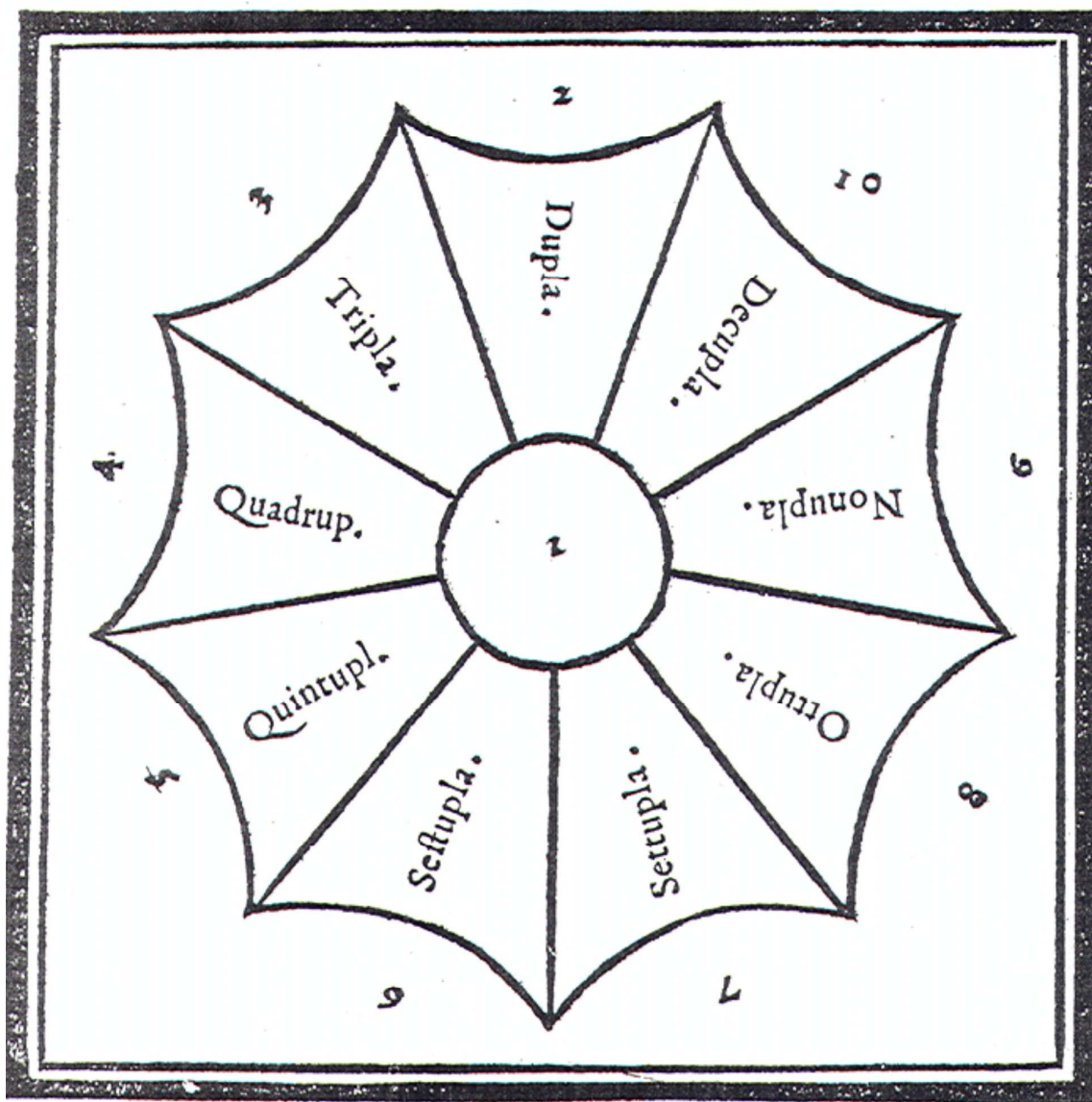


Figure 24.1. Proportions of the Multiple Genus.

Quel che sia Denominatore, & in qual modo si troui; & come di due proposte proportioni si possa conoscere la maggiore, o la minore. / Cap. 25

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Dovemo<sup>1</sup> auertire, che Denominatore (come vuole Euclide<sup>2</sup>) si chiama quel numero, second'l quale si piglia la parte nel suo tutto; & è propriamente detto da alcuni Parte aliquota; & da altri Quotiente: percioche denota quante volte il maggior termine della proportione contenga il minore: & è quello, che è prodotto dalla diuisione del maggior termine, fatta per il minore di qualunque proposta proportione di qual si voglia genere;

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<sup>1</sup> 1573, *Dovemo* reads *Bisogna* (one must).

<sup>2</sup> 1573, Zarlino's marginal note: *Element. lib. 7. Def. 13* (Euclid, *Elements*, Book 7, Definition 13).

What a Denominator Is, and In what Manner It Is Found, and How of Two Proposed Proportions it Is Possible to Know the Greater or the Smaller / Chapter 25

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We must caution that “denominator” (as Euclid suggests) is that number [of a proportion] according to which the part is taken in relation to its whole; and it is properly called “aliquot part” by some, and “quotient” by others,<sup>A</sup> because it indicates how many times the greater term of the proportion contains the smaller [term], and is the result of the division of the greater term by the smaller [term] of any possible proportion of any kind,

---

<sup>A</sup> Here Zarlino seems to equate the definitions of “aliquot part” and “quotient.” (See Chapter 22, page 335 for a dictionary definition of “aliquot part.”) The modern dictionary definition of “quotient” is “the number resulting from the division of one number by another.” As with Zarlino's use of *Denominatore*, one must read *aliquota* in its context each time.

si come per essemplio, diuidendo il maggior termine della Dupla, che si ritroua esser la prima nel genere Moltiplice, il quale è 2. per l'Vnità, che è il minore; ne verrà<sup>3</sup> 2. il quale dico essere il Denominatore di tal proportione: perche il Binario contiene due volte essa vnità, & questa diuide quello interamente in due parti. Medesimamente diremo il 3. esser denominatore della Tripla; & il 4. denominatore<sup>4</sup> della Quadrupla: conciosia che'l 3. contien tre volte l'vnità, & il 4. quattro fiata; & cosi di tutti gli altri seguentemente. Et tali denominationi si chiamano Semplici: perche sono denominate da numeri semplici; che sono 2. 3. 4. & da altri simili.

as, for example, by dividing the larger term of the duple [proportion], which happens to be the first of the multiple genus, which is 2, by 1, which is the smaller [term], 2 results, which I say to be the value<sup>B</sup> of such a proportion, because 2 contains 1 twice, and the latter divides the former entirely into two parts. In the same way, we will say 3 to be the value of the triple [proportion] and 4, the value of the quadruple [proportion], because 3 contains 1 three times, and 4 [contains 1] four times, and thus for all the other [numbers] that follow. And such categories are called simple, because they are defined by whole numbers, which are 2, 3, 4, and other similar [numbers].

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<sup>3</sup> 1573, *verrà* reads *nasce* (arises).

<sup>4</sup> 1573, *denominatore* reads *quello* (that of).

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<sup>B</sup> *Denominatore* takes on several meanings in this chapter. Depending on context, it has been translated as “denominator” in the mathematical sense, “value,” or “number.”

Ma se nel genere Superparticolare  
 diuideremo li termini della Sesquialtera al  
 modo detto; cioè il maggiore per il minore;  
 ne verra  $1\frac{1}{2}$ ; il quale dico esser  
 denominatore della Sesquialtera: conciosia  
 che'l 3. suo<sup>5</sup> termine maggiore contiene il  
 2. termine minore vna volta, con vna meza  
 parte; la quale secondo il costume de  
 mathematici si descriue in tal modo  $\frac{1}{2}$ ; &  
 tal denominatione si nomina Composta:  
 perche si compone della vnità, & di vna sua  
 parte. E ben vero che le parti che nascono  
 in tal modo, tallora, si chiamano Aliquote;  
 & tallora Non aliquote del minor termine,  
 che contiene la proportione:

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<sup>5</sup> 1573, *suo* omitted.

But if in the Superparticular<sup>C</sup> genus we  
 divide the terms of the Sesquialter<sup>D</sup> in  
 the aforementioned way, that is, the  
 greater by the smaller,  $1 - \frac{1}{2}$  results,  
 which I say to be the value of the  
 Sesquialter, because its greater term, 3,  
 contains its smaller term, 2, one and a  
 half times, which [half] according to the  
 usage of mathematicians is described as  
 $\frac{1}{2}$ ; and this number<sup>E</sup> is called  
 compound, because it is composed of 1  
 plus one of its parts. It is quite true that  
 the parts that arise in such a fashion  
 sometimes are called aliquot, and at  
 other times non-aliquot [parts] of the  
 smaller term of the proportion;

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<sup>C</sup> A ratio in which the greater term exceeds the smaller term by 1, e.g. 3:2.

<sup>D</sup> A ratio of one and a half to one.

ma il numero posto sopra la linea è detto il Numeratore di tal parte, & quello posto di sotto il Denominatore.<sup>6</sup>Onde<sup>7</sup> deriui poi<sup>8</sup> questa particella<sup>9</sup> Sesqui, & quello che significhi, non è cosa facile da sapere; se non fusse quello, che vuole Agostino;<sup>10</sup> il quale (leggendo Sesque, & non Sesqui) pensa, che sia detta quasi da Se absque, cioè da Absque se; che significa senza se:

but the number that is placed above the line is called the numerator of this part, and that placed below [the line], the denominator. The origin and significance of the prefix *Sesqui-* are not easy things to know, if it were not for what Augustine says, who (reading *Sesque*<sup>E</sup> and not *Sesqui*<sup>F</sup>) thinks that it actually derives from *se absque*,<sup>G</sup> that is, from *absque se*, which means “without itself,”

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<sup>6</sup> 1573, *il Denominatore* reads *il suo Denominatore* (its denominator).

<sup>7</sup> 1573, *Onde* reads *Ma donde* (but when).

<sup>8</sup> 1573, *poi* omitted.

<sup>9</sup> 1573, *particella* reads *parola* (word).

<sup>10</sup> 1573, Zarlino’s marginal note: *Musicae. libro. 1. ca. 10* (St. Augustine, *On Music*, Book 1, Chapter 10).

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<sup>E</sup> Lat., adverb meaning more by a half; one and a half times.

<sup>F</sup> Lat., prefix indicating a number consisting of a unit and the fraction indicated by the numeral, e.g. *sesquialter*, one and a half times, *sesquitertia*, one and a third times, etc.

<sup>G</sup> Lat. *absque*, preposition meaning without, apart from, but for.

[35] perciocche (s'io non m'inganno) piglia la denominatione delle proportioni dalla parte del numero maggiore, della quale soprauanza il minore, ne i termini, o numeri delle proportioni del genere Superparticolare; i quali nomina numeri Sesquati, & quelli del Moltiplice, Complicati. Et benche siano stati alcuni, i quali habbiano hauuto parere, che sia una Sillabica aggunzione;<sup>11</sup> & che non significhi cosa alcuna; ma sia stata ritrouata solamente per poter proferire più commodamente<sup>12</sup> le dette specie: questo mi par, che sia<sup>13</sup> detto con poca consideratione;

because (if I am not mistaken) it takes the name of these proportions from the part of the greater number by which it exceeds the smaller [number] in the terms or numbers of the proportions of the superparticular genus, which he calls *Sesquati* numbers, and [he calls] those of the multiple [superparticular] genus, *Complicati*. And although some believed [*sesqui*] to be an additional syllable of no significance, solely invented to utter [the names of] such categories more comfortably, it seems to me that this is stated with little thought.

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<sup>11</sup> 1573, *Sillabica aggunzione* reads *aggunzione Sillabica*.

<sup>12</sup> 1573, *più commodamente* reads *con più commodità*.

<sup>13</sup> 1573, *che sia* reads *esser*.

& meglio<sup>14</sup> hanno detto quelli, che dissero, che Sesqui vuol dire Tutto, & che Sesquialtera è detta da tal parola, che è latina, & da Altera medesimamente parola latina, che si vsa<sup>15</sup> quando si parla di due solamente, & significa Altra; quasi<sup>16</sup> proportione, il cui maggior termine contiene tutto il minore vna volta intera, con vna delle due parti. E questo è ben detto: imperoche se fusse altramente (come vogliono alcuni, che Sesqui significhi Altretanto, & la metà) non si potrebbe addattare tal parola nelle altre; come nella Sesquiterza, nella Sesquiquarta, & altre simili.<sup>17</sup> Nondimeno à da auertire, che'l Denominatore di qualunque proportione si ritroua in due modi;

Those were more correct who held *sesqui* to mean “all,” and *sesquialtera* to derive from that Latin word [*sesqui*], and *altera*, another Latin word used when one speaks of only two, and means “other.” [“Sesquialter” expresses] such a proportion whose greater term entirely contains its smaller [term] once, plus one of its two parts. And this is well said, because if it were otherwise (as some say that *Sesqui* signifies the same [quantity] plus a half) such a word could not be adapted to others, as in Sesquitertia, Sesquiquarta, and other similar proportions. Nonetheless one must caution that the denominator of any proportion is written in two ways:

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<sup>14</sup> 1573, *meglio* reads *che meglio*.

<sup>15</sup> 1573, *tal parola, che è Latina, & da Altera medesimamente parola Latina, che si vsa* reads *da Sesqui & da Altera parole latine, delle quali questi si vsa* (from *Sesqui* and *Altera*, Latin words, from which these are used).

<sup>16</sup> 1573, *quasi* reads *quasi volendo dire* (as if to say).

<sup>17</sup> 1573, *altre simile* reads *nelle seguenti* (in the following).

cioè, o ne i puri numeri; ouero<sup>18</sup>  
 aggiungendo a questi le parti. Et potremo  
 ritrouar questo secondo modo in quattro  
 maniere: imperoche alcuna volta  
 ritrouaremo l'Vnità, & alcuna<sup>19</sup> parte; &  
 alcuna volta l'Vnità, et più parti: Ouero  
 ritrouaremo alcun numero, & vna parte;  
 ouero alcun numero aggiunto a più parti.  
 Se noi ritrouaremo numeri semplici;  
 douemo denominare<sup>20</sup> la proportione  
 semplicemente, secondo che nelle specie  
 del Moltiplice si è mostrato; & se  
 ritrouaremo l'vnità aggiunta ad alcuna  
 parte; la douemo denominare,<sup>21</sup> secondo  
 che disopra fuorno [*sic*] denominate quelle  
 del Superparticolare.

either as a whole number or as a whole  
 number plus a fraction. And we will be  
 able to understand this second type [of  
 proportion whose denominator consists  
 of a whole number plus a fraction] in  
 four ways. Sometimes we will find [a  
 denominator of] 1 plus one part.<sup>H</sup> and at  
 times 1 plus more [than one] part.<sup>I</sup> At  
 other times we will find any number  
 plus one part,<sup>J</sup> or any number  
 accompanied by more parts.<sup>K</sup> If we find  
 whole numbers, we must designate the  
 proportion as simple, just as we showed  
 in the multiple [genus]. And if we find  
 1 added to one part, we must then  
 designate it according to the way the  
 superparticular [genera] were designated  
 above.

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<sup>18</sup> 1573, *ouero* reads &.

<sup>19</sup> 1573, *alcuna* reads *vna*.

<sup>20</sup> 1573, *douemo denominare* reads *allora denominaremo* (then we will designate).

<sup>21</sup> 1573, *douemo denominare* reads *denominaremo* (we will designate).

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<sup>H</sup> e.g.,  $1 - 1/2$ .

<sup>I</sup> e.g.,  $1 - 2/3$ .

<sup>J</sup> e.g.,  $3 - 1/2$ .

<sup>K</sup> e.g.,  $3 - 3/4$ .

Quando<sup>22</sup> poi si ritrouerà l'vnità con più parti, allora, lassando<sup>23</sup> l'vnità, si pone<sup>24</sup> auanti questa particella<sup>25</sup> Super al Numeratore delle parti, & al Denominatore quest'altra Partiente; & si compone<sup>26</sup> la denominatione della proportione dalle dette due particelle, & da i termini delle parti; come per essemplio si può vedere nella prima specie del genere Superpartiente, che la proportione detta Superbipartienteterza è denominata da 1. &  $\frac{2}{3}$  suo denominatore: conciosia che diuiso il termine maggiore di tal proportione, che è il 5. per il 3. il quale è il minore; ne risulta 1 &  $\frac{2}{3}$ .

Then, when we find 1 accompanied by more parts, leaving 1 aside, we place the prefix *super-* before the [prefix denoting the] numerator of the fraction, and [attach the suffix] *-partient* [to] the [suffix denoting the] denominator. And we derive the name of this proportion from these two particles [*super-* and *-partient*] and from the names of these parts. Thus we can see, for example, in the first species of the superpartient genus, that the superbi-partient-tertia proportion is designated by its value, 1 -  $\frac{2}{3}$ , because when the larger term of this proportion, 5, is divided by 3, which is the smaller [term], 1 -  $\frac{2}{3}$  results.

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<sup>22</sup> 1573, *Quando* reads *Ma quando* (but when).

<sup>23</sup> 1573, *lassando* reads *lasciando*.

<sup>24</sup> 1573, *pone* reads *porrà* (will place).

<sup>25</sup> 1573, *particella* reads *parola* (word).

<sup>26</sup> 1573, *compone* reads *componerà* (will derive).

La onde pigliando il numeratore delle parti, che è 2. aggiungendoui la particella Super, si dice<sup>27</sup> Superbi; dipoi pigliando il 3. denominatore con la seconda particella<sup>28</sup> Partiente, si dice<sup>29</sup> Partienteterza; & cosi aggiunte insieme si dice,<sup>30</sup> Superbipartienteterza; il che si fa nell'altre ancora, secondo il suo denominatore. Ma quando il denominatore è<sup>31</sup> composto di alcun numero, & di vna parte sola; si denomina<sup>32</sup> prima la proportione dal numero, come fu detto del Moltiplice;

Hence, taking the numerator of the parts, which is 2, and adding the prefix *super-* to it, it is called *superbi -*; then, taking the denominator, 3, with the second suffix, *-partient*, we obtain *-partient-tertia*; and thus adding [both suffixes] together, we obtain *superbi-partient-tertia*. [This process] applies to other [proportions] as well, according to their denominator. But when the value consists of any number and a single part,<sup>L</sup> we will first name the proportion from the number [itself], as was said of the multiple [category].

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<sup>27</sup> 1573, *dice* reads *dirà* (will be called).

<sup>28</sup> 1573, *particella* reads *parola*.

<sup>29</sup> See footnote 27.

<sup>30</sup> See footnote 27.

<sup>31</sup> 1573, *è* reads *sarà* (will be).

<sup>32</sup> 1573, *denomina* reads *denominerà* (will be called).

---

<sup>L</sup> See note H.

dipoi si aggiunge<sup>33</sup> la parte, nel modo che nel Superparticolare hò dichiarato: conciosia che tal proportione si ritroua necessariamente nel primo genere composto detto Moltiplicesuperparticolare; come si può vedere nella Duplasesquialtera, la quale si denomina da 2. & 1/2: percioche il suo termine maggiore, che è il 5. contiene il 2. il quale è il minore; due volte, & vna meza parte del minore; di modo che dal 2. piglia la denominatione della Dupla; & dalla parte, che è 1/2 piglia quella della Sesquialtera. Quando poi il denominatore è<sup>34</sup> contenuto da numero intero, & da più parti; allora si denomina<sup>35</sup> la proportione primieramente dal numero, nel modo che si è mostrato nel Moltiplice;

Then we add the part, in the way that I have discussed about the superparticular [proportion], because such a proportion is necessarily found in the first composite category called multiple superparticular. This may be see in the *dupla-sesquialter*, which derives its name from 2 - 1/2, because its greater term, which is 5, contains its lesser term, 2, two times, plus half of the smaller [term], in the way that from 2 it takes the designation of duple and from the part that is 1/2, [it] takes the designation of sesquialter. When the value consists of a whole number plus more parts, then the proportion is named primarily from the number, as demonstrated in the multiple [genus];

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<sup>33</sup> 1573, *aggiunge* reads *aggiungerà* (will add).

<sup>34</sup> 1573, *è* reads *sarà* (will be).

<sup>35</sup> 1573, *denomina* reads *denominerà* (will be named).

dipoi si aggiungono<sup>36</sup> le parti,  
denominandole secondo che facemmo nel  
genere Superpartiente: percioche tal  
proportione necessariamente cade<sup>37</sup> nel  
secondo genere composto, detto  
Multiplisesuperpartiente. Hauemo  
l'esempio di questo nella  
Duplasuperbipartienteterza, la quale è la  
prima specie di tal genere; come vederemo,  
denominata per le ragioni dette, da 2. & 2/3  
suo denominatore. Lungo sarebbe s'io  
volessi porre gli esempj di ciascuna  
specie: ma perche molti di essi si potranno  
vedere al suo luogo; però in questo hora  
non mi estenderò più oltre:

the parts are then added, labeling them  
as we did in the superpartient genus,  
because such a proportion necessarily  
falls into the second composite genus,  
called multiple superpartient. We have  
an example of this in the *dupla-superbi-*  
*partient-tertia* [proportion], which is the  
first species in this genus, as we shall  
see, named for the aforementioned  
reasons according to its numerical  
designation, 2 - 2/3. It would take me  
too long to discuss examples of each  
species, but because many of them will  
be visible in their own place and time, I  
will not extend my discussion any  
further at this time.

---

<sup>36</sup> 1573, *aggiungono* reads *aggiungeranno* (will be added).

<sup>37</sup> 1573, *cade* reads *caderà* (will fall).

Solamente dirò questo per conclusione, che ciascuna proportione è tanto maggior d'vn'altra (come ne auertisce Euclide<sup>38</sup>) quanto la fa il suo denominatore; & questo in ogni genere di proportione: il che è manifesto: essendo che la Dupla è senza dubbio alcuno maggior della Sesquialtera: conciosia che il 2. suo Denominatore è maggior di 1. &  $\frac{1}{2}$  Denominatore della Sesquialtera; & così si può dire ancora delle altre.<sup>39</sup>

I will just say in conclusion that each proportion is greater than another (as Euclid points out) to the extent that its denominator makes it. This [occurs] in each genus of proportion, which is clear, since the duple [proportion] is without any doubt larger than the sesquialter, because its value, 2, is greater than 1 -  $\frac{1}{2}$ , the value of the sesquialter; and the same can also be said about the other [proportions].

---

<sup>38</sup> 1573, Zarlino's marginal note: *Element. lib. 7. def. 23* (Euclid, *Elements*, Book 7, Definition 5).

<sup>39</sup> 1573, *senza alcuno errore* (without any error) added.

[36] Come nasca il genere

Superparticolare. / Cap. 26

-----

Il secondo genere delle proportioni di maggiore inequalità nasce in questo modo; che lassata<sup>1</sup> solamente nel predetto ordine naturale de i numeri da vn canto l'Vnità, & incominciando dal Binario, seguendo di mano in mano tal ordine; se noi faremo la comparatione del maggior numero al minore più vicino: da tal comparatione sarà prodotto il genere Superparticolare; del quale la prima specie è la Sesquialtera, comparando il Ternario al Binario; percioche comparato poi al Ternario il Quaternario, nasce la seconda specie detta Sesquiterza,

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<sup>1</sup> 1573, *lassata* reads *lasciata*.

How the Superparticular Genus Arises /

Chapter 26

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The second genus of proportions of greater inequality arises in this way: excluding only 1 in the aforementioned natural order of numbers, and beginning with 2, following such order in sequence, if we compare the greater number with the closest smaller number, from such comparison the superparticular genus will be produced, of which the first species is the sesquialter [proportion], comparing 3 with 2; whence, by comparing 3 with 4, the second species [of superparticular proportion], named the sesquitertia, arises;

& così le altre per ordine; ciascuna delle quali (come hò detto)<sup>2</sup> è denominata dal suo proprio denominatore, ouer parte aliquota. Onde si vede, che se in alcuna proportione, la parte per la quale il maggior numero supera il minore, è la metà di esso minore, quella si chiama Sesquialtera; & se è la terza parte, si chiama Sesquiterza; et breuemente tutte l'altre specie, quantunque fussero infinite, sono denominate dalle sue parti;<sup>3</sup> come nel sotto posto<sup>4</sup> essempro si può vedere.

and in this way the others [are produced] in order, each of which (as I have said) is named by its own denominator, or aliquot part. Thus we see that if in any proportion the part that differentiates the greater number from the smaller is half the smaller number, that part is called sesquialter, and if it is one-third [of the smaller number, it] is called sesquitertia. And briefly, all the other species [of superparticular proportions], however many they may be, are defined by their parts, as we can see in the example shown below.

---

<sup>2</sup> 1573, (*come hò detto*) omitted.

<sup>3</sup> 1573, *sue parti* reads *parti loro*.

<sup>4</sup> 1573, *sotto posto* omitted.

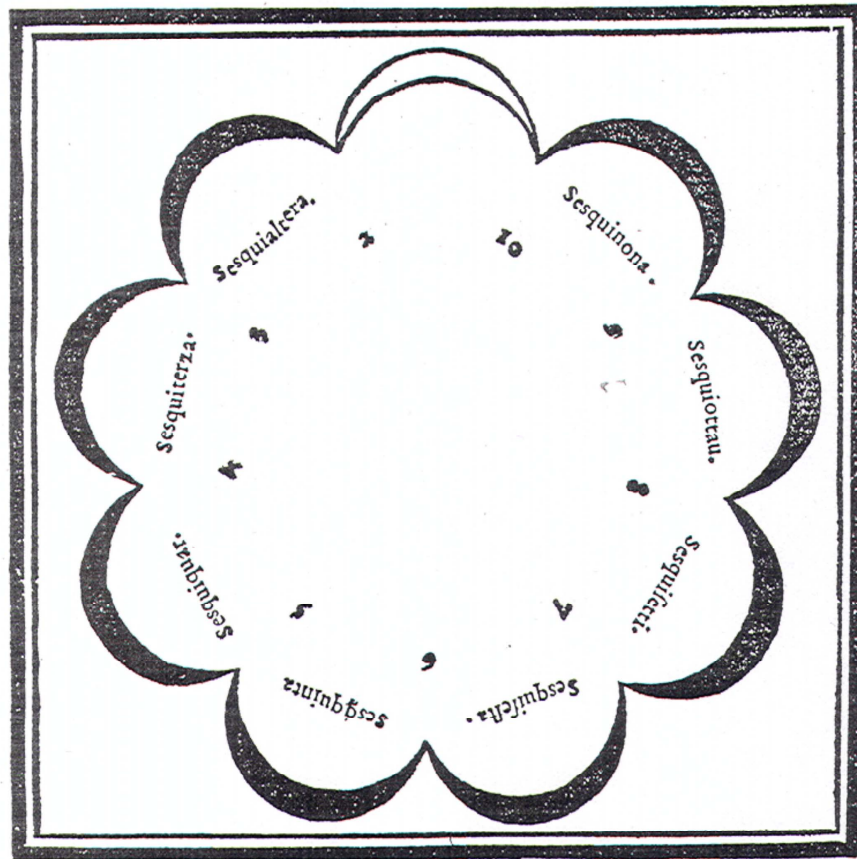


Figure 26.1. Superparticular Proportions.

Della produzione del genere

Superpartiente. / Cap. 27

---

Le specie del terzo genere detto Superpartiente sono infinite: imperoche alcune sono dette Superbipartienti, alcune Supertripartienti, & alcune Superquadripartienti; procedendo cosi in infinito, secondo l'ordine naturale de i numeri. Onde la Superbipartiente si ritroua tra due numeri differenti tra loro per il Binario, che siano di esso maggiori; & esso non possa esser loro misura commune: & vogliono essere tai numeri Contra se primi, la cui natura & propriet  e tale, che sono termini radicali di qual si voglia proportione, che contengono.

On the Production of the Superpartient

Genus / Chapter 27

---

The species of the third genus, called superpartient, are infinite, because some are called superbipartient, some supertripartient, and some superquadripartient, proceeding thus ad infinitum, according to the natural order of numbers. Thus, the superbipartient is found between two numbers that differ from each other by 2, which are [each] greater than [2], and where [2] cannot be their common measure. These numbers must be prime with respect to each other; their nature and property are [to be] the lowest terms of any given proportion to which they belong.

Lassando<sup>1</sup> adunque il Binario da parte,  
 come quello che poco fa al proposito,  
 pigliaremo il Ternario, & il Quinario, che  
 sono nell'ordine naturale de i numeri i  
 primi, che osseruoano cotal legge: percioche  
 se noi compararemo il maggiore al minore,  
 haueremo la proportione detta  
 Superbipartienteterza: conciosia che'l 5  
 contenga [37] il 3. vna volta, & di più vna  
 sua parte non aliquota: cioè due terze parti.  
 Alla differenza della quale, tra'l 7. & il 5. è  
 generata la proportione  
 Superbipartientequinta; & tra'l 9. & il 7. la  
 Superbipartientesettima; & cosi l'altre  
 specie di mano in mano.

Thus, leaving aside 2, which has little to  
 do with our purpose, we will take 3 and  
 5, which in the natural order of prime  
 numbers are the first that observe such  
 law, because if we compare the greater  
 with the smaller, we have the proportion  
 called the super-bi-partient-tertia, because 5 contains 3 once, plus one of  
 its non-aliquot parts, that is,  $2/3$ . From  
 the difference between 7 and 5 the  
 super-bi-partient-quintal proportion is  
 generated, and between 9 and 7, the  
 super-bi-partient-settimal [proportion],  
 and thus the other species in sequence.

---

<sup>1</sup> 1573, *Lassando* reads *Lasciando*.

Ma tra'l 7. & il 4. nasce la Supertripartientequarta, la quale è la prima specie tra le Supertripartienti: onde è necessario, che si come nelle prime si è osseruato la differenza del Binario, che così in queste seconde si osserui quella del Ternario; & in quelle che sono dette Superquadripartienti, quella del Quaternario: per la qual cosa osseruando tal regola nell'altre per ordine, si potrebbe andare in infinito; come qui di sotto si vede.<sup>2</sup>

But between 7 and 4 the super-tripartient-quartal [proportion] arises, which is the first species of the supertripartient [proportions]. Thus it is necessary, just as in the first [species of proportions where] we noticed a difference of 2 [between terms], in the second [species of proportions] [a difference] of 3 is observed, and in those called superquadripartient, [a difference] of 4, for which reason, observing such a rule for the others in order, one can continue ad infinitum, as we may see below.

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<sup>2</sup> 1573, *nell'esempio* added.

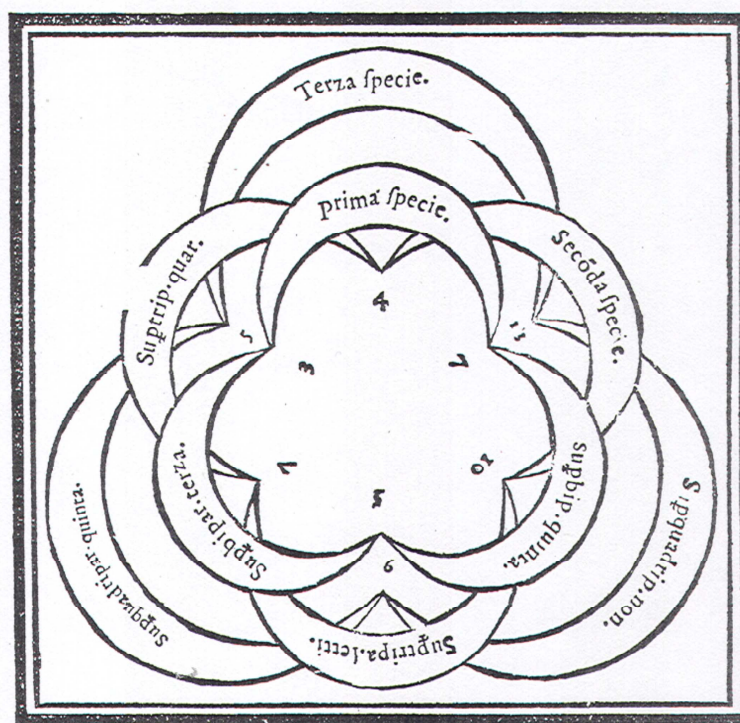


Figure 27.1. Superpartient Proportions.

Del genere Moltiplice superparticolare. /

Cap. 28.

-----

Il quarto genere detto Moltiplice superparticolare nasce aggiungendo'l minor termine di qual si voglia proportione del genere Superparticolare al maggiore, aggiungendo sempre il medesimo minore al numero che viene per tale aggiuntione.

Onde se noi aggiungeremo il Binario minor termine della Sesquialtera, al maggiore, che è il Ternario, ne verrà il Quinario; al quale medesimamente aggiunto esso Binario nascerà il Settenario, & così gli altri in infinito: di modo che osseruando l'istessa regola nell'altre, si potranno hauere infinite specie; come nella sotto posta<sup>1</sup> figura si può comprendere.

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<sup>1</sup> 1573, *sotto posta* omitted.

On the Multiple Superparticular Genus /

Chapter 28

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The fourth genus, called multiple superparticular, arises by adding the smaller term of any given proportion of the superparticular genus to the larger [term], always adding the same smaller [term] to the number that results from this addition. Thus, if we add 2, the smaller term of the sesquialter [proportion], to its larger [term], which is 3, 5 will result. Similarly, if we add 2 [to 5], 7 results, and in the same way, the others ad inifinitum, so that by observing the same rule with other [proportions], we will be able to have infinite species, as can be understood from the figure below.

[38]

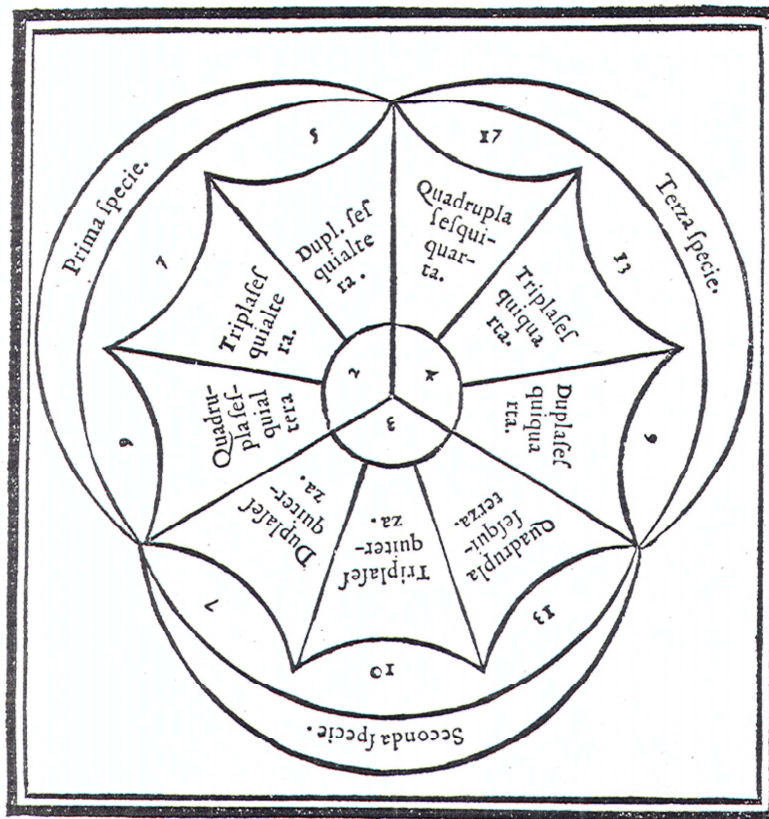


Figure 28.1. Multiple Superparticular Proportions.

Della produzione del Quinto & vltimo  
genere, detto Moltiplice superpartiente. /  
Cap. 29

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Ma se noi osseruaremo il modo, che nella  
produzione del Moltiplicesuperparticolare  
hauemo<sup>1</sup> osseruato; cioè di aggiungere il  
minor termine delle proportioni del genere  
Superpartiente, al termine maggiore; & al  
prodotto aggiungendo sempre esso minor  
termine, continouando in infinito (se far si  
potesse) sarà per tale aggiuntione creato il  
Quinto, & vltimo genere, detto  
Moltiplicesuperpartiente; del quale (per  
non esser cosa molto difficile) non mi  
estenderò a ragionarne più oltra; bastando  
solamente porre gli essempij; accioche  
siano guida, & lume alla intelligenza di tal  
regola; & saranno li sotto posti.

---

<sup>1</sup> 1573, *hauemo* reads *habbiamo*.

On the Production of the Fifth and Last  
Genus, Called Multiple Superpartient /  
Chapter 29

---

But if we follow the method that we  
adopted in the production of the multiple  
superparticular [genus], that is, the  
addition of the smaller term of  
proportions of the superpartient genus to  
the larger term, and always adding this  
smaller term to the result, continuing ad  
infinitum (if this were possible) by such  
addition, the fifth and last genus, called  
the multiple superpartient, will result. I  
will not discuss this further (because it is  
not a very difficult thing), sufficing  
solely to show examples, so that they  
may guide and shed light upon the  
understanding of such a rule; and these  
will be the following.

Et si come ne i modi mostrati si compone la Superbipartienteterza, la Supertripartientequarta, & la Superquadripartientequinta; così ancora si compongono l'altre specie; le quali (come hò detto) sono infinite. Et quello che si è detto de i generi, & delle specie di Maggiore inequalità; si, dice anco di quelle di Minore, le cui specie si ritroueranno collocate tra gli suoi termini radicali, come sono le specie mostrate di sopra. Onde è da notare che quei numeri si dicono Termini radicali, o Radici di alcuna proportione, de i quali è impossibile di ritrouare in quella istessa proportione numeri minori;

Just as the super-bi-partient-tertrial, the super-tri-partient-quartal, and the super-quadri-partient-quintal [species] are composed in the ways demonstrated above, so are all the other spesces [within the multiple superpartient genus], which (as I said) are infinite, similarly composed. And what we said about the genera and species of greater inequality also applies to [the genera of] lesser [inequality], whose species will be found among their lowest terms,<sup>A</sup> as are the species shown above. Thus we should remember that those numbers are called lowest terms, or roots of each proportion, when it is impossible to find in that same proportion any smaller numbers [to which the proportion can be reduced];

---

<sup>A</sup> literally, “radical terms.” In this context, “lowest terms” makes sense, as in reducing the ratio 4:2 to 2:1.

& tali numeri sono Contraseprimi, come di sopra si è mostrato, & come nel lib. 7. delli suoi Elementi, o Principij, che dire li vogliamo Euclide, & anche Boetio nel cap. 8. del secondo libro della Musica ne manifestano. Et li Musici nella prolatione delle figure cantabili segnano i Numeri delle proportioni di Maggiore inequalità in tal modo, che il maggior termine della proportione, che vogliono mostrare, pongono sopra'l minore; si come volendo mostrar la prolation della Dupla, la segnano in questo modo  $2/1$  & quella della Sesquialtera così  $3/2$ : Ma in quelli di Minore inequalità segnano tali numeri<sup>2</sup> al contrario; cioè il minor termine<sup>3</sup> della proportione sopra'l maggiore;

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<sup>2</sup> 1573, *tali numeri* omitted.

<sup>3</sup> 1573, *cioè il minor termine* reads *cioè pongono il minor termine* (placing the smaller term).

and these numbers are mutually prime, as was shown above. This was manifested by Euclid in Book 7 of his *Elements*, or *Principles*, and also shown by Boethius in Book 2, Chapter 8 of *On Music*. And in the construction of melodic figures musicians denote the numbers of the proportions of greater inequality in such a way that places the larger term of the proportion that they wish to show above the smaller [term], just as, wishing to show the construction of the duple proportion, they denote it in this way –  $2/1$  – and that of the sesquialter thus –  $3/2$ . But in those [proportions] of lesser inequality, they denote such numbers in reverse [order], that is, [with] the smaller term of the proportion above the greater,

come si vede nella prolazione della Subdupla, & della Subsesquialtera, le quali segnano in tal modo  $1/2$  &  $2/3$  così ancora nell'altre in ciascun genere. Et quantunque io habbia posto gli essemplij solamente ne<sup>4</sup> i mostrati generi, ne i termini radicali delle proportioni; non si hà però da credere, che tali proportioni non si ritrouino anco ne gli altri numeri: si come nelli Composti,<sup>5</sup> li quali non sono termini radicali delle proportioni: imperoche tanto si ritroua [39] la Dupla esser tra 8. & 4. & tra 12. & 6. quanto tra 2. & 1. il che se debbe intendere etiando delle altre, ne gli altri generi; si come in quelli della Sesquialtera, che tanto si ritroua tra 6. & 4. quanto tra 3. & 2. come più oltra vederemo.

as can be seen in the construction of the subduple and subsesquialter proportions, which they mark in this way –  $1/2$  and  $2/3$  – and thus for the other [proportions] of each genus. And although I have posed examples of the demonstrated genera only in the lowest terms of the proportions, however, one must not believe that such proportions are not also found [between] other numbers, just as in the case of numbers with common factors, which are not the lowest terms [of] proportions, because the duple [proportion] is to be found between 8 and 4, and between 12 and 6, as well as between 2 and 1, which further [applies to] other [proportions] of the other genera, as for example in those of the sesquialter, which is found between 6 and 4 as well as between 3 and 2, as we shall see further on.

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<sup>4</sup> 1573, *ne* reads *de*.

<sup>5</sup> 1573, *nelli Composti* reads *nelle Traloro composti* (with factors common to them).

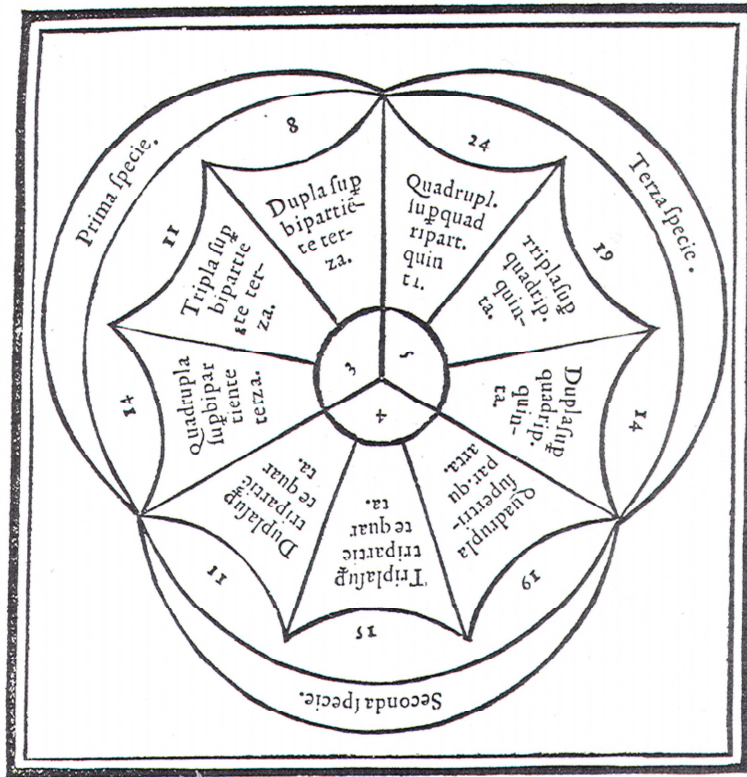


Figure 29.1. Multiple Superpartient Proportions.

Della natura & proprietà de i nominati  
Generi. / Cap. 30.

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Per quello che si è mostrato di sopra  
adunque si può comprendere, che i generi,  
et le specie delle proportioni di minore  
inequalità nascono tra i Numeri in quel  
modo istesso, che nascono quelle di  
maggiore: ne altra differenza si troua  
dall'uno all'altro, se non che in quelle si fa  
la comparatione del termine minore al  
maggiore, in quanto l'vno è contenuto  
dall'altro; & in queste si fa la comparatione  
del termine maggiore al minore, in quanto  
l'vno contiene l'altro. Et cosi tanto quella  
di maggiore, quanto quella di minore  
inequalità vengono ad esser produtte in vn  
tempo, & essere nell'istesso soggetto.

On the Nature and Properties of the  
Aforementioned Genera / Chapter 30

---

Because of what was discussed above,  
one can understand that the genera and  
species of proportions of lesser  
inequality arise between numbers in the  
same fashion as [proportions] of greater  
inequality, nor can any other difference  
between them be found except that in  
the former one compares the smaller  
term to the larger, because one is  
contained in the other, and in the latter  
one compares the larger term to the  
smaller because the one contains the  
other. And thus both the [proportion of]  
greater inequality as well as that of  
lesser come to be produced at the same  
time, and to partake of the same subject.

Ma secondo'l mio giudicio le Proportioni di minore inequalità si possono considerare altramente et anco chiamare Rationali (diro cosi) et Priuative; et quelle di maggiore Reali & positie.<sup>1</sup> Et<sup>2</sup> per maggiore intelligenza di questo, et anco per conoscere la natura di questi generi si dè sapere, che essendo la Equalità come elemento delle proportioni; ella viene ad esser principio della Inequalità

But in my judgment, proportions of lesser inequality can be considered in another way and can also be called fractional (as I will do) and negative, and those of greater [inequality can be called] real and positive.<sup>A</sup> And for greater understanding of this, and also to gain knowledge of the nature of these genera, one must know that, equality being an element of such proportions, it comes to be the beginning of inequality

---

<sup>1</sup> 1573, *et anco chiamare Rationali (diro cosi) et Priuative; et quelle di maggiore Reali & positie* omitted.

<sup>2</sup> 1573, *Et* reads *La onde*.

---

<sup>A</sup> Zarlino uses *Rationali* to mean proper fractions, whose values are less than 1 (*Equalità*), as an antonym for *Reali*, in this context improper fractions, whose values are greater than 1. He does not intend *Reali* — literally, “real” — as an antonym for “imaginary.” To avoid any possible interpretation of a literal translation of *rationali* as its cognate, “rational; pertaining to ratios,” *rationali* has been translated as “fractional,” in the limited sense of “pertaining to proper fractions.” The cognate of *reali*, “real,” has been retained and here means “pertaining to improper fractions.”

In 1573, Zarlino omits the sentence dealing with *proportionali rationali/proportionali reali*. A description of proportions of greater inequality in 1573 as *Reali* occurs later in this chapter (see page 381).

(come vuol Boetio<sup>3</sup> et Giordano<sup>4</sup>) et a tenere il luogo mezano tra il genere di maggiore inequalità, et quello di minore. Et essendo così,<sup>5</sup> è di sua natura semplice; conciosia che (come si può vedere)<sup>6</sup> moltiplicata, o diuisa; quella proportionione, che si ritroua nel tutto, si ritroua anche in ciascuna delle sue parti; & è sempre permanente, & ritiene il suo essere in qualunque genere di inequalità.

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<sup>3</sup> 1573, Zarlino's marginal note: *Arith. lib. 2. ca. 1 & Musice libro 2. ca. 7* (Boethius, *On Arithmetic*, Book 2, Chapter 1; and *On Music*, Book 2, Chapter 7).

<sup>4</sup> 1573, Zarlino's marginal note: *Element. lib. 9* (Giordano, *Elements*, Book 9).

<sup>5</sup> 1573, *Et essendo così* reads *il perche*.

<sup>6</sup> 1573, *essendo* inserted.

(as Boethius and Giordano<sup>B</sup> suggest) and to hold the middle position between the genera of greater and lesser inequality. And being thus, [equality] is simple by nature whether multiplied or divided (as one can see), because that proportion found in the whole is also found in each of its parts, and is always the same, and retains its essence in any genus of inequality.

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<sup>B</sup> Giordano of Nemi (also known as Jordanus Nemorarius or Jordanus de Nemore (1225-1260), along with Leonardo Fibonacci, was the dominant mathematician of the first half of the thirteenth century. He is best known for his works on mechanics (statics) but he also wrote influential works on arithmetic, geometry, and algebra.

Questo si vede manifestamente esser vero; percioche leuando vna Dupla da vn'altra Dupla<sup>7</sup> nel genere di maggiore inequalità, al modo che più oltra vederemo, & simigliantemente in quello di minore vna Subdupla da vn'altra, si viene immediatamente alla Equalità: conciosia che (secondo'l parer di Boetio<sup>8</sup>) ogni Inequalità si risolve nella Equalità, si come in elemento del suo propio genere; il che non auiene delle proportioni di inequalità, che sono mutabili; le quali<sup>9</sup> moltiplicate, o diuise; le proportioni del tutto sono differenti da quelle delle lor parti;

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<sup>7</sup> 1573, *Dupla* omitted.

<sup>8</sup> 1573, Zarlino's marginal note: *Arith. lib. 2. cap. 1* (Boethius, *On Arithmetic*, Book 2, Chapter 1).

<sup>9</sup> 1573, *essendo* inserted.

This is manifestly seen to be true, because dividing<sup>C</sup> a duple<sup>D</sup> by another duple in the genus of greater inequality in the way that we will later see and similarly in [the genus] of lesser [inequality, dividing] a subduple by another [subduple], we immediately reach equality, because (as Boethius believes) each inequality returns to equality, as long as it belongs to the same genus. This does not occur in the proportions of inequality that are [of] different [genera]. Multiplied or divided, the proportions of the whole are different from those of its parts,

---

<sup>C</sup> Although *levando* may be translated as “subtracting,” the act of subtracting any number from itself results in zero, e.g.  $2:1 - 2:1 = 0$ ; this does not make sense in this passage. Zarlino describes first the act of dividing the duple by itself; the result of such division is equality, i.e.  $2:1 \div 2:1 = 2:1 \times 1:2 = 1$ . Similarly, dividing the subduple by itself yields equality, i.e.  $1:2 \div 1:2 = 1:2 \times 2:1 = 1$ . I have therefore translated *levando* as “dividing.”

<sup>D</sup> From this point on, to avoid excessive use of brackets, “duple,” “subduple,” etc. mean “duple proportion,” “subduple proportion,” etc.

& le maggiori proportioni non hanno luogo tra i termini delle minori; come si può vedere dalla Dupla, che per esser maggiore della Sesquialtera, non hà luogo tra [40] li suoi termini; come è manifesto: conciosia che volendo cauar la Dupla contenuta tra questi termini 2. & 1. dalla Sesquialtera contenuta tra questi 3. & 2. nel modo ch'io intendo di mostrare, nasce la Subsesquiterza tra questi due 3. & 4. contenuta nel secondo genere di minore inequalità, detto Subsuperparticolare; la quale per esser di genere diuerso dalle due prime proposte, ne<sup>10</sup> dà segno manifesto, che la Sesquialtera è priua di tanta quantità, quanto è quella, per la quale la Sesquialtera è superata dalla Dupla; cioè è priua di vna Sesquiterza.

---

<sup>10</sup> 1573, *ne* omitted.

and the proportions [of] greater [inequality] do not occur between the terms of lesser [inequality]. This can be seen in the duple; [the proportion by] which it is greater than the sesquialter does not occur between the terms [of the result], as is manifest. By dividing<sup>E</sup> the sesquialter, contained between the terms 3 and 2, by the duple, contained between 2 and 1, in the way I intend to show, we see [that] the subsesquitercia, between 3 and 4, arises, included in the second genus of lesser inequality, called sub-superparticular, which is clearly of a different genus from the first two [that were] proposed, given that the sesquialter is lacking in the quantity by which the sesquialter is exceeded by the duple, that is, lacking by a sesquitercia.

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<sup>E</sup> As explained in note C, page 377, regarding the use of *levando*, here Zarlino intends *cauar*, “to remove,” as “to divide,” since he describes the process of dividing 3:2 by 2:1, i.e.  $3:2 \div 2:1 = 3:2 \times 1:2 = 3:4$ .

Et questo è verissimo: conciosia che aggiungendo la Sesquialtera alla Sesquiterza, immediatamente nasce la Dupla: Onde la Subsesquiterza viene ad esser solamente la ragione di quella proportione, che manca tra gli estremi della Sesquialtera, per ascendere alla somma & quantità della Dupla; il qual difetto si manifesta per la particella Sub, che se le aggiunge, la quale nella compositione dinota alle volte diminutione: la onde dall'effetto la potemo<sup>11</sup> chiamare Priuatiua. Dico Priuatiua, non perche ella habbia possanza di priuare alcuna proportione della sua quantità; ma perche dichiara la proportione à<sup>12</sup> cui si aggiunge esser priua nelli suoi termini & diminuita di tanta quantità, quanta è la sua denominatione.

And this is indeed true, because by multiplying<sup>F</sup> the sesquialter by the sesquitertia, the dupla immediately arises. Thus, the subsesquitertia comes to be the sole value of that proportion which is missing between the extremes of the sesquialter, in order to increase to the sum and quantity of the dupla. This lack is shown by the prefix *Sub-*, which when added [to the name of a proportion] always denotes diminishment; therefore, we can call it “negative.” I call it “negative,” not because it has the power of depriving any proportion of its quantity, but because it declares the proportion to which it is added to be lacking in its terms and decreased by a quantity that is the same size as what its name indicates.

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<sup>11</sup> 1573, *potemo* reads *potiamo*.

<sup>12</sup> 1573, *à* reads *di*.

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<sup>F</sup> In this context, *aggiungendo* must be translated as “multiplying” to be faithful to Zarlino’s intention. The math is as follows:  $3/2 \times 4/3 = 2/1$ .

Et questo non è detto fuor di proposito:  
 percioche si come è impossibile, che da vn  
 numero minore in fatto<sup>13</sup> se ne possa cauare  
 alcun maggiore; cosi ancora è impossibile  
 che da vna proportione, che sia minore,<sup>14</sup> se  
 ne possa in fatto leuare vna maggiore;  
 essendo dibisogno, che quella quantità  
 dalla quale se ne caua vn'altra, sia o  
 maggiore, ouero equale a quella, che  
 intendemo<sup>15</sup> leuare. Però operando nel  
 modo ch'io son per mostrare, da vna Dupla  
 sempre potremo cauare vna Sesquialtera, &  
 ne soprauanzerà vna Sesquiterza; et da vna  
 Sesquialtera potremo leuarne vn'altra, & ne  
 verrà l'Equalita;

And this is not said out of context,  
 because it is impossible that a larger  
 number can really be extracted from a  
 smaller [number]. Likewise, it is also  
 impossible that a proportion of greater  
 [inequality] can be removed from a  
 proportion of lesser [inequality], since it  
 is necessary that the quantity from which  
 one derives another quantity be greater  
 than or equal to that which we intend to  
 remove. However, calculating in the way  
 that I am about to demonstrate, we can  
 always remove a sesquialter from a duple  
 and a sesquitercia will be left and we can  
 remove a sesquialter by another and  
 equality will result;

---

<sup>13</sup> 1573, *che da vn numero minore in fatto* reads *in fatto, che da vn numero minore*.

<sup>14</sup> 1573, *vna proportione, che sia minore* reads *un numero minor*.

<sup>15</sup> 1573, *intendemo* reads *intendiamo*.

ma non potremo giamai cauare vna Dupla da una Sesquialtera, che non manchi alcuna quantità, la quale verrà sempre nel prodotto del Sottrarre l'vna dall'altra, come vederemo; et ne dimostrerà cotal mancamento: essendo la Dupla maggior di essa per vna Sesquiterza; et la Sesquialtera diminuita di tal quantità; come si è potuto vedere. Onde alcuno non si debbe marauigliare,<sup>16</sup> se io assimiglierò le proportioni di maggiore inequalità all'Habito; hauendole chiamate Positiue;<sup>17</sup>

but we will never be able to remove a duple from a sesquialter without finding some quantity missing, because the result that arises from the division of the dupla by the sesquialter always has something left over, as we shall see; and we shall demonstrate this shortcoming, since the duple is greater than [the sesquialter] by a sesquitertia, and the sesquialter is less [than the duple] by the same quantity, as we can see. Thus, no one should be surprised when I compare proportions of greater inequality to possession,<sup>G</sup> having called them positive,

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<sup>16</sup> 1573, *Onde alcuno non si debbe marauigliare* reads *La onde non si marauilierà alcuno*.

<sup>17</sup> 1573, & *Reali* inserted.

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<sup>G</sup> In his German translation of *Le institutioni*, Michael Fend renders *Habito* as its Latin cognate *Habitus*. St Augustine derives *habitus* from the verb *habere*, “to have.” See St. Augustine, *Eighty-three Different Questions, Writings of Saint Augustine*, Fathers of the Church, vol. 70, tr. David L. Mosher (Washington, D.C.: Catholic University of America Press, 1982), 186..

conciosia che danno la ragione delle  
 proportioni; cioè della forma, che dà l'esser  
 ad vn soggetto reale determinato; et quelle  
 di minore alla Priuatione, nominandole  
 Rationali et Priuative: percioche negano la  
 proportione, che rappresentano, nel  
 nominato soggetto; & sono priue di vno de  
 i loro termini reali: perche non trapassano  
 la Equalità: ma sono di lei minore. La  
 onde<sup>18</sup> essendo il genere di maggiore  
 inequalità diuerso & opposito al genere di  
 minore, pigliato a questo modo, è  
 necessario, che l'vno & l'altro si  
 considerino sotto diuerse ragioni; cioè il  
 primo sotto la ragion dell'Habito, o della  
 Positione; & il secondo sotto la ragione  
 della Priuatione; come hò detto.<sup>19</sup>

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<sup>18</sup> 1573, *La onde* reads *Il perche*.

<sup>19</sup> 1573, *come hò detto* omitted.

because they give the ratio of the  
 proportions in the form that lends  
 substance to a real,<sup>H</sup> determined subject,  
 and those of lesser [inequality] to  
 deprivation, calling them fractional and  
 negative, since they deny the proportion  
 which represents the original subject and  
 are lacking one of their real terms,  
 because they do not exceed equality, but  
 are smaller.<sup>I</sup> Thus, since the genus of  
 greater inequality is different and  
 opposite from the genus of lesser  
 [inequality], it is necessary to consider  
 them under different rules, that is, the  
 former under the rules of possession, or  
 positivity, and the latter under the rules  
 of deprivation, as I have said.

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<sup>H</sup> *Reale* here refers to an improper fraction. See note A.

<sup>I</sup> i.e., they are proper fractions.

Et però<sup>20</sup> si debbeno ancora considerare come due oppositi corrispondenti l'vno all'altro nel terzo modo di Oppositione: percioche i generi, & le specie sottoposte di vno, corrispondeno (considerate sotto la ragione dell'Habito) alli generi & alle specie sottoposte dell'altro, considerate sotto la ragione della Priuatione; quasi all'istesso modo, che corrisponde l'Ignoranza alla Scienza, le Tenebre alla Luce, et simili.<sup>21</sup> Si debbono considerare anche come due oppositi corrispondenti al loro mezo, cioè alla Equalità, la quale è quasi come il soggetto dell'habito, & della priuatione: conciosia che intorno a lei auengano tali cose.

However, one must also consider how two opposites relate to each other in a third kind of opposition, because the genera and species within one [kind of opposition] correspond (considered under the rule of possession) to the genera and species within another, considered under the rule of deprivation, almost in the same way that ignorance [corresponds to] knowledge, darkness to light, and so on. They must also be considered as two opposites relating to their mean—that is, equality—which is almost like the subject of possession and deprivation, because such things happen around [equality].

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<sup>20</sup> 1573, *Et però* omitted.

<sup>21</sup> 1573, *simili* reads *simiglianti*.

Ne voglio hauer detto questo senza qualche fondamento: percioche si come il soggetto dell'habito non naturale & della priuatione imperfetta, è atto a riceuere hor l'vno, hor l'altro, per successione; & ritien<sup>22</sup> quello, che se gli appresenta, in fino a tanto che è privo di esso; si come vedemo<sup>23</sup> dell'Aria, che è atta a riceuere hora la luce, & hora le tenebre; & tanto è lucida, quanto la luce le stà vicina, & non si separa da essa; cosi la Equalità è atta a riceuere hora la proportione di maggiore, hora quella di minore inequalità.

---

<sup>22</sup> 1573, *ritien* reads *riceuer*.

<sup>23</sup> 1573, *vedemo* reads *vediamo*.

I do not wish to have said this without any foundation, because just as the subject of an unnatural possession and imperfect deprivation is predisposed to receive now one [thing], now another, in order, and retains what approaches it, to the extent of which it has been deprived, as we see with air, which is predisposed to receive now light, now darkness, and is clearer when light is closer and not separated from it, equality is predisposed to receive now the proportion of greater, now the proportion of lesser inequality.

Et si come'l soggetto mantiene nella sua qualità la cosa, che riceue; & per questo non si varia nella sua sustanza, cosi la Equalità non muta quella proportione di qual si voglia genere, che se le accompagna; ne meno ella si varia quando se le aggiunge, o se le leua alcuna proportione di qual si voglia genere: essendo li suoi termini (come hò mostrato) immutabili & inuariabili. Et perche si come nel soggetto è sempre la priuatione, quando è rimosso l'habito; & l'habito, ouer l'attitudine, quando è rimossa la priuatione: simigliantemente rimossa dalla Equalità vna proportione qual si uoglia di maggiore inequalità, ne viene immediatamente vna quasi simile contraria di quelle di minore;

And just as the subject retains the quality of the thing it receives, and does not change its substance, so equality does not change the proportion of any given genus that accompanies it, nor does it vary when one adds or subtracts any proportion of any genus, its terms (as I have demonstrated) being immutable and invariable. And because, just as deprivation of the subject always occurs when possession is removed, and possession or attitude [returns] when deprivation is removed, similarly, when any given proportion of greater inequality is removed from equality, another, opposite [proportion] of lesser [inequality] immediately results.

& vi si introduce quella di maggiore  
 inequalità, quando se le leua quella di  
 minore: si come leuandole<sup>24</sup> vna Dupla ne  
 viene vna Subdupla; & leuandole la  
 Subdupla nasce la Dupla. Ma perche ogni  
 estremo hà il suo mezo, & il mezo è quello,  
 che equalmente è distante dalli suoi  
 estremi; essendo i due generi di inequalità  
 due estremi equidistanti dalla Equalità;  
 però hò detto, che la Equalità tiene il luogo  
 di mezo tra l'uno, & l'altro delli nominati  
 due generi di inequalità, nel modo che nella  
 sottoposta figura si può chiaramente  
 vedere.

---

<sup>24</sup> 1573, *come leuandole* reads *come è, che levandole*.

[A proportion] of greater inequality is  
 introduced when [a proportion] of lesser  
 [inequality] is taken [from equality], as  
 when a duple is removed [from equality]  
 a subduple results and by removing the  
 subduple [from equality] the duple  
 arises.<sup>J</sup> But because each extreme has  
 its mean, and the mean is that which is  
 equally distant from its extremes, since  
 in the two genera of inequality the two  
 extremes are equidistant from equality, I  
 have said that equality holds the middle  
 place between each of the two named  
 genera of inequality, as can clearly be  
 seen in the figure below.

---

<sup>J</sup> The math is as follows:  $1:1 \div 2:1 = 1:2$ , and  $1:1 \div 1:2 = 2:1$ .

[41]

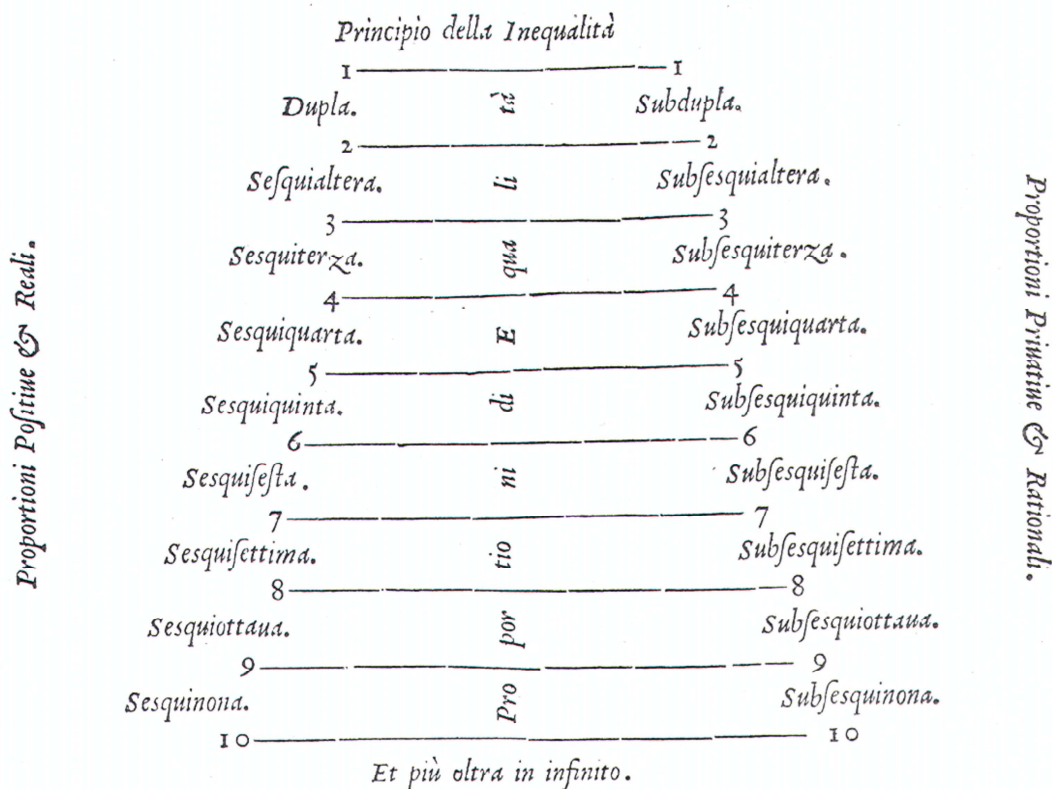


Figure 30.1. “Equality holds the middle place between...the two genera of inequality.”

Et benchè tali essempij siano posti solamente ne i termini di alcune specie delli due primi generi di maggiore, & di minore inequalità; tuttavia vi si debbeno anche intendere quelli delle altre specie, li quali hò lassati<sup>25</sup> per breuità;

And although such examples are presented solely in terms of some species of the first two genera of greater and lesser inequality, nevertheless we must also include those of the other species, which I have omitted for the sake of brevity,

<sup>25</sup> 1573, *lassati* reads *lasciato*.

pensandomi che solamente questi siano bastanti a mostrare quanto abbiamo proposto: però ciascuno il quale fusse desideroso di veder l'altre specie di tai generi, per se stesso le potrà inuestigare, hauendo riguardo a quello, che si è mostrato di sopra. Hora per quello che si è detto, potemo<sup>26</sup> comprendere, per qual ragione possiamo chiamare le proportioni di maggiore inequalità<sup>27</sup> Reali, & Positiue; & quelle di minore Rationali & Priuative; &<sup>28</sup> dire anco, che siano due estremi, tra i quali si ritroui collocata nel mezo la Equalità; & similmente<sup>29</sup> conoscer la natura & propietà di ciascuno di tai generi; & qual sia il loro vero vfficio.

thinking that these alone suffice to show what we proposed, because anyone who desires to see the other species of genera will be able to investigate them by himself, bearing in mind what was shown above. Now because of what has been said, we can understand why we may call the proportions of greater inequality real and positive, and those of lesser inequality fractional and negative, and to say also that they are two extremes between which equality lies at the center, and we can similarly know the nature and properties of each of these genera, and what is their true office.

---

<sup>26</sup> 1573, *potemo* reads *potiamo*.

<sup>27</sup> 1573, *possiamo chiamare le proportioni di maggiore inequalità* reads *le proportioni di maggiore inequalità si possino chiamare*.

<sup>28</sup> 1573, *si possa* inserted.

<sup>29</sup> 1573, *potiamo* inserted.

Quando adunque vorremo nominare alcuna  
 proportione del genere di minore  
 inequalità, le potremo accompagnare  
 questa particella *Sub*; quelle poi che  
 saranno dell'altro genere, porremo senza  
 cotale aggiunto. Et accioche le proportioni  
 di vno delli due oppositi generi si  
 conoschino da quelle dell'altro,  
 osseruaremo quest'ordine, quando sarà  
 dibisogno, che noi porremo i termini  
 maggiori di quelle proportioni, che sono  
 del genere di maggiore inequalità, dal lato  
 sinistro, & li minori dal destro; in cotal  
 modo 3. & 2. & i termini di quelle, che  
 sono del genere di minore, porremo al  
 contrario in cotal maniera 2. & 3.  
 imperoche quelli della Equalità si potranno  
 porre senza alcuna differenza di luogo;  
 essendo per lor natura inuariabili.

When, thus, we will wish to name any  
 proportion from the genus of lesser  
 inequality we will be able to add to it the  
 prefix *Sub-*. Such prefix will not be  
 added to those [proportions] which  
 belong to the other genus. And so that  
 the proportions of one of the two  
 opposite genera may be distinguished  
 from those of the other, we will observe  
 the following order when necessary: we  
 will place the larger terms of those  
 proportions that belong to the genus of  
 greater inequality on the left side, and  
 the smaller terms on the right, such as  
 3:2. We will [place] the terms [of  
 proportions] that belong to the genus of  
 lesser [inequality] in the opposite way,  
 such as 2:3, while we will be able to  
 place the terms of equality without any  
 difference in position, since they are  
 invariable by nature.

## Del Multiplicar delle proportioni. / Cap. 31.

On the Multiplication of Proportions<sup>A</sup> /

## Chapter 31

-----

Havendo a sufficienza mostrato come nascono le proportioni, &<sup>1</sup> le lor denominationi, daremo principio a ragionar delle loro operationi, le quali sono cinque, cioè<sup>2</sup> Multiplicare, Sommare, Sostrare, Partire, & Trouar le lor radici. Quanto alla prima douemo<sup>3</sup> sapere, che sono stati alcuni, li quali hebbero opinione, che il Multiplicare, & il Sommare fussero vna cosa istessa; & alcuni teneuano l'opposito; cioè che fussero due operationi separate; & il medesimo teneuano del Sostrare, & del Partire.

-----

Having sufficiently shown how proportions and their names arise, we will begin to discuss their [mathematical] operations, which are five: multiplication, addition, subtraction, division, and extraction of roots. Regarding the first [operation], we must know that there have been some who believed that multiplication and addition were the same thing; and some [who] held the opposite [view], that is, that [multiplication and addition] are two separate operations; and they held the same about subtraction and division.

---

<sup>1</sup> 1573, *come si trouino* (as may be found) inserted.

<sup>2</sup> 1573, *cioè* omitted.

<sup>3</sup> 1573, *douemo* reads *dobbiamo*.

---

<sup>A</sup> Zarlino's discussion of mathematical operations on proportions is preparatory to his discussion of operations on musical consonances. Adding consonances is equivalent to multiplying their proportions.

Ma lassando<sup>4</sup> io le dispute da vn canto, co  
l'esempio dimostrerò tali operationi non  
essere vna cosa istessa, ma operationi  
separate, cosa molto vtile & necessaria al  
presente negocio. Venendo adunque al  
proposito dico, che'l Moltiplicare è vna  
dispositione di più proportioni in vn  
continouato ordine, poste l'vna dopo l'altra  
in tal modo, che il minor termine dell'vna  
sia il maggior dell'altra, & cosi per il  
contrario.

---

<sup>4</sup> 1573, *lassando* reads *lasciando*.

But leaving the dispute aside, I will  
demonstrate through examples that such  
operations are not the same, but separate  
operations, a most useful and necessary  
thing to the matter at hand. Getting to  
the point, I say that multiplication [of  
proportions] is an arrangement of  
several proportions in a continuous  
order, placed one after the other in such  
a way that the smaller term of one is the  
larger [term] of the other, and likewise  
for the opposite.<sup>B</sup>

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<sup>B</sup> Zarlino's procedure of multiplying proportions in this and the following chapter retains the proportions generated in each step. His process results in a series in which pairs of successive terms reduce to the factors he uses in his example. See the bottom line of Figure 31.1. This is different from modern practice, whereby multiplying proportions yields a single proportion whose numerator is the product of the numerators of the ratios in the problem to be solved, and whose denominator is the product of the denominators; the resulting proportion may be reduced to lowest terms.

Ma il Sommare dico essere vna [42]  
 addunanza di più proportioni addunate  
 insieme sotto vna sola denominatione. Il  
 Multiplicar si può fare in due modi; il  
 primo è quando ad vna proportione se ne  
 moltiplica vn'altra, o più; incominciando  
 dalla parte sinistra, venendo verso la destra;  
 il qual modo nominaremo Soggiungere. Il  
 secondo poi è quando procederemo al  
 contrario; cioè dalla destra verso la sinistra,  
 il qual modo chiamaremo Preporre. Et  
 perche questi due modi sono necessarij, &  
 tornano bene; però mostreremo  
 l'operatione dell'vno, & dell'altro modo.<sup>5</sup>

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<sup>5</sup> 1573, *l'operatione dell'vno, & dell'altro modo*  
 reads *l'vno & l'altro*.

But I declare addition to be a collection  
 of several proportions grouped together  
 over<sup>C</sup> one single denominator.  
 Multiplication can be done in two ways.  
 The first occurs when a proportion is  
 multiplied by one or more [proportions],  
 beginning with the left-hand term and  
 moving towards the right; we will name  
 this method “suffixing.” The second,  
 then, is when we proceed in the opposite  
 manner, that is, from right to left, which  
 method we will name “prefixing.” And  
 because these two methods are  
 necessary and give good results, we will  
 demonstrate the operation of the first  
 and the second method.

---

<sup>C</sup> A translation of *sotto* as “under” would be  
 incorrect in this context, as the denominator of a  
 fraction is normally placed below a horizontal  
 line. Zarlino describes the location of a  
 fraction’s denominator as *sotto vna linea retta in*  
*piano* (under a straight horizontal line) in this  
 chapter, page 395.

Incominciando adunque dal primo dico, che se noi haessimo a moltiplicare insieme due, o più proportioni di vn medesimo genere, o di diuersi (il che non importa) disporremo prima le proportioni contenute ne i lor termini radicali, l'vna dopo l'altra per ordine, secondo che quelle intendiamo moltiplicare;

&<sup>6</sup> pigliando il maggior termine della seconda proportionione da moltiplicare, posta a banda sinistra, lo moltiplicaremo col maggiore, & col minor termine della prima; & questo poi moltiplicaremo col minor termine della seconda; & haueremo tre numeri, continenti due continoue proportioni.

---

<sup>6</sup> 1573, *dipoi* added.

Beginning, then, with the first [method] I say that if we have to multiply two or more proportions of the same or different genera together (whichever does not matter), we will first arrange the proportions contained in their lowest terms, one after the other, in the order in which we intend to multiply them.<sup>D</sup>

Taking the larger term of the second proportion to be multiplied, placed on the left side, we will multiply it by the larger and [then] by the smaller term of the first [proportion]. We will then multiply this [result] by the smaller term of the second [proportion], and we will have three numbers, comprising two continuous proportions.

---

<sup>D</sup> Zarlino's procedure is clarified in the addendum to this chapter, pages 401-405.

Hora moltiplicheremo questi, per il maggior termine della proportione, che si hà da moltiplicare; la quale è terza nel sopradetto ordine, incominciando dalla sinistra, & di mano in mano venendo verso la parte destra. Il che fatto, di nuouo pigliando il minor termine di tal proportione, lo moltiplicheremo col minor delli prodotti; & ne risulteranno quattro termini, o numeri, ne i quali se conteranno le moltiplicate proportioni. Et quando fusse bisogno di soggiungere a queste proportioni di nuouo alcun' altra proportione, moltiplicheremo sempre li prodotti numeri per il maggior termine della proportione, che vorremo soggiungere, & il minor delli prodotti per il suo minore; & da tal moltiplicatione haueremo sempre quello, che ricerchiamo.

Now we will multiply these by the larger term of the proportion that needs to be multiplied, which is the third of the above order, beginning from the left, and one by one moving toward the right-hand side. This done, again taking the smaller term of such proportion, we will multiply it by the smaller [term] of the products, and from this will result four terms or numbers, among which the multiplied proportions will be contained. And if it be necessary to multiply these proportions by any other new proportion, we will always multiply the numbers produced by the larger term of the proportion that we want to add, and the smaller of the products by its smaller [term], and by such multiplication we will always have what we are seeking.

Ma perche gli essempij maggiormente muoueno l'intelletto alla intelligenza di alcuna cosa, che non fanno le parole, & massimamente nelle operationi<sup>7</sup> de i numeri; però desiderando io di esser inteso, verrò all'esempio. Poniamo adunque che si habbiano da moltiplicare insieme quattro proportioni, contenute nel genere Superparticolare, & siano queste, vna Sesquialtera, vna Sesquiterza, vna Sesquiquarta, & vna Sesquiquinta: primamente le porremo l'vna dopo l'altra, secondo l'ordine, che si vorranno moltiplicare, di modo che siano contenute tra i lor termini radicali, in questo modo.  $3/2$ .  $4/3$ .  $5/4$ .  $6/5$ . & dipoi moltiplicheremo il maggior termine della Sesquiterza, che è 4. col 3. & 2. termini della Sesquialtera;

But because examples move the intellect to the comprehension of things more than words do, especially in the operations of numbers, as I wish to be understood, I will come to the example. Let us thus assume that we have to multiply four proportions together that belong to the superparticular genus: a sesquialter, a sesquitertia, a sesquiquarta and a sesquiquinta. First we will place one after the other according to the order in which we wish to multiply them, so that they are expressed in lowest terms, in this way:  $3/2$ ,  $4/3$ ,  $5/4$ ,  $6/5$ . Then we will multiply the larger term of the sesquitertia, which is 4, by 3 and 2, the terms of the sesquialter.

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<sup>7</sup> 1573, *nelle operationi* reads *nel maneggio* (in the handling).

& da tal multiplicatione haueremo 12. & 8. i quali medesimamente conteneranno la Sesquialtera: Percioche li termini di qualunque proportione multiplicati per qual si voglia numero, non fanno uariatione alcuna di quantitate; come per la proua, & per la 18. del lib. 7 de i principij di Euclide, & per quello che dice Boetio nel cap. 29. del lib. 2. della sua Musica, è manifesto. Et tali numeri porremo sotto vna linea retta in piano, la qual diuida questi dalle proposte proportioni.

From this multiplication we will have 12 and 8, which will similarly contain the sesquialter,<sup>E</sup> because the terms of any proportion multiplied by any given number do not produce any variation of quantity, as is proven in Euclid's *Elements*, Book 7, [Demonstration] 18, and according to what Boethius says in *On Music*, Book 2, Chapter 29.<sup>F</sup> And we will place these numbers under a straight horizontal line that separates these from the proposed proportions.

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<sup>E</sup> The math is as follows:  $4 \times 3 = 12$ ;  $4 \times 2 = 8$ .  $12/8$  expressed in lowest terms is  $3/2$ , the sesquialter.

<sup>F</sup> The value of  $3/2$  is the same as the value of  $12/8$ , which is  $1 - 1/2$ .

Fatto questo, moltiplicheremo insieme i minori termini de queste due proportioni, & ne verrà 6; il qual porremo dalla parte destra a canto l'8. & haueremo moltiplicato dette proportioni insieme; cioè soggiunto alla Sesquialtera la Sesquiterza tra questi termini 12. 8. 6. Hora per soggiungere a queste la Sesquiquarta, moltiplicheremo questi termini per il suo maggior termine, che è il 5. incominciando dalla parte sinistra, venendo verso la destra, & haueremo 60. 40. 30. Il che fatto moltiplicheremo il minor termine delli tre primi, che è 6. per il minor termine della Sesquiquarta, che è 4. & ne nascerà 24;

This done, we will multiply the smaller terms of these two proportions together, and 6 will result, which we will place on the right, next to 8, and we will have multiplied said proportions together, thus combining the sesquitertia with the sesquialter among the terms 12 : 8 : 6. Now in order to combine the sesquiquarta with these, we will multiply these terms by [the] larger term [of the sesquiquarta], which is 5, beginning from the left and coming toward the right, and we will have 60 : 40 : 30. This done, we will multiply the smallest term of the first [series of] three, which is 6, by the smaller term of the sesquiquarta, which is 4, and 24 will result.

il quale posto con gli altri, ne darà tale ordine, 60. 40. 30. 24. continente la Sesquialtera, la Sesquiterza, & la Sesquiquarta proportione. Il medesimo faremo, quando vorremo moltiplicare a queste la Sesquiquinta: percioche moltiplicando prima li sopradetti quattro termini, per il suo maggiore, che è 6. ne verrà 360. 240. 180. 144. et dipoi moltiplicato il minor delli mostrati, che è 24. col minor termine di essa proportione, che è 5. ne darà 120;

This [24] placed with the others will give this order: 60 : 40 : 30 : 24, containing the sesquialter, the sesquitertia, and the sesquiquarta proportions. We will do the same when we want to multiply these by the sesquiquinta, because multiplying first the abovementioned four terms by [the] larger [term of the sesquiquinta], which is 6, we will see 360 : 240 : 180 : 144. Then multiplying the smaller of the [numbers] shown, 24, by the smaller term of [the sesquiquinta], 5, 120 will result.

il quale posto al suo luogo, da tal  
 multiplicatione haueremo cinque numeri, o  
 termini cioè<sup>8</sup> 360. 240. 180. 144. 120;  
 continenti esse proportioni; come tra 360.  
 & 240. la Sesquialtera; la Sesquiterza tra  
 240. & 180; tra 180. & 144. la  
 Sesquiquarta; & tra 144. & 120. la  
 Sesquiquinta: ancora che non si ritrouino  
 essere ne i lor termini radicali; come qui  
 nel sottoposto<sup>9</sup> essemplio si vede.

[After 120 is] put in its position, from  
 such multiplication we will derive five  
 numbers or terms, which are 360 : 240 :  
 180 : 144 : 120, containing these  
 proportions: the sesquialter between 360  
 and 240, the sesquitertia between 240  
 and 180, the sesquiquarta between 180  
 and 144, and the sesquiquinta between  
 144 and 120, although they are not found  
 to be in lowest terms, as can be seen in  
 the example below.

<sup>8</sup> 1573, *cioè* omitted.

<sup>9</sup> 1573, *sottoposto* omitted.

<i>Proporzioni da moltiplicare.</i>				
3	4		5	6
2	3		4	5
12	8	6		
60	40	30	24	
360	240	180	144	120
<i>Proporzioni moltiplicate.</i>				

Figure 31.1 Multiplication of Proportions, First Method.

[43] Quando adunque haueremo a moltiplicare & soggiungere insieme molte proportioni, operando al modo che habbiamo dimostrato, potremo hauer sempre il nostro intento.

Therefore, when we will have to multiply and combine many proportions together, working in the way we have shown, we will always be able to reach our goal.

## ADDENDUM AND COMMENTARY TO CHAPTER 31

Zarlino's example on page \_\_\_ multiplies a sesquialter ( $3/2$ ), a sesquitertia ( $4/3$ ), a sesquiquarta ( $5/4$ ), and a sesquiquinta ( $6/5$ ).

The proportions are written "in their lowest terms, in order from left to right, one after the other according to the order in which we wish to multiply them" (*di modo che siano contenute tra i lor termini radicali, l'vna dopo l'altra, secondo l'ordine, che si vorranno moltiplicare.*)

"Taking the larger term of the second proportion to be multiplied" (*pigliando il maggior termine della seconda proportione da moltiplicare*) – 4 – "placed on the left side" (*posta a banda sinistra*), "we will multiply it by the larger" (*lo moltiplicheremo col maggiore*) – 3 – "and [then] by the smaller term (of the first [proportion])" (*col minor termine della prima*) – 2 –

"From this multiplication we will have 12 and 8. And we will place such numbers under a straight horizontal line that separates these from the proposed proportions." (*da tal moltiplicatione haueremo 12. & 8. Et tali numeri porremo sotto vna linea retta in piano, la qual diuida questi dalle proposte proportioni.*) See Figure 31.2.

Proportioni da moltiplicare					
3	4		5		6
2	3		4		5
12	8	6			
60	40	30	24		
360	240	180	144		120
Proportioni moltiplicate.					

Figure 31.2. Multiplying the Larger Term of the Sesquitertia by the Terms of the Sesquialter.

“This done, we will multiply the smaller terms of these two proportions together, and 6 will result, which we will place on the right, next to 8, and we will have multiplied said proportions together, thus combining the sesquitertia with the sesquialter among the terms 12 : 8 : 6.” (*Fatto questo, moltiplicheremo insieme i minori termini de queste due proporzioni, & ne verrà 6; il qual porremo dalla parte destra a canto l'8. & haueremo moltiplicato dette proporzioni insieme; cioè soggiunto alla Sesquialtera la Sesquiterza tra questi termini 12. 8. 6.*) See Figure 31.3.

<i>Proporzioni da moltiplicare</i>					
3	4		5		6
2	3		4		5
12	8	6			
60	40	30	24		
360	240	180	144		120
<i>Proporzioni moltiplicate.</i>					

Figure 31.3. Multiplying the Smaller Terms of the Sesquialter and Sesquitertia.

“Now in order to combine the sesquiquarta with these, we will multiply these terms by [the] larger term [of the sesquiquarta], which is 5, beginning from the left and coming toward the right, and we will have 60 : 40 : 30.” (*Hora per soggiungere a queste la Sesquiquarta, moltiplicheremo questi termini per il suo maggior termine, che è il 5. incominciando dalla parte sinistra, venendo verso la destra, & haueremo 60. 40. 30.*) See Figure 31.4.

<i>Proporzioni da moltiplicare</i>					
3	4		5		6
2	3		4		5
12	8	6			
60	40	30	24		
360	240	180	144		120
<i>Proporzioni moltiplicate.</i>					

Figure 31.4. Multiplying 12:8:6 by 5.

“This done, we will multiply the smallest term of the first [series of] three, which is 6, by the smaller term of the sesquiquarta, which is 4, and 24 will arise.” (*Il che fatto multiplicaremo il minor termine delli tre primi, che è 6. per il minor termine della Sesquiquarta, che è 4. & ne nascerà 24;*). See Figure 31.5.

Proportioni da multiplicare					
3	4		5		6
2	3		4		5
12	8	6			
60	40	30	24		
360	240	180	144		120
Proportioni moltiplicate.					

Figure 31.5. Multiplying 6 by 4 yields 24.

“This [24] placed with the others will give this order: 60 : 40 : 30 : 24, containing the sesquialter, the sesquitertia, and the sesquiquarta proportions.” (*il quale posto con gli altri, ne darà tale ordine, 60. 40. 30. 24. continente la Sesquialtera, la Sesquiterza, & la Sesquiquarta proportione.*) Reduced to lowest terms, 60 : 40 becomes the sesquialter, 40 : 30 becomes the sesquitertia, and 30 : 24 becomes the sesquiquarta. See Figure 31.6.

Proportioni da multiplicare					
3	4		5		6
2	3		4		5
12	8	6			
60	40	30	24		
360	240	180	144		120
Proportioni moltiplicate.					

Figure 31.6. Placing 24 with the others gives the order 60 : 40 : 30 : 24.

“We will do the same when we want to multiply these by the sesquiquinta, because multiplying first the abovementioned four terms by [the] larger [term of the sesquiquinta], which is 6, we will see 360 : 240 : 180 : 144.” (*Il medesimo faremo, quando vorremo multiplicare a queste la Sesquiquinta: percioche multiplicando prima li sopradetti quattro termini, per il suo maggiore, che è 6. ne verrà 360. 240. 180. 144.*) See Figure 31.7.

Proportioni da multiplicare				
3	4		5	6
2	3		4	5
12	8	6		
60	40	30	24	
360	240	180	144	120
Proportioni moltiplicate.				

Figure 31.7. Multiplying 60, 40, 30, and 24 by 6.

“Then multiplying the smallest of the [numbers] shown, 24, by the smaller term of [the sesquiquinta], 5, 120 will result.” (*et dipoi moltiplicato il minor delli mostrati, che è 24. col minor termine di essa proportione, che è 5. ne darà 120;*) See Figure 31.8.

Proportioni da multiplicare				
3	4		5	6
2	3		4	5
12	8	6		
60	40	30	24	
360	240	180	144	120
Proportioni moltiplicate.				

Figure 31.8. Multiplying 24 by 5 yields 120.

“[After 120 is] put in its position, from such multiplication we will derive five numbers or terms, which are 360 : 240 : 180 : 144 : 120, containing these proportions: the sesquialter between 360 and 240, the sesquitertia between 240 and 180, the sesquiquarta between 180 and 144, and the sesquiquinta between 144 and 120....” (*il quale posto al suo luogo, da tal multiplicatione haueremo cinque numeri, o termini cioè 360. 240. 180. 144. 120; continenti esse proportioni; come tra 360. & 240. la Sesquialtera; la Sesquiterza tra 240. & 180; tra 180. & 144. la Sesquiquarta; & tra 144. & 120. la Sesquiquinta...*)

Using Zarlino’s proportions and modern convention, the result of this procedure is 360 : 120, which reduces to 3:1, mediated by 3;2, 4;3, 5;4, and 6:5. Table 31.1 illustrates the steps taken in terms of musical consonances.

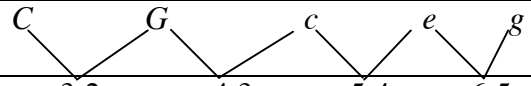
	Multiplication	Result
Pitch		
Proportion	3:2      4:3      5:4      6:5	3 : 1
Consonance	diapente    diatessaron    ditone    semiditone	diapason plus diapente

Table 31.1. Multiplication of Proportions in Musical Terms.

Il secondo modo di multiplicar delle  
proportioni. / Cap. 32.

-----

Occorrendone, che nelle multiplicationi sia  
dibisogno di preporre le proportioni l'una  
all'altra, procederemo in questo modo:  
Multiplicheremo prima per il termine  
minore della seconda proportione posta a  
banda sinistra<sup>1</sup> ciascun termine della prima,  
incominciando dal minore; & di poi il  
maggior dell'vna col maggior dell'altra  
insieme; & da tal multiplicatione haueremo  
tre termini continenti tali proportioni. Dipoi  
multiplicando questi prodotti per il  
maggior<sup>2</sup> termine della terza proportione;  
& il maggior di essi per il maggiore,  
haueremo il nostro proposito.

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<sup>1</sup> 1573, *sinistra* reads *destra*.

<sup>2</sup> 1573, *maggior* reads *minor*.

The Second Method of Multiplication of  
Proportions / Chapter 32

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Should it be necessary in multiplication  
to place one proportion before another,  
we will proceed in this way: first we will  
multiply each term of the first  
[proportion, on the right] by the smaller  
term of the second proportion, placed on  
the left side, beginning with the smaller,  
and then [multiply] the larger [term] of  
the [first] by the larger [term] of [the  
second], and by that multiplication we  
will have three terms containing such  
proportions. Then multiplying these  
products by the larger term of the third  
proportion, and [multiplying] the larger  
of these products by the larger [term],  
we will reach our goal.

---

<sup>A</sup> Zarlino's 1573 reversals of *sinistra* to *destra*  
and *maggior* to *minor* in the following sentence  
leaves his argument unchanged.

Se noi pigliaremo adunque<sup>3</sup> il minor termine della Sesquiquarta, posta nel precedente capitolo, il quale è 4; & lo moltiplicheremo col 5. & col 6. termini della Sesquiquinta, ne risulterà 20. & 24; iquali porremo, come facemmo di sopra, sotto vna linea retta. Dipoi moltiplicato il 5. maggior termine di detta Sesquiquarta col 6. maggior termine della Sesquiquinta, ne vscirà 30; ilquale posto appresso il 24. ne darà tre termini 30. 24. 20; che contengono le proportioni moltiplicate. Ma per moltiplicar con queste la Sesquiterza, pigliaremo il suo termine minore, che è il 3. & lo moltiplicheremo con li tre prodotti, incominciando dalla destra, venendo verso la sinistra parte; & haueremo 90. 72. 60;

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<sup>3</sup> 1573, *Se noi pigliaremo adunque* reads *Se adunque noi pigliaremo*.

If, then, we take the smaller term of the sesquiquarta, which is 4, as discussed in the preceding chapter, and multiply it by 5 and 6, the terms of the sesquiquinta, 20 and 24 will result, which we will place under a straight line, as we did above.<sup>A</sup> Next, multiplying 5, the larger term of the sesquiquarta, by 6, the larger term of the sesquiquinta, results in 30, which placed next to 24 will produce three terms, 30 : 24 : 20, which contain the multiplied proportions. But in order to multiply the sesquitercia with these, we will take its smaller term, which is 3, and multiplying it by the three products, starting from the right and going toward the left, we will obtain 90 : 72 : 60.

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<sup>A</sup> Zarlino's procedure is clarified in the addendum to this chapter, pages 410-413.

assettrandoli l'un dopo l'altro sotto li suoi  
 producenti, i quali sono 30. 24. 20; & di  
 nuouo moltiplicando il 4. maggior termine  
 della Sesquiterza col 30; vscirà 120, il  
 quale dopo che l'haueremo aggiunto alli tre  
 sopradetti, ne darà un tal ordine. 120. 90.  
 72. 60. continenti la Sesquiquinta, la  
 Sesquiquarta, & la Sesquiterza proportione.  
 Ma volendo moltiplicar con queste la  
 Sesquialtera, pigliaremo il 2. suo minor  
 termine, & lo moltiplicheremo al modo detto  
 nelli quattro prodotti, & haueremo 240.  
 180. 144. 120.

Arranging them one after the other  
 under their generators, which are 30, 24,  
 and 20, and again multiplying 4, the  
 larger term of the sesquitertia, by 30,  
 120 will result, which once added to the  
 three previous [terms], will give the  
 series 120 : 90 : 72 : 60, containing the  
 sesquiquintal, the sesquiquartal, and the  
 sesquiterial proportions. But wishing to  
 multiply the sesquialter by these, we will  
 take 2, its smaller term, and multiply it  
 in the aforesaid manner by the four  
 products, and will have 240 : 180 : 144 :  
 120.

Moltiplicheremo poi il 3. suo maggior termine col 120. maggior termine delli prodotti, & nascerà 360; il quale accompagnato alli quattro prodotti, ne darà tutta la multiplicatione tra questi termini 360. 240. 180. 144. 120. i quali contengono le nominate quattro proportioni; come nel sottoposto essemplio si vede, simile a quello, che nel capitolo precedente hauemo mostrato.

We will then multiply 3, the larger term [of the sesquialter], by 120, the largest term of the products, and 360 will result, which, accompanied by the four products, will provide all the [results of] multiplication among the terms 360 : 240 : 180 : 144 : 120, which contain the abovementioned four proportions, as shown in the example below, which is similar to the [example] that we showed in the previous chapter.

<i>Proportioni da moltiplicare.</i>				
3	4		5	6
2	3		4	5
		30	24	20
	120	90	72	60
360	240	180	144	120
<i>Proportioni moltiplicate.</i>				

Figure 32.1. Multiplication of Proportions, Second Method.

## ADDENDUM AND COMMENTARY TO CHAPTER 32

“If ... we take the smaller term of the sesquiquarta, which is 4 ...and multiply it by 5 and 6, the terms of the sesquiquinta, 20 and 24 will result, which we will place under a straight line, as we did above.” (*Se noi pigliaremo ... il minor termine della Sesquiquarta, ... il quale è 4; & lo moltiplicheremo col 5. & col 6. termini della Sesquiquinta, ne risulterà 20. & 24; iquali porremo, come facemmo di sopra, sotto vna linea retta.*) See Figure 32.2.

Proportioni da moltiplicare.					
3	4			5	6
2	3			4	5
			30	24	20
	120	90		72	60
360	240	180		144	120
Proportioni moltiplicate.					

Figure 32.2. Multiplying the Smaller Term of the Sesquiquarta by the Terms of the Sesquiquinta.

“Next, multiplying 5, the larger term of the sesquiquarta, by 6, the larger term of the sesquiquinta, results in 30, which placed next to 24 will produce three terms, 30:24:20, which contain the multiplied proportions.” (*Dipoi moltiplicato il 5. maggior termine di detta Sesquiquarta col 6. maggior termine della Sesquiquinta, ne vscirà 30; ilquale posto appresso il 24. ne darà tre termini 30. 24. 20; che contengono le proportioni moltiplicate.*) See Figure 32.3.

Proportioni da moltiplicare.					
3	4			5	6
2	3			4	5
			30	24	20
	120	90		72	60
360	240	180		144	120
Proportioni moltiplicate.					

Figure 32.3. Multiplying the Larger term of the Sesquiquarta by the Larger Term of the Sesquiquinta.

“But in order to multiply the sesquitertia with these, we will take its smaller term, which is 3, and multiplying it by the three products, starting from the right and going toward the left, we will obtain 90 : 72 : 60.” (*Ma per moltiplicar con queste la Sesquiterza, pigliaremo il suo termine minore, che è il 3. & lo moltiplicheremo con li tre prodotti, incominciando dalla destra, venendo verso la sinistra parte; & haueremo 90. 72. 60;*) See Figure 32.4.

Proportioni da moltiplicare.					
3	4			5	6
2	3			4	5
		30		24	20
	120	90		72	60
360	240	180		144	120
Proportioni moltiplicate.					

Figure 32.4. Multiplying the Smaller Term of the Sesquitertia by 30, 24, and 20, the Three Products Circled in Figure 32.3.

“Arranging them [90, 72, and 60] one after the other under their generators, which are 30, 24, and 20, and again multiplying 4, the larger term of the sesquitertia, by 30, 120 will result” (*assetandoli l’un dopo l’altro sotto li suoi producenti, i quali sono 30. 24. 20; & di nuouo moltiplicando il 4. maggior termine della Sesquiterza col 30; vscirà 120*) See Figure 32.5.

Proportioni da moltiplicare.					
3	4			5	6
2	3	X		4	5
			30	24	20
	120		90	72	60
360	240		180	144	120
Proportioni moltiplicate.					

Figure 32.5. Multiplying the Larger Term of the Sesquitertia by 30.

“which [120], once added to the three previous [terms], will give the series 120 : 90 : 72 : 60, containing the sesquiquintal, the sesquiquartal, and the sesquitercial proportions. (*il quale* [120] *dopo che l’haueremo aggiunto alli tre sopradetti, ne darà un tal ordine. 120. 90. 72. 60. continenti la Sesquiquinta, la Sesquiquarta, & la Sesquiterza proportione.*) See Figure 32.6.

Proportioni da moltiplicare.					
3	4		5	6	
2	3		4	5	
		30	24	20	
		120	90	72	60
360	240	180	144	120	
Proportioni moltiplicate.					

Figure 32.6. Adding 120 to 90, 72, and 60.

“But wishing to multiply the sesquialter by these, we will take 2, its smaller term, and multiply it in the aforesaid manner by the four products, and will have 240 : 180 : 144 : 120.” (*Ma volendo moltiplicar con queste la Sesquialtera, pigliaremo il 2. suo minor termine, & lo moltiplicaremo al modo detto nelli quattro prodotti, & haueremo 240. 180. 144. 120.*) See Figure 32.7.

Proportioni da moltiplicare.					
3	4		5	6	
2	3		4	5	
		30	24	20	
		120	90	72	60
360	240	180	144	120	
Proportioni moltiplicate.					

Figure 32.7. Multiplying 2 by 120, 90, 72, and 60.

“We will then multiply 3, the larger term [of the sesquialter], by 120, the largest term of the products, and 360 will result, which, accompanied by the four products, will provide all the [results of] multiplication among the terms 360 : 240 : 180 : 144 : 120...”

(*Moltiplicheremo poi il 3. suo maggior termine col 120. maggior termine delli prodotti, & nascerà 360; il quale accompagnato alli quattro prodotti, ne darà tutta la moltiplicatione tra questi termini 360. 240. 180. 144. 120...*). See Figure 32.8.

Proporzioni da moltiplicare.					
3	4		5	6	
2	3		4	5	
		30	24	20	
	120	90	72	60	
360	240	180	144	120	
Proporzioni moltiplicate.					

Figure 32.8. Multiplying 3 by 120 yields 360.

## Del sommar le proportioni. / Cap. 33.

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Il sommar le proportioni (come hò detto) non è altro, che il ridurne quante si vuole di vno, o di diuersi generi, sotto vna sola denominatione, la quale si ritroua anche ne gli estremi numeri, o termini di esse proportioni, quando insieme sono moltiplicate; con tal differenza, che questi estremi sono mediati da altre proportioni: ma quelli che nascono dal sommare sono immediati; come vederemo. Se hauessimo adunque da sommare insieme due, o più proportioni di vno, o di diuersi generi, si debbe procedere<sup>1</sup> in questo modo; cioè por<sup>2</sup> prima i maggiori & radicali termini delle proportioni, che si hanno da sommare l'vn sotto l'altro, ouer l'vno di rimpetto all'altro; similmente li minori;

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<sup>1</sup> 1573, *si debbe procedere* reads *procederemo*.

<sup>2</sup> 1573, *cioè por* reads *porremo*.

## On the Addition of Proportions /

## Chapter 33

-----

The addition of proportions (as I have said) is nothing other than the reduction of one or more genera [of proportion] to a single denominator, which is found also in the extremes or terms of said proportions when they are multiplied together, with the difference that [when multiplying proportions] their extremes are mediated by other proportions while those that arise from addition are not mediated, as we shall see. Therefore, if we had to add two or more proportions of one or of different genera together, we would proceed in this manner. First, place the larger and root terms of the proportions to be added one under or across from the other, and similarly for the smaller [terms].

dipoi multiplicar<sup>3</sup> li maggiori l'vno nell'altro, incominciando dalli due primi, & il prodotto da questi nel terzo; & quello che nasce<sup>4</sup> nel quarto; & cosi di mano in mano; & [44] il prodotto da tal multiplicatione sarà il maggior termine continente la proportione, che hà da nascere. Il che fatto si debbono multiplicare<sup>5</sup> medesimamente li minori l'vno nell'altro; & il prodotto sarà il minor termine, che insieme col maggiore contiene<sup>6</sup> la ricercata proportione. Si come, se hauessimo da sommare insieme le<sup>7</sup> moltiplicate proportioni, le accommodaremo prima; come nell'esempio si veggono;

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<sup>3</sup> 1573, *multiplicar* reads *moltiplicaremo*.

<sup>4</sup> 1573, *nasce* reads *nascerà*.

<sup>5</sup> 1573, *si debbono multiplicare* reads *moltiplicheremo*.

<sup>6</sup> 1573, *contiene* reads *contenerà*.

<sup>7</sup> 1573, *già* inserted.

Next, multiply the larger [terms] with each other, beginning with the first two, and their product with the third, and that which results with the fourth, and thus for each in succession; and the product of such multiplication will be the larger term of the proportion that will arise. This done, in the same way, the smaller [terms] must be multiplied one by one, and the product taken together with the larger [term] will be the smaller term of the proportion sought. If one wishes to add the multiplied proportions together, we will arrange them first, as can be seen in the example.<sup>A</sup>

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<sup>A</sup> See Figure 33.1, page 417.

& incominciando da i maggiori termini di quelle, moltiplicheremo li due primi; cioè 3. & 4. l'vn con l'altro; & haueremo 12. Questo poi moltiplicato col 5. ne darà 60; il quale moltiplicato col 6. produrrà 360; & questo numero sarà il maggior termine, che hà da nascere di tal somma.<sup>8</sup> Al medesimo modo moltiplicheremo poi li termini minori; cioè il 2. col 3. & ne verrà 6; il quale moltiplicato col 4. ne darà 24. Con questo si moltiplicherà poi il 5. & ne darà 120; il qual numero sarà<sup>9</sup> il minor termine, che insieme col maggiore contiene<sup>10</sup> la produtta proportionone, la quale è la medesima, che si ritroua ne gli estremi termini delle moltiplicate disopra proportioni; come si può vedere.

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<sup>8</sup> 1573, *hà da nascere di tal somma* reads *hauerà da nascere di cotal somma*.

<sup>9</sup> 1573, *sarà* reads *uerrà ad esser*.

<sup>10</sup> 1573, *contiene* reads *contenerà*.

Beginning with the larger terms of these, we will multiply the first two, that is, 3 by 4, and 12 will result.<sup>B</sup> This, then, multiplied by 5 yields 60, which multiplied by 6 produces 360, and this number will be the larger term that arises from this sum. In the same way we will then multiply the smaller terms, that is 2 with 3, and 6 will result, which multiplied by 4 will yield 24. We will multiply this then by 5, which will yield 120, which number will be the smaller term that together with the larger [term] contains the resultant proportion, which is the same that can be found in the extremes of the proportions multiplied above, as we can see.

---

<sup>B</sup> Zarlino's procedure is clarified in the addendum to this chapter, pages 418-420.

Hauendo adunque ridutte tal proportioni sotto vn solo denominatore, che è il 3; & sotto vna sola proportione, la quale è la Tripla;<sup>11</sup> si può hora vedere la differenza, che si ritroua tra il sommare, & il moltiplicare; conciosia che l'vno si ritroua mediato da alcuna proportione; & l'altro è senza alcun mezo nelli suoi estremi termini; come ne i sottoposti esempij si può vedere.

Having thus reduced such proportions to a single denominator, which is 3, and under a single proportion, which is the triple, we can now see the difference that is found between addition and multiplication, because one [multiplication] is found to be mediated by any proportion, and the other [addition] is without any mean between its extremes, as can be seen in the example below.

<sup>11</sup> 1573, *denominatore, che è il 3; & sotto vna sola proportione, la quale è la Tripla* reads *vna solaproportione, la quale è la Tripla; & sotto vn solo Denominatore, che è il 3.*

<i>Primo.</i>	3	<i>Sesquialtera.</i>	2	<i>modo.</i>		<i>3</i>	<i>Sesquialtera.</i>	<i>2</i>		<i>4</i>	<i>Sesquiterza.</i>	<i>3</i>		<i>5</i>	<i>Sesquiquarta.</i>	<i>4</i>		<i>6</i>	<i>Sesquiquinta.</i>	<i>5</i>		<i>360</i>	<i>Tripla</i>	<i>120</i>																						
	4	<i>Sesquiterza.</i>	3																																											
	5	<i>Sesquiquarta.</i>	4																																											
	6	<i>Sesquiquinta.</i>	5																																											
<i>360 Tripla. 120</i>				<i>Secondo modo.</i>																																										

Figure 33.1. Addition of Proportions.

## ADDENDUM AND COMMENTARY TO CHAPTER 33

Zarlino's example adds a sesquialter ( $3/2$ ), a sesquitertia ( $4/3$ ), a sesquiquarta ( $5/4$ ), and a sesquiquinta ( $6/5$ ).

"Beginning with the larger terms of these, we will multiply the first two, that is, 3 by 4, and 12 will result." (*...incominciando da i maggiori termini di quelle, moltiplicheremo li due primi; cioè 3. & 4. l'un con l'altro; & haueremo 12.*) See Figure 33.2.

$3 \times 4 = 12$ Primo.	3	Sesquialtera.	2	modo.		3	4	5	6		360	Tripla	120
	4	Sesquiterza.	3										
	5	Sesquiquarta.	4										
	6	Sesquiquinta.	5										
				Secondo modo.									

Figure 33.2. Multiplying the Larger terms of the Sesquialter and Sesquitertia.

"This, then, multiplied by 5 yields 60, (*Questo poi moltiplicato col 5. ne darà 60;*) See Figure 33.3.

$12 \times 5 = 60$ Primo.	3	Sesquialtera.	2	modo.		3	4	5	6		360	Tripla	120
	4	Sesquiterza.	3										
	5	Sesquiquarta.	4										
	6	Sesquiquinta.	5										
				Secondo modo.									

Figure 33.3. Multiplying the Product of the Larger Terms of the Sesquialter and Sesquitertia by the Larger Term of the Sesquiquarta.

“which multiplied by 6 produces 360” (*il quale moltiplicato col 6. produrrà 360*). See Figure 33.4.

$60 \times 6 =$ Primo. $\begin{cases} \times 3 & \text{Sesquialtera.} & 2 \\ \times 4 & \text{Sesquiterza.} & 3 \\ \times 5 & \text{Sesquiquarta.} & 4 \\ \times 6 & \text{Sesquiquinta.} & 5 \end{cases}$ modo.	3	4	5	6	360 Tripla 120
	3 Sesquialtera.	4 Sesquiterza.	5 Sesquiquarta.	6 Sesquiquinta.	
360 Tripla. 120	Secondo modo.				

Figure 33.4. Multiplying All the Larger Terms of the Four Ratios.

“In the same way we will then multiply the smaller terms, that is 2 with 3, and 6 will result, which multiplied by 4 will yield 24. We will multiply this then by 5, which will yield 120” (*Al medesimo modo moltiplicheremo poi li termini minori; cioè il 2. col 3. & ne verrà 6; il quale moltiplicato col 4. ne darà 24. Con questo si moltiplicherà poi il 5. & ne darà 120*) See Figure 33.5.

Primo. $\begin{cases} 3 & \text{Sesquialtera.} & \begin{matrix} 2 \\ \times 3 \\ 6 \end{matrix} \\ 4 & \text{Sesquiterza.} & \begin{matrix} 6 \\ \times 4 \\ 24 \end{matrix} \\ 5 & \text{Sesquiquarta.} & \begin{matrix} 24 \\ \times 5 \\ 120 \end{matrix} \\ 6 & \text{Sesquiquinta.} & 5 \times 24 = 120 \end{cases}$ modo.	3	4	5	6	360 Tripla 120
	3 Sesquialtera.	4 Sesquiterza.	5 Sesquiquarta.	6 Sesquiquinta.	
360 Tripla. 120	Secondo modo.				

Figure 33.5. Multiplying All the Smaller terms of the Four Ratios.

“120 ... will be the smaller term that together with the larger [term, 360] contains the resultant proportion ...” (*120 ... sarà il minor termine, che insieme col maggiore [360] contiene<sup>10</sup> la prodotta proportione*). 360/120 expressed in lowest terms is 3/1, the triple proportion.

For Zarlino, multiplying proportions means retaining all of the intermediate terms, while adding proportions means deriving only the final proportion. Table 33.1 compares the two procedures in terms of musical consonances.

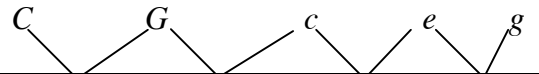
	Multiplication	Addition
Pitch	<i>C</i> <i>G</i> <i>c</i> <i>e</i> <i>g</i> 	<i>C</i> <i>g</i>
Proportion	3:2      4:3      5:4      6:5	1 : 3
Consonance	diapente    diatessaron    ditone    semiditone	diapason plus diapente

Table 33.1. Multiplication vs. Addition of Proportions in Musical Terms.

Del sottrar le proportioni. / Cap. 34.

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La terza operatione si chiama Sottrare, la quale non è altro, che il leuare vna proportione, o quantità minore da vna maggiore, per saper le differenze, ouero di quanta quantità l'vna superi, oueramente sia superata dall'altra; la quale operatione si fa in questo modo. Prima bisogna disporre li termini radicali delle proportioni a modo di vna figura quadrata, di maniera che li termini della maggiore siano nella parte superiore, & quelli delli minore nella inferiore, l'vno sotto l'altro; auertendo però, che li maggior termini dell'vna, & l'altra tenghino la parte sinistra, & li minori la destra.

On the Subtraction of Proportions /

Chapter 34

-----

The third operation is called subtraction, which is nothing other than the removal of a smaller proportion or quantity from a larger one, in order to know their difference or the quantity by which one is greater or smaller than the other. Such operation is done in this manner. First it is necessary to distribute the terms of the proportions, when reduced to their lowest terms, in the shape of a square, so that the terms of the larger [proportion] are in the higher position, and those of the smaller in the lower [position], the lower under the higher, noting, however, that the larger terms are placed on the left side and the smaller [terms] on the right.<sup>A</sup>

---

<sup>A</sup> See Figure 34.1.

Fatto questo moltiplicheremo<sup>1</sup> in croce li termini; cioè<sup>2</sup> il maggior della sopraposta,<sup>3</sup> col minore della sottoposta;<sup>4</sup> & così il maggior della sottoposta,<sup>5</sup> col minore della posta di sopra; & li prodotti porremo perpendicolarmente sotto li termini moltiplicati posti di sopra, diuidendoli dalle proportioni con vna retta linea in piano; & allora da tali prodotti si hauerà, quanto l'vna proportione supera l'altra; & la differenza, che tra l'vna & l'altra si ritroua.

This done, we will multiply the terms crosswise: that is, the larger [term] in the higher [position] with the smaller [term] in the lower [position], and in the same way, the larger [term] in the lower [position] with the smaller [term] in the higher; and we will place the products perpendicularly under the multiplied terms placed above, separating them from the proportions by a horizontal straight line, and then from these products we will know by how much one proportion is greater than the other, and the difference that is found between them.

---

<sup>1</sup> 1573, *moltiplicheremo* reads *bisogna moltiplicare*.

<sup>2</sup> 1573, *cioè* reads *à questo modo*.

<sup>3</sup> 1573, *della sopraposta* reads *posto di sopra*.

<sup>4</sup> 1573, *della sottoposta* reads *posto di sotto*.

<sup>5</sup> 1573, *della sottoposta* reads *posto di sotto*.

Volendo adunque leuare vna Sesquiterza da vna Sesquialtera, & sapere di quanto la Sesquialtera<sup>6</sup> auanzi la Sesquiterza,<sup>7</sup> & la differenza, che si ritroua tra loro, operaremo in questo modo. Ordinaremo prima i termini delle proportioni al modo che si vedono nel sottoposto<sup>8</sup> essemplio; dipoi hauendo tirato di sotto vna linea retta in piano, sotto di essa porremo li termini prodotti dalla moltiplicatione, che si farà di vn termine con l'altro:

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<sup>6</sup> 1573, *Sesquialtera* reads *seconda*.

<sup>7</sup> 1573, *Sesquiterza* reads *prima*.

<sup>8</sup> 1573, *sottoposto* omitted.

Wishing, then, to remove a sesquitertia from a sesquialter, and to know by how much the sesquialter is greater than the sesquitertia, and the difference that is found between them, we will operate in this fashion. First we will order the terms of the proportions in the way that is seen in the example below.<sup>A</sup> Then, having drawn a straight horizontal line underneath, we will place the terms produced by the multiplication of one term by the other under this [line].<sup>B</sup>

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<sup>A</sup> See Figure 34.1, page 423.

<sup>B</sup> Zarlino's procedure is clarified in the addendum to this chapter, pages 427-428.

[45]

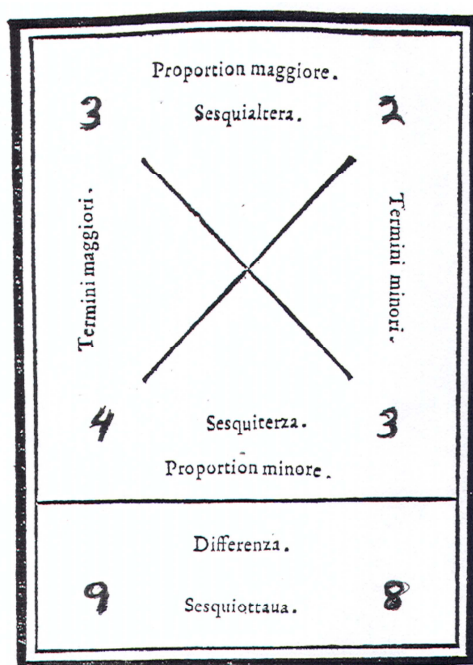


Figure 34.1 Subtraction of Proportions.

Incominciando dipoi dal 3. maggior termine della Sesquialtera, lo moltiplicheremo col 3. minore della Sesquiterza, & il prodotto, il qual sarà 9. porremo perpendicolarmente sotto il 3. maggior termine della Sesquialtera, sotto la linea a banda sinistra; & questo sarà il maggior termine della proportione, che hà da nascere la quale contenerà la differenza, che noi cerchiamo.

Beginning, then, with 3, the larger term of the sesquialter, we will multiply it by 3, the smaller term of the sesquitertia, and we will place the product, 9, perpendicularly under the 3, the larger term of the sesquialter, under the line on the left; and this will be the larger term of the proportion that must arise which will contain the difference that we seek.

Il che fatto moltiplicheremo il 4. che è il maggior termine della Sesquiterza, col 2. che è il minore della Sesquialtera; & il prodotto, che sarà 8. verrà ad essere il minor termine della proportione continentela già detta differenza: Imperoche posto sotto la nominata linea perpendicolarmente sotto il 2. minor termine della Sesquialtera, haueremo la proportione Sesquiottaua, contenuta tra il 9. & l'8: la qual dico esser la differenza di quanto vna è maggior dell'altra; come qui si vede.<sup>9</sup> Potemo<sup>10</sup> hora dire, che sottrata vna Sesquiterza da vna Sesquialtera, resta vna Sesquiottaua;

This done, we will multiply 4, the larger term of the sesquitertia, by 2, the smaller term of the sesquialter, and the product, 8, will come to be the smaller term of the proportion contained in the said difference. This is because placed beneath the said line perpendicularly under the 2, the smaller term of the sesquialter, we will have the sesquioctave proportion contained between 9 and 8, which I say to be the difference by which [the sesquialter] is larger than the sesquitertia, as is seen here. We can now say that when a sesquitertia is subtracted from a sesquialter, a sesquioctave remains,

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<sup>9</sup> 1573, *nell'esempio* inserted.

<sup>10</sup> 1573, *Potemo* reads *potiamo*.

& questa esser la differenza, che si ritroua tra l'vna & l'altra; & esser quella quantità, per la quale la maggiore supera la minore, et questa da quella è superata. Et che così sia il vero,<sup>11</sup> si può prouare: imperoche sommando insieme nel modo mostrato la Sesquiterza con la Sesquiottaua, haueremo da tal somma la Sesquialtera, che fu quella proportionone, che superaua la Sesquiterza di vna Sesquiottaua: Onde da questo potemo<sup>12</sup> ancora vedere, che il sommare delle proportioni è la proua del Sottrare; & per il contrario il sottrare la proua del sommare.

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<sup>11</sup> 1573, *Et che così sia il vero* reads *come*.

<sup>12</sup> 1573, *potemo* reads *si può*.

and this is the difference that is found between one and the other, and it is the quantity by which the larger supersedes the smaller, and by which [the smaller] is superseded by [the larger].<sup>c</sup> And we can prove that this is true, because adding the sesquitertia to the sesquioctave in the way we have shown, we will derive the sesquialter as their sum, which was the proportion that superseded the sesquitertia by a sesquioctave.

Therefore, from this we can also see that the addition of proportions is the proof of their subtraction, and on the contrary, subtraction is the proof of addition.

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<sup>c</sup> In Zarlino's explanations in Chapter 15 above, the difference between the sesquialter, 3:2, and the sesquitertia, 4:3, the difference between the fifth and the fourth, is the interval defined by the sesquioctave, 9:8, which is the major tone. See Figure 15.2, page \_\_\_\_.

## ADDENDUM AND COMMENTARY TO CHAPTER 34

Zarlino's example subtracts a sesquitertia ( $4/3$ ) from a sesquialter ( $3/2$ ).

"...having drawn a straight horizontal line underneath, we will place the terms produced by the multiplication of one term by the other under this [line]. Beginning, then, with 3, the larger term of the sesquialter, we will multiply it by 3, the smaller term of the sesquitertia, and we will place the product, 9, perpendicularly under the 3, the larger term of the sesquialter, under the line on the left; and this will be the larger term of the proportion that must arise which will contain the difference that we seek." (*hauendo tirato di sotto vna linea retta in piano, sotto di essa porremo li termini prodotti dalla moltiplicatione, che si farà di vn termine con l'altro: Incominciando dipoi dal 3. maggior termine della Sesquialtera, lo moltiplicheremo col 3. minore della Sesquiterza, & il prodotto, il qual sarà 9. porremo perpendicolarmente sotto il 3. maggior termine della Sesquialtera, sotto la linea a banda sinistra; & questo sarà il maggior termine della proportione, che hà da nascere la quale contenerà la differenza, che noi cerchiamo.*) See Figure 33.2. Although Zarlino says he placed 9 perpendicularly under the 3 which is the larger term of the sesquialter on the left, the 9 actually lies under the 3 which is the smaller term of the sesquitertia. This does not, however, affect the result of his calculation.

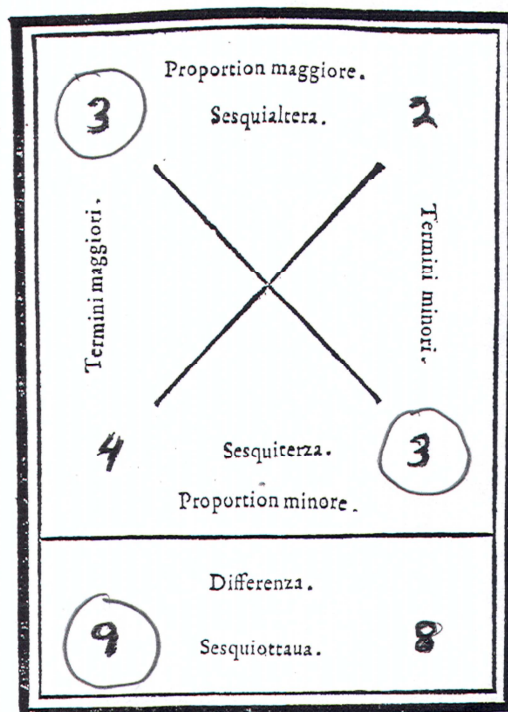


Figure 34.2. Multiplying the Larger Term of the Sesquialter by the Smaller Term of the Sesquitertia.

“This done, we will multiply 4, the larger term of the sesquitertia, by 2, the smaller term of the sesquialter, and the product, 8, will come to be the smaller term of the proportion contained in the said difference.” (*Il che fatto moltiplicheremo il 4. che è il maggior termine della Sesquiterza, col 2. che è il minore della Sesquialtera; & il prodotto, che sarà 8. verrà ad essere il minor termine della proportione contenente la già detta differenza:)* See Figure 34.3.

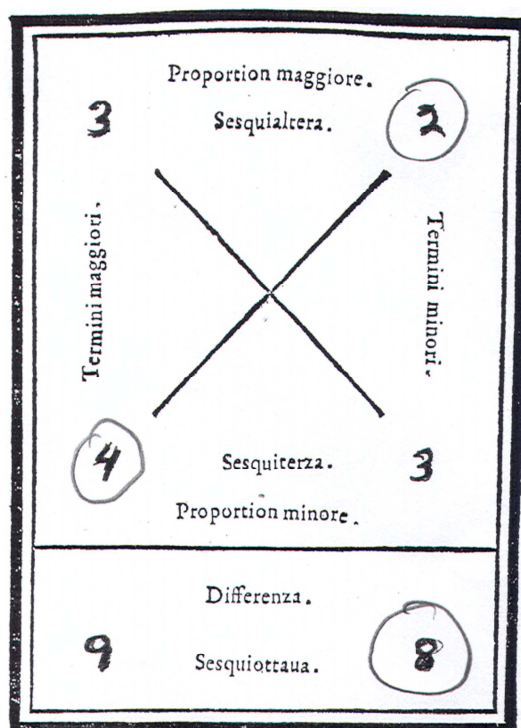


Figure 34.3. Multiplying the Larger term of the Sesquitertia by the Smaller Term of the Sesquialter.

Del partire, o Diuidere le proportioni; &  
quella che sia Proportionalità / Cap. 35.

-----

Si debbe auertire, che per la quarta  
operatione, io non intendo altro, che la  
Diuisione, o Partimento di qualunque  
proportione, che si fa per la collocazione di  
alcun ritrouato numero, tra li suoi estremi;  
& è nominato Diuisore: percioche diuide  
quella proportionatamente in due parti; la  
qual diuisione li Mathematici chiamano  
Proportionalità. o Progressione. Onde mi è  
paruto esser conueniente dichiarare  
primieramente quello, che importi questo  
nome Proportionalità, & dipoi venire alle  
operationi.

On the Partition or Division of  
Proportions, and What Proportionality  
Might Be / Chapter 35

-----

I must point out that by the fourth  
operation I mean nothing other than  
division or partition of any proportion  
that is made by the placement of any  
number to be found between its  
extremes, and it is called divisor,  
because it divides that proportionately  
into two parts. Mathematicians call that  
division proportionality, or progression.  
Therefore, it appeared to me to be  
convenient first to explain the  
significance of the name,  
proportionality, and then come to the  
operations.

La Proportionalità adunque, secondo la mente di Euclide,<sup>1</sup> è similitudine delle proportioni, che si ritroua almeno nel mezo di<sup>2</sup> tre termini, che contengono due proportioni. Et quantunque appresso li Mathematici (come dimostra Boetio<sup>3</sup>) le proportionalità siano Diece; ouero (secondo la mente di Giordano<sup>4</sup>) Vndeci; nondimeno le tre prime, che sono le più famose, & approuate da gli antichi Filosofi; Pithagora, Platone, & Aristotele, sono considerate, & abbracciate dal Musico, come quelle che fanno più al suo proposito che le altre.

Proportionality, then, to Euclid's way of thinking, is the comparison of the proportions that are created in the simplest case by the middle of three terms that contain two proportions. And although for mathematicians (as Boethius shows) there are ten or (according to Giordano's opinion) eleven proportionalities, nevertheless the first three, the best known and approved by the ancient philosophers Pythagoras, Plato, and Aristotle, are considered and embraced by the musician as those that pertain to him more than the others.

---

<sup>1</sup> 1573, Zarlino's marginal note: *Element. libro 4. def. 4* (Euclid, *Elements*, Book 4, Definition 4).

<sup>2</sup> 1573, *nel mezo di* reads *tra*.

<sup>3</sup> 1573, Zarlino's marginal note: *Arith. lib. 2. cap. 53* (Boethius, *On Arithmetic*, Book 2, Chapter 53).

<sup>4</sup> 1573, Zarlino's marginal note: *Arith. libro 10* (Giordano, *On Arithmetic*, Book 10).

Di queste la prima è detta Arithmetica, la seconda Geometrica, & la terza Harmonica.

Et volendo io ragionare alcuna cosa di ciascuna<sup>5</sup> di esse, prima vederemo quel che sia ciascuna<sup>6</sup> separatamente.

Incominciando adunque dalla prima dico, che la diuisione, o proportionalità Arithmetica è quella, la quale tra due termini di qualunque proportione hauerà vn mezano termine accommodato in tal modo, che essendo le differenze de i suoi termini equali, inequali saranno le sue proportioni: Per il contrario, dico che la diuisione, o proportionalità Geometrica è quella, le cui proportioni, per virtù del nominato mezano termine, essendo equali, inequali saranno le sue differenze.

---

<sup>5</sup> 1573, *di ciascuna* reads *particolarmente* (particularly).

<sup>6</sup> 1573, *sia ciascuna* reads *ciascuna sia*.

Of these the first [proportionality] is called arithmetic, the second, geometric, and the third, harmonic. And wishing to discuss everything about each one of these [proportionalities], we will first see what each one is separately.

Beginning with the first, I say that arithmetic division or proportionality is the one which will have a middle term between two terms of any proportion calculated so that although the differences between its terms are equal, their proportions will be unequal. On the contrary, I say that geometric division or proportionality is the one whose proportions, by virtue of the said middle term, are equal, while their differences are unequal.

[46] L'Harmonica poi chiamo quella, che col tal termine farà inequali<sup>7</sup> non solo le sue differenze, ma le sue proportioni ancora; di maniera che l'istessa proportione, che si troua tra esse differenze, si ritroui<sup>8</sup> etiando nelli suoi estremi termini; come qui sotto si vede.<sup>9</sup>

I call harmonic [proportionality], then, the one whose [middle] term causes inequality not only in the differences [between terms] but also in the proportions [between terms] in the way that the same proportion that is found between such differences is also found in its extreme terms, as is seen below.

<sup>7</sup> 1573, *L'Harmonica poi chiamo quella, che col tal termine farà inequali* reads *Ma quella si chiama Harmonica, nella quale tal termine farà inequali*. (But that [proportionality] which is called harmonic, whose [middle] term creates inequality).

<sup>8</sup> 1573, *ritroui* reads *ritrouerà*.

<sup>9</sup> 1573, *come qui sotto si vede* reads *si vede nell'esempio* (as can be seen in the example).

Arithmetica.	Geometrica	Harmonica.
Differenze equali.	Differenze inequali.	Differenze inequali.
2      1	2      1	2      1
4. Sesquiterza 3. Sesquialtera . 2	4. Dupla. 2. Dupla. 1	6. Sesquialtera. 4. Sesquiterza. 3
Proportioni inequali.	Proportioni equali.	Proportioni inequali.

Figure 35.1. Arithmetic, Geometric, and Harmonic proportions.

Name of Proportionality	Arithmetic	Geometric	Harmonic
Differences between first and second/ second and third terms	equal 1 and 1	unequal 2 and 1	unequal 2 and 1
Conflation of	sesquitertia and sesquialter	dupla and dupla	sesquialter and sesquitertia
Example	4:3:2	4:2:1	6:4:3
Proportions between first and second/ second and third terms	unequal	equal	unequal
Remarks			The proportion between the differences between the two pairs of terms, 2:1, is the same as the proportion between the extremes of the proportionality, 6:3, reduced to lowest terms.

Table 35.1. Clarification of Figure 35.1.

Diuidendosi adunque le proportioni  
regolatamente per vno delli modi mostrati,  
fa bisogno di mostrare separatamente in  
qual modo potemo facilmente ritrouare il  
termine mezano di ciascuna, il quale sia il  
suo Diuisore: però incominciando dalla  
prima, vederemo come si possa ritrouare il  
Diuisore Arithmetico, & in qual modo ogni  
proportione possa da lui esser diuisa.<sup>10</sup>

Proportions being thus properly divided  
according to one of the methods shown,  
we must demonstrate separately how we  
can easily find the middle term of each,  
which is its divisor. Thus, beginning  
with the first, we will see how it is  
possible to discover the arithmetic  
divisor, and in which way each  
proportion can be divided by it.

---

<sup>10</sup> 1573, *fa bisogno di mostrare separatamente in qual modo potemo facilmente ritrouare il termine mezano di ciascuna, il quale sia il suo Diuisore: però incominciando dalla prima, vederemo come si possa ritrouare il Diuisore Arithmetico, & in qual modo ogni proportione possa da lui esser diuisa* reads *vederemo prima come si possa ritrouare il Diuisore arithmetico: & in qual modo ogni proportione possa da lui esser diuisa: & dipoi, in qual maniera si possano ritrouargli altri per ordine* (we will first see how the arithmetic divisor can be found and how each proportion can be divided by it, and then, in what manner the [geometric and harmonic divisors] can be found).

Della Proportionalità, o Diuisione

arithmetica. / Cap. 36.

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Si potrà adunque<sup>1</sup> diuidere qual si voglia proportione secondo la proportionalità arithmetica, quando haueremo ritrouato vn Diuisore, il quale posto nel mezo de i termini della proportione da esser diuisa, diuiderà quella in tal maniera, che essendo le differenze delli termini (come si è detto) equali, le sue proportioni saranno inequali; di modo che tra li maggior numeri si ritroueranno le proportioni minori, & tra li minori le maggiori; cosa che solo appartiene alla proportionalità arithmetica. Questo potremo ritrouar facilmente, quando sommati insieme li termini della proportione proposta, diuideremo il prodotto in due parti equali:

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<sup>1</sup> 1573, *adunque* omitted.

On Arithmetic Proportionality or

Division / Chapter 36

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Any given proportion can be divided arithmetically once we have found a divisor which, when placed between the terms of the proportion to be divided, will divide it so that if the differences between the terms (as has been said) are equal, their proportions will be unequal. In this way, the smaller proportions can be found between the larger numbers and the larger [proportions can be found] between the smaller [numbers], something that only pertains to arithmetic proportionality. We will easily be able to discover this when, having added the terms of the proposed proportion together, we divide the result into two equal parts,

perciocche quel numero, che nascerà da tal diuisione sarà il ricercato Diuisore, che diuiderà secondo le sopradette conditione la detta proportione in due parti.

Nondimeno bisogna auertire,<sup>1</sup> che essendo la proposta proportione nelli suoi termini radicali, non si potrà osseruare il predetto modo: imperocche necessariamente sarà contenuta da numeri Contraseprimi, i quali sommati insieme ne daranno vn numero impare, che non si può diuidere in due parti equali, cioè in due numeri interi:

because that number which arises from such division will be the sought-after divisor, which will divide the said proportion into two parts according to the said conditions. Nonetheless, it is necessary to advise that since the proposed proportion is in its lowest terms, the aforementioned method cannot be observed. This is because [the proportion] must be by numbers that are prime with respect to each other. [Two prime numbers] added together will give an odd number which cannot be divided into two equal parts, that is, into two whole numbers.

---

<sup>2</sup> 1573, *Nondimeno bisogna auertire* reads *Bisogna però auertire*.

la onde volendo ritrouare tal diuisore, & schifare<sup>2</sup> i numeri rotti, che non sono riceuuti dall'arithmeticco, sempre raddoppiaremo li detti termini, & ne verranno due numeri pari, li quali no varieranno la prima proportione. Hora fatto questo sommando i detti numeri pari insieme, & diuidendo il prodotto in due parti equali, quello che ne verrà sarà il ricercato Diuisore. Et sia per essemplio, che noi volessimo diuidere la proportione Sesquialtera, contenuta tra questi termini radicali 3. & 2. secondo la diuisione arithmetica; essendo tai numeri Contraseprimi, si debbono raddoppiare:

---

<sup>3</sup> 1573, *schifare* reads *schiuare*.

Wishing, thus, to find such a divisor, and to avoid mixed numbers,<sup>A</sup> which are not recognized by arithmeticians, we will always double the said terms, and two even numbers will result, which will not change the first proportion. Now, having [doubled each term], by adding the said even numbers together, and dividing their product into two equal parts, the sought divisor will result. And if, for example, we wish to divide arithmetically the sesquialter proportion contained between these lowest terms, 3 and 2, since [3 and 2] are prime with respect to each other, they must be doubled.

---

<sup>A</sup> Mixed numbers, quantities that are whole numbers plus a fraction, cannot be expressed as integers, e.g. 1 - 1/2.

il che fatto haueremo 6. & 4. continenti la Sesquialtera; i quali sommati insieme, ne verrà 10. che diuiso in due parti equali ne darrà 5. Onde dico che il 5. sarà il Diuisore della proposta proportione: Imperoche oltra che costituisce in tal proportionalità le differenze equali, diuide ancora la proportione (si come è il propio di tal proportionalità) in due proportioni inequali, in tal maniera, che tra li maggiori numeri si ritroua la proportion minore;

This done, we will have 6 and 4, which contain the sesquialter; these [6 and 4] added together will yield 10, which, divided into two equal parts, will give 5. Thus I say that 5 is the [arithmetic] divisor of the proposed proportion, because beyond constituting equal differences in such proportionality, it also divides the proportion (as is the characteristic of such proportionality) into two unequal proportions in such a manner that between the larger numbers the smaller proportion is found,

& per il contrario tra li minori la maggiore;  
 come tra 6. & 5. la Sesquiquinta; & tra 5. &  
 4. la Sesquiquarta; come qui si vede.<sup>4</sup>

and on the contrary, between the smaller  
 [numbers] the larger [proportion is  
 found], as between 6 and 5, the  
 sesquiquinta, and between 5 and 4, the  
 sesquiquarta, as we see here:

---

<sup>4</sup> 1573, *come qui si vede* reads *come qui si vede nell'esempio* (as can be seen in the example). 1573 adds, *E ben vero, che questa piu tosto si chiamerà Progressione, che Proportionalità: essendo che incominciando dal minimo termine & venendo al mezano: & da questo al maggiore: si procede con equali differenze: percioche sempre si troua la Vnità, ouero il Binario, o il Ternario: oueramente altro numero, che è la detta differenza* (It is quite true that this should rather be called progression rather than proportionality, since starting with the smaller term and coming to the middle, and from this to the larger, one proceeds with equal differences, because one always finds 1, or 2, or 3, or another number that is the said difference) was added.

[47]

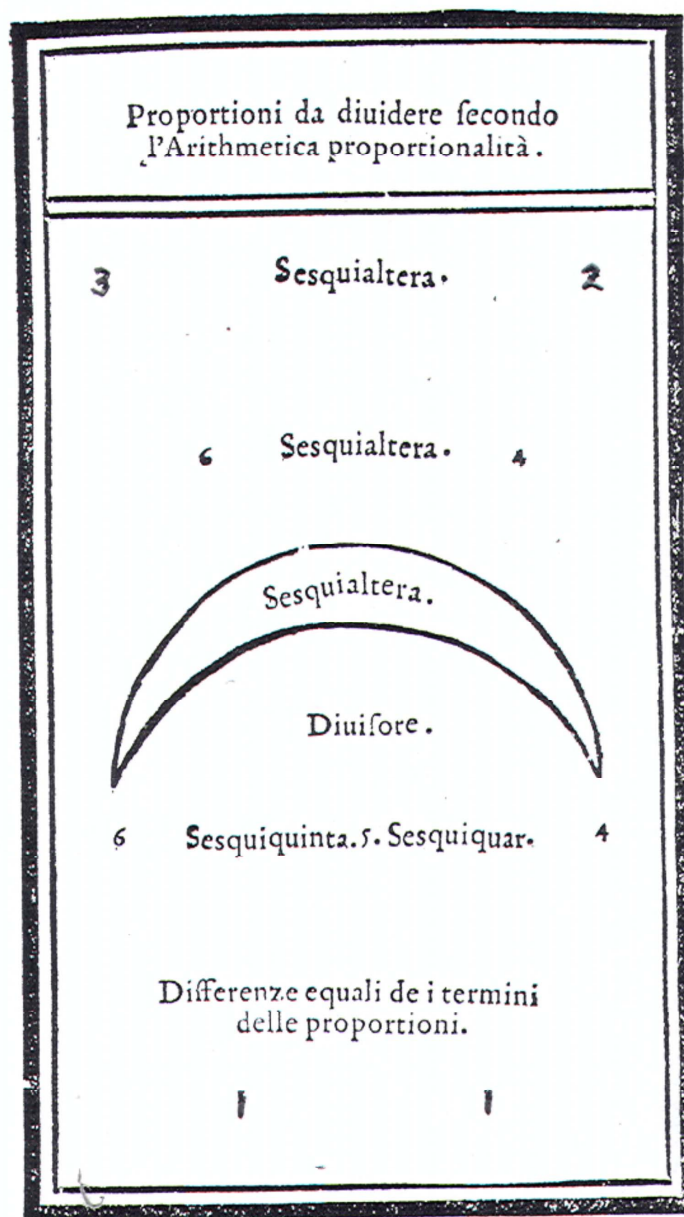


Figure 36.1. Arithmetic division of the sesquialter.

Description	Numerical Expression	Value
Sesquialter in lowest terms, which are prime with respect to each other	3:2	$1 - \frac{1}{2}$
Doubling each term of the sesquialter does not change its value.	6:4	$1 - \frac{1}{2}$
Arithmetic divisor (half the sum of the terms)	5	
Arithmetic proportionality	6:5:4	
Difference in terms of the two proportions formed by the arithmetic divisor	$6 - 5$ $5 - 4$	1 1
Sesquiquinta, the proportion formed by the larger terms of the proportionality 6:5:4	6:5	$1 - \frac{1}{4}$
Sesquiquarta, the proportion formed by the smaller terms of the proportionality 6:5:4	5:4	$1 - \frac{1}{3}$
Between the larger numbers of the arithmetic proportionality the smaller proportion is found; between the smaller numbers, the larger proportion is found.	$6:5 < 5:4$	$1 - \frac{1}{4} < 1 - \frac{1}{3}$

Table 36.1. Clarification of Figure 36.1.

Della Diuisione, o Proportionalità

Geometrica. / Cap. 37.

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La divisione Geometrica si fa, quando il Diuisore è collocato in tal modo tra gli estremi di alcuna proportione, che serba le conditioni toccate nel capitolo precedente. Onde è da sapere, che ogn'altra Proportionalità è di tal natura, che solamente diuide la proposta proportione in due parti inequali: ma il propio della Geometrica è diuiderla sempre in due parti equali;

On Geometric Division or

Proportionality / Chapter 37

-----

Geometric division occurs when the divisor is placed between the extremes of any proportion in such a way that the conditions touched upon in the previous chapter are observed. Therefore, it is understood that whereas every other [type of] proportion[ality] is such that it lends itself to the exclusive division of any proportion into two unequal parts, the property of geometric [proportionality] is always to be divided into two equal [proportions].

dal quale effetto è detta propriamente Proportionalità: conciosia che tra li suoi termini maggiori, & tra li minori ancora<sup>1</sup> siano le proportioni equali; & il prodotto del Diuisore moltiplicato in se stesso è equale al prodotto de gli estremi termini di detta Proportionalità, tra loro moltiplicati. Ma per ritrouare tal Diuisore osseruaremo questa regola: proposto che haueremo qual si voglia Proportione da diuidere, contenuta nelli suoi termini radicali, per schiuar la lunghezza dell'operare, la fatica, & i molti errori che occorrono,<sup>2</sup> primieramente moltiplicheremo quelli l'vn con l'altro; dipoi caueremo la Radice quadrata del prodotto, la quale sarà vn numero, che moltiplicato in se stesso, renderà di punto tal prodotto; & tal Radice sarà il ricercato Diuisore.

This effect is properly called [geometric] proportionality because the proportions between its larger and smaller terms are equal and the product of the divisor multiplied by itself is equal to the product of the extreme terms of the said proportion when multiplied together. But in order to discover such a divisor we will observe this rule: suppose that we have to divide any given proportion, reduced to its lowest terms. In order to avoid a long and laborious operation, fatigue, and the many errors that [might] occur, we will first multiply those [terms] with each other. Then we will extract the square root of the product, which will be a number that, multiplied by itself, will immediately yield this product, and this root will be the sought-after divisor.

---

<sup>1</sup> 1573, *ancora* omitted; reads *& tra le differenze delle suoi termini*. (and between the differences of their terms)

<sup>2</sup> 1573, *possono* added.

<sup>3</sup> 1573, *douemo* reads *dobbiamo*.

Et accioche più facilmente io sia inteso  
 verrò all'esempio. Poniamo la Quadrupla  
 proportione contenuta nelli suoi termini  
 radicali 4. & 1; volendola noi diuidere  
 Geometricamente, douemo<sup>3</sup> prima  
 multiplicar li detti termini l'vno per l'altro,  
 & cosi haueremo 4. dipoi pigliata la sua  
 Radice quadrata, che sarà 2. diremo tal  
 numero essere il Diuisore geometrico di tal  
 proportione: percioche il prodotto, che  
 viene dalla multiplicatione di se stesso, è  
 equale à quello, che nasce dalla  
 multiplicatione de i proposti termini  
 moltiplicati tra loro: conciosia che tanto  
 rende il 4. moltiplicato per la vnità, quanto  
 il 2. moltiplicato in se stesso; come nella  
 figura si vede.<sup>4</sup>

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<sup>4</sup> 1573, *come nella figura si vede* omitted.

In order to be more easily understood I  
 will offer an example. Let us take the  
 quadruple proportion contained between  
 its lowest terms, 4 and 1. Wishing to  
 divide it geometrically, we must first  
 multiply the said terms with each other,  
 and thus we will have 4. Then, having  
 extracted its square root, which is 2, we  
 will call this number the geometric  
 divisor of said proportion, because its  
 product, which comes from its  
 multiplication by itself, is equal to that  
 which arises from the multiplication of  
 the proposed terms between themselves,  
 because 4 multiplied by 1 yields as  
 much as 2 multiplied by itself, as is  
 shown in the diagram.<sup>A</sup>

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<sup>A</sup> See Figure 37.1.

La Quadrupla adunque è diuisa in due parti  
 equalmente da tal Diuisore; cioè in due  
 Duple; l'vna delle quali si ritroua essere tra  
 4. & 2; & l'altra tra 2. & 1.

The quadruple [proportion], then, is  
 [geometrically] divided into two equal  
 [proportions] by this divisor, that is, into  
 two duples, one of which is to be found  
 between 4 and 2, and the other, between  
 2 and 1.

[48]

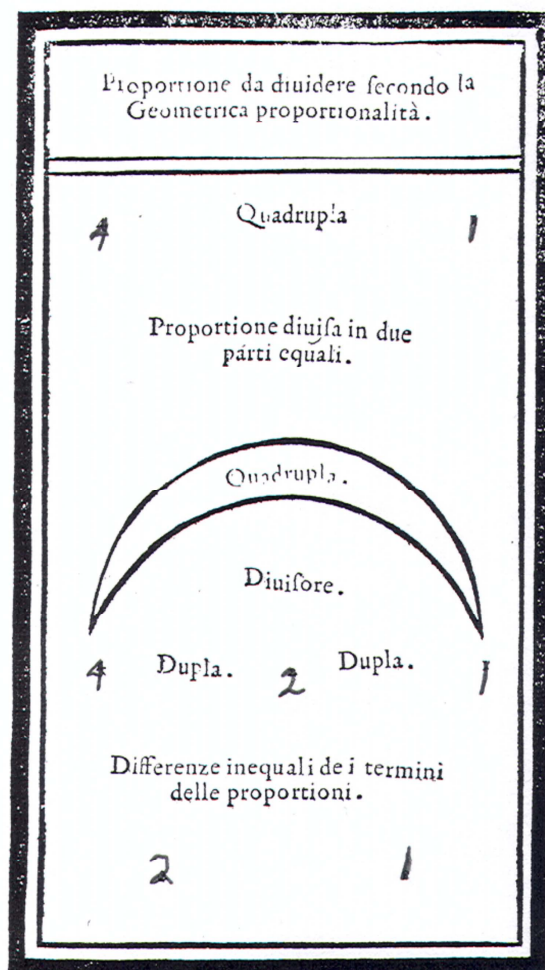


Figure 37.1. The Geometric Divisor of the Quadruple Proportion is 2.

Ma bisogna auertire, quantunque il propio della proportionalità Geometrica sia il diuidere qual si voglia proportione in due parti equali, che questo si fa vniuersalmente nella quantità continua: imperoche nella discreta tutte le proportion [sic] non sono diuisibili per tal modo: conciosia che li numeri non patiscono la diuisione della vnità. Onde si come è impossibile di poter diuidere rationalmente alcuna proportione in due parti equali, la quale sia contenuta nel genere Superparticolare; come affermano Boetio nella sua Musica, & Giordano nella sua Arithmetica;<sup>5</sup> per non cader tra li suoi termini altro numero, che la vnità, la quale non si può diuidere;

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<sup>5</sup> 1573, & per quello, ch'io dimostrai nella Nona del Primo delle Dimostrazioni [Harmoniche] (and for this, as I showed in the ninth [book] of the first [part] of *Dimostrazioni [Harmoniche]* inserted. Zarlino's marginal note: *Lib.9. p. 61.*

But one must be aware, although the characteristic of the geometric proportion is its division of any given proportion into two equal [proportions], that this is always done in the continuous quantity. In the discrete [quantity] all the proportions are not divisible in this way, because [among these] numbers, 1 cannot be divided. Thus, as it is impossible to be able to divide rationally any proportion that belongs to the superparticular genus into two equal [proportions], as Boethius affirms in *On Music*, and Giordano in *On Arithmetic*, because no other numbers fall between its terms other than 1, which cannot be divided;

---

<sup>B</sup> i.e., the superpartient, multiple superparticular, and multiple superpartient genera.

così sarà impossibile di divider quelle de  
 gli altri generi, che sono dopo questo:  
 essendo che quelle, le quali si possono  
 divider, sono contenute nel genere  
 Multiplice, & hanno<sup>6</sup> in vno de i loro  
 estremi vn numero Quadrato, & nell'altro  
 la Vnità; & così sono capaci (come afferma  
 lo stesso Giordano) di tal diuisione. Si che  
 dalla proportionalità Geometrica potemo  
 hauere due diuisioni, cioè la Rationale, &  
 la Irrationale. La Rationale dico, che è  
 quella, che si fa per via de i numeri  
 rationali, di modo che il suo Diuisore sia di  
 punto la Radice quadrata del prodotto della  
 multiplicatione de i termini di alcuna  
 proportione moltiplicati tra loro;

so it will be impossible to divide  
 [proportions] of other genera which  
 occur after this.<sup>B</sup> This is because those  
 [proportions] that can be divided belong  
 to the multiple genus, and have a square  
 number as one of their extremes and 1 as  
 the other [extreme], and thus are capable  
 (as the same Giordano affirms) of such  
 division. Furthermore, in the geometric  
 proportion we can have two divisions,  
 that is, rational and irrational. I say that  
 rational [geometric division] is that  
 which is made by means of rational  
 numbers in such a way that the divisor is  
 exactly the square root of the product of  
 the multiplication of the terms of any  
 proportion,

---

<sup>6</sup> 1573, per il Corollario della Ventesima seconda  
 del Secondo delle nominate Dimostrazioni in  
 parentheses, (according to the corollary of the  
 twenty-second [chapter] of the second [part] of the  
 aforementioned *Dimostrazioni*) inserted.

et le parti di tal diuisione si possono denominare, si come è la mostrata contenuta tra questi termini 4. 2. 1. Ma la irrationale è quella,<sup>7</sup> che si fa per via di misure, & ancora di numeri, i quali si chiamano Sordi & Irrationali: percioche tal diuisione à modo alcuno ne si può fare, ne meno circoscriuere con numeri rationali, o misure simili; & questo accade, quando dal prodotto non potemo<sup>8</sup> hauer la sua Radice di punto; si come per essemplio auerrebbe, quando volessimo diuidere in tal modo vna Sesquialtera:

and the parts of such division can be named, as is that [proportion] which is shown [to be] contained among the terms 4, 2, and 1. But the irrational [geometric division] is that which is done by way of measures or numbers that are called surd and irrational because such division can neither be done nor even circumscribed with rational numbers or similar measures in any way. And this occurs when we cannot obtain the [square] root of the product exactly. For example, [this would happen] if we wished to divide a sesquialter in this way,

---

<sup>8</sup> 1573, *potemo* reads *potiamo*.

<sup>7</sup> 1573, *Ma la irrationale è quella* reads *& la irrationale, che è quella*.

<sup>8</sup> 1573, *potemo* reads *potiamo*.

perciocche allora moltiplicati tra loro i termini, che sono 3. & 2; dal 6. che sarà il prodotto, non si potrà cauare tal radice, cioè non si potrà hauere vn numero, che moltiplicato in se stesso faccia 6. E ben vero che tal numero si potrà denominare secondo il costume de i Mathematici in questo modo, dicendo Radice 6. cioè la Radice quadrata, che si potesse cauar di questo numero, quando fusse possibile; & questo sarebbe il suo Diuisore:

because then the multiplication of its terms, 3 and 2, will be 6, a product from which it is impossible to extract a [rational square] root; i.e., it will be impossible to have a [rational] number that multiplied by itself yields 6. It is quite true that such a number can be calculated according to the custom of mathematicians in this way, calling it “root 6,” that is, the square root of 6, which can be extracted from this number, if possible, and this would be its divisor.

ma tal Radice, o numero, che si vede nel sottoposto essemplio,<sup>9</sup> per la ragione detta sempre si nominerà Sorda, & Irrationale. Et perche non si può hauer la radice rationale di tal numero, però le parti di questa diuisione non si possono denominare, o descriuere; ancora che li suoi estremi siano compresi da numeri Rationali. Onde tal diuisione, per le ragioni dette si chiamerà sempre Sorda, & Irrationale; &<sup>10</sup> dal Musico non è considerata.<sup>11</sup>

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<sup>9</sup> 1573, *che si vede nel sottoposto essemplio* omitted.

<sup>10</sup> 1573, & reads *laquale* (which).

<sup>11</sup> 1573, *se non per accidente: come altroue son per dimostrare* (if not by accident, as is otherwise demonstrated) added.

However, for this reason, such a root or number, as we can see in the example below, will always be called surd or irrational.<sup>c</sup> And because one cannot have a rational [square] root of such a number, the parts of this division cannot be calculated or described, although its extremes are comprised of rational numbers. Thus such division, for the said reasons, will always be called surd, and irrational, and is not considered by the musician.

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<sup>c</sup> See Figure 37.2.

[49]



Figure 37.2. The Geometric Divisor of the Sesquialter is the Square Root of 6.

N.B.  $\mathcal{R}$ . is the symbol for “square root.”

In qual modo si possa cauare la Radice quadrata da i numeri.<sup>1</sup> / Cap. 38.

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Vederemo hora in qual modo si possa cauare la Radice quadrata da i numeri; Però descritto<sup>2</sup> il numero del quale vorremo la Radice, incominciaremo dalla prima figura posta a banda destra del predetto numero, ponendoli sotto vn punto; il che fatto, lassando<sup>3</sup> quella figura che segue, porremo sotto la terza vn'altro punto, & cosi sotto la quinta per ordine, lassando<sup>4</sup> sempre vna figura, quando fossero molte. Dipoi incominciando dall'ultimo punto posto a banda sinistra, trouaremo vn numero Quadrato, che sia eguale a tutto il numero, che si ritroua dal punto indietro, verso la parte sinistra: ouer li sia più vicino; pur che non lo auanzi;

---

<sup>1</sup> 1573, *i numeri* reads *vn proposto numero* (a given number).

<sup>2</sup> 1573, *Però descritto* reads *Descritto adunque*.

<sup>3</sup> 1573, *lassando* reads *lasciando*.

<sup>4</sup> 1573, *lassando* reads *lasciando*.

In What Manner the Square Roots of Numbers may be Extracted / Chapter 38

---

We will now see how the square root may be extracted from numbers. Once the number whose [square] root we wish [to extract] is written, we shall begin with the first digit that is on the right side of the given number, placing a dot underneath it; this done, skipping the digit [on its left], we will place another dot under the third [digit from the right], and so under the fifth in order, always skipping a digit when there are many [digits]. Then, beginning with the last dot on the left side, we will find a square number that is equal to the entire number that is found left of the dot, or [the square number] that is closest to it, but does not exceed it.

la Radice del quale porremo sotto il detto punto; & cauaremo il quadrato dal numero posto dall'vltimo punto indietro; & quello che auanzasse porremo sempre sopra questo numero. Raddoppiaremo oltra di questo la Radice, che fu posta sotto il punto; & quello che nascerà porremo sotto la figura, che segue immediatamente dopo tal punto dalla parte destra; accommodando le figure di mano in mano verso la sinistra. Fatto questo, vederemo quante volte il doppio della Radice è contenuto da quel numero, che è posto sopra la Radice & il suo doppio; & il risultante, che sarà la Radice d'vn'altro numero Quadrato, porremo sotto il punto seguente, moltiplicandolo col risultante del raddoppiato, & cauando<sup>5</sup> il prodotto dal numero posto disopra.

We will place its square root underneath the said dot, and we will subtract the square of this number from the number placed on the left of the dot, and we will always place what remains above this number. We will then double the root that was placed below the dot, and we will place the result below the digit that immediately follows the dot on the right, writing the digits one by one from right to left. This done, we will see how many times the double of the root is contained in that number that is placed over the root and its double, and the result, which will be the root of another square number, we will place under the following dot, multiplying it by the result of the doubling, and subtracting its product from the number placed above.

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<sup>5</sup> 1573, *cauando* reads *cauandone*.

Ma bisogna auertire, che auanzi vn numero, il quale sia equale al numero Quadrato di questa Radice, accioche sottratto l'vno dell'altro auanzi nulla: Percioche haueremo a punto la vera radice quadrata del proposto numero, che sarà contenuta tra le radice delli Quadrati, che sono sottoposte alli punti. Et se auanzasse vn numero, che fusse maggior del Quadrato; allora non si potrebbe hauere se non la Radice irrationale & sorda, nel modo che altroue hò dimostrato<sup>6</sup> & sarà dibisogno ricorrere alla Quantità continoua, operando nel modo che nella seconda parte son per mostrare.<sup>7</sup>

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<sup>6</sup> 1573, *che altroue hò dimostrato* reads *detto di sopra*.

<sup>7</sup> 1573, & *si come nella Decima & nella vndecima del Terzo delle Dimostrationsi hò dimostrato* (and as I showed in the tenth and eleventh propositions of the third argument of *Dimostrationsi [harmoniche]*).

But we must caution that should a number remain which is equal to the square of this root, so that one subtracted from the other yields nothing, we would have, then, the true square root of the proposed number, which will be contained between the roots of the squares that are placed under the dots. And should a number result that is greater than the square, then it is only possible to have a root that is irrational and surd, in the way that I showed elsewhere, and it will be necessary to have recourse to the continuous quantity, functioning in the way that I will show in the second part [of *Le istituzioni harmoniche*].

Et perche è cosa molto difficile trattar questa materia in vniuersale, però verremo ad uno essemplio particolare, accioche si possa comprendere quello che si è detto. Poniamo adunque che si volesse cauar la Radice quadrato di 1225. [50] dico primieramente douemo<sup>8</sup> porre vn punto sotto la prima figura posta a banda destra, che è il 5; dipoi lassando la seconda, che segue, faremo<sup>9</sup> vn'altro punto sotto la terza; cioè sotto il 2: il che fatto trouaremo vn numero Quadrato, che sia equale, o poco meno del 12; & sarà il 9. del quale il 3. è la sua Radice. Questa accommodaremo primamente sotto il punto posto dalla parte sinistra; cioè sotto il 2:

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<sup>8</sup> 1573, *douemo* reads *dobbiamo*.

<sup>9</sup> 1573, *faremo* reads *fare*.

And because it is very difficult to treat this matter in general, we will look at a particular example, so that we may understand what has been said. Suppose that we wish to extract the square root of 1,225.<sup>A</sup> I say that first we must place a dot under the first digit on the right, which is 5. Then skipping the second [digit from the right], we will place another dot under the third, that is, under the 2. This done, we will find a square number that is equal to or a little less than 12, and this will be 9, whose [square] root is 3. This [3] we will first put under the dot placed on the left side, that is, under the 2.

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<sup>A</sup> Table 38.1, page 458, clarifies Zarlino's procedure.

dipoi cauaremo il 9. di 12. & resterà 3; il quale porremo sopra il 2. puntato, accompagnandolo col 2. non puntato, & haueremo 32. Raddoppiando hora la Radice, cioè il 3. posto sotto il punto, haueremo 6; ilquale accommodaremo sotto il 2. non puntato, & vederemo quante volte sia contenuto dal 32; & saranno 5. & auanzerà 2. Questo dipoi accompagnato col 5. puntato ne darà 25; ilquale essendo pari al 25. che è il numero Quadrato, che nasce dal 5. che è la sua Radice, ne darà a punto quello che si ricerca cioè la Radice che sarà 35.

Then we will subtract the 9 from 12, and 3 will remain, which we will place over the dotted 2, accompanying it with the 2 that is not dotted, and we will have 32. Now doubling the root, 3, placed under the dot, we will have 6, which we will put under the 2 that is not dotted, and we will see how many times [6] is contained in 32, which is 5 with a remainder of 2. This [remainder], then, accompanied with the 5 that was dotted, will give 25; this being equal to 25, the square of its root, 5, will give exactly what we seek, that is, the [square] root [of 1,225], which will be 35.

Porremo adunque questa seconda Radice sotto il 5. puntato; & cauando del 32. il 30. che nasce dalla moltiplicatione di tal Radice, col doppio della prima, resterà 2; il quale col 5. puntato dice 25; come habbiamo detto: & cosi cauando da questo il 25. che è il secondo numero Quadrato, resterà nulla; & haueremo a punto la radice quadrata del proposto numero, la quale, secondo ch'io hò detto, è 35. che si ritroua sotto li punti del sottoposto essemplio: conciosia che moltiplicato il 35. in se, rende a punto 1225. che è il suo Quadrato.

We will then place this second [square] root under the 5 that was dotted, and subtracting from 32 the 30 that arises from the multiplication of such root with the double of the first, 2 will remain, which with the 5 that was dotted, reads 25, as we have said; and thus subtracting from this the 25 which is the second squared number, nothing remains, and we will have the exact square root of the proposed number, which, according to what I said, is 35, which is found under the dots of the example below, because when 35 is multiplied by itself, 1,225 results, which is its square.

$$\begin{array}{r}
 \circ \\
 \circ \quad 3 \quad \circ \quad \circ \\
 \text{I} \quad 2 \quad 2 \quad 5 \\
 \cdot \quad 6 \quad \cdot \\
 \text{Radice quadrata} \quad 3 \quad \quad 5 \quad \text{del proposto numero}
 \end{array}$$

Figure 38.1. Extracting the Square Root of 1,225.

Step		
1	Write the number whose square root we wish to extract.	1225
2	Place a dot under the first digit on the right.	1225 .
3	Skipping the second from the right, place another dot under the third from the right.	1225 . .
4	Beginning with the last dot on the left, find a square number that is equal to the entire number found left of the dot, or the square number that is closest to it, but does not exceed it.	9 is the closest square number that does not exceed 12.
5	The square root of 9	3
6	Place this square root under the said dot.	1225 . 3
7	Subtract the square of this number from the number placed on the left of the dot.	$12 - 9 = 3$
8	Place what remains above this number.	3 1225 . 3
9	Accompany 3 with the 2 that is not dotted.	32
10	Double the root that was placed before the dot.	$3 \times 2 = 6$
11	Place the result below the digit that immediately follows the dot on the right.	3 1225 . 6 . 3
12	6 is contained 5 times in 32, with a remainder of	2
13	This remainder, accompanied with the 5 that was dotted	25
14	Its square root	5
15	Place this second square root under the 5 that was dotted.	3 1225 . 6 . 3 5
16	Multiply 5 by 6, the double of the first square root.	30
17	Subtract 30 from 32	2
18	Combine 2 with 5 (see step 13)	25
19	Subtract 25, the second squared number, from this	0
20	The exact square root of 1225	35

Table 38.1. Extracting the Square Root of 1,225, Step By Step.

Della Diuisione, ouero Proportionalità  
harmonica. / Cap. 39.

-----

La Divisione, ouero Proportionalità  
harmonica si fa, quando tra i termini di  
alcuna proportione si hà collocato vn  
Diuisore in tal maniera, che oltra le  
conditioni toccate nel cap. 35. tra i termini  
maggiori si ritrouino le proportioni  
maggiori, & tra li minori le minori:  
proprietà che solamente si ritroua in questa  
proportionalità; la quale è detta  
propriamente Mediocrità: imperoche ne i  
suoni, la chorda<sup>1</sup> mezana di tre chorde  
tirate sotto la ragione delli suoi termini,  
partorisce con le sue estreme chorde quel  
soaue concento, detto Harmonia.

On Harmonic Division or  
Proportionality / Chapter 39

-----

Harmonic division or proportionality is  
made when a divisor is inserted between  
the terms of any proportion so that,  
according to the conditions touched  
upon in Chapter 35, larger proportions  
are found between the larger terms of  
the proportions and smaller proportions  
between the smaller [terms], a property  
that is found only in this proportionality,  
which is properly called “mediation,”  
because among sounds, the middle of  
three strings whose lengths correspond  
to the ratio of the terms [of this  
proportionality], together with the  
strings corresponding to its extremes,  
gives rise to that sweet sound called  
harmony.

---

<sup>1</sup> 1573, *chorda* omitted.

Onde Pietro d'Abano,<sup>2</sup> commentatore de i Problemi di Aristotele molto ben disse, che Il mezo è quello, che genera l'harmonia. Tal Diuisore adunque potremo facilmente ritrouare, quando pigliati li termini radicali di quella proportione, che vorremo diuidere, li diuideremo primamente per la Proportionalità Arithmetica; dipoi moltiplicati gli estremi suoi termini per il termine mezano; i prodotti verranno ad essere gli estremi dell'Harmonica: & medesimamente moltiplicato il maggiore col minimo, si verrà a produrre il mezano di tal Proportionalità, cioè il Diuisore:

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<sup>2</sup> 1573, Zarlino's marginal note: *Probl. par. 19* (Petrus de Abano, *Exposition on the Problems of Aristotle*, 19)..

Thus, Petrus de Abano,<sup>A</sup> commentator of Aristotle's *Problems*, said very well that "the middle is what generates harmony." We can easily discover such a divisor when, taking the extremes of that proportion (in lowest terms) we wish to divide, we divide them first according to arithmetic proportionality. Once their terms are multiplied by the middle term its products will come to be the extremes of the harmonic [proportion], and similarly multiplying the largest [term] by the smaller [term] will come to produce the middle of such proportionality, that is, the divisor,

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<sup>A</sup> Petrus de Abano (1257 - c. 1315), an Italian scholastic, translated Greek medical texts of Hippocrates, Galen, and others into Latin. His major work, the *Conciliator differentiarum* (*Reconciler of the Differences Between Philosophers and Physicians*) represents his attempt to answer medical questions through a synthesis of Greek, Arabic, Jewish, and Latin authorities, including Aristotle, Avicenna, and Averroës.

perciocche tali termini verranno ad esser collocati sotto le conditioni narrate disopra. Adunque se noi vorremo diuidere harmonicamente vna Sesquialtera, contenuta tra questi termini radicali 3. & 2; la diuideremo prima Arithmeticamente, secondo il modo mostrato nel cap. 36;<sup>3</sup> & haueremo tal proportionalità tra questi termini 6. 5. 4. Ridurremo dipoi questa all'harmonica, moltiplicando il 6. & il 4. per il 5: dipoi<sup>4</sup> il 6. per il 4. & haueremo da i prodotti la diuisione ricercata, contenuta tra questi termini 30. 24. 20; come nella figura seguente si vede.

because such terms come to be placed under the conditions mentioned above. Thus, if we wish to divide a sesquialter, whose lowest [possible] terms are 3 and 2, harmonically, we will first divide it arithmetically, according to the method shown in Chapter 36, and we will have such proportionality between the terms 6, 5, and 4. Then we will reduce this to the harmonic [proportion], multiplying 6 and 4 by 5, and then 6 by 4, and from the products we will have the division sought, contained between the terms 30, 24, and 20, as the following diagram shows.

---

<sup>3</sup> 1573, *nel cap. 36* reads *di sopra*. Zarlino adds the marginal note, *Capit. 36*.

<sup>4</sup> 1573, *dipoi* reads &.

[51]

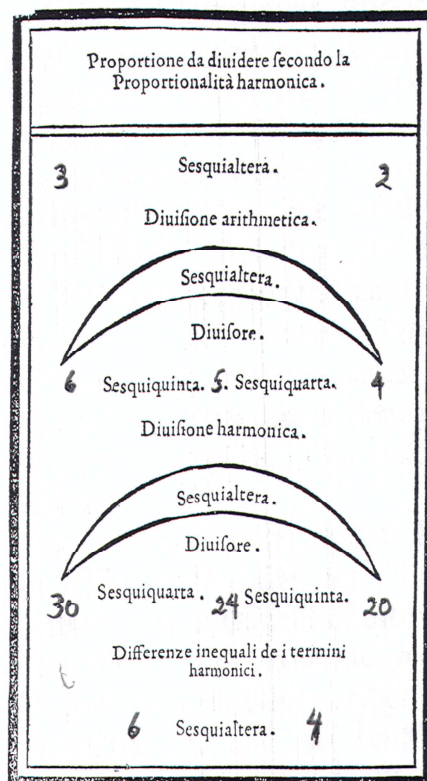


Figure 39.1. Harmonic Proportion of Numbers.

	Description	Numerical Expression	Value
1	Sesquialter in lowest terms	3:2	1 - 1/2
2	Arithmetic division of sesquialter (see Table 36.1)	6:5:4	
3	Multiply the extremes by the middle term	6 x 5 4 x 5	30 20
4	Multiply the largest term of the arithmetically divided sesquialter by the smallest term	6 x 4	24
5	Resultant proportion, the harmonic division sought	30:24:20	
6	Proportions between 6 and 4, and 30 and 20, are equal	6:4 = 30:20	1 - 1/2
7	Larger proportions are found between larger terms; smaller proportions are found between smaller terms.	30:24 > 24:20	1 - 1/4 > 1 - 1/5

Table 39.1. Clarification of Figure 39.1.

N.B. The proportion in Zarlino's Step 5 is not in lowest terms.

Imperochè tanta è la proportione, che si ritroua tra 6. & 4. che sono le differenze de i termini harmonici, quanta è quella, che si troua tra 30. & 20. che sono gli estremi della Sesquialtera, che si hauea da diuidere; la qual resta diuisa in vna Sesquiquarta contenuta tra 30. & 24. & in vna Sesquiquinta contenuta tra 24. & 20. Et così tra i termini maggiori si ritrouano le proportioni maggiori, & tra i minori le minori; come è il proprio di tal proportionalità.

Thus, the proportion that is found between 6 and 4, which are the differences between the harmonic terms, is equal to what is found between 30 and 20, the extremes of the sesquialter that was to be divided. This is divided into a sesquiquarta contained between 30 and 24, and a sesquiquinta between 24 and 20. And thus, the larger proportions are found between the larger terms, and the smaller [proportions] between the smaller [terms], as is proper to such proportionality.

Consideratione sopra quello che si è detto  
intorno alle Proportioni & Proportionalità /  
Cap. 40.

-----

Non è dubbio alcuno, essendo la  
Proportione (come altre volte hò detto<sup>1</sup>)  
Relatione di vna quantità ad vn'altra, fatta  
sotto vno istesso genere propinquo, che ella  
non si possa considerare se non in due  
modi solamente. Prima, in quanto vna  
quantità numera, ouero è numerata  
dall'altra; dipoi in quanto l'vna dall'altra è  
misurata: Di maniera che da questo primo  
modo hanno origine le proportioni, et le  
proportionalità arithmetiche; & dal secondo  
le Geometriche.

A Consideration of What has been Said  
about Proportions and Proportionality /  
Chapter 40

-----

There is no doubt – since proportion, as I  
have said elsewhere, is the relationship of  
one quantity to another made within the  
same genus<sup>A</sup> – that [proportion] can only  
be considered in two ways: first, insofar  
as one quantity contains or is contained  
in another quantity; [second], insofar as  
one [quantity] is measured by the other.  
From the first way, arithmetic  
proportions and proportionality originate,  
and from the second, geometric  
[proportions and proportionality] arise.

---

<sup>A</sup> See Chapter 22.

Essendo adunque due modi, & non più, da i quali nascono queste due sorti di proportioni, & proportionalità; veramente ogn'altra dipende, et<sup>2</sup> hà il suo essere da loro. Onde essendo l'harmonica proportionalità<sup>3</sup> molto differente dalle due nominate, necessariamente viene ad esser composta di queste due. Et benchè si veda esser diuersa &<sup>4</sup> dall'vna, & dall'altra; è nondimeno ad esse in tal modo congiunta, che quella varietà, che hanno insieme le due toccate disopra, con giocunda varietà<sup>5</sup> in essa è moderata:

Since there are two, and only two, ways in which these two kinds of proportions and proportionality originate, any other [type] truly depends on them, and derives its essence from them. Thus, although harmonic proportionality is much different from the previous [types], it must be composed of these two [types]. And while it is different from the others, it is nonetheless connected to them in such a way that the essence of that variety which the two aforementioned [types] possess is moderated with great marvelousness,

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<sup>1</sup> 1573, Zarlino's marginal note: *Supra, Capit. 22* (above, Chapter 22).

<sup>2</sup> 1573, *dipende* reads *proportione & proportionalità*; *et* omitted.

<sup>3</sup> 1573, *proportionalità* reads *come vedemmo* (as we shall see).

<sup>4</sup> 1573, & omitted.

<sup>5</sup> 1573, *giocunda varietà* reads *gran marauiglia*.

perciocche si vede tallora essere lontana dall'Arithmetica, & accostarsi alla Geometrica; & tallora per il contrario: Similmente alle volte si vede con mirabilissimo ordine assigliarsi all'vna, & all'altra; & dall'vna, & dall'altra tallora esser molto differente. Di modo che quantunque bene mancassero altre ragioni, da questo solo si può credere, & conoscere,<sup>6</sup> che ella si habbia acquistato<sup>7</sup> il nome di Harmonica proportionalitate.<sup>8</sup> Ne, per dire, che ella sia composta delle due nominate, debbe parere strano ad alcuno:

because it can be seen in some cases to be far from the arithmetic and closer to the geometric, and in other cases the contrary [holds true]. Similarly, at times one sees [harmonic proportionality] resemble [arithmetic] or [geometric proportionality] with most marvelous order, although it is very different from them. In this way, no matter what other reasons may be lacking, from this alone it is possible to believe and to know what is called "harmonic proportionality." Nor if we said that it is composed of the other two [types of proportionality], would this look strange to anyone,

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<sup>6</sup> 1573, *può credere, & conoscere* reads *potrà conoscere*.

<sup>7</sup> 1573, *acquistato* omitted.

<sup>8</sup> 1573, *proportionalitate* reads *meritamente acquistato* (deservedly acquired).

perciocche il Musico (come altroue hò detto) piglia non solo dall'Arithmetica i Numeri; ma dalla Geometria ancora piglia le altre Quantità.<sup>9</sup> Et si come il puro Mathematico considera l'vna, & l'altra quantità, come lontana dalla materia, se non in quanto al loro essere, almeno in quanto alla loro ragione; così il Musico, per non essere puro mathematico, considera non solo la forma, ma la materia ancora delle Consonanze; cioè le Voci, & i Suoni come la materia, & li Numeri, & Proportioni come la forma. Ma perche (come altroue hò detto<sup>10</sup>) le ragioni delle Voci, & de i [52] Suoni graui & acuti non si possono sapere, se non col mezo di alcun Corpo sonoro, il quale è sottoposto alla<sup>11</sup> quantità continua:

because the musician (as I said elsewhere<sup>B</sup>) not only takes numbers from arithmetic, but also takes the other quantities<sup>C</sup> from geometry. And just as the pure mathematician considers both [the discrete and continuous] quantities to be far from the material—if not in their essence, at least in their reason—so the musician, so as not to be a pure mathematician, considers not only the form, but also the matter of consonances, that is, the vocal and instrumental sounds as matter, and numbers and proportions as form. But because (as I said elsewhere<sup>D</sup>) the ratios of low and high vocal and instrumental sounds cannot be known if not by means of a sounding body that belongs to the continuous quantity,

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<sup>9</sup> 1573, *a prestanza* (borrowed) added.

<sup>10</sup> 1573, Zarlino's marginal note: *Supra. Capit. 19* (above, Chapter 19).

<sup>11</sup> 1573, *sottoposto alla* reads *di*.

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<sup>B</sup> See Chapter 21.

<sup>C</sup> i.e., fractions and irrational roots of positive numbers, which belong to the "continuous quantity."

però pigliando nel ritrouar tali ragioni il mezo di vna Chorda sonora, seruendosi dell’vna & dell’altra quantità, viene a sottoporre la sua scienza all’Arithmetica, & alla Geometria. La onde gli fu dibisogno ritrouare vna Proportionalità, la quale negoziando intorno alla quantità discreta, non fusse lontana dalla continoua; & che si conuenisse alla natura delle due nominate; accioche ne i Corpi sonori si scorgesse ogni consonanza accommodata secondo la forma de i Numeri harmonici. Et perche le parti delle Quantità sonore, dalle quali nascono le Consonanze, sono ordinate, & diuise dal Musico secondo la ragione de i numeri; i quali sono le loro forme, & i loro progressi sono senza dubbio arithmetici;

thus seeking in the discovery of such ratios the means of a sonorous string, [the musician], utilizing the [continuous and discrete] quantities, comes to subject his science to [both] arithmetic and geometry. Thus, it was necessary to discover a proportionality which, operating within the discrete quantity, would not be far from the continuous [quantity], and would pertain to both, so that one could identify any consonance accommodated to the form of harmonic numbers among sonorous bodies. And because the parts of the sonorous quantity<sup>E</sup> from which consonances arise are ordered and divided by the musician according to the rule of numbers, which are their forms, and their progressions are beyond a doubt arithmetic,

---

<sup>E</sup> “Sounding quantity” here implies “sounding body,” more specifically, a vibrating string.

de qui nasce, che non si vede alcuna  
 diuisione, ouero Proportionalità harmonica,  
 che appartenga a i concetti musicali, che  
 non si ritroui medesimamente  
 nell'Arithmetica: percioche quelle  
 proportioni, che ne dà l'Harmonica,  
 l'istesse l'Arithmetica ne concede; ancora  
 che in diuerso modo. Et questo non senza  
 ragione:<sup>12</sup> imperoche l'Arithmetica non  
 attende ad altro, che alla moltiplicatione  
 della Vnità, ponendola nell'ordine naturale  
 de numeri nel primo luogo, nel secondo il  
 Binario, dal quale nasce immediatamente la  
 Dupla proportione, il Ternario nel terzo, &  
 cosi gli altri per ordine:

there arises no discernable division or  
 harmonic proportionality that pertains to  
 musical consonances that cannot  
 similarly be identified in arithmetic  
 [proportionality], because those same  
 proportions offered by harmonic  
 [proportionality] are similarly given by  
 the arithmetic, albeit in a different  
 fashion. And this is not unreasonable,  
 because arithmetic [proportionality] is  
 concerned with nothing other than the  
 multiplication of 1, according it first  
 place in the natural order of numbers. In  
 the second place, [the number] 2  
 [occurs], whence immediately arises the  
 duple proportion; 3, in third place; and  
 thus for the other [numbers] in order.

---

<sup>12</sup> 1573, *Et questo non senza ratione* omitted.

ma l'Harmonica all'incontro attende alla sua diminutione, cioè alla diminutione, o diuisione del corpo sonoro, numerando, ouer moltiplicando le sue parti, secondo la ragione delle propotioni contenute nell'ordine naturale de i numeri: percioche diminuito di vna meza parte, tra il tutto, & la metà hauemo<sup>13</sup> la forma della consonanza Diapason, che tiene il primo luogo nella progressione, ouero ordine naturale delle consonanze, & de gli altri interualli; Diminuito poi di due terze parti, hauemo<sup>14</sup> quella della Diapente, che tiene il secondo luogo, tra la metà, & una terza parte;

But harmonic [proportionality], on the contrary, is concerned with lessening, that is, the shortening or division of the sounding body, enumerating or multiplying its parts, according to the rule of the proportions contained in the natural order of numbers. [This is] because [when the length of the sounding body] is reduced by half, between the whole and the half we will have the form of the consonance of the diapason, which holds first place in the progression or natural order of the consonances and of the other intervals. [When the length of the sounding body is] diminished by two-thirds, we will have the form of the diapente, which ranks in second place [among consonances], between the half and a third [of this half],

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<sup>13</sup> 1573, *hauemo* reads *habbiamo*.

<sup>14</sup> 1573, *hauemo* reads *habbiamo*.

oueramente hauemo<sup>15</sup> la forma della Diapason Diapente, tra il tutto, & la terza parte. Similmente hauemo<sup>16</sup> la forma della Diatessaron, ouero della Disdiapason, diminuito di tre quarte parti; cioè l'vna tra la terza, & la quarta parte di esso, & l'altra tra il tutto & la quarta parte. Si hauerebbe anco quella del Ditono, quando fusse diminuito di quattro quinte parti; & quella del Semiditono, quando fusse diminuito di cinque seste parti; & quella de gli altri interualli per ordine, che sarebbe lungo il voler discorrere particolarmente sopra di ciascuno. Diminuendosi adunque in cotal modo, ritiene la natura della quantità continua;

or we will have the form of the diapason diapente between the whole and the third [of the whole]. Similarly, we will have the form of the diatessaron, or the disdiapason, [when the length of the sounding body is] diminished by three-fourths, that is, the diatessaron between its third and fourth parts, and the disdiapason between the whole and its fourth part. We would also have [the form of] the ditone when [the length of the sounding body] is diminished by four-fifths, and that of the semiditone when [the length] is diminished by five-sixths, and [the forms] of the other intervals in order, discussion of which would be too lengthy. Being diminished, then, in such a way, [the form of the interval] retains the nature of the continuous quantity,

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<sup>15</sup> 1573, *hauemo* reads *habbiamo*.

<sup>16</sup> 1573, *hauemo* reads *habbiamo*.

& nel diminuirsi numera, o<sup>17</sup> moltiplica le parti, secondo le ragioni delle proportioni contenute nell'ordine naturale de i numeri, & si assomiglia alla discreta. Et benchè la Proportionalità harmonica habbia le istesse proportioni, che si ritrouano nell'Arithmetica: percioche le forme delle consonanze (come hauemo veduto) sono contenute tra le parti del numero Senario, che sono in progressione arithmetica; nondimeno nell'Arithmetica, tra i termini minori le proportioni sono maggiori, & tra li maggiori le minori;

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<sup>17</sup> 1573, *o* reads &.

and by decreasing the number, its parts are enumerated or multiplied according to the rules of proportions that are contained in the natural order of numbers and becomes part of the discrete [quantity]. And although harmonic proportionality has the same proportions that are found in arithmetic [proportionality] – because the forms of the consonances (as we have seen<sup>F</sup>) are contained among the numbers of the Senario, which are in arithmetic progression – nevertheless, in arithmetic [proportionality], the proportions are larger between the smaller terms and smaller between the larger [terms],<sup>G</sup>

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<sup>F</sup> See Chapter 15.

<sup>G</sup> See Chapter 36. Table 36.1, page 440, shows a numerical example.

& nell'Harmonica si ritroua il contrario, cioè ne i maggiori le maggiori; & ne i minori le minori. Et tal diuersità nasce, perche negociando l'vna intorno i numeri puri, & l'altra circa le quantità sonore; procedono al contrario; cioè l'vna per accrescimento, & l'altra per diminutione del suo principio; come hò mostrato; non si partendo ciascuna di loro dalla naturale progressione, che si ritroua nell'ordine delle proportioni collocate ne i numeri: di modo che nell'Arithmetica i Numeri sono vnità poste insieme: & nell'Harmonica sono le parti delle quantità sonore.

and in harmonic [proportionality] the contrary is found, that is, the [proportions are] larger between the larger [terms] and smaller between the smaller [terms].<sup>H</sup> And such diversity arises because, since the former is concerned with pure numbers and the latter with sonorous quantities, they proceed in opposite directions—that is, one by growth, and the other by reduction of its source, as I have demonstrated, not departing from the natural progression that is found in the order of proportion assigned among numbers. It follows that in arithmetic [proportionality], the numbers are units placed together, and in harmonic [proportionality, the numbers] are parts of the sonorous quantities.

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<sup>H</sup> See Chapter 39. Table 39.1, page 461, shows a numerical example.

Et accioche queste cose siano meglio intese, verremo a darne vno essemplio. Poniamo la sottoposta<sup>18</sup> linea AB, laquale all'Arithmetico sia la Vnità; & al Musico vn corpo sonoro, cioè vna chorda; & sia lunga vn piede: dico che volendo dare vn progresso arithmetico, sarà necessario lassarla intera, & indiuisibile: imperoche procedendo arithmeticamente, non si concede che la Vnità si possa diuidere. Sia adunque tal progresso contenuto da tre termini in questo modo, che la proportione Tripla sia diuisa dal mezano in due patti; Sarà bisogno di procedere in tal modo; cioè di raddoppiar prima (se fusse possibile) la detta linea, nel modo che veggiamo la Vnità esser raddoppiata nel Binario, il quale segue senza mezo alcuno la Vnità;

And in order for these things to be better understood, we will give an example. Let us take the line AB [in figure 40.1] below, which to the arithmetician would be 1, and to the musician, a sonorous body, that is, a string one foot long. I say that if one desires an arithmetic progression, it will be necessary to leave it whole and indivisible, because proceeding arithmetically, 1 cannot be divided. Should, then, such progression be contained by three terms in such a way that the triple proportion be divided by its midpoint into two halves, it will be necessary to proceed in the following manner: that is, first to double the said line (if possible), in the way that we see 1 to be doubled to 2, which directly follows 1.

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<sup>18</sup> 1573, *sottoposta* omitted.

Onde hauendola raddoppiata, haueremo la linea AC lunga due piedi. Se noi compararemo la linea AC raddoppiata alla linea AB, ritrouaremo tra loro la proportione Dupla, che è prima nell'ordine naturale delle proportioni; si come si ritroua anco ne i numeri tra il Binario, & la Vnità. Hora per dare il terzo termine di tal progressione, faremo la linea AC lunga tre piedi, di modo che ariui in punto D: conciosia che il Ternario segue immediatamente il Binario; & haueremo tra la DA, & la BA la proportione Tripla; imperoche la AD è misurata tre volte a punto dalla AB; ouer la AD contiene tre volte la AB; si come ne i numeri il Ternario contien tre volte la Vnità.

Having thus doubled it, we will have line AC, which will be two feet long. If we compare line AC, which is double [the length of line AB], to AB, we will discover between them the duple proportion, which is first in the natural order of proportions, in the way that is also found in numbers between 2 and 1. Now, to achieve the third term of this progression, we will make line AC three feet long, so that it arrives at point D. Because 3 immediately follows 2, we will have the triple proportion between DA and BA, since AD is three times as long as AB, or AD contains AB three times, just as among numbers 3 contains 1 three times.

Et così tal proportione resterà mediata, & diuisa in due parti dalla AC; cioè in vna Dupla CA & BA; & in vna Sesquialtera DA & CA, in proportionalità arithmetica; si come tra li termini nello esempio manifestamente si può vedere.

[53]

And thus such proportion will be mediated and divided into two parts by AC, that is into a duple [by] CA and BA, and into a sesquialter by DA and CA, in arithmetic proportionality, as is manifest among the terms of the example.

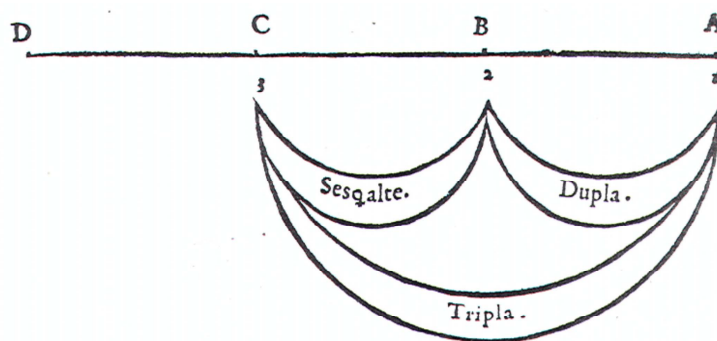


Figure 40.1. Division of a Line in Arithmetic Proportion.

Ma se noi vorremo dare vn progresso harmonico, procederemo in questo modo: Diminuiremo prima la detta linea AB della sua metà in punto C:

But if we desire a harmonic progression, we will proceed in this fashion: we will first diminish the said line AB by half at point C.

conciosia che la metà sia prima di ogn'altra parte; il che fatto dico, che tra la data chorda, o linea AB, & la sua metà, la quale è la CB (per la ragione, che altroue vederemo) si ritroua la proportione Dupla, che è la prima nell'ordine naturale delle proportioni. Diminuiremo dipoi la detta AB. di due terze parti in punto D, & haueremo la Proportione Sesquialtera; la quale è nel secondo luogo nell'ordine delle proportioni. La Sesquialtera dico tra CB & DB; & la Tripla ancora tra AB & DB; la quale dalla CB è mediata & diuisa in due proportioni in harmonica proportionalità; come<sup>19</sup> qui si vede.

Because the half is first of all the parts, I say it follows that between the said string or line AB, and its half, which is [line] CB (for the reason that we will see elsewhere), the duple proportion, the first in the natural order of proportions is found. We will then diminish the said AB by two-thirds at point D, and we will have the sesquialter proportion, which is in second place in the order of proportions. I say the sesquialter to be between CB and DB, and the triple again between AB and DB, which CB mediates and divides into two proportions in harmonic proportionality, as we see here.

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<sup>19</sup> 1573, *nell'esempio* inserted.

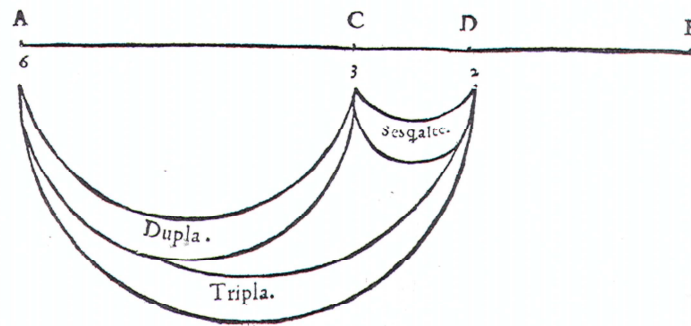


Figure 40.2. Division of a Line in Harmonic Proportion.

Et si come i termini della progressione  
Arithmetica sono vnità moltiplicate; cosi  
quelli dell'Harmonica sono il numero delle  
parti numerate nel Corpo sonoro, che  
nascono dalla sua diuisione: essendo che in  
quella si considera la moltiplicatione della  
Vnità contenuta in questo ordine. 3. 2. 1; &  
in questa si considera la moltiplicatione  
delle parti nel soggetto diuiso, contenute tra  
questi termini. 6. 3. 2:

And just as the terms of the arithmetic  
progression are multiples of 1, so those  
of the harmonic are the number of the  
named parts of the sonorous body that  
arise from its division, since in [the  
arithmetic] one considers the  
multiplication of 1 as contained in the  
order 3, 2, 1, and in [the harmonic] one  
considers the multiplication of the parts  
in the divided subject, contained between  
the terms 6, 3, and 2.

perciocche se noi consideraremo il Tutto diuiso nelle parti, ritrouaremo che la linea CD è la minima parte della linea AB, & misura la AB sei volte intere; la CB tre volte; & DB due volte. Hora si può vedere, che tra i maggior termini della progression harmonica sono contenute le proportioni maggiori, & li suoni graui; & tra li minori le minori, & li suoni acuti; conciosia che questi sono prodotti dalle chorde di minore estensione, & quelli da quelle di maggiore. Si che potemo ancora vedere,<sup>20</sup> che si come nell'Arithmetica (dato che si potesse fare al mostrato modo) si procederebbe dall'acuto al graue moltiplicando la chorda; cosi nella harmonica per il contrario si vada dal graue all'acuto diminuendola;

If we consider the whole divided into its parts, we will find that line CD is the smallest part of line AB, and that it is contained six times in AB, three times in CB, and twice in DB. Now it can be seen that the larger proportions and the low[er] sounds are contained within the larger terms of the harmonic progression; and the smaller [proportions] and high[er] sounds [are contained] within the smaller [terms], because the latter are produced by strings of shorter length, and the former by longer [strings]. Thus, we can also see that just as in the arithmetic [progression] (provided that it be done in the way demonstrated) one may proceed from high to low [pitch] by multiplying [the length of] the string, so in harmonic [progression], on the contrary, one goes from low to high [pitch] by diminishing [string length].

---

<sup>20</sup> 1573, *Si che potemo ancora vedere* reads *Et potiamo anco vedere*.

& nella progressione, o proportionalità  
 Arithmetica gli interualli di minor  
 proportione hauerebbero luogo nel graue,  
 contra la natura dell'harmonia, il cui propio  
 è, di hauere i suoni graui, di maggiore  
 interuallo de gli acuti, & questi per il  
 contrario di minore. Ma perche tutte quelle  
 proportioni, che si ritrouano nel Progresso  
 arithmetico, seguendo l'ordine naturale  
 delle proportioni, si ritrouano anco nel  
 Progresso harmonico in quello ordine  
 istesso; però potremo vedere in qual modo  
 si habbia a pigliare il senso delle parole,  
 ch'io dissi nel cap. 15. cioè<sup>21</sup> che tra le parti  
 del numero Senario sono contenute tutte le  
 Forme delle consonanze Musicali semplici,  
 possibili a prodursi;

And in arithmetic progression or  
 proportionality the intervals of smaller  
 proportion would occur among low  
 [pitches], contrary to the nature of the  
 harmonic [proportion], whose property is  
 to have low pitches with larger intervals  
 than the higher, and on the contrary, to  
 have higher pitches with smaller  
 [intervals]. But because all those  
 proportions that are found in the  
 arithmetic progression following the  
 natural order of proportions are also  
 found in the harmonic progression in that  
 same order, we can see how one must  
 interpret the words I wrote in Chapter 15:  
 all the forms of simple musical  
 consonances can be produced from the  
 parts of the Senario.

---

<sup>21</sup> 1573, cioè reads *le quali*.

& come le consonanze chiamate da i pratici Perfette, si trouino naturalmente in esso collocate in harmonica diuisione: percioche quando fussero accommodate nel corpo sonoro, questi termini. 60. 30. 20. 15. 12. 10; che sono le ragioni delle sue parti, si vederebbero tramezate in quella [54] stessa maniera, che si veggono tramezate nelle parti di esso Senario; ancora che fussero ordinate in diuerso modo.

And the consonances called perfect by practitioners are naturally placed in harmonic division [in the Senario] since, when they are accommodated in the sonorous body, the terms 60. 30. 20. 15. 12. and 10, which are the ratios of its parts, may be seen partitioned in that same way that they would be seen partitioned in the parts of said Senario, even if they were ordered in a different manner.

Similmente si potrà conoscere, in qual senso si debbono intendere le parole del dottissimo Giacompo Fabro Stapulense, poste nella 34. del lib. 3.<sup>22</sup> della sua Musica: & quanta sia la necessità della proportionalità harmonica; & in qual modo; essendo concorde con l'Arithmetica, quanto alla quantità delle proportioni; sia discorde poi intorno al modo del procedere, & circa il sito loro: ma ciò non darà marauiglia, considerato che ogni effetto segue naturalmente la propietà, & la natura della sua cagione.

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<sup>22</sup> 1573, *de gli Elementi* (of the *Elements*) inserted.

Similarly, it will be possible to know in what sense the words of the most learned Jacobus Faber Stapulensis<sup>1</sup> written in Book 3, Chapter 34 of his *Elements of Music* may be interpreted, and how necessary harmonic proportionality might be, and in which way, [although] agreeing with arithmetic [proportionality] regarding the quantity of proportions, they disagree regarding the way of proceeding and positioning. But that must not cause astonishment, considering that each effect naturally follows the property and nature of its cause.

---

<sup>1</sup>Jacobus Faber Stapulensis (c. 1455-1536) is the Latin name of the French humanist, theologian, and translator Jacques Lefèvre d'Étaples. Lefèvre wrote student manuals on physics and mathematics; published new, annotated translations or paraphrases of Aristotle's works on ethics, metaphysics, and politics; and translated the Bible into French. An ordained priest, he nevertheless endeavored to divorce religious studies from Scholasticism. His scholarship stimulated scriptural studies during the Protestant Reformation.

Et perche l'vna & l'altra di queste due  
 proportionalità si serue de i numeri, li quali  
 sono per natura tra loro communicanti;  
 ouero hanno almeno tra loro vna misura  
 commune, la quale è (quando altro numero  
 non vi fusse) la Vnità; però ogni loro  
 ragione è rationale: ma la Geometrica, il  
 cui soggetto (assolutamente parlando) è la  
 Quantità continoua, diuisibile in potenza in  
 infinite parti, considera non solo le  
 rationali, ma le irrationali ancora, come hò  
 detto altroue:<sup>23</sup> percioche è facil cosa al  
 Geometra, per virtù de i suoi principij, far  
 di qualunque linea tre parti, che siano tra  
 loro proportionate geometricamente;<sup>24</sup>  
 ouero gli sarà facile il porre vna, o più linee  
 mezane tra due estreme, che siano  
 proportionate con le prime, come nella  
 Seconda parte mostreremo:

And because each of these two  
 proportionalities utilizes numbers which  
 have a common factor, or at least have a  
 common measure among themselves,  
 which is 1 (in the absence of any other  
 [common factor]), each ratio is rational.  
 But geometric [proportionality], whose  
 subject (absolutely speaking) is the  
 continuous quantity, potentially divisible  
 into infinite parts, considers not only  
 rational, but irrational [numbers], as I  
 have said elsewhere, because it is easy  
 for the geometrician, by virtue of his  
 principles, to divide any line into three  
 parts that are geometrically  
 proportionate, or it will be easy for him  
 to place one or more middle lines  
 between two extremes that are  
 proportionate with the first, as I will  
 show in the second part [of *Le istituzioni  
 harmoniche*].

---

<sup>23</sup> 1573, *come hò detto altroue* omitted.

<sup>24</sup> 1573, *geometricamente* omitted.

Ma l'Arithmetico non potrà mai, ne il Musico<sup>25</sup> ritrouare vn termine mezano ad ogni proposta proportione, che la diuida in due parti equali; conciosia che tra li termini delle loro proportionalità non cada alcun numero mezano, che la possa diuidere secondo il proposito. Et benche la Quadrupla si veda alle volte diuisa dal Musico in due parti equali; cioè in due Duple; non è però tal diuisione semplicemente fatta dal Musico come Musico; ma si vsurpa tal diuisione come Geometra.

But neither the arithmetician nor the musician will ever be able to find a middle term of every proposed proportion that divides it into two equal parts, because between the terms of their proportionality there is no middle number that can divide it according to this proposition. And while the quadruple [proportion] is seen to be divided at times by the musician into two equal parts, that is, into two duples, such division cannot easily be made by the musician as such, unless he usurps the role of geometrician for this division.

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<sup>25</sup> 1573, *Ma l'Arithmetico non potrà mai, ne il Musico* reads *ma ne l'Arithmetico, ne anco il Musico potranno mai*.

Che il Numero non è cagione propinqua & intrinseca delle Proportioni Musicali, ne meno delle Consonanze. / Cap. 41.

How Number is Neither an Immediate and Intrinsic Cause of Musical Proportions, Nor Even of Consonances / Chapter 41

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Avegna ch'io habbia detto di sopra, che li Suoni siano la materia delle consonanze, & li Numeri, & le proportioni la lor forma; non si dee per questo credere, che il Numero sia la cagione propinqua & intrinseca delle Proportioni musicali, ne meno delle Consonanze: ma si bene la remota, & estrinseca, come vederemo. Onde si debbe auertire, che essendo il propio fine del Musico (come vogliono i Filosofi, & massimamente Eustratio<sup>1</sup>) il cantare con modulatione, oueramente il sonare ogni istrumento con harmonia, secondo i precetti dati nella Musica;

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Although I have said earlier that sounds are the material of consonances, and numbers and proportions their form, this is not the reason to believe that number is the proximate and intrinsic cause of musical proportions, nor even of consonances. Rather, [number is] their remote and extrinsic [cause], as we shall see. Hence one must caution that since the true goal of the musician (as the philosophers, especially Eustratius,<sup>A</sup> believe) is to sing in a pleasing manner, or to play any instrument harmoniously, according to the precepts given in music,

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<sup>1</sup> 1573, Zarlino's marginal note: *1. Ethic. cap.1* (Eustratius, *Ethics*, Book 1, Chapter 1)..

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<sup>A</sup> Eustratius, a twelfth-century metropolitan of Nicaea, wrote neo-Platonic commentary on Aristotle.

similmente il giouare & il dilettere, si come è quello del Poeta; hauendo egli riguardo a tal cosa,<sup>2</sup> come a quella, che naturalmente lo spinge all'operare,<sup>3</sup> piglia primieramente lo istrumento, nel quale si ritroua la materia preparata, cioè le chorde;<sup>4</sup> dipoi per poter conseguire il desiderato fine, introducendo in esse la forma delle consonanze, le riduce<sup>5</sup> in vna certa qualità, & in vn certo termperamento, ponendo<sup>6</sup> tra loro vna distanza proportionata, & tirandole<sup>7</sup> di modo, che percosse da lui rendono poi<sup>8</sup> perfetto concento, & ottima harmonia.

and, like the poet, to provide joy and delight, paying proper attention to what naturally impels him to function, [the musician] first takes the instrument in which the material, that is, the strings, is already prepared; then, in order to reach the desired end, applying the ratios of consonances to [the strings], he evokes from them a certain quality and tuning, placing a proportionate interval between them, and drawing [sounds from] them so that when struck by him they will render perfect consonance and optimal harmony.

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<sup>2</sup> 1573, *havendo egli riguardo a tal cosa* reads *havendo sopra'l tutto riguardo a cotal cosa* (above all, paying attention to what).

<sup>3</sup> 1573, *come a quella, che naturalmente lo spinge all'operare* omitted.

<sup>4</sup> 1573, *si ritroua la materia preparata, cioè le chorde* reads *ritroua le chorde, che rendono li Suoni*. (is found the strings that produce the sound).

<sup>5</sup> 1573, *li riduce* reads *riducendole*.

<sup>6</sup> 1573, *ponendo* reads *pone*.

<sup>7</sup> 1573, *tirandole* reads *le tira*.

<sup>8</sup> 1573, *poi* omitted.

Et quantunque vi<sup>9</sup> concorrino quattro cose,  
 si come etiandio concorrono in  
 ciascun'altra operatione; cioè il Fine  
 dell'attione, al quale sempre si hà riguardo;  
 & è il Sonare con harmonia; ouero il  
 giouare, & dilettere, che si dice cagion  
 finale; lo Agente, cioè il Musico, che si  
 nomina cagione efficiente; la Materia, che  
 sono le chorde, & si chiama cagione  
 materiale;<sup>10</sup> & la Forma, cioè la  
 proportione,<sup>11</sup> che si addimanda cagione  
 formale; nondimeno queste due vltime  
 sono cagione intrinseche della cosa; &  
 l'Agente, & il Fine sono cagioni  
 estrinseche:

And although four things concur in this,  
 as they also concur in any other  
 operation: [1] the goal of the action,  
 always to be borne in mind, is  
 harmonious playing, or providing joy and  
 delight, which is said to be the final  
 cause; [2] the agent, that is, the musician,  
 who is called the efficient cause; [3] the  
 material, which are the strings, also  
 called material cause; and [4] the form,  
 that is, the proportion, named formal  
 cause; nevertheless, the last two [the  
 material and formal] are intrinsic causes  
 of something, and the agent and the goal  
 are its extrinsic causes,

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<sup>9</sup> 1573, *vi* reads *in questo*.

<sup>10</sup> 1573, *che sono le chorde, & si chiama cagione materiale* reads *che sono li Suoni mandati fuori dalle chorde, & si chiamano Cagione materiale* (which are the sounds brought forth by strings, and are called material cause).

<sup>11</sup> 1573, *che si ritroua nelle distanze da un suono all'altro* (which are found in the distances between one sound and another) added.

conciosia<sup>12</sup> che queste non appartengono ne  
 alla natura, ne all'esser suo; & quelli sono  
 parti essenziali di essa: percioche ogni cosa  
 corruttibile è composta di materia & di  
 forma; Et la Materia si dice quella, della  
 quale si fa la cosa, & è permanente in essa,  
 si come i suoni de i quali si fa la  
 Consonanza; & la Forma è quella specie, o  
 similitudine, o vogliam dire essemplio, che  
 ritiene la cosa in se, per la quale è detta  
 tale; si come è la proportione nella  
 Consonanza. Et questa si chiama cagione  
 intrinseca, a differenza della estrinseca; la  
 quale è (per dir cosi) il Modello, o vogliam  
 dire Essemplio, alla cui similitudine si fa  
 alcuna cosa; si come è quella della  
 Consonanza, che è la proportione di  
 numero a numero.

because [the latter] partake neither of its  
 nature nor of its being, and [the former]  
 are essential parts of it, because every  
 corruptible thing is composed of material  
 and form. And material is said to be [the  
 matter] from which something is made,  
 and remains permanently in it, as are the  
 sounds from which consonance arises.  
 And form is that species, or grouping, or  
 exemplar, [as] we may say, which  
 defines the thing in itself, as is proportion  
 in consonance. And this is called the  
 intrinsic cause, in contrast to the extrinsic  
 cause, that is, the model, or better, the  
 exemplar, which everything is made to  
 resemble. In the same way, consonance,  
 the proportion of number to number, is  
 the model [of the goal].

---

<sup>12</sup> 1573, *conciosia* reads *imperò*.

Nondimeno è da auertire, che di queste cagioni, alcune sono dette Prime, & alcune Seconde; & tale ordine di primo & di secondo si può intendere in due modi; primieramente secondo vn certo ordine di numeri, nel quale vna cosa è prima & remota, & l'altra seconda & propinqua; secondariamente si può intendere secondo l'ordine compreso dalla ragione in vna sola cagione, il quale è posto tra l'vniuersale & il particolare: imperoche naturalmente l'Vniuersale è primo, & dipoi il Particolare. Nel primo modo dicemo quella cagione [55] esser prima, la quale dà virtù & possanza alla seconda di operare;

Nevertheless, we must caution that some of these causes are called primary, and some secondary. And such order can be understood in two ways. First, [it may be understood] according to a certain order of numbers in which one thing is primary and remote, and the other, secondary and proximate. Second, it may be interpreted as the order understood by [human] reason as a single cause, which is placed between the universal and the particular, where naturally the universal comes first, and the particular follows. In the first instance, we say the first cause is the one that bestows power and the ability to operate upon the second,

si come si dice nella cagione efficiente, che il Sole è la prima cagione (remota però) della generatione; L'animal poi è cagione seconda, & propinqua di tal generatione: percioche egli dà allo animale la virtù, & la possanza di generare. Ma nel secondo il Genere è il primo, & la Specie il secondo: la onde dico, che la prima & vniuersal cagione della Sanità è l'artefice, & la seconda, & particolare il Medico, ouero il tal Medico. E ben vero che la prima & la seconda cagione del primo modo sono differenti dalla prima, & dalla seconda del secondo: Percioche nel secondo modo non si distinguono in effetto l'vna dall'altra; ne la più vniuersale della meno vniuersale; ne questa dalla singolare; ma sono distinte solamente nell'intelletto.

just as we say about the efficient cause that the sun is the primary (yet remote) cause of generation and the animal is its secondary cause, and closer to such generation itself, because the sun gives the animal power and the ability to generate; but in the second [instance], the genus is the first and the species is the second. Hence I say that the first and universal cause of health is the Creator and the second and particular [cause] the physician, or a [particular] physician. It is quite true that the first and second causes of the first instance are different from the first and second [causes] of the second, inasmuch as in the second, one is not effectively distinguished from another, neither the more universal from the less universal, nor [the universal] from the particular, but they are distinguished solely by the intellect.

Ma nel primo modo sono distinte:  
 conciosia che l'vna è contenuta dall'altra,  
 & non per il contrario. Et questi due modi  
 (massimamente in quanto al secondo) si  
 ritrouano in tutti i generi delle cagioni:  
 percioche nella materiale il Metallo è prima  
 cagione del coltello, & il Ferro la seconda;  
 si come nella formale (venendo ad vno  
 accommodato essemplio secondo il nostro  
 proposito) la prima cagione della  
 Consonanza Diapason è il numero, cioè 2,  
 & 1, & la seconda la proportione Dupla, &  
 così delle altre per ordine. La proportione  
 adunque è la causa formale, intrinseca &  
 propinqua delle consonanze, & il Numero è  
 la causa vniuersale, estrinseca & remota;

But in the first they are distinct, because  
 one is contained within the other, and not  
 vice versa. And these two instances<sup>A</sup>  
 (particularly the second) are found in all  
 types of causes. In the material [sphere]  
 metal is the first cause of the knife, and  
 iron the second, just as in the formal  
 [sphere] (coming to an example that is  
 closer to our purpose) the first cause of  
 the consonance of the diapason is  
 number, that is, 2 and 1, and the second  
 [cause] is the duple proportion, and thus  
 for the other [consonances] in turn.  
 Proportion, then, is the formal cause,  
 intrinsic and proximate, of consonances  
 and number is the universal [cause],  
 extrinsic and remote.

---

<sup>A</sup> The first instance places the order of causality of an event as (1) primary and remote and (2) secondary and proximate. In the second instance, the order of causality is (1) the universal and (2) the particular.

& è come il modello della Proportione, per la quale si hanno da regolare & proportionare li corpi sonori, accioche rendino formalmente le consonanze. Et questo acennò il Filosofo,<sup>13</sup> mentre dichiarando quel che fusse la Consonanza disse, Che ella è ragione de numeri nell'acuto, & nel graue; intendendo della ragione, secondo la quale si vengono a regolare i detti corpi sonori. La onde non disse, che fusse numero assolutamente, ma ragione de numeri; il che si può vedere più espressamente nelle proportioni musicali, comprese ne i nominati corpi: imperoche non si ritroua in esse alcuna specie, o forma di numero:

This is the model of proportion by which sonorous bodies must be regulated and proportioned so that they may formally render consonances. And the Philosopher hinted at this when, declaring what consonance was, he said that it is the ratio of high and low numbers, meaning the rule according to which such sonorous bodies come to be regulated. Therefore, he did not say that it is absolute numbers [per se], but [rather] the ratio of numbers that can be seen more expressly in musical proportions, comprised in the said [sonorous] bodies, since no species or form of number can be found in them.

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<sup>13</sup> 1573, Zarlino's marginal note: *Post. c. 1.* (Aristotle, *Postulates*, Chapter 1).

conciosia che se noi pigliamo i loro  
 estremi, misurandoli per il numero; dappoi  
 che è fatta cotal misura, tai corpi restano  
 nella loro prima integrità & continouati  
 come erano prima; ne si ritroua  
 formalmente in essi numero alcuno, il  
 quale costituisca alcuna proportione:  
 Percioche se ben noi prendemo alcuna  
 parte di vna chorda in luogo di vnità, & per  
 replicatione di quella venimo a sapere la  
 quantità di essa, & la sua proportione,  
 secondo i numeri determinati; & per  
 conseguente la proportione de i suoni  
 prodotti dalle chorde, cioè dal tutto & dalle  
 parti; non potemo<sup>14</sup> però dire, se non che  
 tali numeri siano quel Modello, & quella  
 Forma de i suoni, che sono cagione  
 esemplare, & misura estrinseca di essi  
 corpi sonori, che contengono le proportioni  
 musicali; le quali senza il suo aiuto  
 difficilmente si potrebbero ritrouare nelle  
 quantità continoue.

[This is true] because if we take their  
 extremes, measuring them by number,  
 once such measurement is taken, those  
 bodies remain whole and continuous as  
 they were before. Neither is any number  
 formally found in them that constitutes  
 any proportion, since if we take any part  
 of a string in place of 1, and by  
 replication we come to know its quantity  
 and proportion according to the  
 determined numbers, and consequently  
 the proportion of the sounds produced by  
 the strings, that is, by the whole and its  
 parts, we can say only that such numbers  
 are the model and form of the sounds, the  
 exemplary cause and extrinsic measure  
 of these sonorous bodies containing the  
 musical proportions, which without the  
 help [of the model and form] would be  
 difficult to find among the continuous  
 quantities.

---

<sup>14</sup> 1573, *potemo* reads *potiamo*.

Essendo adunque il Numero sola cagione di far conoscere, & ritrouare artificiosamente le proportioni delle consonanze, & di qual si voglia interuallo musicale; è necessario<sup>15</sup> nella Musica, in quanto che per esso più espeditamente si vanno speculando le differenze de i suoni, secondo il graue, & l'acuto, & le sue passioni; & con più certezza di quello, che si farebbe misurando co il Compassi, ouero altre misure li corpi sonori; hauendo prima conosciuto con la esperienza manifesta, come si misurino secondo la loro lunghezza con proportione, & percossi insieme muouano l'vdito secondo il graue & l'acuto, non<sup>16</sup> altramente di quello, che si considerano ne i numeri puri secondo la ragione.

---

<sup>15</sup> 1573, *molto* inserted.

<sup>16</sup> 1573, *non* reads *ma*.

Because number is the only cause by which proportions of consonances and any given musical interval can be made known and artificially discovered, [number] is necessary in music since through it one can speculate more directly upon the differences of sound, whether low [or] high, and their attributes, and with more certainty than what would be done by measuring sonorous bodies with compasses or other means. Having first known from manifest experience how [strings] are measured according to their length with proportion, and how, struck together, they move the listener according to [how] low and high [they are, intervals are] none other than what are considered to be pure numbers judging by reason.

Ma per concludere dico, che si come il numero non può essere a modo alcuno la cagione intrinseca & propinqua di tal proportioni, così non potrà essere la cagione intrinseca & propinqua delle consonanze; come hò dichiarato.

But to conclude, I say that, just as number cannot in any way be the intrinsic and proximate cause of such proportions, so it cannot be the intrinsic and proximate cause of consonances, as I have declared.

Della inuentione delle Radici delle  
proportioni. / Cap. 42.

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Ritornando hormai, secondo l'ordine  
incominciato,<sup>1</sup> alla quinta & vltima  
operatione, detta Inuentione delle Radici  
dico, che tale operatione non è altro, che  
ridur le proportioni ne i primi loro termini  
radicali, quando si ritrouassero fuori:  
Percioche le proportioni, che sono  
contenute tra i termini non radicali, cioè tra  
i numeri Tralorocomposti, oltrache si  
rendono più difficili da conoscere, fanno  
anco difficili le loro operationi.

---

<sup>1</sup> 1573, *doue habbiamo lasciato: cioè* (where we  
have left it, i.e.) inserted.

On the Determination of the Roots of  
Proportions<sup>A</sup> / Chapter 42

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Returning, now, according to the original  
plan, to the fifth and last operation, called  
extraction of roots, I say that such an  
operation is none other than the reduction  
of proportions to their lowest terms when  
they are found to be otherwise, because  
proportions that are contained between  
terms other than their lowest, that is,  
between numbers that have common  
factors, besides being more difficult to  
understand, also make their operations  
difficult.

---

<sup>A</sup> One definition of *inventione* is “discovery,” and  
that is the sense of which it is used here. Thus,  
*inventione* in the title has been translated as  
“determination.” The subject of this chapter is to  
express proportions in their lowest terms, or to  
determine the roots of proportions, i.e. the  
numbers in which the proportion may be  
expressed that have no common factors.

Onde accioche si possa hauer di loro più facile cognitione, & più facilmente le possiamo adoperare, darò hora il modo di ridurle ne i termini radicali, cioè ne i numeri Contraseprimi, che sono i minimi numeri, da i quali possono esser contenute, come altroue hò detto. Et perche non solo le proportioni contenute tra due termini, ma anche ogni ordine di più proportioni moltiplicate, può esser contenuto da numeri Tralorocomposti; però mostrando prima, in qual modo si possino ridurre a i lor termini radicali quelle, che sono contenute solamente tra due termini; mostrerò dipoi in qual modo le altre si potranno ridurre. Incominciando adunque dalle prime [56] terremo questo ordine;

Therefore, in order to grasp them better and use them more easily, I will now give the method of reducing them to their lowest terms, that is, to numbers that are mutually prime, which are the smallest numbers between which they can be contained, as I have said elsewhere.<sup>B</sup> And because proportions contained not only between two terms, but also [comprised of] any number of terms that are multiples of a lower number, can be contained between numbers that have common factors, I will first show how those [proportions] that are contained solely between two terms may be reduced to their lowest terms. I will then show how the others can be reduced. Beginning, then, with the first, we will use this method:

---

<sup>B</sup> See Chapter 31.

Essendoci proposta qual si voglia  
 proportione, contenuta tra<sup>2</sup> numeri  
 Traloro composti, cercheremo di trouare vn  
 numero maggiore, il qual numeri, o misuri  
 comunemente i termini della proportione  
 proposta; per il quale diuidendo tai termini,  
 li prodotti siano le radici, o termini radicali  
 di tal proportione. Volendo adunque  
 ritrouar tal numero, diuideremo prima il  
 maggior termine della proportione per il  
 minore, di poi questo per quel numero, che  
 auanza dopo tal diuisione. Et se di nuouo  
 auanzasse numero alcuno, diuideremo il  
 primo auanzato numero per il secondo; &  
 questo per il terzo; & cosi di mano in  
 mano, fino à tanto che si ritroui vn numero,  
 che diuida a punto l'altro, senza auanzar  
 nulla; & questo sarà il numero ricercato:

faced with any given proportion  
 contained between numbers with  
 common factors, we will seek to find the  
 largest number that enumerates or  
 measures both terms of said proportion,  
 by which, dividing such terms, the results  
 are the roots or root terms of such  
 proportion. Wishing, then, to discover  
 that number, we will first divide the  
 larger term of the proportion by the  
 smaller, and then the result by the  
 number that remains after such division.  
 And if any number should remain, we  
 will divide the first remainder by the  
 second, and this by the third, and thus  
 one by one, until a number is left that,  
 divided by the other, leaves no  
 remainder, and this will be the number  
 sought.

---

<sup>2</sup> 1573, *tra* reads *da*.

per il quale diuidendo dipoi ciascun termine della proportione proposta, li prodotti saranno i minimi numeri, & termini radicali della proportione. Poniamo adunque che vogliamo ritrouar la Radice della proportione contenuta tra questi termini, o numeri 45. & 40. che sono Tralorocomposti; diuideremo primieramente il 45. per il 40. & verrà 1. auanzando 5; Dipoi lassando<sup>3</sup> la vnità, come quella, che fa poco al nostro proposito, si in questa, come anco nelle altre diuisioni, pigliaremo il 5, il quale diuiderà il 40.<sup>4</sup> apunto, senza auanzare alcuna cosa; & questo sarà il numero maggiore ricercato, che numererà l'vno & l'altro delli due proposti termini.

Then, dividing each term of said proportion [by this number], the results will be the smallest numbers and lowest terms of the proportion. Suppose we wish to find the root of the proportion contained between the terms or numbers 45 and 40, which have a common factor. We will first divide 45 by 40 and will obtain 1 with a remainder of 5. Then, omitting 1 because that factor is of little help to our purpose in this as in other divisions, we will take 5, which will divide 40 exactly without leaving any remainder, and this will be the largest number sought that [exactly] divides both of the proposed terms.

---

<sup>3</sup> 1573, *lassando* reads *lasciando*.

<sup>4</sup> 1573, *in otto parti* (in eight parts) inserted.

Onde diuidendo il 45. per il 5. ne verrà 9.  
& diuidendo il 40. haueremo 8. i quai  
numeri, senza dubbio, sono Contraseprimi,  
& minimi termini, ouer la Radice della  
proposta proportione, che fu la  
Sesquiottaaua.

Then, dividing 45 by 5, 9 will result, and  
dividing 40 [by 5] we will have 8; both  
numbers, without a doubt, contain no  
common factor, and are the lowest terms,  
or the roots of the said proportion, which  
was the sesquioctave.

In che modo si possa ritrouar la Radice di  
più proportioni moltiplicate insieme. / Cap.  
43.

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Ma volendo ritrouar la Radice di vn'ordine  
di più termini continouati, come sono  
quelli, che nascono dalla moltiplicatione di  
più proportioni poste insieme; ouer quelli,  
che vengono dalla proportionalità  
harmonica, che sono senza dubbio termini,  
o numeri Traloro composi; procederemo in  
questo modo. Ritrouaremo prima, per la  
Terza del Settimo di Euclide, vn numero  
maggiore, che diuida, o misuri  
communemente ciascuno de i numeri  
contenuti in tal ordine; per il quale  
diuideremo poi ciascun di loro; & li  
prodotti, che verranno da tal diuisione,  
saranno la Radice di cotale ordine.

In What Manner It Is Possible to Find the  
Root of Several Proportions Multiplied  
Together / Chapter 43

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But wishing to discover the root of a  
series of several continuous terms, as are  
those that arise from the multiplication of  
several proportions together, or those that  
come from harmonic proportionality, [all  
of] which are, without question, terms or  
numbers with common factors, we will  
proceed in this fashion. We will first  
discover, as in the third [demonstration]  
of [Chapter] Seven of Euclid [’s  
*Elements*] a large number that commonly  
divides or measures each of the numbers  
contained in that series, by which we will  
then divide each of them, and the results  
that come from that division will be the  
root of this series.

Siano adunque i sottoposti quattro<sup>1</sup> termini, o numeri Traloro composti, cioè 360. 240. 180. 144. 120. prodotti dalla multiplicatione fatta nel Cap. 31. ouer 32. i quali vogliamo ridurre in vno ordine di numeri Contraseprimi, cioè alla loro radice; dico che bisogna ritrouar prima, nel modo che si è mostrato nel cap. precedente, vn numero maggiore, che numeri, o misuri communemente li due maggiori termini delli proposti, che sono il 360. & 240. & tal numero sarà il 120. percioche diuide, o misura il 360. tre volte, & il 240. due volte. Vederemo dipoi se può misurare il 180. ma perche non lo può misurare, però è dibisogno di ritrouare vn'altro numero simile, il quale diuida, o misuri communemente il 180. & il 120. operando secondo la regola data, che sarà il 60.

Let five terms or numbers with common factors – 360, 240, 180, 144, and 120, the products of the multiplication done in Chapter 31 or 32 – be the [terms] we wish to reduce to a series of numbers with no common factors, that is, to their root. I say that we first must discover, in the manner that was shown in the preceding chapter, a large number that counts or commonly measures the two largest terms of those proposed, which are 360 and 240, and this number will be 120, because it divides or measures 360 three times, and 240, two times. We will then see if [120] can divide 180, but because it cannot, perhaps we must find another, similar number, which commonly divides or measures 180 and 120, operating according to the prescribed rule, which will be 60.

---

<sup>1</sup> 1573, *quattro* reads *cinque*.

Et questo per il corollario della Seconda del Settimo di Euclide, numererà comunemente li tre maggiori delli proposti termini, & anco il 120. conciosia che numera il 360. sei volte, il 240. quattro volte, il 180. tre volte, & il 120. due volte. E ben vero, che non potrà misurare il 144. la onde sarà dibisogno di ritrouare vn'altro maggior numero, che lo misuri insieme con gli altri: onde ritrouatolo secondo il modo mostrato, haueremo il 12. che non solo misurerà il 144. ma gli altri ancora, come chiaramente si può vedere.<sup>2</sup>

And this, according to the corollary of the second [demonstration] of the seventh [chapter] of Euclid [’s *Elements*], will commonly divide the three largest of the proposed terms, as well as 120, because [60] divides 360 six times, 240, four times, 180, three times, and 120, two times. It is quite true that [60] cannot divide 144 [evenly]. Therefore, we must find another large number that divides [144] together with the others. Thus, discovered according to the demonstrated method, we will have 12, which not only will divide 144, but also the others, as we can easily see.

---

<sup>2</sup> 1573, *come chiaramente si può vedere* omitted.

Et perche tal numero numera etiandio il minore delli proposti, cioè il 120. però dico, che il 12 è il numero maggiore ricercato, il qual numera communemente ciascuno delli cinque proposti termini, o numeri: conciosia che se noi diuideremo ciascuno di questi numeri per il 12. che fu l'ultimo numero maggiore ritrouato, ne verrà 30. 20. 15. 12. 10. & tra questi termini dico esser la Radice del proposto ordine: percioche senza dubbio sono numeri Contraseprimi; come nel suo essemplio si può esaminare. La onde osseruando tal regola, non solo si potranno hauere i termini radicali di qualunque ordine, che contenga quattro, cinque, & sei proportioni, ma più ancora, se bene (dirò così) si procedesse all'infinito.

And because this number also divides the smallest of the proposed [numbers], 120, I say that 12 is the largest number found that commonly divides each of the five proposed terms or numbers, because if we divide each of these numbers by 12, which was the final largest number found, we will obtain 30, 20, 15, 12, and 10; and I say that the root of the proposed series is to be found among these terms, because without a doubt they are numbers with no common factors, as one can see in the example below. Therefore, [by] observing such a rule, not only can one obtain the root terms of any series that contains four, five, and six proportions, but still more [proportions], even if (I daresay) one were to proceed to infinity.

[57]

360	240	180	144	120
120. è il numero maggiore, che misura comunemente i due primi termini maggiori.				
3	2			
60. è il numero maggiore, che misura i tre primi termini maggiori & il ritrouato. 120				
60	40	30		
12. è il numero maggiore, che misura tutti li proposti termini & anco il ritrouato 60				
30	20	15	12	10
Numeri Contrafeprimi, i quali sono termini radicali del sopra posto ordine.				

Figure 43.1. Reduction of a Series of Five Terms to Its Root.

Della Proua di ciascuna delle mostrate  
operationi. / Cap. 44.

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Perche l'huomo nelle sue operationi può  
facilmente errare, massimamente nel  
maneggio de i numeri, ponendo per  
inaduertenza alle volte un numero in luogo  
di un'altro; però io per non lassare a dietro  
alcuna cosa, che possa tornare utile alli  
studiosi, hò uoluto aggiungere il modo, per  
il quale possino<sup>1</sup> conoscere, se nelle  
operationi si ritroua alcuno errore; accioche  
ritrouato lo possino<sup>2</sup> emendare. Onde  
incominciando dalla prima, che fu il  
Moltiplicare dico; che quando haueremo  
moltiplicato insieme molte proportioni, li  
termini prodotti da tal moltiplicatione  
saranno (come altroue si è detto) fuor de i  
suoi<sup>3</sup> termini radicali;

On the Proof of Each of the  
Demonstrated Operations / Chapter 44

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Because one can easily be mistaken in  
these operations, especially in dealing  
with numbers, inadvertently substituting  
one number for another, in order not to  
neglect anything that may prove useful to  
scholars, I wished to add the method by  
which it is possible to determine whether  
there might be an error in the operations,  
so that once found, it can be corrected.  
Thus, beginning from the first  
[operation], which was multiplication, I  
say that when we have multiplied many  
proportions together, the terms produced  
by such multiplication will be (as has  
been said elsewhere) distant from their  
root terms.

---

<sup>1</sup> 1573, *possino* reads *si possa*.

<sup>2</sup> 1573, *lo possino* reads *si possa*.

<sup>3</sup> 1573, *suoi* reads *loro*.

si che volendo sapere, se le dette proportioni siano<sup>4</sup> contenute in tali termini senza errore, pigliaremo prima due termini, tra i quali c'imaginiamo di hauer collocato alcuna proportione, & li diuideremo per li suoi termini radicali, cioè il maggior per il maggior, & il minor per il minore; & se li prodotti da tal diuisione saranno equali; tal proportione sarà contenuta nelli suoi termini senza errore alcuno; & se fusse altramente, sarebbe il contrario. Volendo adunque sapere, se la proportione Sesquialtera, posta tra questi numeri 360. & 240. sia contenuta nella sua vera proportione; pigliaremo i suoi termini radicali 3. & 2; per li quali diuideremo 360. & 240. in cotal modo; 360. per il 3. & 240. per il 2. & ne verrà da ciascuna parte 120.

Therefore, wishing to know whether the said proportions were contained in such terms without error, we will first take two terms, between which we imagine to have assigned any proportion, and will divide them by their root terms, i.e., the larger by the larger, and the smaller by the smaller, and if the products of such division are equal, this proportion will be contained between the terms without any error, and if it were otherwise, the contrary would occur. Wishing, then, to know if the sesquialter proportion were truly contained between the numbers 360 and 240, we will take its root terms, 3 and 2, by which we will divide 360 and 240 thus – 360 by 3, and 240 by 2 – and we will obtain 120 from each division.

---

<sup>4</sup> 1573, *siano* reads *saranno*.

per il che<sup>5</sup> tale equalità dimostra, che la detta proportione è contenuta tra li proposti numeri, quantunque non siano radicali. Ma quando vno delli prodotti venisse maggior dell'altro, saria segno manifesto, che in tal multiplicatione si hauesse commesso errore. Il medesimo potremo etiandio vedere, multiplicando il maggior delli prodotti proposti col minor termine radicale della proportione, & il minor col maggiore; cioè 360. per il 2. & 240. per il 3: Percioche allora l'vno & l'altro prodotto verrebbero equali, cioè 720; che ne dimostrerebbe, che tal proportione si contiene<sup>6</sup> tra li proposti prodotti senza errore.

---

<sup>5</sup> 1573, *per il che* reads *il perche*.

<sup>6</sup> 1573, *si contiene* reads *è contenuta*.

Such equality demonstrates that the said proportion is contained between the proposed numbers [360 and 240], although they are not in lowest terms. But if one of the products were to be larger than the other, it would be a clear sign that an error in multiplication was committed. We can also see the same [result] by multiplying the larger of the proposed products by the smaller root term of the proportion, and the smaller [product] by the larger [root term], i.e., [by multiplying] 360 by 2, and 240 by 3, because both products would be equal, that is, 720. This would demonstrate that such proportion is contained between the proposed products without error.

Et benchè il Sommar delle proportioni possa esser la proua del Moltiplicare, et il Moltiplicar quella del Sommare; tuttauia non potemo<sup>7</sup> vedere, se ne i loro mezani termini sia alcuno errore, se non nel mostrato modo.<sup>8</sup> Ma veramente la vera proua del Sommare è il Sottrare: percioche se noi sottraremo di vna in vna le sommate proportioni dal prodotto del Sommare, senza alcun fallo potremo conoscer tal somma esser fatta senza errore, quando all'vltimo si verrà alla Equalità.

---

<sup>7</sup> 1573, *potemo* reads *potiamo*.

<sup>8</sup> 1573, *mostrato modo* reads *modo mostrato*.

And although the addition of proportions can be the proof of multiplication, and multiplication [that] of addition, nevertheless we cannot see if their middle terms contain any error, if not for this demonstrated method. But actually the true proof of division is multiplication,<sup>A</sup> because if we divide the added proportions of the result<sup>B</sup> of multiplication one by one, without any fault, we can know that such result was made without error, if in the end equality were reached.

---

<sup>A</sup> As in Chapter 30, Zarlino takes us through a process of successful divisions. Therefore, *Sommare* and *Sottrare* have been translated as “multiplication” and “division,” respectively.

<sup>B</sup> As per note A, *somma* has been rendered as “result” rather than “sum”.

Se noi adunque dal prodotto della somma  
 posta nel ca. 33. che è la Tripla proportione  
 leuaremo di vna in vna le proportioni  
 sommate, incominciando dalla maggiore,  
 che fu la Sesquialtera, ne resterà la Dupla;  
 dalla quale sottraendo la Sesquiterza,  
 resterà la Sesquialtera; Onde cauando da  
 questa la Sesquiquarta, restera la  
 Sesquiquinta, dalla quale cauata l'vltima  
 proportione, che fu medesimamente la  
 Sesquiquinta, senza dubbio si peruenirà  
 alla Equalità,<sup>9</sup>

If we were then to divide the result of the  
 product located in Chapter 33, which is  
 the triple proportion, by the added  
 proportions, one by one, beginning with  
 the largest [proportion], which was the  
 sesquialter, the duple will remain. After  
 dividing [the duple proportion] by the  
 sesquitertia, the sesquialter will remain.  
 Then, dividing the sesquiquarta by [the  
 sesquialter], the sesquiquinta will result,  
 from which the final proportion, which  
 was also the sesquiquinta, is derived.  
 Without a doubt, equality will have been  
 reached.<sup>c</sup>

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<sup>9</sup> 1573, *restera la Sesquiquinta, dalla quale cauata l'vltima proportione, che fu medesimamente la Sesquiquinta, senza dubbio si peruenirà alla Equalità* reads, *senza dubbio si peruenirà alla Equalità: cioè ad vna proportione simile alla Sesquiquinta, che resterà da cauare* (without a doubt, it pertains to equality, i.e. to a proportion similar to the sesquiquarta, which remains after the division).

---

<sup>c</sup> The math is shown in Table 44.1.

1	<i>la Tripla proportione leuaremo...incominciando dalla...Sesquialtera...resterà la Dupla.</i>	Dividing the triple proportion by the added proportions, beginning with the sesquialter, the duple will remain.	$3/1 \div 3/2 = 3/1 \times 2/3 = 2/1$
2	<i>dalla quale sottrando la Sesquitertia, resterà la Sesquialtera</i>	After dividing the duple proportion by the sesquitertia, the sesquialter will remain.	$2/1 \div 4/3 = 2/1 \times 3/4 = 6/4 = 3/2$
3	<i>Onde cauando la questa la Sesquiquarta, resterà la Sesquiquinta.</i>	Dividing the sesquiquarta by the sesquialter, the sesquiquinta will result.	$3/2 \div 5/4 = 3/2 \times 4/5 = 12/10 = 6/5$
4	<i>dalla quale cauata...la Sesquiquinta...si peruenirà alla Equalità.</i>	Equality will have been reached.	$6/5 \div 6/5 = 6/5 \times 5/6 = 1$

Table 44.1. The Proof of Division is Multiplication.

la quale ne fara<sup>10</sup> conoscere, che in tal somma non vi si troua errore alcuno: ma si bene sarebbe, quando alla fine restasse da cauare vna proportione di maggior quantità di vna minore, ouero per il contrario.<sup>11</sup>

From this [procedure] it will be understood that in this compilation no error is found whereas, on the contrary, [an error would be found] if a larger and a smaller proportion remain from this division.

<sup>10</sup> 1573, *fara* reads *da à*.

<sup>11</sup> 1573, *maggior quantità di vna minore, ouero per il contrario* reads *vn'altra, che fusse di maggiore, o di minor quantità di quella, che si hauesse da cauare* (another, which was larger or smaller than that which was to be divided).

La proua<sup>12</sup> del Sottrare (come altroue hò detto)<sup>13</sup> è il Sommare; & perche a sufficienza hò ragionato ivi<sup>14</sup> di tal cosa, però non accade, che qui io<sup>15</sup> replichi cosa alcuna. Ma<sup>16</sup> nel Partire, quando nella equal diuisione delle proportioni, li termini contenuti nella proportionalità Geometrica,<sup>17</sup> non si ritrouassero collocati nel modo, che di sopra hò mostrato; allora sarebbe segno manifesto di errore; si come sarebbe etiandio errore nella Arithmetica<sup>18</sup> & nella Harmonica, quando i loro fussero collocati altramente, che nel modo dichiarato;

The proof of subtraction (as I have said elsewhere<sup>D</sup>) is addition, and because I have discussed this matter sufficiently there, however, I will not repeat anything here. Finally, if in the equal division of proportions, the terms contained in geometric proportion were not found assigned in the way that I have shown above, this would be a manifest indication of error, just as it would also be an error in arithmetic and harmonic [proportions] if [the terms] were to be assigned other than in the stated fashion,

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<sup>12</sup> 1573, *La proua* reads *Ma La proua*.

<sup>13</sup> 1573, (*come altroue hò detto*) omitted.

<sup>14</sup> 1573, *ivi* reads *altroue*.

<sup>15</sup> 1573, *che qui io* reads *ch'io*.

<sup>16</sup> 1573, *Ma* reads *Vltimamente*.

<sup>17</sup> 1573, *Geometrica* reads *Arithmetica*.

<sup>18</sup> 1573, *Arithmetica* reads *Geometrica*. (N.B. the reversal of *Geometrica* and *Arithmetica* does not change the meaning of this sentence.)

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<sup>D</sup> See Chapter 36.

& che le Proportioni, o qualunque  
 continuato ordine di proportioni fussero  
 fuori de i loro termini radicali, quando non  
 si ritrouassero collocate ne i numeri  
 Contraseprimi. Hora parmi, che tutto ciò  
 ch'io hò detto di sopra sia a sufficienza, per  
 mostrar li principij della Musica, i quali se  
 noi non saperemo, non potremo hauer mai  
 buona cognitione delle cose seguenti, ne  
 mai peruenire ad vn perfetto fine;<sup>19</sup> La onde  
 ogn'vno, che desidera di fare acquisto di  
 questa scienza, debbe con ogni suo potere  
 sforzarsi di possederli perfettamente;  
 accioche possa acquistar degna laude, &  
 honoreuole frutto delle sue fatiche.

IL FINE DELLA PRIMA PARTE.

and if the proportions, or whatever  
 continuous order of proportions, were not  
 in lowest terms, expressed as numbers  
 with no common factors. Now it seems  
 to me that everything I have said above  
 would be sufficient to demonstrate the  
 principles of music, which, if we were  
 not to know them, we would neither be  
 able to possess good knowledge of the  
 following things, nor ever attain a perfect  
 goal. Therefore, everyone who wishes to  
 acquire this science must strive with all  
 his might to possess [these principles]  
 perfectly, so that he may amass worthy  
 praise and honorable fruit of his labors.

THE END OF THE FIRST PART.

---

<sup>19</sup> 1573, & tutte queste cose, che concorrono intorno  
 la cognitione delle Forme delle Consonanze (and all  
 these things that are relevant to the knowledge of  
 the forms of the consonances) inserted.

## Appendices

## Appendix 1. Astrolabe, Mesolabe, and Clepsydra.

The astrolabe (Plate A1.1), known to the ancient Greeks, is a two-dimensional model of the celestial sphere used to determine the position of celestial objects, the time of the day and year, the part of the sky visible at any time, and the altitude of any object over the horizon.



Plate A1.1. Astrolabe.<sup>1</sup>

The mesolabe (Plate A1.2), an instrument for finding two or more mean, or geometric, proportionals between two given lines, was developed by Eratosthenes of Cyrene during the third century B.C.E. in order to double the cube, a problem insoluble by the strict Euclidean means of straight edge and compass.<sup>2</sup> A mesolabe consists of a rectangular framework along which three rectangular plates of height equal to the width of the frame slide in three grooves, moving independently of one another and able to overlap.

<sup>1</sup> <[http://www.astrolabepartners.com/the\\_astrolabe.htm](http://www.astrolabepartners.com/the_astrolabe.htm)> (accessed June 9, 2007)

<sup>2</sup> In the fifth century B.C.E. Hippocrates of Chios reduced the problem of doubling the cube to that of finding two mean proportionals in continued proportion as follows: given a cube of side  $a$ , a cube with double its volume can be constructed if two mean proportionals,  $x$  and  $y$ , can be determined such that  $a:x = x:y = y:2a$ .

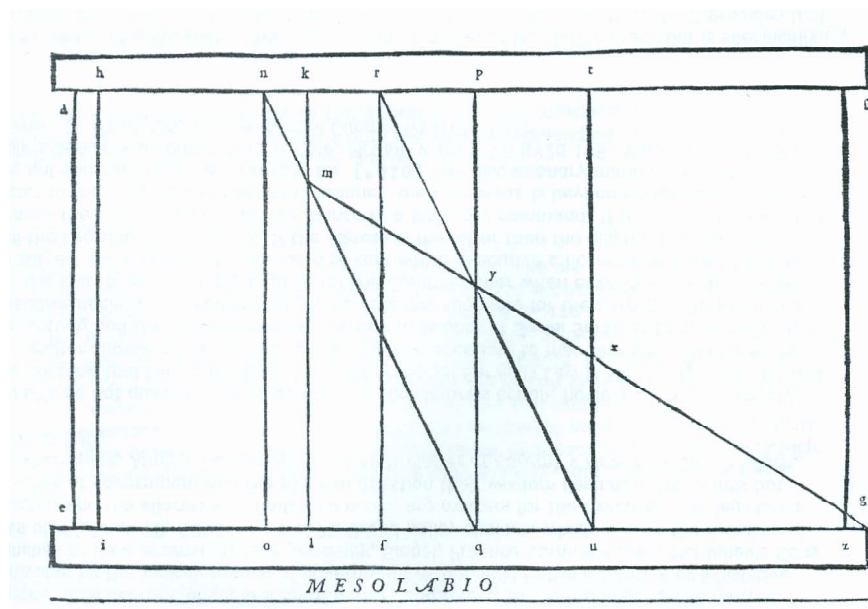


Plate A1.2. Zarlino's Drawing of the Mesolabe.<sup>3</sup>

Figure A1.1 shows the original positions of the rectangular plates (marked with their diagonals).  $AP$  and  $FQ$  are the sides of the frame.  $ARGF$ ,  $RSHG$ , and  $STIH$  are the plates that slide.

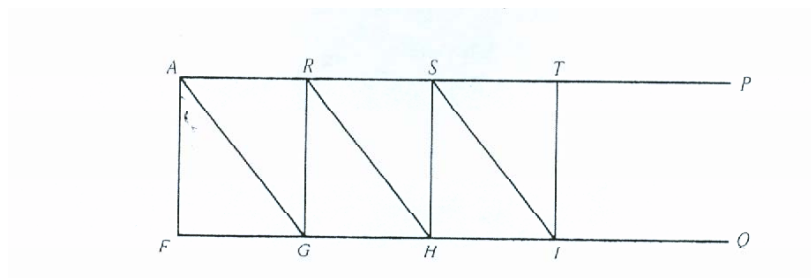


Figure A1.1. Original Position of the Mesolabe.

If plate  $ARGF$  remains stationary while plate  $RSHG$  slides under plate  $ARGF$ , and plate  $STIH$  slides under plate  $RSHG$ , to a position in which the points  $A$ ,  $B$ ,  $C$ , and  $D$  are brought into line, the result looks like Figure A1.2.

<sup>3</sup> Zarlino, *Ist.* (1558), 96.

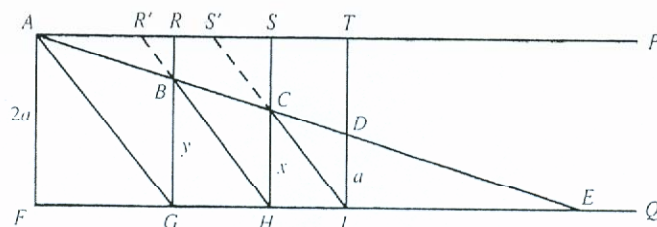


Figure A1.2. Plates *RSHG* and *STIH* are Moved.

Draw a straight line through the collinear points *A*, *B*, *C*, and *D*, meeting side *FQ* at *E*. The ratios of corresponding sides of similar triangles are equal.

$$\frac{HE}{GE} = \frac{BE}{AE} = \frac{GE}{FE},$$

$$\frac{BG}{AF} = \frac{GE}{FE} \quad \text{and} \quad \frac{CH}{BG} = \frac{HE}{GE}.$$

Therefore,

$$\frac{CH}{BG} = \frac{BG}{AF}.$$

Similarly,

$$\frac{DI}{CH} = \frac{CH}{BG},$$

and *DI*, *CH*, *BG*, and *AF* are in continued proportion. Setting *DI* = *a*, *AF* = *2a*. *CH* = *x*, and *BG* = *y*,

$$\frac{a}{x} = \frac{x}{y} = \frac{y}{2a},$$

therefore, *x* and *y* are the mean proportionals between the lengths *a* and *2a*.

Zarlino used the mesolabe to divide consonances into equal parts.<sup>4</sup>

<sup>4</sup> Zarlino describes the mesolabe in Part II, Chapter 25 of *Le istituzioni*. He cites Giorgio Valla (1447-1500) as an authority on its use (*Ist.* [1558], 94). A treatise by Jacques Lefèvre d'Étaples, *Musica libris quatuor demonstrata* (*Music Demonstrated in Four Books*, 1496), which Zarlino cites in a marginal note in the 1573 edition, also includes detailed calculations of geometric proportionalities.

The clepsydra (Plate A1.3), used by the ancient Egyptians, is a water clock that relies on a steadily rising or falling water level in a container to indicate the lapse of predetermined periods of time.

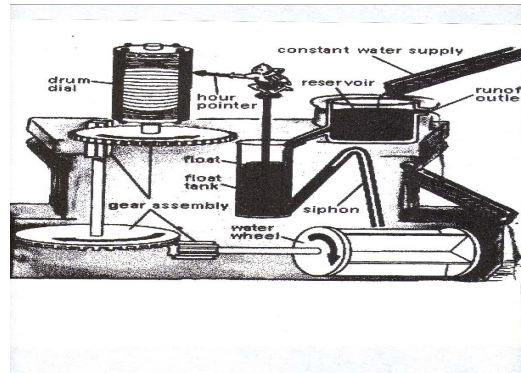


Plate A1.3. Clepsydra<sup>5</sup>

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<sup>5</sup> <<http://www.britannica.com/clockworks/clepsydra.html>>, accessed January 31, 2005.

Appendix 2. Sources Cited by Zarlino in 1573 Marginal Notes.<sup>6</sup>

Location in the Bible	Chapter in <i>Ist.</i> (1573)	Page
Genesis 4:1	1	6
“ 1 (entire)	13	29
1 Samuel 6:23	2	10
2 Kings 3:9-19	2	10
2 Chronicles 7:6	2	10
Job 38:33	6	16
Psalms 8:6	1	5
“ 88:16	2	9
“ 90:4	14	30
Wisdom 11:21	6	18
Isaiah 66:1	1	5
Matthew 9:23	6	16
Romans 1:19ff	13	29
Revelation 4:6ff, 5:8, 19:4	2	8

Table A2.1. Biblical Sources

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<sup>6</sup> Most citations are in the marginal notes. They are indicated where they are solely in the text.

Writer	Work	Chapter	Page
Alessandro Alessandri	<i>Dies geniales</i>	2	10
Ambrose, St.	<i>Commentary on the Gospel According to Luke</i>	6	16
“	<i>Commentary on Psalm 118</i>	2	10 (in text)
Aristotle	<i>Metaphysics</i>	1	6 (twice)
“	<i>On Generation</i>	6	20
“	<i>On Heaven</i>	6 12	16 27
“	<i>On The Nature of Animals</i>	2	10
“	<i>Physics</i>	Prologue 21	3 38
“	<i>Politics</i>	2 3	11 11
“	<i>Postulates</i>	41	64
“	<i>Sophistic Refutation</i>	1	6
“	<i>On The Soul</i>	2 20	9 37
Augustine, St.	<i>Eighty-three Different Questions</i>	7	21
“	<i>On Christian Doctrine</i>	10 12	25 27
“	<i>On Music</i>	9 10 25	24 25 42
“	<i>On Order</i>	10	25
Averroes	<i>Commentary on Aristotle’s “Metaphysics”</i>	1	6
Avicenna	<i>Sufficientia</i>	18 20	35 38
Basil the Great, St.	<i>Homilies to Adolescents</i>	2	10
Berosus of Chaldea	<i>Babylonian History</i>	1	6
Boccaccio	<i>Genealogy of the Gods</i>	10	25
Boethius	<i>On Aristotle’s “On Interpretation”</i>	9 30	24 47 (twice)
“	<i>On Arithmetic</i>	1 30 35	6 47 53

Table A2.2. Laic and Clerical Sources.

The notation “(in text)” appears where there is no marginal note for the entry.

Writer	Work	Chapter	Page
Boethius	<i>On Music</i>	1	6
		6	17, 21
		29	46 (in text)
		31	50 (in text)
“	<i>Consolation of Philosophy</i>	6	16 (in text) 19 (twice)
Cicero	<i>Conversations in Tusculum</i>	2	10
“	<i>On Oration</i>	2	7
“	<i>On the Republic</i>	6	16 16-17 (in text )
Diodorus	<i>Library of History</i>	1	6
Euclid	<i>Elements</i>	12	27
		21	38
		23	40
		25	41, 43
		29	46 (in text)
		31	50 (in text)
		35	53
Eustratius	<i>Ethics</i>	41	63
Giordano	<i>Arithmetic</i>	30	47
Guido d’Arezzo	<i>Micrologus</i>	1	6
Hesiod	<i>Theogonia</i>	6	16
Horace	<i>The Art of Poetry</i>	2	21
“	<i>Satires</i>	4	11
Isidore of Seville	<i>Etymology</i>	2	9
Joseph Flavius	<i>Jewish Antiquity</i>	1	6
Lactantius	<i>Dialogues with God</i>	1	6
“	<i>Divine Institutions</i>	14	30
Macrobius	<i>Commentary on Scipio’s Dream</i>	1	6
“	<i>Saturnalia</i>	6	21
“Mercurius Trismegistus”	<i>Hermetica</i>	6	18
Ovid	<i>Metamorphoses</i>	6	15 (in text)
		6	20
“	<i>The Art of Love</i>	4	13
		6	20
Pausanias	<i>Description of Greece</i>	2	10
Petrus de Abano	<i>Exposition on the Problems of Aristotle</i>	39	59
Plato	<i>Alcibiades</i>	10	25
“	<i>Epinomis</i> (spurious)	12	27
“	<i>Gorgias</i>	2	8

Table A2.2 (continued)

Writer	Work	Chapter	Page
Plato	<i>Laws</i>	2	7, 11
“	<i>Philebus</i>	14	30
“	<i>Symposium</i>	6	20
“	<i>Timaeus</i>	6	17
		14	30
		21	38
Pliny	<i>Natural History</i>	1	6
		2	10
		6	17
		10	25
Pseudo-Dionysius the Areopagite	<i>Celestial Hierarchy</i>	1	6
Ptolemy	<i>Almagest,</i>	11	25
“	<i>Harmonics</i>	6	17
		7	22
		19	36
Quintilian	<i>On Oratory</i>	10	25
Valerius Maximus	<i>Nine Books of Memorable Deeds</i>	2	7, 11
Virgil	<i>Aeneid</i>	2	8 (twice)
		6	16
		7	23
“	<i>Bucolics</i>	2	8 (twice)
		6	16
		10	25
“	<i>Georgics</i>	2	8
Vitruvius	<i>On Architecture</i>	2	8

Table A2.2 (continued)

### Appendix 3. Kepler's Derivation of Musical Consonances.

“Kepler perceives musical sounds not as numbers, simple collections of individuals, but as highly organized movements of voices through time....”<sup>7</sup> In his view, the source of harmony is to be found in geometry—the realm of the continuous quantity, rather than in arithmetic—the realm of the discrete quantity. His geometrical solution for the derivation of consonance determines the ratios of consonances by inscribing regular polygons in a circle as well as by dividing the circle by its diameter. Using only a compass and straight edge the circumference of a circle is divisible in equal parts in 4 basic ways (Table A3.1):

	Division of circle	Ratio: One side to whole	Interval	Ratio: Residue to whole	Interval
1	diameter	1/2 : 1	octave	1/2 : 1	octave
2	triangle	1:3	twelfth	2:3	fifth
3	square	1:4	double octave	3:4	fourth
4	pentagon	1:5	double octave + major third	4:5	major third

Table A3.1. Intervals Defined by Dividing a Circle by its Diameter and Inscribing Regular Polygons Within.

The ratio of the major sixth, 3:5, is obtained by using two and then three sides of the pentagon (Table A3.2).

<sup>7</sup> Paolo Gozza, *Number to Sound: The Musical Way to the Scientific Revolution*. Vol.64 in The Western Ontario Series in Philosophy of Science. (Dordrecht, The Netherlands: Kluwer Academic Publishers, 2000), 47.

Division of circle	Ratio: Two sides to whole	Interval	Ratio: Three sides to whole	Interval
pentagon	2:5	octave + major third	3:5	major sixth

Table A3.2. Deriving the Major Sixth by Inscribing the Pentagon in a Circle.

Using the hexagon and the octagon, the consonances of 5:6 (minor third) and 5:8 (minor sixth) are derived.

Appendix 4. Frontispieces of three editions of *Le istituzioni harmoniche*.

# LE ISTITVTIONI HARMONICHE

DI M. GIOSEFFO ZARLINO DA CHIOGGIA;

Nelle quali; oltre le materie appartenenti

ALLA MVSICA;

Si trouano dichiarati molti luoghi  
di Poeti, d'Historici, & di Filofofi;

*Si come nel leggerle si potrà chiaramente vedere.*

¶ Θεὸς διδάσκει, οὐδὲν ἰσχύει φθόνος.  
Καὶ μὴ διδάσκει, οὐδὲν ἰσχύει πόνος.



Con Priuilegio dell'Illustrifs. Signoria di Venetia,  
per anni X.

IN VENETIA M D LVIII.

Plate A4.1. Frontispiece of *Le istituzioni harmoniche* (1558).

# LE ISTITVTIONI HARMONICHE

DEL REVERENDO M. GIOSEFFO ZARLINO  
DA CHIOGGIA;

Nelle quali; oltre le materie appartenenti  
ALLA MUSICA;

Si trouano dichiarati molti luoghi  
di Poeti, d'Historici, & di Filofofi;

*Si come nel leggerle si potrà chiaramente vedere.*

¶ Θεὸν διδόντος, οὐδὲν ἰσχύει πόνος.  
Καὶ μὴ διδόντος, οὐδὲν ἰσχύει πόνος.



Con Priuilegio dell'Illustris. Signoria di Venetia,  
per anni X.

IN VENETIA,  
Appresso Francesco Senese, al segno della Pace.  
M D L X I.

Plate A4.2. Frontispiece of *Le istituzioni harmoniche* (1561).

ISTITVTIONI  
HARMONICHE  
DEL REV MESSERE  
GIOSEFFO ZARLINO  
DA CHIOGGIA,

Maestro di Capella della SERENISSIMA SIGNORIA di VENETIA: di  
nuouo in molti luoghi migliorate, & di molti belli secreti  
nelle cose della Pratica ampliate.

*Nelle quali; oltre le materie appartenenti alla MUSICA; si trouano dichiarati  
molti luoghi di Poesi; Historici, & di Filosofi; si come nel  
leggerle si potrà chiaramente vedere.*

Con due Tavole; l'vna che contiene le Materie principali: & l'altra  
le cose più notabili, che nell'Opera si ritrouano

Ἐὐδιδόντος, οὐδ' ἐν ἰσχύει θόνος;  
Καὶ μὴ διδόντος, οὐδ' ἐν ἰσχύει πόνος.



Σημεῖον τῆ εἰδότητος καὶ τὸ δῶναι διδάσκειν ἐστὶ.

IN VENETIA,  
Appresso Francesco de i Franceschi Senese.  
M. D. LXXIII.

## Appendix 5. Comparison of Ramis's and Zarlino's Division of the Monochord.

In *Musica Practica* (1482), Ramis describes a division of the monochord (Plate 3) that uses ratios between pairs of numbers (1 through 6) to define the octave, fifth, three of the fourths, the two major thirds, three of the minor thirds, and the major sixth, all of which lie within the octave between proslambanomenos and mese of the Greater Perfect System.<sup>8</sup> Zarlino's syntonic diatonic division of the monochord (Plate 4) yields similar ratios, but the anomalous fourths and minor thirds occur in different places. Ramis's fourth between *d* and *g* is given the ratio of 27:20, larger than the 4:3 ratio of the other fourths. Zarlino's fourth between *e* and *a* has the 27:20 ratio, whereas his other fourths have the 4:3 ratio. Ramis's minor third between *B* and *d*, ratio 32:27, is smaller than the other minor thirds, ratio 6:5. Zarlino's exception occurs between *A* and *c*. The ratios are compared in Table A5.1.

Absolute pitches with Proslambanomenos-mese <i>A-a</i>	Interval	Ramis	Zarlino
<i>A – a</i>	octave	2:1	2:1
<i>A – e</i>	fifth	3:2	3:2
<i>B – e</i>	fourth	4:3	4:3
<i>c – f</i>	fourth	4:3	4:3
<i>d – g</i>	fourth	27:20	4:3
<i>e – a</i>	fourth	4:3	27:20
<i>c – e</i>	major third	5:4	5:4
<i>f – a</i>	major third	5:4	5:4
<i>A – c</i>	minor third	6:5	32:27
<i>B – d</i>	minor third	32:27	6:5
<i>d – f</i>	minor third	6:5	6:5
<i>e – g</i>	minor third	6:5	6:5
<i>c – a</i>	major sixth	5:3	5:3

Table A5.1. Ratios of Intervals in Divisions of the Monochord by Ramis and Zarlino.

<sup>8</sup> See Bartolomeo Ramis de Pareia, *Musica Practica*, trans. and ed. Clement A. Miller (Neuhausen-Stuttgart: Hänssler-Verlag, 1993), 162-164.



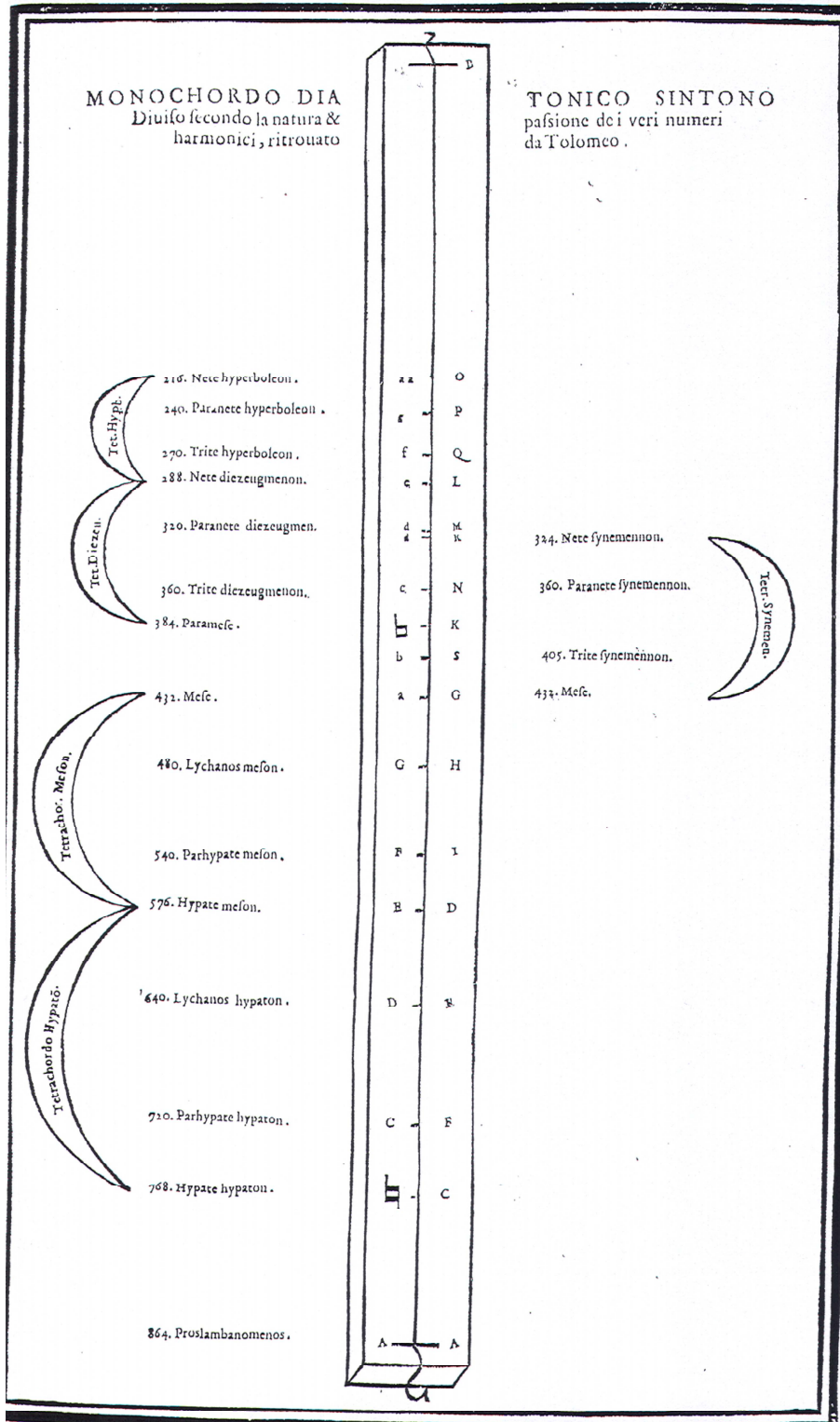


Plate A5.2. Zarlino's Syntonic Diatonic Monochord<sup>10</sup>

<sup>10</sup> Zarlino, *Ist.* (1558), 124. The numbers to the left of the pitch names refer to string lengths.

## Appendix 6. Proportion and Proportionality

Table A6.1 defines the types of proportion and provides an example of each.

Type of Proportion	Definition	Example
Arithmetic	A relation among quantities such that the difference of the first and second is equal to the difference of the third and fourth.	24:20::12:8, because $24-20=4$ and $12-8=4$ . Expressed in lowest terms these ratios are not equivalent; $24:20=6:5$ , but $12:8=4:3$ .
Geometric	A relation among quantities such that the quotient of the first divided by the second is equal to that of the third divided by the fourth.	24:6::12:3, because $24\div 6=4$ and $12\div 3=4$ . The two ratios are equivalent; expressed in lowest terms, they are 4:1.
Harmonic	A relation among quantities such that the first is to the last as the difference between the first two is to the difference between the last two.	24:16::12:9, because $24:9=8:3$ , and $24-16=8$ and $12-9=3$ .

Table A6.1. Types of Proportion.

Table A6.2 defines the arithmetic, geometric, and harmonic mean and provides a formula and an example for each type of mean.

Definition of mean	Formula to calculate mean m of two numbers, a and b	Example
Arithmetic mean divides two numbers so that $a-m = m-b$	$m = \frac{a+b}{2}$	Arithmetic mean of 24 and 6 = 15
Geometric mean divides two numbers so that $a/m = m/b$	$m^2 = ab$ , or $m = \sqrt{ab}$	Geometric mean of 24 and 6 = 12
Harmonic mean divides two numbers so that $a-m/m-b=a/b$	$m = \frac{2ab}{a+b}$	Harmonic mean of 24 and 6 = 9.6  The harmonic mean of 12 and 4 = 6, because in the proportionality $12:6 :: 6:4$ , $12:4=6:2$ .

Table A6.2. Types of Mean.

Table A6.3 provides a formula for each of the five genera of proportion that Zarlino defines in Chapter 22 of *Le istitutioni* and gives the interval defined by the example for which numbers are substituted for the variables in each formula.

Genus	Formula	Explanation of Terms	Substitute Numbers for Variables	Proportion in Lowest Terms	Interval
Multiple	$y : mx$	m is a whole number	$y = 2$ $x = 1$ $m = 2$	2:1	Octave
Superparticular	$y : x + a$	a is an aliquot part of x	$y = 6$ $x = 4$ $a = 2$	3:2	Fifth
Superpartient	$y : x + b$	b is a non-aliquot part of x	$y = 5$ $x = 3$ $b = 2$	5:3	Major sixth
Multiple superparticular	$y : mx + a$	m is a whole number a is an aliquot part of x	$y = 10$ $x = 4$ $m = 2$ $a = 2$	5:2	Octave + major third
Multiple superpartient	$y : mx + b$	m is a whole number b is a non-aliquot part of x	$y = 8$ $x = 3$ $m = 2$ $b = 2$	8:3	Minor sixth

Table A6.3. The Five Genera of Proportion with Examples and Intervals for Each.

## Bibliographies

## PRIMARY SOURCES

- Aaron, Pietro. 1539. *Toscanello in musica*. Repr. Kassel: Bärenreiter, 1970.
- Aristoxenus. *Elementa Rhythmica*. Edited by Lionel Pearson. Oxford: Clarendon Press, 1990.
- Artusi, Giovanni Maria. 1600. *L'Artusi overo delle imperfettioni della moderna musica*. Repr. Bologna: Forni Editore, 1968.
- . *Discorse secondo musicale di Antonio Braccino da Todi*. Venice: Giacomo Vincenti, 1608.
- . *Impresa del molto R.M. Gioseffo Zarlino da Chioggia*. Bologna: Giovanni Battista Bellagamba, 1604.
- Augustine, Saint, Bishop of Hippo. *De diversis quaestionibus octoginta tribus*. Edited by Almut Mutzenbecher. Turnholt: Brepols, 1975.
- Baldi, Bernardino. 1707. *Cronica de mathematici, overo Epitome dell'istoria delle vite loro*. Edited by Elio Nenci as *Le vite de' matematici*. Milan: FrancoAngeli, 1998.
- Biblia Sacra Vulgata*. Stuttgart: Deutsche Bibelgesellschaft, 1994.
- Boethius, Anicius Manlius Severinus. *De institutione arithmetica, Libri Duo / De institutione musica, Libri Quinque*. Edited by Gottfried Friedlein. Frankfurt am Main: Minerva, 1966.
- Censorinus. *De die natali liber*. Edited by Otto Jahn. Amsterdam: Editions Rodopi, 1964.
- Ficino, Marsilio. *Opera Omnia*, vol. 1. Monumenta Politica et Philosophica Rariora, ser. 1, no. 7. Torino: Bottega d'Erasmus, 1962.
- Florio, John. *Queen Anna's New World of Words, or Dictionarie of the Italian and English Tongues*. London: Melch, Bradwood, 1611.
- Fogliano, Lodovico. 1529. *Musica theorica*. Repr., Bologna: Forni Editore, 1970.
- Gaffurio, Franchino. 1518. *De harmonium musicorum instrumentorum opus*. Repr., [Rome]: American Institute of Musicology, 1977,
- . *Theorica musice*. Milan: Philippus Mantegatius, 1492.
- Ganassi, Silvestro. 1543. *Letzione seconda pur della prattica di sonare il violone d'arco da tasti*. Repr. Bologna: Forni Editore, 1970.

- The Holy Bible: Saint Joseph Edition*. New York: Catholic Book Publishing Co., 1991.
- The Holy Bible: New International Version*. Grand Rapids: Zondervan, 1990.
- Kepler, Johannes. 1619. *Harmonices mundi libri v*. Repr., Vienna: Anton F. W. Sommer, 2005.
- Lefèvre d'Étaples, Jacques. 1551. *Musica libris quatuor demonstrata*. Repr. in Jean Saint-Arroman, *Renaissance Française: Traités Méthodes / Préfaces / Ouvrages Généraux / quatre volumes réalisé par Olivier Trachier*, vol. 2, 141-228. Courlay, France: Editions Fuzeau, [n.p.].
- Martini, Giovanni Battista. 1757. *Storia della musica*. Repr., Graz: Akademische Druck u. Verlagsanstalt, 1967.
- Morley, Thomas. 1697. *A Plaine and Easie Introduction to Practicall Musicke*. Repr., London: Oxford University Press, 1937.
- Odington, Walter. [1316?] *Summa de speculatione musicae*. Edited by Frederick F. Hammond. *Corpus Scriptorum de Musica*, 14. [n.p.]: American Institute of Musicology, 1970.
- Pontio, Pietro. 1588. *Ragionamento di musica*. Repr., Kassel: Bärenreiter, 1959.
- Rameau, Jean Philippe. 1722. *Traité de l'harmonie réduite à ses principes naturels*. Repr., New York: Broude Brothers, 1965.
- Ramis de Pareia, Bartolomeo. *Musica practica*. Edited by Clemente Terni. Madrid: Joyas Bibliográficas, 1983.
- Tartini, Giuseppe. 1767. *De' principij dell'armonia musicale contenuta nel diatonico genere*. Repr., New York, Broude Brothers, 1967.
- . 1754. *Trattato di musica secondo la vera scienza dell'armonia*. Repr., New York: Broude Brothers, 1966.
- Tigrini, Orazio. *Il compendio della musica*. Venice: Ricciardo Amadino, 1588.
- Vicentino, Nicola. 1555. *L'antica musica ridotta alla moderna prattica*. Repr., Kassel: Bärenreiter, 1959.
- Webster's Encyclopedic Unabridged Dictionary of the English Language*.
- Zacconi, Lodovico. 1592. *Prattica di musica*, Part 1. Repr., Bologna: Editore Forni, n.d.

- . 1622. *Prattica di musica*, Part 2. Repr., Bologna: Editore Forni, n.d.
- Zarlino, Gioseffo. 1571. *Dimostrazioni harmoniche*. Repr. New York: Broude Brothers, 1965.
- . 1558. *Le istituzioni harmoniche*. Repr., New York: Broude Brothers, 1965.
- . 1561. *Le istituzioni harmoniche*. Repr., Bologna: Arnaldo Forni, 1999.
- . 1573. *Le istituzioni harmoniche*. Repr., Englewood, NJ: Gregg Press, 1966.
- . *Motets from 1549. Part I: Motets Based on the Song of Songs*. Edited by Cristle Collins Judd. Middleton, WI: A-R Editions, 2006.
- . *Motets from 1549. Part II: Eleven Motets from "Musici quinque vocum moduli" (Venice, 1549)*. Edited by Cristle Collins Judd. Middleton, WI: A-R Editions, 2007.
- . 1588. *Sopplimenti musicali*. Repr., Ridgewood, NJ: Gregg Press, 1966.

#### SECONDARY SOURCES

- Aaron, Pietro. *Toscanello in Music*. Translated by Peter Bergquist. Colorado Springs: Colorado College Music Press, 1970.
- Adkins, Cecil. "The Technique of the Monochord." *Musica Disciplina* 39 (1967):34-43.
- Adrio, Adam, and Clytus Gottwald. "Sethus Calvisius," *Grove Music Online*, ed. L. Macy. <<http://www.grovemusic.com>> (accessed June 1, 1966).
- Alighieri, Dante. *The Divine Comedy of Dante Alighieri: A Verse Translation with Introductions and commentary by Allen Mandelbaum. III. Paradiso*. Berkeley: University of California Press, 1982.
- Allen, Michael J.B. *Nuptial Arithmetic: Marsilio Ficino's Commentary on the Fatal Number in Book VIII of Plato's "Republic"*. Berkeley: University of California Press, 1994.
- Aristotle. *The Basic Works of Aristotle*. Edited by Richard McKeon. New York: Modern Library, 2001,
- Arnold, Denis. *Giovanni Gabrieli and the Music of the Venetian High Renaissance*. London, Oxford University Press, 1979.
- Atlas, Allan W. *Renaissance Music*. New York: W.W. Norton, 1998.

Augustine, Saint, Bishop of Hippo. *Eighty-three Different Questions, Writings of Saint Augustine*, Fathers of the Church, vol. 70, Translated by David L. Mosher. Washington, D.C.: Catholic University of America Press, 1982.

———. “On Music,” *Writings of Saint Augustine*, Fathers of the Church, vol. 4, Translated by Robert Catesby Taliaferro. New York: Fathers of the Church, Inc., 1947: 153-379.

Baker, Nancy Kovaleff and Barbara Russano Hanning. *Musical Humanism and its Legacy: Essays in Honor of Claude V. Palisca*. Stuyvesant, NY: Pendragon, 1992.

Baker, Thomas W. *Ptolemy's Treatise on Music: A Partial Translation with an Introduction*. Unpublished thesis, Columbia University, 1974.

Bailhache, Patrice. “Music Translated into Mathematics: Leonhard Euler.” <<http://sonic-arts.org/monzo/euler/euler-en.htm>> (accessed June 16, 2007).

Barbera, André, ed. *Music Theory and its Sources: Antiquity and the Middle Ages*. Notre Dame, IN: University of Notre Dame Press, 1990.

———. “The Persistence of Pythagorean Mathematics in Ancient Musical Thought.” PhD diss., The University of North Carolina, 1980.

Barbieri, Patrizio. “Il mesolabio e il compasso di proporzione: le applicazioni musicali di due strumenti matematici (1558-1675),” *Musica, scienza e idée nella Serenissima durante il seicento*, Edited by Francesco Passadore and Franco Rossi. Venice: Edizioni Fondazione Levi, 1996, 201-220.

Barbour, J. Murray. *Tuning and Temperament*. East Lansing, MI: Michigan State College Press, 1951.

Barker, Andrew, editor: *Greek Musical Writings, Volume II: Harmonic and Acoustic Theory*. New York: Cambridge University Press, 1989.

———. *Scientific Method in Ptolemy's "Harmonics"*. Cambridge: Cambridge University Press, 2000.

Berger, Karol. *Theories of Chromatic and Enharmonic Music in Late Sixteenth-Century Italy*, *Studies in Musicology*, No. 10. Ann Arbor: UMI Research Press, 1980.

Blackburn, Bonnie, Edward E. Lowinsky, and Clement A. Miller, Editors. *A Correspondence of Renaissance Musicians*. Oxford: Clarendon Press, 1991.

Blazekovic, Zdravko. “What Marsyas May Have Meant to the Cinquecento Venetians, or Andrea Schiavone's Symbolism of Musical Instruments.” *Music in Art* 26 (2001), 30-46.

Boalch, Donald H. *Makers of the Harpsichord and Clavichord 1440-1840*. Oxford: Clarendon Press, 1974.

Boethius, Anicius Manlius Severinus. *The Consolation of Philosophy*. Translated by Richard Green. Indianapolis: Bobbs-Merrill, 1962.

———. *Fundamentals of Music*. Translated by Calvin M. Bower. New Haven: Yale University Press, 1989.

Bolzoni, Lina. "L'Accademia Veneziana: splendore e decadenza di una utopia enciclopedica," *Università, Accademie e Società Scientifiche in Italia e in Germania del Cinquecento al Settecento*, Edited by Laetitia Boehm and Ezio Raimondi. Bologna: Società editrice il Mulino, 1981.

———. "Rendere visibile il sapere: l'Accademia Veneziana fra modernità e utopia," *Italian Academies of the Sixteenth Century*, Edited by D. S. Chambers and F. Quiviger. London: The Warburg Institute, 1995.

Bonino, MaryAnn. *Don Severo Bonini (1582-1633), his Discorsi e regole*. PhD diss., University of Southern California, 1971.

Bottrigari, Hercole. *Il Desiderio*. Translated by Carol MacClintock. [n.p.]: American Institute of Musicology, 1962.

Bowen, William R. "Ficino's Analysis of Musical *Harmonia*. *Ficino and Renaissance Neoplatonism*. Edited by Konrad Eisenbichler and Olga Zorzi Pugliese. Toronto: Dovehouse Editions Canada, 1986.

———. "Music and Number." Ph.D. diss., University of Toronto, 1984.

Brink, C.O. *Horace on Poetry: The 'Ars Poetica'*. Cambridge: Cambridge University Press, 1971.

Brown, Patricia Fortini. Review of *Venice & the East: The Impact of the Islamic World on Venetian Architecture 1100-1500*, by Deborah Howard. *The Journal of the Society of Architectural Historians* 60/3 (September 2001), 357-359.

Brucegari, Marcello. *Guida Insolita ai misteri, ai segreti, alle leggende e alle curiosità delle chiese di Venezia*. Rome: Newton & Compton Editori, 2004.

Bryant, David. "The *cori spezzati* of St. Mark's: Myth and Reality," *Early Music History* 1 (1973), 165-186.

Buelow, George J. "Athanasius Kircher," *Grove Music Online*, ed. L. Macy. <<http://www.grovemusic.com>> (accessed September 5, 2006).

- Burkert, Walter. *Lore and Science in Ancient Pythagoreanism*. Cambridge: Harvard University Press, 1972.
- Burton, David M. *The History of Mathematics: An Introduction*. New York: McGraw Hill, 1997.
- Caffi, Francesco. *Storia della musica sacra nella già cappella ducale di San Marco in Venezia dal 1318 al 1797*. Venice: G. Antonelli, 1854.
- Carpenter, Nan Cooke. *Music in the Medieval and Renaissance Universities*. Norman, OK: University of Oklahoma Press, 1958.
- Chafe, Eric T. *Monteverdi's Tonal Language*. New York: Schirmer Books, 1992.
- Cohen, Albert. "Mersenne, Marin," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com> (accessed June 23, 2007).
- Cohen, H. Floris. *Quantifying Music*. Dordrecht, The Netherlands: D. Reidel, 1984.
- Chrissochoidis, Ilias. "The Artusi-Monteverdi Controversy; Background, Content and Modern Interpretations." <http://www.bpmonline.org.uk/bpm6-artusi.htm>. (accessed February 3, 2008).
- Christensen, Thomas. Introduction to *The Cambridge History of Western Music Theory*, edited by Thomas Christensen, 1-23. Cambridge: Cambridge University Press, 2002.
- Chroust, Anton-Hermann. "A Contribution to the Medieval Discussion: *Utrum Aristoteles Sit Salvatus*." *Journal of the History of Ideas* 6/2 (April, 1945), 231-238.
- Crocker, Richard L. "'Musica Rythmica' and 'Musica Metrica' in Antique and Medieval Theory." *Studies in Medieval Music Theory and the Early Sequence*. Great Yarmouth, Norfolk, Great Britain: Gailliard, 1997: 2-23.
- . "Pythagorean Mathematics and Music." *Studies in Medieval Music Theory and the Early Sequence*. Great Yarmouth, Norfolk, Great Britain: Gailliard, 1997: 189-198; 326-335.
- . "Why did Zarlino Re-number the Modes?" *Studies in Medieval Music Theory and the Early Sequence*. Great Yarmouth, Norfolk, Great Britain: Gailliard, 1997: 1-10.
- Da Col, Paolo. "The Tradition and Science—The *Istitutioni harmoniche* of Gioseffo Zarlino," in Zarlino 1561. *Le istitutioni harmoniche*. Edited by Paolo Da Col and Iain Fenlon. Arnaldo Forni, 1999, 35-55.
- Damschroder, David A. *Music Theory from Zarlino to Schenker: A Bibliography and Guide*. Stuyvesant, NY: Pendragon, 1990.

Descartes, René. *Compendium of Music = Compendium musicae*. Translated by Walter Robert. Musicological Studies and Documents, edited by Armen Carapetyan, 8. [n.p.]: American Institute of Musicology, 1961.

Dickreiter, Michael. *Der Musiktheoretiker Johannes Kepler*. Berne: A. Franck AG Verlag, 1975.

Drake, Stillman. "Renaissance Music and Experimental Science." *Journal of the History of Ideas* 31:4 (1970), 483-500.

Edwards, Rebecca. "Setting the Tone at San Marco: Gioseffo Zarlino Amidst Doge, Procuratori and Cappella Personnel," *La cappella musicale di San Marco nell'età moderna*. Edited by Francesco Passadore and Franco Rossi. Venice: Edizioni Fondazione Levi, 1998, 389-400.

Eggebrecht, Hans Heinrich. *Handwörterbuch der musikalischen Terminologie*. Weisbaden: F. Steiner, 1972-.

Fauvel, John, Raymond Flood, and Robin Wilson, eds. *Music and Mathematics from Pythagoras to Fractals*. Oxford: Oxford University Press, 2003.

Feldman, Martha. *City Culture and the Madrigal at Venice*. Berkeley: University of California Press, 1995.

Fend, Michael. "Zarlino's Versuch einer Axiomatisierung der Musiktheorie in den *Dimostrazioni harmoniche (1571)*," *Musiktheorie* 4/2 (1989): 113-126.

Fenlon, Dermot. *Heresy and Obedience in Tridentine Italy*. Cambridge: Cambridge University Press, 1972.

Fenlon, Iain. "Bottrigari, Ercole," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com> (accessed October 15, 2006).

———. "Gioseffo Zarlino and Venetian Humanism" in Zarlino 1561. *Le istituzioni harmoniche*. Edited by Paolo Da Col and Iain Fenlon. Bologna: Arnaldo Forni, 1999, 7-12.

———. *Music and Culture in Late Renaissance Italy*. Oxford: Oxford University Press, 2002.

———. "Zarlino and the Accademia Venetiana," *Italian Academies of the Sixteenth Century*, Edited by D.S. Chambers and F. Quiviger. London: The Warburg Institute, 1995.

- Ferris, Joan. "The Evolution of Rameau's Harmonic Theories," *Journal of Music Theory* 3/2 (1959-1960): 231-256.
- Flaccus, Quintius Horace. *The Complete Works of Horace*. Edited by Casper J. Kraemer, Jr. New York: Modern Library, 1936.
- Flansburg, Margaret. Review of *The Myth of Apollo and Marsyas in the Art of the Italian Renaissance*, by Edith Wyss, *Renaissance Quarterly* 51/2 (Summer 1998), 632-633.
- Fose, Luanne Eris. *The "Musica Practica" of Bartolomeo Ramos de Pareia: A Critical Translation*. Ann Arbor: University Microfilms International, 1992.
- Franzoi, Umberto and Dina Di Stefano. *Le Chiese di Venezia*. Venice: Alfieri, 1976.
- Gadol, Joan. "The Unity of the Renaissance: Humanism, Natural Science, and Art." In *From the Renaissance to the Counter-Reformation*, edited by Charles H. Carter, 29-55. New York: Random House, 1965.
- Gaffurio, Franchino. *The Theory of Music*. Translated by Walter Kurt Kreyzig. New Haven: Yale University Press, 1993.
- Gaspari, Gaetano. *Musica e musicisti a Bologna*. Bologna: Forni Editore, 1969.
- Glixon, Jonathan. *Honoring God and the City: Music at the Venetian Confraternities, 1260-1807*. Oxford: Oxford University Press, 2003.
- Goldman, David. "A New Look at Zarlino's Theory and its Effect on his Counterpoint Doctrine." *Theory and Practice* 16 (1991), 163-177.
- Gosman, Alan. "Rameau and Zarlino: Polemics in the *Traité de l'harmonie*." *Music Theory Spectrum* 22/1 (Spring 2000): 44-59.
- Gozza, Paolo, ed. *Number to Sound: The Musical Way to the Scientific Revolution*. Dordrecht, The Netherlands: Kluwer Academic Publishers, 2000.
- Grout, Donald J. and Claude V. Palisca. *A History of Western Music*. 4th ed. New York: W.W. Norton, 1988.
- Gullino, G. "Vincenzo Diedo," *Dizionario biografico degli italiani*. Rome: Società Grafica Romana, 1991. 39:81-784.
- Haar, James. "Humanismus." *Die Musik in Geschichte und Gegenwart*, ed. Friedrich Blume, *Sachteil*. Kassel: Bärenreiter, 1994. 4: columns 440-454.
- Hammond, Frederick, and Peter M Lefferts. "Odington, Walter." *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com> (accessed May 8, 2007).

Harrán, Don. "In Pursuit of Origins: The Earliest Writing on Text Underlay (c. 1440)." *Acta Musicologica* 50 (1978): 217-240.

———. *In Search of Harmony: Hebrew and Humanistic Elements in Sixteenth-Century Musical Thought*. Neuhausen-Stuttgart: Hänssler-Verlag, 1988.

———. "New Light on the Question of Text Underlay Prior to Zarlino," *Acta Musicologica* 45 (1973), 24-56.

———. "Sulla genesi della famosa disputa fra Gioseffo Zarlino e Vincenzo Galilei: Un nuovo profilo" *Nuova rivista musicale italiana* 21 (1987): 467-470.

———. *Word-Tone Relations in Musical Thought*. Neuhausen-Stuttgart: Hänssler-Verlag, 1986.

Hatch, Christopher, and David W. Bernstein, ed. *Music Theory and the Exploration of the Past*. Chicago: University of Chicago Press, 1993.

Heath, Sir Thomas Little. *Greek Mathematics*. New York: Dover, 1981.

Hirtler, Eva. *Die Musik als scientia mathematica von der Spätantik bis zum Barock*. Frankfurt am Main: Peter Lang, 1995.

Horn, Wolfgang. "Zarlino." *MGG*, revised edition, Ludwig Finscher, editor, *Personteil*. Kassel: Bärenreiter, 2006. 17: columns 1348-1354

Hyer, Brian. "Before Rameau and After," *Music Analysis* 15/i, 75-100.

Judd, Cristle Collins. "A Newly Recovered Eight-Mode Motet Cycle from the 1540s: Zarlino's Song of Song Motets." In *Théorie et analyse musicales / 1450-1650 / Music Theory and Analysis*, 229-270. Louvain: Raymond Brulet, 2001.

———. "Learning to Compose in the 1540s: Gioseffo Zarlino's *Si bona suscepimus*." In *Citation and Authority in Medieval and Renaissance Musical Culture: Learning From the Learned*, edited by Suzannah Clark and Elizabeth Eva Leach, 184-205. Trowbridge, Wiltshire, England: Cromwell Press, 2005.

———. *Reading Renaissance Music Theory: Hearing with the Eyes*. Cambridge: Cambridge University Press, 2000.

———. "Renaissance Modal Theory: Theoretical, Compositional, and Editorial Perspectives." In *The Cambridge History of Western Music Theory*, edited by Thomas Christensen, 364-406. Cambridge: Cambridge University Press, 2002.

Kartomi, Margaret J. *On Concepts and Classifications of Musical Instruments*. Chicago: University of Chicago Press, 1990.

Kaufmann, Henry William. *The Life and Works of Nicola Vicentino*. [n.p.]: American Institute of Musicology, 1966.

Kepler, Johannes. *The Harmony of the World*. Translated by E. J. Aiton, A.M. Duncan, and J.V. Field. Philadelphia: American Philosophical Society, 1997.

Kristeller, Paul Oskar. *Renaissance Thought*. New York: Harper and Row, 1961.

Labowsky, Lotte. *Bessarion's Library and the Biblioteca Marciana: Six Early Inventories*. Rome: Edizioni di storia e letteratura, 1979.

Lester, Joel. *Compositional Theory in the Eighteenth Century*. Cambridge: Harvard University Press, 1992.

Lockwood, Lewis. "Music and Religion in the High Renaissance and the Reformation." In *The Pursuit of Holiness in Late Medieval and Renaissance Religion*, edited by Charles Trinkhaus and Heiko A. Oberman), 496-502. Leiden: E.J. Brill, 1974.

Logan, Oliver. *Culture and Society in Venice, 1470-1790*. New York: Charles Scribner's Sons, 1972.

Lowinsky, Edward E. *Music in the Culture of the Renaissance and Other Essays*. Chicago: University of Chicago Press, 1989.

Macrobius, Ambrosius Theodosius. *Commentary on the Dream of Scipio*. Translated by William Harris Stahl. New York: Columbia University Press, 1952.

Maniates, Maria Rika. "Bottrigari versus Sigonio: on *Vicentino and his Ancient Music Adapted to Modern Practice*." In *Musical Humanism and its Legacy: Essays in Honor of Claude V. Palisca*, edited by Nancy Kovaleff Baker and Barbara Russano Hanning, 79-107. Stuyvesant, NY: Pendragon Press, 1992,

———. *Mannerism in Italian Music and Culture, 1530-1630*. Chapel Hill: University of North Carolina Press, 1979.

———. "The Cavalier Ercole Bottrigari and his Brickbats." In *Music Theory and the Exploration of the Past*, edited by Christopher Hatch and D. W. Bernstein, 137-188. Chicago: University of Chicago Press, 1993.

Marco, Guy A. "Zarlino's Rules of Counterpoint in the Light of Modern Pedagogy." *Music Review* 22 (1961): 1-12.

Mathiesen, Thomas J. *Apollo's Lyre: Greek Music and Music Theory in Antiquity and the Middle Ages*. Lincoln: University of Nebraska Press, 1999.

———. "Aristides Quintilianus," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed August 10, 2006).

Montanari, Claudia, "La musica come armonia celeste." *Hortus Musicus* 8 (2001): 58-64.

Monterosso, Raffaello. "L'estetica di Gioseffo Zarlino." *Chigiana* 24 (1967). 13-28.

Moreno, Jairo. *Musical Representations, Subjects, and Objects: The Construction of Musical Thought in Zarlino, Descartes, Rameau, and Weber*. Bloomington: Indiana University Press, 2004.

Moyer, Ann E. *Musica Scientia: Musical Scholarship in the Italian Renaissance*. Ithaca: Cornell University Press, 1992.

Mullet, Michael A. *The Catholic Reformation*. London and New York: Routledge, 1999.

Murata, Margaret. "Giovanni Maria Artusi: From *Artusi, or, Of the Imperfections of Modern Music*." In *Source Readings in Music History*, Leo Treitler, general editor. Vol. 4: *The Baroque Era*, edited by Margaret Murata, 16-26. New York: W.W. Norton, 1998:

Naso, Publius Ovidius. *Metamorphoses*. Translated by Frank Justus Miller. London: William Heinemann, 1916.

———. *The Art of Love and Other Poems*. Translated by J. H. Mozley. Cambridge, MA: Harvard University Press, 1979.

Nettl, Bruno. "Music." *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed November 7, 2006).

Norwich, John Julius. *A History of Venice*. New York: Random House, 1989.

O'Connell, Marvin R. *The Counter Reformation 1559-1610*. The Rise of Modern Europe, edited by William L. Langer, 4. New York: Harper and Row, 1974.

O'Connor, J. J. and E. F. Robertson. "Euclid of Alexandria." <http://www-gap.dcs.st-and.ac.uk/~history/Mathematicians/Euclid.html>. (accessed November 2, 2003).

Ongaro, Guilio, "Sixteenth-century patronage at St. Mark's, Venice," *Early Music History* 8 (1980): 81-116.

Owens, Jessie Ann. "Rore, Cipriano de," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed February 7, 2005).

Palisca, Claude V. "Aristoxenus Redeemed in the Renaissance." *Revista de musicologia* 16/3 (1993): 1283-1293.

———. "The Artusi-Monteverdi Controversy." In *The Monteverdi Companion*, edited by Denis Arnold and Nigel Fortune, 133-66. New York: W.W. Norton, 1972.

———. "Empirismo scientifico nel pensiero musicale. In *La musica nella rivoluzione scientifica del seicento*, edited by Paolo Gozzo, 167-177. Bologna: Società editrice il Mulino, 1989.

———. "Salinas," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed June 24, 2007).

———. *Girolamo Mei (1519-1594): Letters on Ancient and Modern Music to Vincenzo Galilei and Giovanni Bardi*. Musicological Studies and Documents, 3. [n.p.]: American Institute of Musicology, 1960.

———. *Humanism in Italian Renaissance Musical Thought*. New Haven: Yale University Press, 1985.

———. *Music and Ideas in the Sixteenth and Seventeenth Centuries*. Studies in the History of Music Theory and Literature, edited by Thomas J. Mathiesen, 1. Urbana and Chicago: University of Illinois Press, 2006.

———. *Studies in the History of Italian Music and Music Theory*. Oxford: Clarendon Press, 1994.

———. "Zarlino," *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed October 15, 2003).

———. "Zarlino." *MGG*, Friedrich Blume, editor, *Personteil*. Kassel: Bärenreiter, 1968. 14: columns 1017-1022

Palumbo-Fossati, Isabella. "La casa veneziana di Gioseffo Zarlino nel testamento e nell'inventario dei beni del grande teorico musicale." *Nuova rivista musicale italiana* 20 (1986): 633-649.

Passadore, Francesco, and Franco Rossi, eds. *La cappella musicale di San Marco nell'età moderna*. Venice: Edizioni Fondazione Levi, 1998.

Planchart, Alejandro Enrique. "A Study of the Theories of Giuseppe Tartini." *Journal of Music Theory* 4/1, (1960): 32-61.

Plato. *Complete Works*. Edited by John M. Cooper. Indianapolis: Hackett Publishing Company, 1997.

Quintilianus, Aristides. *On Music in Three Books*. Translated by Thomas J. Mathiesen. New Haven and London: Yale University Press, 1983.

Rameau, Jean Philippe. *Treatise on Harmony*. Translated by Philip Gossett. New York: Dover, 1971.

———. *Musica practica*. Translated by Clement A. Miller. Neuhausen and Stuttgart: Hänssler-Verlag, 1993.

Reese, Gustave. *Music in the Renaissance*. New York: W.W. Norton, 1954.

Richter, Lukas. "Ptolemy." *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed July 22, 2004).

Riemann, Hugo. *Hugo Riemann's "History of Music Theory, Books I and II: Polyphonic Theory to the Sixteenth Century"*. Translated by Raymond Herbert Haggh. Lincoln: University of Nebraska Press, 1962.

Riemann, Hugo. 1898. *Geschichte der Musiktheorie im IX.XIX Jahrhundert*. Repr., Hildesheim: Olms, 1990.

Rivera, Benito V. "Theory Ruled by Practice: Zarlino's Reversal of the Classical System of Proportions." *Indiana Theory Review* 16 (1995): 145-170.

Rosand, Ellen. "Music in the Myth of Venice." *Renaissance Quarterly* 30 (1977): 511-537.

Rose, Paul Lawrence. "The *Accademia Venetiana*: Science and Culture in Renaissance Venice." *Studi veneziani* 11 (1969): 191-242.

Santarelli, Daniele. "Morte di un eretico impenitente," *Storia del mondo* 16 (2003). <http://www.storiadelmondo.com/16/santarelli.algerio.pdf>. (accessed September 14, 2006).

Sanvito, Paolo. "Le sperimentazioni nelle scienze quadriviali in alcuni epistolary zarliniani inediti." *Studi musicali* 19 (1990): 305-318.

Tarán, Leonardo. *Academica: Plato, Philip of Opus, and the Pseudo-Platonic Epinomis*. Philadelphia: American Philosophical Society, 1972.

Tenaglia, Alessandro. "Le 'Istitutioni harmoniche' di Gioseffo Zarlino" *Eunomino: Parole di musica* 5-6 (Spring-Summer 1987): 22-24.

Tigrini, Orazio. *Il compendio della musica*. Venice: Ricciardo Amadino, 1588.

Tomlinson, Gary. *Monteverdi and the End of the Renaissance*. Berkeley and Los Angeles: University of California Press, 1987.

———. *Music in Renaissance Magic: Toward a Historiography of Others*. Chicago, University of Chicago Press, 1993.

———. “Giuseffo Zarlino, from *Istitutioni harmoniche*, Book 1, Chapter 2: On the Praises of Music.” In *Source Readings in Music History*, Leo Treitler, general editor. Vol. 3: *The Renaissance*, edited by Gary Tomlinson, 15-21. New York: W.W. Norton, 1998:

Toschi, Andrea. “Un modello geometrico del sistema tonale.” *Nuova rivista musicale italiana* 19 (1985): 458-470.

Trinkhaus, Charles. “The Religious Thought of the Italian Humanists, and the Reformers: Anticipation or Autonomy.” In *The Pursuit of Holiness in Late Medieval and Renaissance Religion*, edited by Charles Trinkhaus, 339-366. Studies in Medieval and Reformation Thought, edited by Heiko A. Oberman, X. Leiden: E.J. Brill, 1974.

———. *The Scope of Renaissance Humanism*. Ann Arbor: University of Michigan Press, 1983.

van Wymeersch, Brigitte. “La consonance et l’idée de nature: d’une pensée mystique à une conception empiriste.” *Revue de la Société liégeoise de Musicologie* 3 (1995): 46-64.

Vasoli, Cesare. “Il tema musicale e architettonico della ‘Harmonia mundi’ da Francesco Giorgio Veneto all’Accademia degli Uranici e a Giuseffo Zarlino.” *Musica e storia* 6 (1998): 193-210.

Virgil (Publius Vergilius Maro). *Eclogues, Georgics, and Aeneid*. Translated by H. Rushton Fairclough, Cambridge, MA: Harvard University Press, 1967.

Walker, Daniel Pickering. “Musical Humanism in the 16<sup>th</sup> and Early 17<sup>th</sup> Centuries.” *Music Review* 2 (1941): 1-13, 111-121, 220-227, and 288-308; *Music Review* 3 (1942): 55-71.

———. *Spiritual and Demonic Magic from Ficino to Campanella*. Studies of the Warburg Institute, 22. London: The Warburg Institute, 1958.

———. *Studies in Musical Science of the Late Renaissance*. London: E.J. Brill, 1978.

———. “Vincenzo Galilei e Zarlino,” In *La musica nella rivoluzione scientifica del seicento*, edited by Paolo Gozzo, 179-186. Bologna: Società editrice il Mulino, 1989.

Walker, Paul. “From Renaissance ‘Fuga’ to Baroque Fugue: The Role of the ‘Sweelinck Theory Manuscripts’.” *Schütz-Jahrbuch* 7-8 (1985-1986): 93-104.

Wason, Robert W. "Musica practica: Music Theory as Pedagogy." In *The Cambridge History of Western Music Theory*, edited by Thomas Christensen, 46-77. Cambridge: Cambridge University Press, 2002.

Wienpahl, Robert W. "Zarlino, the Senario, and Tonality." *Journal of the American Musicological Society* 12 (1959): 27-41.

Wilson, Blake McDowell. "Ut oratorio musica in the Writings of Renaissance Music Theorists." In *Festa Musicologica: Essays in Honor of George J. Buelow*, edited by Thomas J. Mathiesen and Benito V. Rivera, 341-368. Stuyvesant, NY: Pendragon Press, 1995.

Wind, Edgar. *Pagan Mysteries in the Renaissance*. New York: Barnes & Noble Inc., 1968.

Wright, Owen. "Ibn Sina (Abu 'Ali al-Hysayn; Avicenna)." *Grove Music Online*, ed. L. Macy. <http://www.grovemusic.com>. (accessed September 22, 2004).

Wyss, Edith. *The Myth of Apollo and Marsyas in the Art of the Italian Renaissance*. Newark, DE: University of Delaware Press, 1996.

Zarlino, Gioseffo. *The Art of Counterpoint: Part Three of Le istituzioni harmoniche, 1558*, Translated by Guy Marco and Claude Palisca. New York: Da Capo Press, 1983.

———. *On the Modes: Part Four of Le istituzioni harmoniche, 1558*. Translated by Vered Cohen. New Haven: Yale University Press, 1983.

———. *Theorie des Tonsystems: Das erste und zweite Buch der "Istitutioni harmoniche" (1573)*. Translated and edited by Michael Fend. Frankfurt am Main: Peter Lang, 1989.

Zenck, Hermann. "Zarlino's 'Istitutioni harmoniche' als Quelle zur Musikanschauung der italienischen Renaissance." *Zeitschrift für Musikwissenschaft* 12 (1929-30): 540-578.