

The Harmony of the Spheres and Dante's *Paradiso*¹

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ABSTRACT

This article proposes a reading of Dante's treatment of the harmony of the spheres in the *Paradiso*, against the backdrop of classical and Christian views of the earlier Pythagorean notion. Rooted in textual evidence, the study highlights Dante's subtlety in dealing with an extraordinarily evocative subject that had nevertheless been refuted by Aristotelian theologians and thus constituted a contentious issue in the acoustic physics and metaphysics of the late Middle Ages.

How sweet the moonlight sleeps upon this bank!
Here will we sit, and let the sounds of music
Creep in our ears: soft stillness and the night
Become the touches of sweet harmony.
Look, how the floor of heaven
Is thick inlaid with patines of bright gold:
There's not the smallest orb that thou behold'st
But in his motion like an angel sings
Still quiring to the young-eyed cherubins;
Such harmony is in immortal souls;
But, whilst this muddy vesture of decay
Doth grossly close it in, we cannot hear it.
— William Shakespeare, *The Merchant of Venice*,
Act 5, sc. 1, ll. 54–65

1. I have used Petrocchi's 1966–1967 edition of Dante's *Commedia*; translations of the *Commedia* are by Robert and Jean Hollander, of the *Convivio* by Richard Lansing (*Dante Princeton Project*). For the commentaries I have consulted the *Dante Dartmouth Project* and *Dantelab*.

AT THE DAWN OF THE FOURTEENTH CENTURY, THE THEORY OF THE Harmony of the Spheres was in decline among thinkers and poets. Originally proposed by Pythagoras, then embraced by Plato and Cicero, the notion that the planets produce harmonious sounds by means of their movement around the earth was rejected as a pagan fancy by early Christian thinkers such as Ambrose and Basil, but later espoused by Boethius, Isidore of Seville, and Cassiodorus who disseminated it into the Middle Ages; this harmony still resounded in the neo-platonic circles of the School of Chartres (See JAMES 1993; MILLER 1986; MUNXELHAUS 1976). Shortly after, the Christian universe was silenced by the stern refutation of Aristotelian thinkers such as Albert the Great and Thomas Aquinas, who shared Aristotle's opinion that if the planets did produce a sound, such sound would be so loud as to kill all living creatures; therefore they produce no sound ("si quidem ferebantur corpora horum, sive in aeris multitudine expansa per totum, sive ignis, quemadmodum omnes dicunt necessarium facere super naturalem magnitudinem sonum; hoc autem facto et huc pertingere et perimere"; Aristotle, quoted in AQUINAS 1952, 2, Lectio 14, Caput 9, n. 311 (54–6), p. 209). Nevertheless, the attractive notion of a musical universe appealed to the poets, and Dante himself was not immune to such fascination, alluding, in several passages of the *Paradiso*, to the musical and cosmic structures bound in a harmonious mixture as the spheres revolve around one another. As is well known, the etymology of the word "harmony" comes from the Greek ἁρμόττω, "to assemble", "to put together", and thus harmony came to signify to the systematic thinkers of the late Middle Ages more than just a musical term; it was a means of understanding the universe and the human soul. Before Aristotelianism waned in Europe, Simplicius, in commenting on the portion of *De Caelo* which refutes the harmony of the sphere as a physical reality, proposed that this harmony be understood not in a literal sense (i.e., as a vibration propagated in the air which affects human hearing), but as an intellectual act, through which we perceive the harmonic relationships that govern the ordered structure of the universe. Later, the authoritative Christian views of Isidore of Seville and Boethius, who accepted the physical reality of the music of the spheres, were superseded from the thirteenth century onward by Aristotelian theologians, from Albert the Great to Thomas Aquinas. The most frequently referenced passage from Dante's poem concerning the Platonic-Pythagorean harmony of the spheres is likewise rather famous and widely noted for the beauty with which it leads us into the celestial element:

Quando la rota che tu sempiterni
desiderato, a sé mi fece atteso,
con l'armonia che temperi e discerni,
parvemi tanto allor del cielo acceso
de la fiamma del sol, che pioggia o fiume
lago non fece mai tanto disteso.
La novità del sono e 'l grande lume
di lor cagion m'accesero un disio
mai non sentito di cotanto acume.

(Par. 1.76–84)

When the heavens you made eternal, / wheeling in desire, caught my
attention / with the harmony you temper and attune, / then so much of
the sky seemed set on fire / by the flaming sun that neither rain nor river
/ ever fed a lake so vast.

It is desire, repeatedly stated at ll. 77 and 83, that makes the pilgrim soar amidst the marvelous sounds and radiance of paradise. Harmony and light expand like a flame which becomes rain, river, and lake, but which is sharp and bends the viator's desire toward knowledge of the origin ("cagione") of light and sound — God, who is also the conductor of this performance. The heavens are transformed into a musical instrument ("temperi e discerni"), just as happens in *Paradiso* 15.5–6, with "le sante corde / che la destra del cielo allenta e tira" ["the sacred strings / that Heaven's right hand loosens and draws taut"]. It is indeed very natural, for any reader familiar with the notion of the harmony of the spheres, to imagine precisely this music and the associated scene of revolving planets, and most modern Dante scholars make reference to it when commenting on *Paradiso* 1.78 without dwelling on the historical and theological complications of the idea.² But since this myth of Platonic-Pythagorean origin was a controversial subject, the way

2. For examples of modern scholars who brazenly associate *Paradiso* 1.78 with the harmony of the spheres, see SALVETTI 1971, 198; SINGLETON 1970–1975, *ad loc.* and on *Par.* 6.126. Pasquini and Quaglio (1982) invoke Cicero's *Dream of Scipio* ("Si allude alla dottrina pitagorica e platonica dell'armonia delle sfere, mediata a Dante da Cicerone, nel *Somnium Scipionis*"), but do not delve further; Iannucci expresses no doubts that that "the new, extraordinary sound which the pilgrim perceives is the mythical harmony of the spheres" (1989, 89); likewise PICCHI 1967, 182, note 69; STEVENS 1968, 3; and PUCA 2001, 217–43. For a general overview of the Platonizing view of the harmony of the spheres see CRISTIANI 2007 and HICKS 2017; for a treatment of Dante's cosmos from an historical and

in which Dante treated it in the *Paradiso* ought to be contextualized and framed within the reception of the theory of harmony of the spheres in the theology of the late Middle Ages.

Swiss scholar Reinhold Hammerstein proposed several causes originating the music of Heaven in Dante's *Paradiso* (1962, 178): planets, angels, and blessed souls come together to create a blend of melodious sounds, marrying Dante's philosophical-astronomical notions to the theological-liturgical theories of music. Mario Pazzaglia considers the mention of harmony in *Paradiso* 1.78 ("con l'armonia che temperi e discerni") too isolated to capitalize on it and make Dante a follower of the theory (1986, 85), and Claudio Bacciagaluppi identifies a split between Dante's poetic and philosophical positions (2002, 54), a position previously and more elaborately held by Nino Pirrotta, who observed that "canti e danze idealizzati sostituiscono il concetto, respinto da Dante come filosofo, della musica delle sfere celesti" ["idealized songs and dances replace the concept, rejected by Dante as a philosopher, of the music of the heavenly spheres"] (1966, 13). Chiara Richelmi (2001) offered a recapitulation of the question, but the most famous treatment of world harmony remains — at least for its philosophical scope — the seminal study by Leo Spitzer (1963).

I propose that in the *Paradiso*, the music of the spheres is employed rhetorically, an artifice like those allegories that Dante had called "una veritade ascosa sotto bella menzogna" ["a truth hidden beneath the cloak of these fables"] (*Conv.* 2.1.3) to delight the reader. The poet leaves us, in fact, with no certain elements to classify definitively his position on this matter, evoking the poetic effects of the myth with a tangential strategy (see SERMONTI 1993, 18), as Bruno Nardi had intuited when he located Dante's position within a brief historical context (but then took a stance in favor of Dante accepting the harmony of the spheres):

Non l'udirono, quel divino concerto delle sfere, Aristotele e Tommaso,
perché troppo la loro mente giudicò "ex apparentibus secundum sensum";
l'udirono invece Pitagora e Dante, che seppero innalzarsi sopra il mondo
terrestre dei sensi.

Aristotle and Thomas could not hear that divine symphony because they judged *from what is manifest to the senses*. But Pythagoras and Dante, who were able to soar higher than the earthly world of the senses, heard it.

(NARDI 1967, 76, my transl.)³

astronomical point of view, see CORNISH 2000, and for a musico-mathematical approach see ADOYO 2018.

3. See also SANTARELLI 2015.

In their commentary on the *Commedia*, Umberto Bosco and Giovanni Reggio note how Dante seems to distance himself from Aristotle, connecting instead with Cicero's *Dream of Scipio*; Bosco and Reggio make the very important distinction that the poetic intention here overrides a scientific approach, but their formulation that "Dante states that the celestial spheres, by revolving, emanate a harmonious sound"⁴ is incorrect: the subject of "temperi e discerni" is unequivocally and uncoincidentally God, not the spheres. Dante's treatment of the matter is quite subtle and avoids potentially compromising statements, taking into consideration the enormously influential opinion of Aristotelian scholars. It is only natural that Dante would be attracted to the theory of the harmony of the spheres — after all, the standard text for musical learning in schools was Boethius's *De institutione musica*, which supports the theory —, but the *Paradiso* manages to suggest its resonance without overtly taking a stance in its favor. It would have been extremely risky, both intellectually and doctrinally, to embrace wholeheartedly a theory that was refuted by preeminent contemporary theologians. Instead, Dante stages music in paradise, which the blessed and the angels perform, with subtle allusions to *rote, giri, spere*.

Some early commentators also viewed *Paradiso* 1.78 as a clear reference to the music of the spheres,⁵ but Dante must have been familiar with Aristotle's rejection of the acoustic theory, as Thomas Aquinas, Albert the

4. "Non è questo l'unico caso in cui in Dante la ragion poetica ha il sopravvento sulla scientifica: per esempio, in *Paradiso* I, afferma che le sfere celesti emanano, girando, un armonioso suono: questo contro l'opinione di Aristotele e della filosofia scolastica, ma secondo proprio un passo dello stesso *Somnium Scipionis*" ["This is not the only case in which Dante favors poetic reason over scientific discourse: for example, in *Paradiso* I, he states that the celestial spheres produce a harmonious sound as they turn: this is against the opinion of Aristotle and scholastic philosophy, but follows a passage from the *Somnium Scipionis*] (Bosco and REGGIO 1988, *ad loc.*, my transl.)

5. "Del suono è stato detto ch'era cagione lo rotamento dei Cieli, li quali nel suo girare e nel toccamento che fanno l'uno co l'altro generano sì dolce armonia" ["The rotating heavens was considered to be the cause of the harmony, as in spinning the heavens and planets touched each other and generate such sweet harmony"] (BUTI 1858–1862, *ad loc.*, my transl.); Buti, like the Ottimo Commento, quotes Macrobius's commentary on the "Dream of Scipio"; Pietro Alighieri quotes Macrobius and pseudo-Aristotle's *De proprietatibus elementorum*; Benvenuto da Imola invokes Pythagoras and glosses: "armonia, idest, melodia, quae causatur a motu coeli" ["a harmony, that is a music produced by the motion of the heavens"] (1887, *ad loc.*).

Great,⁶ and other late-medieval Aristotelians thoroughly commented on this refutation. John of Serravalle, alone among the early commentators, problematizes the question:

De illo cantu suavi mirabiliter sensit una opinio, que dixit quod planete et orbes, dum moventur ita circulariter, causant unum dulcem sonum, dulcissimam melodiam suavissimamque, unde anime, que sunt in illis speris, beatificantur. Hanc opinionem tangit Macrobius, De sompno Scipionis: etiam Boetius tangit, non dico quod assertive, sed bene retractive; de qua opinione Aristotiles trufatur: sed sive illa opinio sit vera vel non, non est presentis speculationis hoc inquirere. Auctor ipse non loquitur de armonia sensibili, sed de armonia et proportione celi, que consistit in coniunctionibus planetarum, et constellationibus [et] in dispositionibus.

On that most marvelously sweet song he provides an opinion, which states that the planets and spheres, with their circular motion, produce a sweet sound, the sweetest and most soothing melody, by which the souls in that sphere are blessed. Macrobius holds this opinion in *The Dream of Scipio*. Boethius also holds it, not in the positive, but in a counterclaim; Aristotle refutes this opinion; but whether this opinion is true or not, it is not the object of this present speculation. The author himself does not speak of perceptible harmony, but of the harmony and proportions of the heavens, which consist in planetary conjunctions and constellations, and in their hierarchical arrangements.

(1891, *comm. ad loc.*, my transl.)

One should therefore use caution and entertain doubt about the poet's endorsement of the theory's truthfulness from a scientific point of view: on the one hand, Dante exploits the poetic potential of the music of the spheres; on the other, he never fully embraces it, since he does not devote explicit treatment to this philosophical issue in any of his works. Pythagoras, as states Isidore (*Etym.* 3.15), was the first to theorize the mathematical

6. "Unde impossibile esset ex motibus caelestium corporum provenire sonos tam vehementes, nisi perciperentur ab hominibus, vel corrumpent eorum auditum: nisi forte dicatur quod soni illi aequivoce dicerentur" ["Hence it would be impossible for such violent sounds to proceed from the movements of the heavenly bodies without being perceived by men or without harming their hearing; unless of course they are called sounds equivocally"] (AQUINAS 1952, 2, Lect. 14, 426 [7], p. 212, tr. by Fabian R. Larcher and Pierre H. Conway, www.aquinas.cc).

structure governing the system of consonances and dissonances, and in the *Convivio* (2.15.12) Dante attributes to him the *impositio nominis* of Philosophy, whose personification in the philosophical treatise takes the place of Beatrice as the poet's new love. The names of Pythagoras and the Pythagoreans resonate several times in the philosophical treatise,⁷ and precisely at the juncture in which the structure of the universe is discussed (*Conv.* 3.5.4–5, based on Aristotle's *De caelo* 2.13, one paragraph before the philosopher's explicit rejection of the harmony of the spheres), but Dante makes no mention of the theory. The *Convivio* follows the order of angelic hierarchy given by Gregory the Great, but the *Commedia* recants this statement, and Dante now accepts Dionysius's ordering, implicitly admitting his earlier mistake, as does Gregory (see BARSELLA 2010; BUSNELLI 1911). Within this discussion of the angelic choirs, Dante certainly had the opportunity to expound his philosophical ideas on the music of the spheres and make his position equally as clear as, for example, that on the lunar spots. But he did not. He chose instead to leave this matter unspoken.

As is known, we possess no extant writings by Pythagoras, but his views were relayed by later philosophers, such as Plato, in whose *Republic* the music of the spheres found magnificent representation.⁸ In the tenth book, the famous myth of Er associates a singing Siren with each of the eight heavens:

The spindle turns on the knees of Necessity; and on the upper surface of each circle is a siren, who goes round with them, hymning a single tone or note. The eight together form one harmony; and round about, at equal intervals, there is another band, three in number, each sitting upon her throne: these are the Fates, daughters of Necessity, who are clothed in white robes and have chaplets upon their heads, Lachesis and Clotho and Atropos, who accompany with their voices the harmony of the sirens.⁹

Plato's treatment enjoyed great popularity and may have inspired the famous episode in the *Dream of Scipio*, a passage which was widely copied

7. *Conv.* 2.13.18; 2.14.5; 3.11.3–5; 4.1.1; 4.21.3. Since Pythagoras's original work was lost centuries before Dante's time, these are, obviously, all mediated quotations, namely from Aristotle, *Metaphysics* 1.5; Augustine, *De civitate Dei* 8.2; Cicero, *Tusculanae disputationes* 5.3; *De officiis* 1.17; and Boethius, *De Institutione Musica* 1.2. See TOYNBEE 1895.

8. For the circulation of Plato's works in the Middle Ages see KANTOROWICZ 1942.

9. Plato, *Republic* 617B. See also the reference to this myth and the tone scale of the universe in the *Timaeus*, in GUILLELMUS DE CONCHES 1965, 186.

throughout the Middle Ages, along with Macrobius's commentary, and which was likely the only part of Cicero's *De re publica* known to Dante:

“quis hic” inquam [quis] “est qui complet aures meas tantus et tam dulcis sonus?” “hic est” inquit “ille qui intervallis coniunctus inparibus, sed tamen pro rata parte ratione distinctis, impulsu et motu ipsorum orbium efficitur, et acuta cum gravibus temperans varios aequabiliter concentus efficit; nec enim silentio tanti motus incitari possunt, et natura fert ut extrema ex altera parte graviter, ex altera autem acute sonent. quam ob causam summus ille caeli stellifer cursus, cuius conversio est concitator, acuto et excitato movetur sono, gravissimo autem hic Lunaris atque infimus”.

“Pray, what is this sound that strikes my ears in so loud and agreeable a manner?” I asked. To which he replied, “It is that which is called the music of the spheres, being produced by their motion and impulse; and being formed by unequal intervals, but such as are divided according to the most just proportion, it produces, by duly tempering acute with grave sounds, various concerts of harmony. For it is impossible that motions so great should be performed without any noise; and it is agreeable to nature that the extremes on one side should produce sharp, and on the other flat sounds.”

(6.18, transl by Oliver J. Thatcher, 237)

The popularity of the *Dream of Scipio* over the centuries testifies to the critical debate about the harmony of the spheres among early Christian writers: many Church Fathers confronted the notion, either by subsuming the Pythagorean and Platonic views into their doctrine — perhaps with a certain latitude of interpretation to make them congruent with Christian beliefs — or by rejecting them as a pagan fancy. Even when they rebuffed the idea that the planets produce sounds, they could not deny that some form of music permeated the heavens, because the Scriptures refer to it: one example being Job, who in a stupor asks “Quis enarrabit caelorum rationem, et concentum caeli quis dormire faciet?” [“Who can declare the order of the heavens, or who can make the harmony of heaven to sleep?”; *Job* 37:38].¹⁰ Thus, a few notes of Pythagorean music slipped into Christian liturgy, for example in the Sanctus of the Roman Missal, part of the

10. All quotations from the Bible are from the *Vulgata*, with English translations from the Douay-Rheims Bible.

proprium missae which Gregory the Great related to the jubilant exclamation of the Seraphim in *Isaiah* 6:3 and in *Apocalypse* 4:8:

Et ideo cum angelis et archangelis, cum thronis et dominationibus, cumque omni militia caelestis exercitus, hymnum gloriae tuae canimus, sine fine dicentes: Sanctus; “cumque omni militia caelestis exercitus, hymnum gloriae tuae concinunt, sine fine dicentes. Sanctus, Sanctus, Sanctus”.¹¹

And therefore with angels and archangels, thrones and dominations, and with the whole company of the heavenly army, we sing the hymn of Thy glory, evermore saying “Holy, holy, holy, Lord of Hosts”.

Among the skeptics, Basil of Caesarea showed a disparaging condescendence, to the point that he believed refuting the Pythagoreans “is not worthwhile for a man who knows the value of time or the intelligence of his hearers.”¹² Basil, however, did concede that a “harmonious chorus” exists among the four elements that constitute the universe, thus acknowledging cosmic harmony in a general, albeit non-musical sense.¹³ What is noteworthy is that Basil deploys Aristotelian arguments and quotes *De Caelo* 2.9 to counter the Pythagoreans, in an early preview of

11. I quote from *Liber Sacramentorum*, in PL 104, col. 31. Further mentions of the harmony of the heavens occur in Gregory the Great, *Moralia in Iob* 30.19–21; Ambrose, *Hexaemeron* 2.2. Transl. from *Ordo Romanus Primus*, vol. 6, ed. by Edward Godfrey Cuthbert and Frederic Atchley, University of Michigan Press, 1905, 173.

12. In *Hexaemeron homiliae* 3.3, *Patrologia Graeca* vol. 29, col. 57. The English translation from the Greek is as follows: “And these, carried around in the opposite direction to everything else, when they cleave through the ether, give out such a melodious and harmonious sound that it surpasses the sweetest of singing. Then, when those who say these things are asked for sensible proofs, what do they say? That, having become accustomed to this sound from our birth, we fail to notice the sound through our early familiarity with it and because of habitually hearing it, like men in smithies who have their ears incessantly dinned. To refute their subtleties and unsoundness, made so clearly evident to all from their first word, is not the practice of a man who either knows how to use time sparingly or has regard for the intelligence of his hearers” (BASIL OF CAESAREA 2010, 41).

13. In *Hexaemeron homiliae* 5.5; *Patrologia Graeca* vol. 29, col. 89–92: “Thus it becomes a circle and a harmonious choir, since all are in unison and have mutually corresponding elements” (BASIL OF CAESAREA 2010, 63).

the thirteenth-century scholastic debate around this theme. American musicologist James Haar — who saw in Dante’s *Paradiso* “perhaps the greatest triumph of *musica mundana* over Aristotelian objections” (1960, 322) — compared the positions of Ambrose and Basil, noting a degree of inconsistency in the criticism of both authors concerning the harmony of the spheres. In the *Hexaemeron*, Ambrose posits the chorus of the heavens as undeniable because it is mentioned in the Psalms:

David etiam coelos coelorum in illo laudantium Dominum constituit choro. Quem imitantes philosophi quinque stellarum et solis et lunae, globorum consonum motum introduxerunt, quorum orbibus vel potius globis connexa memorant omnia, quos sibi innexos et velut insertos versari retro et contrario caeteris motu ferri arbitrantur, eoque impulsu et *motu ipsorum orbium* dulcem quemdam et plenum suavitatis atque artis et gratissimi modulaminis sonum reddi, quoniam scissus aer tam artifi ci motu, et *acuta cum gravibus temperante, ita varios aequabiliter concentus efficiat*, ut omnem supergrediatur musici carminis suavitatem.

David constituted the heaven of heavens in that chorus of beings praising the Lord. Imitating David, the philosophers have introduced an harmonious motion of the orbs of the sun, the moon and the five stars; they recount that all things are linked in the orbs or rather globes of these planets, which, linked, as it were, inserted inside each other, turn one way and are judged to be moved by the contrary motion of the other. They are further thought to give out a certain sweet sound full of suavity, art and most pleasing modulation; because the air, cut by such skillful motion, thus produces harmonies equably varied, the low tempered with the high, and exceeds every sweetness of musical song.

(2.2.6, in *PL* 14, col. 147B, my emphasis and transl.)

Ambrose delivers a rebuke of pagan philosophers, who allegedly imitated David in imagining a universe full of music, and he does so without directly mentioning any by name, but nonetheless uses the very same words with which the *Dream of Scipio* describes the concert of the heavens (“*motu ipsorum orbium efficitur et acuta cum gravibus temperans varios aequabiliter concentus efficit*”; see the text of the *Dream of Scipio* above). It is therefore to Cicero that the Milanese bishop refers with “imitantes philosophi”: Ambrose defends Christianity and attacks pagan authors, accusing them of being mere imitators of the true Christian prophets. Furthermore, he rejects their theories, including the postulation of a harmony of the planets, again with

an argument similar to that of Aristotle, maintaining that our senses should perceive the sounds of so many and such large celestial bodies:

Sed facile his ipsa respondet veritas. Nam qui tonitrua audimus nubium collisione generata, tantorum orbium conversiones, qui majori utique sicut motu ferri aestimantur, ita vehementiores sonitus excitarent, non audiremus? Addunt praeterea, ideo sonum hunc non pervenire ad terras, ne capti homines per suavitatem ejus atque dulcedinem, quam celerrimus ille coelorum effecit motus, ab orientalibus partibus usque in occasum, propria negotia atque opera derelinquerent, et omnia hic otiosa remanerent, quodam humanae ad coelestes sonos mentis excessu. Sed ea quae sunt aliena a studio nostro, et a divinae lectionis serie, iis qui foris sunt, relinquamus: nos inhaereamus Scripturarum coelestium magisterio.

But the truth answers easily to these things. For if we hear thunder, which is generated by the collision of clouds, should we not hear the revolution of such great spheres, which, as they are judged to be moved by greater force should excite louder sounds? They then add that this sound does not reach the earth lest men, seized by its smoothness and sweetness (which that most rapid motion of the heavens from east to west effects), should neglect their own business and work, and leave all things here in idleness, through a certain unbalance of the mind, for the celestial sounds. But let us relinquish those things which are foreign to our study, and to the progress of divine reading; let us adhere to Scripture for judgment on the heavens.

(*Hexaemeron*, 2.2.7, in *PL* 14 col. 159C, my transl.)

In terms of acoustic physics Ambrose must leave the matter unresolved, as he cannot counter the Scriptures, which at several points avow some form of “concentus coeli”. Ambrose, for example, famously commented on the Psalms, which invite angels, planets and heavens to praise the Lord (“Laudate eum, sol et luna; laudate eum, omnes stellae et lumen. / Laudate eum, caeli caelorum” [“Praise ye him, O sun and moon / praise him, all ye stars and light.”] *Ps.* 148:3–4, tr. Douay-Rehims), and although elsewhere the Milanese saint acknowledges a certain grace and sweetness to the theory of the music of the spheres,¹⁴ he hastens to take distance from Plato and Origen, siding instead with Saint Paul:

14. “Quod autem Aquila ait: *Sonans sicut sol*, videtur illa axis coelestis conversio, solisque et lunae et stellarum cursus, concentusque globorum exprimi:

Plato autem dulces quosdam sonitus siderum mutuavit sphaerae coelestis generari conversione, famam magis et pompam, quam veritatem secutus. Nam licet Origenes quoque noster, hoc est, ecclesiastico vir officio deditus, planetarum stellarum quamdam inenarrabilem motu harmoniam esse suavissimi illius soni coelestis asserat, tamen etiam ipsum plurimum indulgere philosophorum traditioni pleraque ejus scripta testantur; quod eo scripsi, ut et ab aruspinae et a philosophiae traditione sacrificii istius interpretationem secernerem. Velint alii doctrinam probare suam, ego juxta Apostolum timidus malo, quam doctus videri, qui ait: Videte ne quis vos depraedetur per philosophiam et inanem seductionem secundum traditionem hominum, secundum elementum hujus mundi, et non secundum Christum.

While Plato claimed that a certain sweet sound of the stars was produced by the rotation of the celestial spheres, what he followed was mere rumor and pomp rather than the truth. On the other hand, although our Origen, a man devoted to the ecclesiastical office, asserts that there is a certain indescribable harmony in the motion of the planets and stars, a most pleasing and heavenly sound, nevertheless, the majority of his writings attest that he frequently indulges in the philosophical tradition; I have mentioned this so that I may separate the interpretation of these duties from those of soothsayers and from the philosophical tradition. Let others try to prove his doctrine; rather than to appear learned, I prefer to be cautious but closer to the Apostle [Paul], who says: Take heed lest any man take you captive through philosophy and vain deceit, according to the tradition of men, according to the elements of this world, and not according to Christ.

(*De Abraham Libri duo* 2.8, in *PL* 14 col. 480C–D, my transl.)

In the preface to the *Enarrationes in psalmos*, Ambrose refers to *Isaiah* (6:3) and *Apocalypse* (19:1) and envisions the angels as performers, thus allowing for music to resound in the heavens without embracing the pagan theory that the planets' rotation produces sound:

quibusdam etiam nostris videtur" ["But what the Eagle says, "Sounding like the sun," appears to be refer to the turning of the celestial axis, and the course of the sun and the moon and the stars, and the harmony of the spheres."] (Ambrose, *De Isaac et Anima* 7, in *PL* 14, col. 526).

Laudant Angeli Dominum, psallunt ei Potestates coelorum, et ante ipsum initium mundi Cherubim et Seraphim cum suavitate canorae vocis suae dicunt: *Sanctus, sanctus, sanctus*. Innumera angelorum milia assistunt, et seniores et turba magna sicut voces aquarum multarum concinunt *Alleluia*. Ipsum axem coeli fert expressior sermo cum quadam perpetui concentus suavitate versari, ut sonus ejus extremis terrarum partibus audiretur, ubi sunt quaedam secreta naturae. Nec id ab usu naturae alienum videtur; quandoquidem vox missa gratiore plausu e nemoribus resultat, aut montibus, et suaviore sono reddant quod acceperint.

The Angels praise the Lord, the heavenly Powers sing to him, and the Cherubim and Seraphim speak before him, with the sweetness of their melodious voices, of the beginning of the world: *Sanctus, sanctus, sanctus*. Countless thousands of angels stand by him, and the elders along with a great multitude sing *Hallelujah* together with voices like the many waters. More importantly, the heavenly axis turns with the sweetness of perpetual harmony, so that its sound may be heard in the most extreme parts of the earth, where exist the secrets of nature. Nor does this use of nature seem strange, since the voice resounds from the wood or the mountaintops with a more pleasing boom, and they echo what they receive with a more pleasing tone.

(*Enarrationes in XII psalmos Davidicos*, Psalmum primum, praefatio, 2, in *PL* 14, col. 921B–922A, my transl.)

Ambrose manages a problematic issue with subtlety, constrained as he was by a compounded difficulty: he could not dispute that there was music in the heavens, undeniably attested by the Scriptures; nor could he refute the notion of cosmic harmony in a general sense, lest he belittle the Creator's mastery. It was only when paganism was ultimately defeated and its philosophy came to be valued again that Boethius, Cassiodorus, and Isidore could espouse the harmony of the spheres, no longer fearing its heretical connotations. Their works, forgetful of Aristotle's opposition, lay the ground for its diffusion into the Christian Middle Ages. Boethius opens his treatise on music by addressing exactly the issue whether the heavens' revolution makes a sound, enthusiastically defending the opinion that they do:

Qui enim fieri potest, ut tam velox caeli machina taciti silentisque cursu moveatur? [. . .] non poterit tamen motus tam velocissimus ita magnorum corporum nullo omnino sonos ciere, cum praesertim tanta sint stellarum

cursus coaptatione coniuncti, ut nihil aeque compaginatum, nihil ita commissum possit intellegit.

For how can it happen that so swift a heavenly machine moves on a mute and silent course? [. . .] it is nevertheless impossible that such extremely fast motion of such large bodies should produce absolutely no sound, especially since the courses of the stars are joined by such harmonious union that nothing so perfectly united, nothing so perfectly fitted together, can be realized.

(*De Institutione Musica* 1.2, transl. by Calvin Bower, 49)

This conviction was shared by Cassiodorus, who, in expounding the powers of music, hastens to condemn as false the myth of Orpheus's lyre and the sirens' song. He then counterposes against these pagan fables the truth of the Bible, in which David exorcized Saul with his cithara and, lastly, he propounds cosmic harmony as a commonly accepted principle:

Coelum ipsum, sicut supra memoravimus, dicitur sub harmoniae dulcedine revolvi. Et ut breviter cuncta complectar, quidquid in supernis sive terrenis rebus convenienter secundum auctoris sui dispositionem geritur, ab hac disciplina non refertur exceptum.

As we have mentioned above, it is said that the heavens themselves rotate in accord with the sweetness of music. In short, whatever design there is in the heavens and on earth which accords with the governance of the Creator Himself occurs only through this discipline.

(*De artibus ac disciplinis liberalium litterarum*, in *PL* 70, col. 1212B, transl. by Helen Dill Goode and Gertrude C. Drake, 9)

Isidore of Seville also displays an explicit acceptance using phrases similar to those of Cassiodorus:

Nam et ipse mundus quadam harmonia sonorum fertur esse compositus, et coelum ipsum sub harmoniae modulatione revolvitur.

Even the cosmos itself is said to have been set in order by a harmony of sounds, and melody governs the revolution of the very heavens.

(*Etymologiarum Liber* 3.17, in *PL* 82, col. 133, transl. by Helen Dill Goode and Gertrude C. Drake, 14)

For centuries, Isidore's *Etymologiae* remained the standard treatment of the harmony of the spheres, to be referenced and taught in schools. Martianus Capella's fifth-century *De Nuptiis Philologiae et Mercurii*, presenting a complex tonal scale of the planets' sounds, also enjoyed an enduring readership through the Middle Ages, later followed by Bernardus Silvestris and Alain of Lille, who also absorb elements derived from the Platonic myth of Er.¹⁵ Thus, at the end of the millennium, the harmony of the spheres became an edifying doctrine to teach in schools along with the tonal scale of sounds actually produced by the planets and was espoused by twelfth-century Platonism, although without the scientific interest of earlier philosophers. Peter Abelard, another Platonizing author, reintroduced the notion of the sonic heavens in a manner reminiscent of Ambrose to Christianly interpret the myth of the harmony of the spheres:

Quis etiam, si diligenter attenderit, non animadvertat quod de coelesti dixerunt harmonia, quae in superioribus mundi partibus incessanter resonat, cum coelestes videlicet spiritus et assidua divinae Majestatis visione, et summa invicem concordia ligentur, et in ejus quem conspiciunt laudes jugi et ineffabili exultatione illud decantent quod juxta Isaiam seraphim die ac nocte conclamare non cessant: *Sanctus, Sanctus, Sanctus, Dominus Deus Sabaoth*, etc.?

Who, then, reflecting attentively, will not realize that they — the philosophers — talked about celestial harmony, which resounds incessantly in the higher parts of the universe, since the celestial spirits, in the constant vision of divine Majesty, are both bound together by the highest harmony, and, in conjoined and ineffable exaltation of Him whom they behold, sing praises, those which according to Isaiah the Seraphim sing incessantly night and day; *Sanctus, sanctus, sanctus, God almighty*.

(*Theologia christiana* 1.5, in *PL* 178, col. 1148D–1149A, my transl.)

Abelard thus reintroduces the singing angels, moving back to a non-literal interpretation of heavenly music and foreshadowing the eclipse of cosmic music by Aristotelianism.

15. See specifically Bernardus Sylvestris, *De mundi universitate sive Megacosmus et Microcosmus*, 51; and Alain of Lille, *Anticlaudianus*, in *PL* 210 col. 517. See also HAAR 1960, 291–96.

The tune began to change with the waning of Platonic philosophy and the rise of Aristotelian thinkers in late medieval Europe, an epistemic shift which Michel Huglo (1990) views as the origin of the decline of music in medieval culture. In the scholastic environment, many began to criticize and reject the notion of music produced by the planets, commenting on the passage from *De caelo et mundo* in which the Stagirite discards the sounding spheres theory because such a sound would be so loud as to destroy all life on earth:

Quaecumque quidem enim secundum se ipsa feruntur, faciunt sonum et plagam. Quaecumque autem in lato infixae sunt, aut existunt, quemadmodum in navi partes, non possibile est sonare: neque rursus navi, si feratur in fluvio. [. . .] Quare hic dicendum quod, si quidem ferebantur corpora horum, sive in aeris multitudine expansa per totum, sive ignis, quemadmodum omnes dicunt necessarium facere super naturalem magnitudinem sonum; hoc autem facto et huc pertingere et perimere.

All that moves against something else produces a friction and a sound and all that is fixed, such as the parts of a ship, cannot possibly sound: like a ship sailing a river [. . .] Therefore if the celestial bodies were moving, either through air or fire, as everyone says, they should produce a sound of enormous loudness. But this would destroy everything.

(Aristotle, quoted in AQUINAS 1952, 209,
my transl.)

Aristotle's rejection in *De caelo et mundo* offered a typically empirical approach "che solo da sensato apprende" ["can only understand in perceiving through the senses"] (*Par.* 4.41), on which Thomas Aquinas thus commented:

Quod quidem si fieret, sequeretur quod sonus ille usque huc pertingeret; et non solum audiretur a nobis, sed etiam corrumperet corpora quae sunt hic. Sed quia hoc non videmus contingere, consequens quod nulla stellarum moveatur per seipsam, neque motu violento, neque motu qui sit ab anima. Non enim possent moveri stellae per seipsas, nisi facerent divisionem vel ipsarum sphaerarum caelestium vel aliquorum corporum intermediorum. Ipsae autem sphaerae caelestium vel aliquorum corporum intermediorum. Ipsae autem sphaerae moventur per seipsas, nec tamen aliquod corpus dividunt; unde etiam ex eorum motu nullus provenit sonus.

If this indeed were to occur, it would follow that the sound would reach all the way to this point; and not only would it be audible to us, but it would also destroy all bodies that are here. But because we do not see this happening to mankind, it follows that none of the stars move on their own, nor through violent motion, nor by a motion that comes from the soul. For the stars would not be able to move on their own unless they could create a division either in the celestial sphere itself or in some intermediate bodies. But the spheres do move by themselves, and yet they do not divide any other body; thus, no sound is produced by their motion.

(AQUINAS 1952, 213, my transl.)

In addressing the conciliatory views of Simplicius's commentary on *De caelo*, Aquinas refutes it with the tools of scholastic analysis and reiterates his condemnation of cosmic music. The terrible sound posited by the Pythagoreans would have devastating consequences, instead because life goes on and men do not hear that sound, the perfectly logical conclusion is that there is no such sound. Thomas Aquinas, Averroes, Albert the Great, Roger Bacon, Ristoro D'Arezzo, Nicholas Oresmes, and Vincent of Beauvais all discard cosmic harmony as a foolish opinion, and even among thirteenth-century music theorists *musica mundana* was not accepted uncritically, a circumstance made clear by Jacques de Liège's dismissal of the concept.¹⁶

Given the general refutation by all Aristotelian theologians, Dante's position on the physical veracity of the harmony of the spheres should be considered with care. The ascent of the pilgrim (*Par.* 1.76–82), enraptured into a spectacle of sound and light as he enters the Heaven of the Moon, does indeed seem reminiscent of Cicero's *Dream of Scipio* in his combination of "armonia" and "luci". Music and light appear linked together from the beginning of the third canticle and will often reappear inextricably conjoined. In the spectacular manifestation of heaven, creations of light are produced by the blessed souls dancing and arranging themselves to form a series of concentric rings, a cross, or an eagle, in the same way

16. In addition to the passage by Thomas Aquinas, see: Averroes, *Commentary on De Caelo et Mundo*, 2.52–56; Albert the Great, *Comm. De Caelo et Mundo*, 2.3.10; Roger Bacon, *De Caelestibus* 4.9; Ristoro D'Arezzo, *La composizione del mondo con le sue cagioni* 8.19; Nicholas Oresmes, *Quaestiones de Caelo* 2.9 and *Le livre du ciel et du monde* 2.18. Among music theorists, the *musica mundana* was denied by Jacques de Liège in his *Speculum Musicae* 1.13, as well as by Vincent of Beauvais, whose *Speculum Maius* (Chapter 32 bears the title "Falsa opinio de concentu coeli") was a work of great importance.

that their voices combine to make up powerful chords (see CIABATTONI 2021). But if we look at the letter of the text, in this “magnifica sinestesia di sons et lumières” (SERMONTI 1993, 18), we do not find a clear statement suggesting Dante’s scientific adherence to the theory of the harmony of the spheres. The Florentine poet seems rather to take a stance similar to that of Ambrose, who rejected Cicero without contradicting the biblical passages on celestial music. On closer inspection of the text, Dante never explicitly speaks of sounds produced by the revolution of celestial bodies, but rather of a harmony, tempered and tuned by God. Although the “rota” does indeed attract the pilgrim by means of such harmony, nowhere does Dante say that the music is produced by the sphere or the planet itself; it could very well be the harmony sung by the blessed souls, as is clear in the pilgrim’s encounter with Justinian:

Diverse voci fanno dolci note
 così diversi scanni in nostra vita
 rendon dolce armonia tra queste rote

[Differing voices make sweet music. / Just so our differing ranks in this
 our life /create sweet harmony among these wheels.]
 (Par. 6.124–26)

Here, too, “rote” appears in conjunction with harmony, as in *Par.* 1.76–78, making Justinian’s words sound like a gloss of what had been said five cantos earlier. Here the “scanni” — a term coming from the Latin *scannum* and meaning “seat” — are said to produce the harmony: the seats of the blessed to which Beatrice will point (“vedi li nostri scanni sì ripieni” *Par.* 30.131) before the “sempiterna rosa” (v. 124, and note the adjective recalling the lemma used in the verbal form in *Par.* 1.76). Also, a little earlier, in the Heaven of the Moon, Beatrice had used this term to explain the disposition of holy souls and angels:

“D’i Serafin colui che più s’india,
 Moïse, Samuel, e quel Giovanni
 che prender vuoli, io dico, non Maria,
 non hanno in altro cielo i loro scanni
 che questi spirti che mo t’appariro [. . .]”

“Not the Seraph that most ingods himself, /not Moses, Samuel, or
 whichever John you please -- / none of these, I say, not even Mary, /

'have their seats in another heaven than do these spirits you have just now seen' [. . .]"

(Par. 4.28–33)

The seats, representing the “degree” or “condition” of the heavenly souls’ blessedness, are a metonymic rendering of the souls themselves. Thus, it is clearly understood that Par. 6.125–62 (“*diversi scanni in nostra vita / rendon dolce armonia tra queste rote*”), by recalling the “armonia” of Par. 1.78, suggests that the harmony of heaven is in fact produced by the voices of the blessed, as several commentators on the passage remark.¹⁷

Thus, if “scanno” refers metonymically to the souls, it would be the holders, so to speak, of the seats that produce harmony through “differing voices”. It is not, therefore, the celestial sphere that produces sound by its movement, but the voices of the blessed. The use of an astronomical lexicon includes terms such as “rote” and “giri”, and once again we find voices, harmony, and wheels arranged in such a way as to suggest musical spheres. Dante’s poetic skill manages to evoke implicitly what he could not state explicitly. Another passage that could be taken as a reference to the music of the spheres is found in the holy forest of Eden, where the angels sing and process after the eternal wheels:¹⁸

Così fui senza lagrime e sospiri
anzi ‘l cantar di quei che notan sempre
dietro alle note delli eterni giri;
ma poi che ‘ntesi nelle dolci tempre [. . .]

17. Bosco and Reggio (1988), as well as Chiavacci Leonardi (1991–1997), speak of vocal polyphony for Par. 6.125–26, as is naturally suggested by both the noun “armonia” and the verb “rendon”, found in several commentaries on the Psalms. See for example Cassiodorus: “[Labia nostra] non immerito inter instrumenta musica posita sunt, quia et similitudo quaedam est cymbalorum, et per ea voces humanae *harmoniam reddere* suavissimam comprobantur. Harmonia est enim diversarum rerum in unam convenientiam redacta copulatio; quod et in voce humana constat accidere, quando et tempora ipsa et syllabae ad unam vocis concordiam perducuntur” (*Expositio in psalterium* 150.5, in *PL* 70, col.1053A). Of course, the type of vocal polyphony with which Cassiodorus was familiar in the sixth century was quite different from the polyphony to which Dante had exposure.

18. Mark Musa (1984–1986) actually translates these lines as: “I heard the song of those attuned / forever to the music of the spheres.”

Just so was I with neither tears nor sighs / before they sang who always
are in tune / with notes set down in the eternal spheres, / but, when their
lovely harmonies revealed [. . .]

(*Purg.* 30.91–94)

The angels forming the pageant produce an emotional reaction in the pilgrim's heart. Their song is a sweet mélange of sound, the word “tempre” likely indicating, as elsewhere (*Par.* 5.146; *Par.* 14.118), a polyphony of voices. However, for the purpose of this essay, the key to interpreting these lines is the word “giri”: does it mean the planets turning harmoniously, or the angelic orders? Dante does not say. An association between the singing and dancing souls, and the sounding and revolving stars, was famously proposed by John Freccero (1968), who showed how symbolic imagery in *Paradiso* 10 connects the dance of the twelve theologians to the Apostles and the Zodiac. Through the complexity of astrological, choreographic, and musical elements, Freccero establishes an indirect connection with Plato's *Timaeus*, in particular with the image of the clock.

Indi come orologio che ne chiami
ne l'ora che la sposa di Dio surge
a mattinar lo sposo perché l'ami
che l'una parte l'altra tira e urge
“tin tin” sonando con sì dolce nota,
che 'l ben disposto spirto d'amor turge;
così vid'io la gloriosa rota
muoversi e render voce a voce in tempra
ed in dolcezza ch'esser non po' nota
se non colà dove gioir s'insempra.

Then, like a clock that calls us at the hour / when the bride of God gets
up to sing / matins to her bridegroom, that he should love her still, /
when a cog pulls one wheel and drives another, / chiming its ting-ting
with notes so sweet / that the willing spirit swells with love, / thus I saw
that glorious wheel in motion, / matching voice to voice in harmony /
and with sweetness that cannot be known / except where joy becomes
eternal.

(*Par.* 10.139–48)

The key terms “rota” and “tempra” reappear in combination with intricate imagery: the clock, the stars, the approaching dawn, all elements used in

the measuring of time. The simile of the lover who sings an aubade to the beloved (FOSCA 2003–2015, *ad loc.*; BOSCO and REGGIO, *ad loc.*), a topos of Provençal poetry, is reconfigured for a Christian context with monks singing Matins, or theologians who move and match each other's voices in harmony. Freccero observed that the circular motion of the blessed mirrors the revolution of the zodiacal signs around the sun. The revolution of the twelve signs of the zodiac (the theologians are organized in two garlands of twelve spirits each) around the sun measures time, in the same way that a clock does:¹⁹ "Because the Sun measures both the day and the year, [. . .] in its path, the Zodiac, may be said to mark both the hours and the months" (FRECCERO 1968, 95). Freccero viewed the theologians' circular dance as connected with the Platonic theory of cosmic Love, envisioning the *Paradiso* as a system of musical emanation, in which music is the "wave" that distributes love and grace. Thus, in *Paradiso* 10 Dante's poetics of universal love is circulated through music (a concept akin to Gabriel's song to May as "circulata melodia" *Par.* 23.19), in a stretch of Platonic and subtly anti-Aristotelian narrative: while Dante avoids any direct compromise with the harmony of the spheres, he silently discards and possibly alludes to the silent cosmos of Aristotle when praising the song of revolving lights in opposition to those who cannot soar up in ecstasy because they await news from a mute:

Ne la corte del cielo, ond' io rivegno,
si trovan molte gioie care e belle
tanto che non si posson trar del regno;
e 'l canto di quei lumi era di quelle;
chi non s'impenna sì che là su voli
dal muto aspetti quindi le novelle

In the court of Heaven, from which I have returned, / there are many precious gems of such worth and beauty / that they may not be taken from the realm. / These lights were singing of those gems.

(*Par.* 10.70–75)

Like luminescent bulbs, the theologians revolve in a choir as if they were stars rather than singers. This originally Platonic choreography may have come to Dante from Guillelmus de Conches's commentary on the *Timaeus*

19. For the novelty of the device, see THORNDIKE 1942, 242 and MOEVS 1999, 60.

(Dante quotes Plato's *Timaeus* in *Par.* 4.49), in which the astronomical structure of the universe is made to sound and dance in a similar way:

Et est chorea circularis motus cum concordi sono. Inde dicunt philosophi
stellas facere choream quia circulariter moventur et ex motum concor-
dem reddunt sonum.

And there is a circular dance movement along with the harmonious sound. The philosophers say that the stars dance because they move in a circle, and from this motion they produce a harmonious sound.

(GUILLELMUS OF CONCHES 1965, 186, my transl.)

Dante's imitation of planetary motion through performing souls reappears at several other points in the same canto:

Io vidi più folgòr vivi e vincenti
Far di noi centro e di sé far corona
Più dolci in voce che in vista lucent

I saw many flashing lights of blinding brightness / make of us a center
and of themselves a crown, / their voices sweeter than the radiance of
their faces

(*Par.* 10.64–66)

Poi, sì cantando, quelli ardenti soli
Si fuor girati intorno a noi tre volte,
Come stelle vicine a'fermi poli
Donne mi parver non da ballo sciolte
Ma che s'arrestin tacite, ascoltando
Finché le nove note hanno ricolte.

When, with just such songs, those blazing suns / had three times made
their way around us, / like stars right near the still and steady poles, /
they seemed to me like ladies, poised to dance, / pausing, silent, as they
listen, / until they have made out the new refrain.

(*Par.* 10.76–81)

In the *Commedia*, Dante's interest in the speculative side of musical thought yields to poetic invention. The poet constructs a musical edifice of

the sounding universe that acts as a blueprint of the harmonious cosmos envisioned by Pythagoras, Plato, and Cicero, and transmitted by Boethius, Cassiodorus and Isidore. In so doing, however, he cleverly avoids taking overt stances against the current theological and philosophical authorities, and at the same time does not renounce a rich source of poetic inspiration.

Any interpretations that resolutely accept or reject the theory of the harmony of the spheres would not do justice to the subtlety of this poetic treatment, for Dante never explicitly affirms or denies that the heavens rotate sonorously; rather, he creates a musical environment by which the reader is led to imagine cosmic harmony. It seems as though Dante scholars have undergone the same fascination which Dante felt for the theory of cosmic harmony but have let themselves be carried to radical stances on an issue that calls for hermeneutic caution. That Dante shows caution about the stern Aristotelian rejection of cosmic music can be explained with the tremendous influence that this belief exerted on Christian thinkers for centuries, a notion that still held fascination in the minds of the poets. Dante wants to assign celestial harmony a beatifying role, and he does so by avoiding direct confrontation with Platonizing views of the sounding cosmos.

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Works Cited

- ADOYO, Catherine S. 2018. "Dante Decrypted: Musica Universalis in The Textual Architecture of the 'Commedia'". *Bibliotheca Dantesca: Journal of Dante Studies*, 1.3: 37–69. <https://repository.upenn.edu/bibdant/vol1/iss1/3>.
- ALIGHIERI, Pietro. 1845. *Petri Allegherii super Dantis ipsius genitoris Comoediam Commentarium, nunc primum in lucem editum . . .* Edited by Vincenzo NANNUCCI. Firenze: G. Piatti, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- AQUINAS, Thomas. 1952. *In Aristotelis libros de caelo et mundo expositio*. Torino: Marietti.
- BACCIAGALUPPI, Claudio. 2002. "La 'Dolce Sinfonia di Paradiso': le funzioni delle immagini musicali nella *Commedia*". *Rivista di Studi Danteschi*, 2.2: 1–55.
- BARSELLA, Susanna. 2010. *In the Light of the Angels. Angelology and Cosmology in Dante's Divina Commedia*. Florence: Olschki.
- BASIL OF CAESAREA. 2010. "Homilies". In *Exegetic Homilies*, translated by Sister Agnes Clare WAY. The Fathers of the Church, Volume 46. Washington, DC: The Catholic University of America Press.
- BENVENUTO DA IMOLA. 1887. *Benevenuti de Rambaldis de Imola Comentum super Dantis Aldigherij Comoediam, nunc primum integre in lucem editum sumptibus Guilielmi Warren Vernon, curante Jacobo Philippo Lacaita*. Firenze: G. Barbèra, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.

- BOETHIUS, Anicius Manlius Severinus. 1989. *Fundamentals of Music.*, translated with an introduction by Calvin M. BOWER. Edited by Claude V. PALISCA. New Haven: Yale University Press.
- BOSCO, Umberto, and Giovanni REGGIO, eds. 1988. Dante Alighieri, *La divina commedia*. Firenze: Le Monnier.
- BUSNELLI, Giovanni. 1911. “L’ordine dei cori angelici nel *Convivio* e nel *Paradiso*”. *Bulletino della società dantesca italiana*, New Series 18: 127–28.
- BUTI, Francesco. 1858–1862. *Commento di Francesco da Buti sopra La Divina Commedia di Dante Alighieri*. Edited by Crescentino GIANNINI. Pisa: Fratelli Nistri, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- CASSIODORUS (Magnus Aurelius Cassiodorus Senator). 1980. *Institutiones. Book 2, Chapter 5*, translated by Helen DILL GOODE and Gertrude C. DRAKE. Colorado Springs: Colorado College Music Press.
- CHIAVACCI LEONARDI, Anna Maria. 1991–1997. Dante Alighieri, *La divina commedia*. Milano: Mondadori, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- CIABATTONI, Francesco. 2021. “Testualità, canto e danza nel cielo di Giove”. *Ermeneutica Letteraria*, 17: 247–57.
- CICERO, Marcus Tullius. 1907. *De re publica*. In *The Library of Original Sources*, Vol. 3, edited and translated by Oliver J. THATCHER. Milwaukee: University Research Extension Co.
- CORNISH, Alison. 2000. *Reading Dante’s Stars*. New Haven: Yale University Press.
- CRISTIANI, Marta. 2007. “Dal sensibile all’intelligibile : la musica nell’enciclopedia del sapere tra Antichità e Medioevo”. In *Harmonia mundi: musica mondana e musica celeste fra antichità e Medioevo: atti del convegno internazionale di studi, Roma, 14–15 dicembre 2005*, edited by Marta CRISTIANI, Cecilia PANTI and Graziano PERILLO, 15–56. Florence: SISMEL - Edizioni del Galluzzo, 2007.
- CURTIUS, Ernst Robert. 1992. *Letteratura europea e Medio Evo latino*. Firenze: La Nuova Italia.
- The Douay-Rheims Bible*. 2001–2021. <http://www.drbo.org/>.
- FOSCA, Nicola. 2003–2015. Dante Alighieri, *La commedia*. In *The Dartmouth Dante Project*. <https://dante.dartmouth.edu/>.
- FRECCERO, John. 1968. “Paradiso 10: The dance of the Stars”. *Dante Studies*, 86: 87–111.
- GUILLELMUS DE CONCHES. 1965. *Glosae super Platonem*. In *Texts philosophiques du Moyen Age*, 13, edited by Edouard JEAUNEAU. Paris: Vrin.
- HAMMERSTEIN, Reinhold. 1962. *Die Musik der Engel; Untersuchungen zur Musikanschauung des Mittelalters*. Bern: Francke.
- HAAR, James. 1960. *Musica mundana*. PhD Dissertation, Harvard University.
- HICKS, Andrew James. 2017. *Composing the World: Harmony in the Medieval Platonic Cosmos*. Oxford University Press.
- HOLLANDER, Robert, and Jean HOLLANDER, trans. 2000. Dante Alighieri, *Inferno*. New York: Anchor Books.
- . 2003. Dante Alighieri, *Purgatorio*. New York: Anchor Books.
- . 2007. Dante Alighieri, *Paradiso*. New York: Anchor Books.

- HUGLO, Michel. 1990. "The Study of ancient Sources of Music Theory in the Medieval University". In *Music Theory and its Sources*, edited by André Barbera, 150–72. Notre Dame, IN: University of Notre Dame Press.
- IANNUCCI, Amilcare. 1989. "Musica e ordine nella *Divina Commedia* (Purgatorio II)". In *Studi americani su Dante*, 87–111. Milano: Franco Angeli.
- ISIDORE OF SEVILLE (Isidorus Hispalensis). 1980. *Etymologies. Book 3*, translated by Helen Dill GOODE and Gertrude C. DRAKE, Chapters 15–23. Colorado Springs: Colorado College Music Press.
- JAMES, Jamie. 1993. *The Music of the Spheres: Music, Science, and the Natural Order of the Universe*. New York: Grove Press.
- JOHN OF SERRAVALLE. 1891. *Fratris Johannis de Serravalle Ord. Min. Episcopi et Principis Firmani Translatio et Comentum totius libri Dantis Aldigherii, cum textu italico Fratris Bartholomaei a Colle eiusdem Ordinis, nunc primum edita*. Edited by Fr. MARCELLINO DA CIVEZZA and Fr. Teofilo DOMENICHELLI. Prati: Giachetti, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- KANTOROWICZ, Ernst H. 1942. "Plato in the Middle Ages". *The Philosophical Review*, 51.3: 312–23.
- MILLER, James L. 1986. *Measures of Wisdom: The Cosmic Dance in Classical and Christian Antiquity*. Toronto: University of Toronto Press.
- MOEVS, Christian. 1999. "Miraculous Syllogisms: Clocks, Faith and Reason in *Paradiso* 10 and 24". *Dante Studies*, 117: 59–84.
- MUNXELHAUS, Barbara. 1976. *Pythagoras musicus*. Bonn: Verlag fur Systematische Musikwissenschaft.
- MUSA, Mark, trans. 1984–1986. Dante Alighieri, *The Divine Comedy*. London: Penguin Books.
- NARDI, Bruno. 1967. "La novità del suono e 'l grande lume". In *Saggi di filosofia dantesca*, 73–88. Firenze: La Nuova Italia.
- OTTIMO COMMENTO. 1827–1829. *L'Ottimo Commento della Divina Commedia [Andrea Lancia]. Testo inedito d'un contemporaneo di Dante . . .* Edited by Alessandro TORRI. Pisa: N. Capurro, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- PANTI, Cecilia, Graziano PERILLO, and Marta CRISTIANI, eds. 2007. *Harmonia mundi: musica mondana e musica celeste fra antichità e Medioevo: atti del convegno internazionale di studi, Roma, 14–15 dicembre 2005*. Firenze: SISMEL Edizioni del Galluzzo.
- PASQUINI, Emilio, and Antonio QUAGLIO, eds. 1982. *Commedia di Dante Alighieri*. Milano: Garzanti, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- PAZZAGLIA, Max. 1986. "L'universo metaforico della musica nella 'Commedia'". *Lecture classensi*, 15: 79–97.
- PETROCCHI, Giorgio, ed. 1966–1967. Dante Alighieri, *La Commedia secondo l'antica vulgata*. Milano: Mondadori, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- PICCHI, Alessandro. 1967. "Musicalità dantesca e metodologie filosofiche medievali". *Annali dell'Istituto di Studi Danteschi* 1: 155–94.
- PIRROTTA, Nino. 1966. "Ars Nova e Stil Novo". *Rivista Italiana di musicologia*, 1: 3–19.

- PLATO. 1901. *Republic*, translated by Benjamin JOWETT. New York: P. F. Collier & Son.
- PUCA, Antonella. 2001. "Astronomia e 'musica medievale' nella *Commedia* di Dante". In *La musica nel pensiero medievale*, edited by Mauro LETTERIO, 217–43. Ravenna: Longo.
- RICHELMI, Chiara. 2001. "Circolata melodia. L'armonia delle sfere nella *Commedia* di Dante Alighieri". In *De Musica. Annuario del Seminario Permanente di Filosofia della Musica*, edited by Carlo SERRA. Accessible at <http://www.gianfrancobertagni.it/materiali/musicaemistica/dante.htm#m21>.
- SALVETTI, Guido. 1971. "La musica in Dante". *Rivista Italiana di Musicologia*, 6: 160–204.
- SANTARELLI, Cristina. 2015. "'La Rota Che Tu Sempiterni'. Musica E Danza Delle Sfere Nella Cultura Visiva Fiorentina Del Quattrocento". *Gli Spazi Della Musica*, 4.1: 39–65. <https://www.ojs.unito.it/index.php/spazidellamusica/article/view/1023>.
- SERMONTI, Vittorio. 1993. *Il Paradiso di Dante*. Milano: Rizzoli.
- SINGLETON, Charles S., trans. 1970–1975. Dante Alighieri, *The Divine Comedy, Translated, with a Commentary, by Charles S. Singleton*. Princeton: Princeton University Press, in *Dante Lab*. <http://dantelab.dartmouth.edu/>.
- SPITZER, Leo. 1963. *Classical and Christian Ideas of World Harmony: Prolegomena to an Interpretation of the Word 'Stimmung'*. Baltimore: Johns Hopkins University Press.
- STEVENS, John. 1968. "Dante and music". *Italian Studies*, 23: 1–18.
- THORNDIKE, Lynn. 1942. "The Invention of the Mechanical Clock about 1271 A.D." *Speculum*, 16.2: 242–43.
- TOYNBEE, Paget. 1895. "Dante's References to Pythagoras". *Romania*, 24: 376–84.