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# Galileo's Letter to Christina: Some Rhetorical Considerations

by JEAN DIETZ MOSS

The year 1982 marked the 350th anniversary of the publication of Galileo's *Dialogue Concerning the Two Chief World Systems*, a work that was to have a tragic impact on the astronomer's life, and also on the relations between science and religion. It was the publication of the *Dialogue* that precipitated the trial of Galileo before the Inquisition on charges of teaching the Copernican system, which had been condemned in 1616. The book sets forth the inadequacies of the Ptolemaic system and the superiority of the Copernican for "saving the appearances" of celestial motion, but it does not press openly for acceptance of the theory. An earlier writing of Galileo, the *Letter to Madame Christina of Lorraine, Grand Duchess of Tuscany*, referred to in short as the *Letter to Christina*, does just that. It was written in 1615 before the opinion on Copernicanism was delivered, and written, moreover, to dissuade the Church from condemning Copernicus's *De revolutionibus* of 1543. The letter, which has since become a classic in literature relating to the conflict between science and religion, attempts to work out an acceptable solution that would preserve the autonomy of each. Passages are often quoted for the sheer power of their expression and the acuity of their observations.

A recent work, *Galileo and the Art of Reasoning* by Maurice A. Finocchiaro, has drawn attention to a neglected dimension of the much discussed *Dialogue*.<sup>1</sup> Finocchiaro suggests that the rhetoric Galileo uses in the *Dialogue* was a form of scientific proof; thus Finocchiaro's subtitle: *Rhetorical Foundations of Logic and Scientific Method*. By a careful analysis of the form and content of the *Dialogue* and its relation to the argumentation developed in the work, Finocchiaro has illuminated not only the multifaceted nature of Galileo's rhetoric, but made some provocative assertions regarding the complex nature of scientific reasoning itself.

While this essay takes its inspiration from Finocchiaro's approach, it has a more modest aim. It focuses mainly on the rhetorical aspects of the *Letter to Christina*, particularly on the audience and the appeals

<sup>1</sup> Volume 61, Boston Studies in the Philosophy of Science (Dordrecht, 1980).

used by Galileo to move them. At the same time it sounds a theme similar to Finocchiaro's: that Galileo attempted to influence his audience by using an impressive array of rhetorical appeals. His attention was to induce his readers to see that a condemnation of Copernicus' book was inappropriate, even immoral. Since the letter did not succeed in this, an examination of the strategies employed by Galileo to move his readers might reveal some of the reasons for its failure. What follows is an analysis of these strategies within the context of *ars dictaminis*, continuously taking into account the audience Galileo addressed and the responses that might be conjectured for it.

It could be argued that the *Letter* should not be treated as part of the letter genre at all because of its length and subject matter, that it is really a treatise. In response to this objection one need only consider the fact that many Renaissance letters cross the narrow line between letter and treatise, as Paul Oskar Kristeller has pointed out.<sup>2</sup> But, as he suggests, another characteristic that distinguishes letters from treatises is whether they arise from particular occasions. Galileo's composition was certainly prompted by specific circumstances, and even more importantly, he addresses the Duchess several times in the text; sufficient reason, then, for maintaining that Galileo deliberately chose the letter format and for analyzing the text within that genre.

What precipitated the letter was actually a conversation at a dinner party given by the mother of Galileo's patron Cosimo II de Medici, the Grand Duchess of Tuscany, Christina of Lorraine.<sup>3</sup> She had voiced concern about the new Copernican system in view of the prevailing interpretations of the Scriptures, especially those texts that spoke of the earth as stationary. Father Benedetto Castelli, a Benedictine monk and a friend of Galileo, tried to allay her doubts and to counter the objections of Cosimo Boscaglia, a Pisan professor, who

<sup>2</sup> Edward P. Mahoney, ed. and tr., "The Scholar and his Public in the Late Middle Ages and the Renaissance," *Medieval Aspects of Renaissance Learning: Three Essays by Paul Oskar Kristeller* (Durham, North Carolina, 1974), pp. 12–13. I have greatly benefited from Professor Kristeller's and Professor Mahoney's observations on a number of points in this essay.

<sup>3</sup> See the discussion of the background of the letter in Stillman Drake, *Discoveries and Opinions of Galileo* (New York, 1957), pp. 145–171, and in Jerome Langford, *Galileo, Science and the Church* (Ann Arbor, 1971), pp. 50–78. Another quite different view is that of Arthur Koestler, *The Sleepwalkers* (New York, 1968), pp. 415–463. An earlier and very careful recapitulation of the events leading up to the trial is in Karl von Gebler, *Galileo Galilei and the Roman Curia*, tr. Mrs. George Sturge (London, 1879).

was also present. Castelli had succeeded Galileo in the chair of mathematics at the University of Pisa and was aware of the growing opposition to Galileo's views on astronomy and physics from Boscaglia and others, such as the Florentine philosopher Ludovico delle Colombe. Their antipathy had been growing since the publication of Galileo's *Sidereus nuncius* in 1610, describing his discoveries with the telescope and the inferences he drew from them. His critics thought he claimed too much in view of the Scriptures and the province of natural philosophy. Castelli reported by letter on the argument, outlining his own answers, which he felt effectively refuted the contentions of Professor Boscaglia.

Fearing perhaps a threat to his position as the Tuscan court philosopher and mathematician, Galileo gathered his observations on the problem and sent them to Castelli, and the monk seems to have widely circulated copies of the missive. During the year following the exchange, anti-Galileist sentiment grew in Florence among friends and supporters of Colombe. On December 14, 1614, the Dominican Tomasso Caccini preached a sermon in Santa Maria Novella attacking Galileo, reputedly by using a pun on the text of Acts 1:1, "ye men of Galilee [Galileo], why stand ye gazing up into heaven?"<sup>4</sup> About the same time another Dominican friar, Niccolò Lorini, sent to the Holy Office a replica of Galileo's letter to Castelli, which seems to have contained some alterations by an unknown hand that rendered the thought suspect of heresy.<sup>5</sup> Upon hearing of this Galileo retrieved the original and sent his own authenticated copy to his friend Bishop Piero Dini in Rome. He asked that it be shown to influential clerics, Cardinal Bellarmine among them, to aid in the defense of the Copernican system, rumored to be facing condemnation. At the same time, mid-February of 1615, he told Bishop Dini that he was at work on an amplified version of the letter that he would send to him soon. Galileo took much more time than he had anticipated, however, probably because he decided to consult theologians in order to buttress his views with references to the Scriptures and the Church Fathers. He evidently pressed Castelli and others into

<sup>4</sup> The sermon was deplored by Luigi Maraffi, a preacher general of the Dominican Order. See Maraffi to Galileo in the National Edition of Galileo's works, *Le Opere di Galileo Galilei* (henceforth referred to as *Opere*), ed. Antonio Favaro, 20 vols. in 21 (Florence, 1890–1909, rpt. 1968), XII, 127–128.

<sup>5</sup> Lorini to the Holy Office, *Opere* XII, 297ff.

helping him in this. A letter from Castelli in January 1615 mentions that he will send on to Galileo some opinions of St. Augustine and other recognized authorities, which had been compiled by a Barnabite priest on the subject of the proper relationship of science to Scripture.<sup>6</sup>

The new version of the letter was completed sometime before Galileo made a visit to Rome at the end of 1615 to press his case for Copernicus. In its much expanded form the letter seems to have been widely circulated there, as the numerous extant manuscript copies and correspondence about it suggest.<sup>7</sup> Neither it nor the original version had the desired effect, unfortunately, for on February 26, 1616, Galileo was told in an interview in Rome with Cardinal Bellarmine that the Holy Office had decided to ban the teaching of the heliocentrism espoused by Copernicus. For this reason Galileo would be expected not to advocate the system. Under this stricture he could not afford to expose his *Letter to Christina* to a wider audience at that time. The letter was not actually published until 1636, when it was issued as an appendix to the Italian-Latin version of the *Dialogue Concerning the Two Chief World Systems*, a final apologia published despite his trial and abjuration of 1633.<sup>8</sup>

Paradoxically, the essence of the view of science vis-à-vis Scriptural interpretation that Galileo urges in the letter is one that the Church had entertained since the time of St. Augustine, as the astronomer points out. In addition, and just as paradoxically, Cardinal Bellarmine argues against the Copernican system on some of the same grounds that Galileo presses upon the Church as support for his

<sup>6</sup> Castelli says that the Barnabite had promised passages from St. Augustine and other doctors who confirm Galileo's preferred interpretation of Joshua, developed in the earlier letter to Castelli, *Opere* XII, 126–127. François Russo conjectures that Galileo used St. Augustine's commentary on Genesis more frequently than the others because that was the source most sympathetic to his views, "Lettre à Christine de Lorraine Grande-Duchesse de Toscane (1615)," *Revue d'histoire des sciences*, 17 (1964), 337.

<sup>7</sup> Favaro examined 34 manuscript copies of the letter in preparing his edition; *Opere* V, 272–278, contains a discussion of these.

<sup>8</sup> See the communication of Mathias Bernegger to Elio Diodati, December 1634, referring to the letter's forthcoming publication, *Opere* XVI, 168. According to Bernegger the letter was furnished by his and Galileo's friend Diodati, who translated it into Latin. One might conjecture that this was with Galileo's knowledge, but Favaro points out there is no evidence in Galileo's correspondence that he was aware of these preparations, *Opere* V, 275.

own stand. In view of these remarkable congruities, one cannot help but wonder why Galileo was so unsuccessful in his determined and eloquent attempt to persuade at least part of his audience, indeed the most important part, the ecclesiastical hierarchy. The reasons become clearer when one examines the composition of the letter, its audience, and the techniques used to move them. Two other rhetorical reference points, author and occasion, also become clearer in the process.

The letter follows for the most part the conventions of the art of letter writing developed at Bologna centuries before. Galileo employs the traditional parts: *salutatio*, *captatio benevolentiae*, *narratio*, *petitio*, and *conclusio*.<sup>9</sup> Yet he occasionally departs from this form, incorporating into it other elements of classical oratory following the practice of his contemporaries. As will be seen, he introduces an elaborate argumentative strategy to support his *petitio*.

In the *salutatio* he addresses his patroness with appropriate deference, almost in the same breath reminding her of his own claim to renown:

Galileo Galilei, To the Most Serene Grand Duchess Mother: Some years ago, as Your Serene Highness well knows, I discovered in the heavens many things that had not been seen before our age. (p. 175)<sup>10</sup>

The *captatio benevolentiae* he here begins, modeled as it was on the classical oration, allows him to recite his singular accomplishments and to appeal to his reader's sympathies by describing the unjustified attacks of skeptical rivals. The fact that he chooses to address the Grand Duchess instead of Dom Castelli or Bishop Dini in what

<sup>9</sup> For discussions of the influence of *ars dictaminis* through the Renaissance see Kristeller, "The Scholar and his Public," pp. 10–14, and "Humanism and Scholasticism in the Italian Renaissance" in his collected essays, *Renaissance Thought and its Sources*, Michael Mooney, ed. (New York, 1979), pp. 85–105. Jerrold E. Seigel treats the topic in *Rhetoric and Philosophy in Renaissance Humanism* (Princeton, 1968), ch. 7. For the late Middle Ages see James J. Murphy, *Rhetoric in the Middle Ages* (Berkeley, 1974), ch. 5, and Ronald Witt, "Medieval 'Ars Dictaminis' and the Beginnings of Humanism: A New Construction of the Problem," *Renaissance Quarterly*, 35 (Spring 1982), 1–35. See also Helene Wieruszowski, "Ars dictaminis in the Time of Dante," *Politics and Culture in Medieval Spain and Italy* (Rome, 1971).

<sup>10</sup> Favaro's critical edition of the letter appears in *Opere V*, 309–348. For the convenience of the reader I have followed Drake's English translation in this essay, emending it occasionally for style and nuances in conformity with Favaro's version. (Drake's translation is in *Discoveries*, pp. 175–216). It was based on Thomas Salusbury's 1661 English translation and Favaro's edition.

became the preferred version of the letter is appropriate in a number of ways. The observations he refers to in the first sentence were those, after all, he reported in *Sidereus nuncius* (1610), which he dedicated to her son Cosimo II. The satellites of Jupiter there described he named the Medicean stars, and he explains in the preface to the work that he did so in hope that “this name will bring as much honor to them as the names of other heroes have bestowed on other stars.”<sup>11</sup>

The discoveries earned him fame. But more importantly his elegant compliment was helpful in effecting his release from teaching at the University of Padua and in obtaining for him the post of chief mathematician and philosopher to the Grand Duke. Thus Castellì’s earlier conversation with the Grand Duchess on the new astronomy served as a convenient pretext for Galileo’s again addressing a member of the Medici family on the subject of the stars. It served too as another tribute to those illustrious patrons of learning, and at the same time reminded his readers of his association with them. At a point when Galileo’s detractors seemed to be growing, the gesture also might have helped to consolidate his position with the family.

From a rhetorical standpoint the choice of audience must have seemed particularly apropos. The Grand Duchess had shown herself interested in the topic and desirous of enlightenment on subjects beyond her ken: philosophy, mathematics, and theology. She was also devout. In addressing such a personage Galileo would not have to be embarrassed at starting at ground level to build his argument. He need not suppose a reader more familiar with theology than himself, as he would were he to address Dini or Castellì. In this way too he might hope to reach a much wider audience than if he were to direct his discourse to either of them.

Writing to Christina gave Galileo the opportunity to address the lay public in general, a kind of secondary audience that contained the politically powerful, as well as mathematicians and philosophers like himself. That these considerations are important to him is evidenced by the thrust of his arguments, which seem to court a larger appreciative readership of friends. In this regard, of course, Galileo followed the general practice of humanists of his day, who almost al-

<sup>11</sup> The National Edition includes facsimiles of the *Sidereus Nuncius* in autograph and in its first printed edition, *Opere* III. 1, 15–96. Drake translated the work in *Discoveries*, pp. 23–58.

ways had more than the titular audience in mind for their elaborate letters. Interestingly enough, an even larger audience of modern readers find his letter quite convincing, as is shown by the reprinting of the letter in anthologies and by the enthusiastic response to it by Galileo scholars such as Stillman Drake and Giorgio de Santillana.<sup>12</sup>

Nevertheless, Galileo's underlying purpose, as noted earlier, was to dissuade the religious authorities, who he believed were planning to condemn Copernicus. They were actually his primary audience, and he appeals to them in the implicit *petitions* he interjects at various points in his discourse. Part of the reason for the letter's failure to accomplish its purpose lies in Galileo's focus on Christina as the titular audience, and his appeal to the secondary audience of laymen instead of the primary shadow audience he really needed to move. In effect, he compounded an already difficult task by attempting to persuade a public so different in terms of familiarity with the subject matter he discusses, and so variously disposed in attitudes toward it.

Galileo's choice of the vernacular was also a decision of rhetorical importance. It was especially suitable for the circulation of his views on a theological matter, for he had been warned by both Cardinal Bellarmine and Cardinal Barberini against invading the province of theologians, a point discussed at greater length below. By writing to his patroness in the Italian he customarily used for friendly correspondence, and on a topic of conversation she had raised, he might have hoped to circumvent the objections a more formal treatise in Latin on the subject would have aroused. Moreover, he seems to have arrived at his rhetorical strategy gradually. The earliest version of the letter shows that he originally planned to send it as before to Father Castelli: it is addressed simply to "Paternità," and modifications in Galileo's hand direct it instead to her most serene highness, "Sua Altezza Serenissima," the Grand Duchess Christina.<sup>13</sup> It too is written in Italian, further evidence that he hesitated to make a formal exposition of his opinions in these earliest stages. His decision to shift

<sup>12</sup> Drake's attitude is apparent in his introduction to the letter in *Discoveries* where he presents it as a valiant and uncompromising effort to describe the "proper relation of science to religion," p. 145 (cf. p. 165). De Santillana places the letter on a plane with Milton's *Areopagitica* in his well known work on the trial, *The Crime of Galileo* (Chicago, 1955), pp. 96–98.

<sup>13</sup> Favaro discusses the evidence for this, based on the draft of the *Letter* found in Codex Volpicelliano, *Opere*, V, 274–275.



the focus from Castelli to Christina might be seen as underscoring his desire to keep the discussion on an informal plane, so that it could appear to be “overheard,” as it were, by the primary shadow audience.

The letter itself is quite long, comprising thirty-nine pages of text in the National Edition, as compared with seven pages for the original letter to Castelli in the same work. Both the *captatio benevolentiae* and the *narratio* clearly display the *ethos* of the writer. The style is straightforward and logical, suiting the image of an earnest, devout, yet embattled philosopher. Galileo projects himself as a man of good will who seeks only to disclose the truth. Still, the tone of the emotional appeals he introduces seems to undercut on occasion the spirit of the ethical appeal, at least for his shadow audience. In the *captatio benevolentiae* he mentions that he has been unfairly treated by “no small number of professors” (p. 175). These men appear to be upset because what he has discovered in the heavens has contradicted traditional views. It is as if they believe “I had placed these things in the sky with my own hands in order to upset nature and overturn the sciences.” He goes on to say that they choose to ignore the fact that “the increase of known truths stimulates the investigation, establishment, and growth of the arts; not their diminution or destruction” (p. 175). The edge of ridicule and impatience in his voice establishes at once the stance he is to maintain throughout. This tone might be expected to arouse a sympathetic response in the Duchess, who would not want to see her resident philosopher insulted, and also from philosophers with views similar to his, but he could not expect his opponents to be placed in a receptive mood for what was to follow. And what of the primary audience whose minds were not yet quite made up? Cardinal Bellarmine and many other theologians were conservative in the original sense of the term. They were primarily interested in conserving the teachings of the Church, and these new theories were indeed revolutionary. Moreover their implications threatened traditional wisdom regarding the cosmos and man’s place in it.

By his deprecating tone Galileo effectively marks off a group of philosophers and theologians as adversaries whose faults he proceeds to define in the *narratio*. They are, he says, men determined in “hypocritical zeal” to preserve at all costs what they believe, rather than admit what is obvious to their eyes (p. 179). Instead they go about

invoking the Bible to disprove arguments on physical matters “they do not understand.” On the other hand, those who are well-versed in physical science and astronomy are quite able to see the truth of his discoveries (pp. 175–176).

*Ethos* and *pathos* commingle as he adds that his enemies prefer to “cast against me imputations of crimes, which must be and are more abhorrent to me than death itself” (p. 176). The reference undoubtedly is to the allegations of Colombe, Lorini, Caccini, and others that Galileo's views were opposed to the reigning theological opinions. Here he may well have been distracted by his titular audience and his own indignation from realizing that to achieve his purpose he needed to reach those who might sympathize with his opponents.

At this stage of Galileo's life, it must be remembered, his critics were scattered and did not present an organized or powerful opposition. In fact, following the publication of his *Sidereus nuncius* he had many admirers among clerics and the scholarly world in general. No battle between science and religion had yet begun. In retrospect, then, this was a crucial period. Whatever Galileo wrote or said was to be extraordinarily magnified.

The author's castigation of his adversaries for their stupidity and hypocrisy is repeated often throughout the letter. In this, Galileo departs from advice offered by classical rhetoricians and the *dictatores* not to antagonize the audience or readers through arrogance. The astronomer's rivals were themselves vituperative, it is true, but one wonders why he responded in equally inflammatory fashion, astute rhetorician that he was. The answer seems not to lie in any innate maliciousness: rather it appears that Galileo was very sensitive to criticism. Evidence of this trait occurs in the memoranda for his *De motu*, written as a young man, long before his writing had become known and provoked controversy. He conjectures even then that many will on reading his writings “turn their minds not to reflecting whether what I have written is true, but solely to seeking how they can, justly or unjustly, undermine my arguments.”<sup>14</sup> A similar defensiveness is evident in Galileo's references, just noted, to the professors opposed to his discoveries. He says that a few of these have

<sup>14</sup> *Opere* I, 412 [m. 17], English translation by Drake in *Mechanics in Sixteenth Century Italy* (Madison, 1969), p. 382. The same sentiment is sounded in Galileo's *Dialogue on Motion* of c. 1586–87, *Opere* I, 398, also in *Mechanics*, pp. 364–365.

been persuaded, but others “now take refuge in obstinate silence,” but in their exasperation “divert their thoughts to other fancies and seek new ways to damage me” (p. 176). Two paragraphs later he maintains that they are “persisting in their original resolve to destroy me and everything mine by any means they can think of” (p. 177).

One of the reasons for the stubborn resistance to Galileo’s assertions regarding his discoveries was that some academicians were very concerned about what they perceived as an erosion of their disciplinary kingdoms. This is what Galileo refers to in the quotation cited above that his critics fear he will “overturn the sciences.” A recent essay by Robert Westman describes in detail the importance of the political dimension of this interdisciplinary dispute and the repercussions the discoveries in astronomy had upon what had been considered the superior discipline: natural philosophy.<sup>15</sup> Its province included speculations about the physical world, while astronomy was simply to be concerned with mathematical theory or “saving the appearances,” not with analyzing the nature of the physical world.

Following his initial reference to the intentions of his enemies, Galileo interjects a quotation from St. Augustine, which actually becomes a theme of the letter:

Now keeping always our respect for moderation in grave piety, we ought not to believe anything inadvisedly on a dubious point, lest in favor to our error we conceive a prejudice against something that truth hereafter may reveal to be not contrary in any way to the sacred books of either the Old or the New Testament. (pp. 175–176)

The quotation derives from Augustine’s commentary on the book of Genesis, *De Genesi ad litteram* (Lib. 2, cap. 18), where he considers what can be said with certainty about the heavenly bodies. The text

<sup>15</sup> Robert Westman, unpublished paper, “The Copernicans and the Churches: From *De Revolutionibus* to the Decree of 1616,” for the Carner Foundation—University of Wisconsin Conference on “Christianity and Science: Two Thousand Years of Conflict and Compromise,” Madison, 23–25 April 1981, pp. 8–10, 31. The thesis will be further developed in Professor Westman’s forthcoming book, *The Copernicans: Universities, Courts and Interdisciplinary Conflict, 1543–1700*. In his Oberlin lecture on Aristotelianism, Kristeller makes the same point, emphasizing the fact that Galileo’s new conception of a physics based on mathematics was thought to be an intrusion by a mathematician and astronomer upon the field of natural philosophy that had previously been separate from mathematics and astronomy (*Renaissance Thought and Its Sources*, pp. 48–49). See also the discussion of disciplinary rivalries among Florentine humanists and philosophers before Galileo’s day in Seigel, pp. 68–98.

provides a perfect transition to Galileo's *narratio* and his description of the circumstances behind the current controversy over the Copernican system. He repeats the motif at several places in the letter, using it as the context from which to issue his *petitio* to the ecclesiastical authorities for freedom of thought. Throughout the letter, in fact, Galileo relies heavily upon the *De Genesi ad litteram*, citing it more frequently than any other source.

The elaborate argument Galileo develops in his letter rests initially upon the previously noted assumption that his opponents are seeking to discredit him, and it is against them that he directs his refutation. What might be termed the *divisio*, ordinarily not found in letters, follows the *narratio*. He says, "I shall therefore discourse of the particulars which these men produce to make this opinion detested and to have it condemned not merely as false but as heretical." Then he adds pointedly,

I hope to show that I proceed with much greater piety than they do, when I argue not against condemning this book, but against condemning it in the way they suggest—that is, without understanding it, weighing it, or so much as reading it. (p. 179)

He says that his motive is "to justify myself in the eyes of men whose judgments in matters of religion and reputation I hold in great esteem" (p. 179). The defense he develops here he hopes might aid the Church, but if his effort is not viewed as constructive he vows to "renounce any errors" he might make concerning religious questions. He does not "desire in these matters to engage in disputes with anyone, even on points that are disputable." "And if not," he adds, "let my book be torn and burnt, as I neither intend nor pretend to gain any fruit that is not pious and Catholic" (pp. 180–181). These words are touchingly prophetic of the events of the trial that was to follow sixteen years later. The reference to "my book" is Drake's free translation of "*mia scrittura*" in the Favaro edition, that is, "my writing."<sup>16</sup> Galileo probably was referring to the letter itself, not, as one might be tempted to conjecture, to the *Dialogue* on which he was already at work.

In setting forth the *divisio* Galileo explains that in condemning the twofold claim that "the earth rotates on its axis and revolves around the sun," his detractors would also suppress any discussion of other

<sup>16</sup> *Opere* V, 315, lines 2–3.

related observations and physical statements. This view of the planetary system, he points out, was really not original with him but was that of Copernicus too, a fact that his enemies have attempted to hide from the “common people.” The academic philosophers “pretend not to know” that Copernicus was “not only a Catholic, but a priest and a canon”; yet the work of this esteemed scholar, *De revolutionibus*, “has been read and studied by everyone without the faintest hint of any objection ever being conceived against its doctrines.”<sup>17</sup> Galileo claims that only the campaign to discredit himself, moreover, has prompted this effort to have Copernicus’ book condemned (pp. 178–179).

Galileo may not have known it, but he was in error in his appeal to precedent here. The Church had not previously received Copernicus’ work with universal approval. In this regard, Westman cites the discovery of Eugenio Garin that *De revolutionibus* had been challenged by a Dominican theologian and astronomer named Tolosani as early as 1544. Tolosani mentions that in fact the Master of the Sacred Palace (the pope’s theologian) intended to condemn the book, but was taken ill before he could do so. Although Tolosani expressed the hope that his writings would accomplish the same purpose, they had not done so by the time Galileo began his letter.<sup>18</sup> In *The Sleepwalkers* Arthur Koestler makes a similar point, drawing further inferences. Rather than seeing the growing opposition to Galileo’s teachings as responsible for the disapproval of Copernicus, as Galileo himself does, Koestler sees the *Letter to Christina* as the precipitating factor in converting the Church’s ambivalent stance to an antagonistic one. He terms the letter a “theological atom bomb” because it was

<sup>17</sup> Here Galileo’s enthusiasm carries him too far. Although, as is well known, Copernicus’ uncle was archbishop of Frauenburg and he himself was a canon of the cathedral there, the Polish astronomer was never ordained to the priesthood. Moreover, Galileo’s first reference to Copernicus occurs in his *Tractatio de caelo, Opere I*, 43, 47–48, an early work wherein he himself rejects outright the heliocentric teaching. Alistair Crombie provides a replica of the folio containing this reference in Galileo’s own handwriting in his “Sources of Galileo’s Early Natural Philosophy,” in *Reason, Experiment, and Mysticism in the Scientific Revolution*, M. L. Righini Bonelli and W. R. Shea, eds. (New York, 1975), facing p. 162.

<sup>18</sup> Westman, pp. 14–16. Garin’s account of Tolosani’s work is in his *Rinascite e rivoluzioni. Movimenti culturali dal XIV al XVIII secolo* (Bari, 1976), pp. 255–281, giving Tolosani’s text on pp. 283–295.

“the principal cause of the prohibition of Copernicus and Galileo’s downfall.” And he adds that its “radioactive fallout is still being felt.”<sup>19</sup>

In the development of the main points of his argument against his opponents, the author’s tone is not as continuously querulous as in the introductory parts, although the text is still interlaced with incisive, scornful comments delivered at strategic places. Generally Galileo proceeds in the manner of a philosopher-scientist who is also skilled in rhetoric. Because of this it is especially important to note the precise terminology he uses when advancing an argument, and particularly when characterizing it as a “necessary demonstration”—a nuance generally overlooked by Finocchiaro in his analysis of the *Dialogue*, possibly because of the paucity of such arguments in that work. With regard to Galileo’s knowledge of rhetorical techniques, one can presume that his training in classical rhetoric and poetics during his student days at Vallombrosa and the University of Pisa had equipped him well in these areas.<sup>20</sup> Surely he was acquainted with the dialectical and persuasive reasoning expounded by Aristotle in the *Topics* and *Rhetoric* respectively, and then carried on in the revived classical tradition of Cicero, the *Rhetorica ad Herennium*, and

<sup>19</sup> Koestler, pp. 433–434. Koestler’s treatment of Galileo’s *Letter to Christina* and the character of the astronomer is too harsh, and his book has been countered in reviews by De Santillana, Drake, and others. Koestler does not distinguish carefully enough between the earlier version of the letter written to Castelli and the later one to Christina. On the other hand, De Santillana makes too much of the effect of the *Letter to Christina* on Cardinal Barberini, based on a conversation with Galileo recorded by Giovanfrancesco Buonamici in the latter’s diary. A rereading of Buonamici’s diary by a disinterested eye does not yield the interpretation that the Cardinal was persuaded by the letter to counsel the Holy Office against accusing Galileo of heresy in 1616; cf. De Santillana, pp. 203, 289, and *Opere* XV, 111.

<sup>20</sup> Fragments of classical selections, probably written by Galileo as scholastic exercises at Vallombrosa, have been assembled by Favaro in Vol. 9 of the National Edition. The extent of Galileo’s training in rhetoric at the University of Pisa is difficult to ascertain, and more research is required in this area. Angelo Fabroni provides a survey of the professors and texts used in Galileo’s time in his history of the university, *Historia Academiae Pisanae*, 3 vols. (Pisa, 1791–1795), Vol. II, cap. 15. The principal rhetoricians who taught there were Francesco Robortello, Ciriaco Strozzi, Pietro Angelio Bargeo, and Aldo Manucci. Especially noteworthy is the fact that the funeral oration for Bargeo was delivered in 1595 by Jacopo Mazzoni (II, 431, n. 1), the close friend of Galileo and his father, which could indicate that Bargeo was also part of their circle. See notes 22 and 35, *infra*.

Quintilian.<sup>21</sup> The literary circles in which Galileo moved, and his own compositions previous to the *Letter to Christina*, amply confirm his acquaintance with artistic devices and polemical modes of argumentation.<sup>22</sup> Less appreciated is his understanding of the techniques of proof as explained in Aristotle's *Posterior Analytics*, the portion of the *Organon* that set the standards of scientific methodology generally accepted in the universities throughout the Middle Ages and the Renaissance. In fact Galileo wrote a commentary on this work, which unfortunately was misdated by Favaro and not included by him in the National Edition.<sup>23</sup> The manuscript has recently been tran-

<sup>21</sup> A translation of a passage from Isocrates, the Greek rhetorician, into Latin, probably done by Galileo during his student days, is in *Opere IX*, 283–284. Fabroni states that the translation of Isocrates into Latin was a part of the requirement introduced by Lorenzo Lippi at Pisa near the end of the fifteenth century (I, 373). The *Rhetorica ad Herennium*, Cicero's rhetorical works, and Quintilian's, were newly appreciated in the early Renaissance and commentaries on them again appeared; see the discussion in Kristeller, *Renaissance Thought*, pp. 239, 245–255, and George A. Kennedy, *Classical Rhetoric and Its Christian and Secular Tradition from Ancient to Modern Times* (Chapel Hill, 1980), pp. 195–217. Aristotle's *Rhetoric* was part of the curriculum for universities in Italy in the sixteenth century according to the researches of Lisa Jardine, *Studies in the Renaissance*, 11 (1974), 31–62. In his "Rhetoric in the Middle Ages," *Speculum*, 17 (1942), 1–32, Richard McKeon points out that close connections between rhetoric and logic lingered on into the Renaissance and beyond, 31–32. Kristeller also discusses this connection and notes that dialectical argument emerged in Italy about the same time as Humanism, *Renaissance Thought*, pp. 99–101.

<sup>22</sup> Galileo was reared in a family with extensive cultural and literary contacts. His father was a lutenist and musicologist, well acquainted with classical languages and mathematics, and their home was the frequent meeting place for the *litterati* of Pisa and Florence. Apart from his knowledge of Virgil, Ovid, and Seneca, Galileo was particularly interested in the essays of Berni, the comedies of Ruzzante, and the verse of Ariosto and Tasso. In 1588 he delivered two lectures at the Florentine Academy on the dimensions of hell as set out in Dante's *Inferno*, and while teaching at Pisa around 1590 he composed a satirical poem "Against wearing the toga." These are included in Vol. 9 of the National Edition (pp. 31–57 and 212–223 respectively), along with his other literary and poetic compositions. Ludovico Geymonat describes Galileo's literary interests in *Galileo Galilei: A Biography and Inquiry into his Philosophy of Science*, S. Drake, tr. (New York: 1965), pp. 9–15. Even more polemical and rhetorical in style are two pseudonymous dialogues written in Tuscan dialect in 1605 and 1606, which Drake has shown to be Galileo's and which he regards as the astronomer's first published work; see his *Galileo Against the Philosophers* (Los Angeles, 1976).

<sup>23</sup> The autograph is preserved in the collection of Galileiana at the Biblioteca Nazionale Centrale in Florence with the signature MS Gal. 27. Misled by a statement in Vincenzo Viviani's biography of Galileo, Favaro regarded it as a mere scholastic exercise composed while the young Pisan was studying at the Monastery of Vallombrosa, and published only a brief excerpt from it and a listing of the questions they contain, now generally referred to as the "Logical Questions," in *Opere IX*, 279–282, 291–292.

scribed in its entirety by William F. Edwards.<sup>24</sup> When one studies its contents, and notes Galileo's continued use of its terminology in his later writings, to be cited below, one can appreciate more fully the logical force of the claims advanced in the *Letter to Christina*.

The *refutatio* portion of Galileo's argument begins after the *divisio* and the declaration of his intent to aid the Church. He states the principal issue in a provocative and dramatic manner:

The reason produced for condemning the opinion that the earth moves and the sun stands still is that in many places in the Bible one may read that the sun moves and the earth stands still. Since the Bible cannot err, it follows as a necessary consequent that anyone takes an erroneous and heretical position who maintains that the sun is inherently motionless and the earth movable. (p. 181)

That he presents the issue in this way after showing his own ideas to be identical with Copernicus' is a direct and unprecedented challenge for an avowedly believing Catholic to most of his primary audience. It shows Galileo's enormous faith in his own powers of persuasion. It also signals his decision to pursue the issue on theological grounds. Even as empathic a commentator as Stillman Drake sees that decision as a daring move. He remarks that Galileo was proceeding against "advice from his friends at Rome [Prince] Cesi, [Monsignor] Ciampoli and [Cardinal] Barberini to keep the battle on general grounds."<sup>25</sup> They said that as long as Galileo spoke as a mathematician and regarded the Copernican system as an hypothesis there would be no problem. But to venture into theological arguments and to maintain that the theory was demonstrable would be foolhardy. Galileo recognized this much earlier and remarked to Bishop Dini that he had been advised not to discuss Scriptural matters and that "no astronomer or scientist who remained within the proper bounds had ever got into such things."<sup>26</sup> Why did he do so? Drake advances the most plausible reason. He thinks that reading a work by a provincial of the Carmelite Order, Paolo Antonio Foscarini, published just at the time Galileo was rewriting his letter, led to a hardening of his

<sup>24</sup> Edwards' transcription, with an introduction and commentary by William A. Wallace, is forthcoming. Another transcription has been made independently by Adriano Carugo, and a brief summary of its contents appears in Crombie's essay, "Sources of Galileo's Early Natural Philosophy," pp. 171–175.

<sup>25</sup> Drake, *Galileo at Work: His Scientific Biography* (Chicago, 1978), p. 245, and *Discoveries*, p. 167.

<sup>26</sup> See *Opere* XII, 183–184; his letter is translated in Drake, *Discoveries*, p. 167.



position. In that work Foscarini defends Galileo's discoveries and the Copernican system, arguing that the Scriptures could be interpreted differently.<sup>27</sup> The priest sent the book to Cardinal Bellarmine for his reactions and received a courteous reply in mid-April 1615 that outlined the Church's position. Galileo seems to have believed that he could successfully counter Bellarmine's opinion, for even though he knew of the prelate's views he attempted to contravene them.<sup>28</sup>

On his part the Cardinal must have meant his letter to apply to Galileo as well as Foscarini, for he begins by saying, "it appears to me that your Reverence and Sig. Galileo did prudently content yourselves with speaking hypothetically and not positively, as I always believed Copernicus did."<sup>29</sup> He goes on to warn them that to maintain "that the earth is situated in the third sphere and revolves very swiftly around the sun is a very dangerous thing" because it irritates "all the theologians and scholastic philosophers" and is inimical to faith since it makes "the sacred Scripture false." He agrees with Foscarini and Galileo that the Copernican system "saves the appearances better than [the Ptolemaic] eccentrics and epicycles," and thinks that this is what the mathematicians might well state.

His second point concerns the decree of the Council of Trent prohibiting statements that contradict the consensus of the holy Fathers. The case of the earth's being stationary in the center of the universe is one of these, he says, for all the "commentaries of modern writers" and "Greek and Latin expositors" agree that this is the sense of the Scripture.

The last point of Bellarmine's letter is crucial to our appraisal of the *logos* of Galileo's argument. The Cardinal says that the Scripture would be in need of a new interpretation in the event that there were "a true demonstration that the sun was the center of the universe

<sup>27</sup> Foscarini's defense of Copernicanism also took the form of a published letter. Its long title is *Lettera del R.P.M. Paolo Antonio Foscarini Carmelitano Sopra l'Opinione de'Pittagorici e del Copernico, della Mobilità della Terre e Stabilità del Sole, e del Nuovo Pittagorico Sistema del Mondo* (Naples, 1615).

<sup>28</sup> Notes made by Galileo and containing rebuttals of the various points in Bellarmine's letter have been transcribed by Favaro and published under the title *Considerazioni circa l'opinione Copernicana, Opere V*, 349–370; excerpts from this material are translated by Drake in *Discoveries*, pp. 167–170. The notes were probably written before Galileo revised his epistle to Castelli, but in any event Bellarmine's observations are all taken into account in the *Letter to Christina*.

<sup>29</sup> *Opere XII*, 171; the letter is translated in *Discoveries*, pp. 162–164.

. . . and that the sun did not go around the earth but the earth went around the sun.” He adds:

But I do not think there is any such demonstration, since none has been shown to me. To demonstrate that the appearances are saved by assuming the sun is at the center and the earth in the heavens is not the same thing as to demonstrate that in fact the sun is in the center and the earth in the heavens. I believe that the first demonstration may exist, but I have very grave doubts about the second; and in case of doubt one may not abandon the Holy Scriptures as expounded by the holy Fathers.<sup>30</sup>

For the Cardinal this is the crux of the matter, the point on which the argument turns. If astronomers can *demonstrate* the physical fact of the Copernican system, then Scripture will have to be reinterpreted.

Now the use of the term “demonstration,” or, as Bellarmine’s Italian gives it, “*vera demonstratio*” [sic], meant that a rigorous argument could be supplied following the formal methodology of Aristotle’s *Posterior Analytics*.<sup>31</sup> This mode of proof is not in the rhetorical sphere but belongs in the logic of scientific demonstration. Galileo also thought demonstration was important to the case, as is obvious from a letter he wrote to Bishop Dini in mid-May—probably after learning of Cardinal Bellarmine’s response to Foscarini:

To me the surest and swiftest way to prove that the position of Copernicus is not contrary to Scripture would be to give a host of proofs that it is true and that the contrary cannot be maintained at all; thus, since no two truths can contradict one another, this and the Bible must be perfectly harmonious.<sup>32</sup>

But he says that he does not intend to proceed in this way because the Peripatetics who must be convinced “show themselves incapable of following even the simplest and easiest of arguments.”<sup>33</sup>

<sup>30</sup> *Opere* XII, 173, 3°.

<sup>31</sup> See *Opere* XII, 171, line 32. That Galileo understood the precise meaning of this expression is clear from his commentary on the *Posterior Analytics* contained in the Logical Questions. The second treatise in this work is in fact entitled *De demonstratione*, and it consists of three disputations, the first on the nature and importance of demonstration, the second on its properties, and the third on its kinds (*Opere* IX, 280–281). W. A. Wallace has given the more important readings from this treatise and has traced their recurrence in Galileo’s later writings on his “The Problem of Causality in Galileo’s Science,” *The Review of Metaphysics*, 36 (1983), 607–632. Additional details are provided in his “Aristotle and Galileo: The Uses of ΥΠΟΘΕΣΙΣ (Suppositio) in Scientific Reasoning,” in *Studies in Aristotle*, Dominic O’Meara, ed. (Washington, D.C., 1981), pp. 47–77. I am indebted to Professor Wallace for discussions of this and other points related to Galileo’s science and scientific reasoning.

<sup>32</sup> *Opere* XII, 185; Drake, *Discoveries*, p. 166.

<sup>33</sup> *Ibid.*

The magnitude of the task that Galileo has set for himself now becomes clearer. To argue for the Copernican system without offering demonstrative proof in view of its contradiction of Scripture would be to defy traditional procedures in the eyes of his principal audience.

The manner in which Galileo handles this critical dilemma, as we shall see, is simply to presume at the outset that such proofs exist. In the *divisio* where he remarks on the Church's supposed prior acceptance of Copernicus' book, Galileo says flatly that he finds it difficult to believe that people would see the statements therein as heretical, "now that manifest experiences and necessary demonstrations have shown them to be well grounded" (p. 179).<sup>34</sup>

In spite of the advice of his ecclesiastical friends, Galileo thus does not choose to press the case for the Copernican system on scientific grounds. Rather, and this is most surprising, throughout the letter he never presents a confirmation of inductive or deductive proofs for his position, but instead relies upon a refutation of deductive arguments from theology to counter his opponents' contentions. For the Grand Duchess, and other unsophisticated readers, he evidently assumes that he need only state that demonstrations exist and then in a rhetorical mode take up the theological difficulties. As for his opponents, he simply lumps them together as Peripatetics, those academicians who look only to the text of Aristotle for proof of a proposition. They would not be expected to listen to arguments, whatever the

<sup>34</sup> The Italian reads ". . . quanto ella sia ben fondata sopra manifeste esperienze e necessarie dimostrazioni . . ." (*Opere* V, 312, lines 27–28). In view of Galileo's understanding of the expression "necessarie dimostrazioni," there is an ambiguity in this statement that will be exploited throughout the remainder of the *Letter*. As Galileo states it, the Copernican system is "well grounded" (*ben fondata*) on manifest experiences and necessary demonstrations. Does this mean that the system is actually demonstrated on the basis of sense experience, or that it is merely a plausible hypothesis that can be supported in part by observation and strict mathematical reasoning? The first is the impression Galileo intends to convey, as can be seen throughout the remainder of the *Letter*, whereas the second would be consonant with Bellarmine's understanding of the proofs Galileo and Foscarini were alleging, which would not be sufficient to evoke a wholesale reinterpretation of the Scriptures, as Galileo states in the *Letter*. The authority of the Bible, he says there, "ought to be preferred over that of all human writings which are supported only by bare assertions and probable arguments, and not set forth in a demonstrative way" (*Opere* V, 317, lines 21–24; *Discoveries*, p. 183). See also my comparison of Galileo's argumentation in the *Letter* with that employed in his *Dialogue* of 1632, "Galileo's Rhetorical Strategies in Defense of Copernicanism," in *Novità Celesti, Crisi del Sapere*, Paolo Galluzzi, ed., forthcoming.

physical evidence offered or however cogently proofs were presented, if corroboration could not be found in Aristotle's works. In this characterization of his opponents, Galileo fails to consider that among his audience for the letter were others, opposed or unconvinced, who were progressive Aristotelians like himself, such as Bishop Dini, Cardinals Bellarmine and Barberini, and the Jesuit astronomers at the Collegio Romano.<sup>35</sup> They, unlike the conservative Peripatetics, would have been responsive to a scientific demonstration. But he does not give one or explain that one might in time be given; he prefers to attack the theological views of his opponents.

Following his bold recognition of the possibly heretical character of the Copernican position at the beginning of his *refutatio*, Galileo sets out to show why such a characterization is untenable. In summary, his argument runs as follows: first, it is true that the Bible cannot err, that is, if its true meaning is understood. However, its true meaning is not always clear, for sometimes it speaks ambiguously, and sometimes it adopts common parlance in order to accommodate itself to the untutored mind. Therefore, one cannot hold that its statements about physical things are meant to be taken literally.

Further, he says that two truths cannot contradict one another; Nature like Scripture cannot be false because they both have their origin in the Holy Spirit. Nature is what our senses and necessary demonstrations show her to be. Therefore, since Nature cannot be other than she is, while Scripture can be and sometimes is interpreted

<sup>35</sup> Galileo describes himself as an Aristotelian in his scientific reasoning in his letter of September 14, 1640, to Fortunio Liceti, *Opere* XVIII, 248; see the passage translated into English in Wallace, "Aristotle and Galileo," p. 75. The "progressive Aristotelianism" of Galileo in matters methodological is delineated by Wallace in his "Aristotelian Influences on Galileo's Thought," in *Aristotelismo Veneto e Scienza Moderna*, Luigi Olivieri, ed., 2 vols. (Padua, 1983), I, 349–378. This is not to deny that Galileo was also influenced by Plato, as has been noted by Kristeller in his *Renaissance Thought*, p. 64 and notes 47 and 48 on pp. 269–270, and also urged by Alexandre Koyré in his *Metaphysics and Measurement: Essays in the Scientific Revolution* (Cambridge, Mass., 1968), pp. 16–43. During Galileo's days at Pisa the oppositions between Aristotelianism and Platonism were not as clearly noted as they are in our times; both Jacopo Mazzoni and Cosimo Boscaglia taught Aristotle and Plato at the university there, and Mazzoni even attempted a complete reconciliation of the two philosophers. Galileo studied with Mazzoni in 1590, as he records in his letter to his father on November 15th of that year (*Opere* X, 44–45), and seems to have been particularly impressed with the way in which his father's friend used mathematics to remove *impedimenti* to man's knowledge of the physical world. For more details, see Frederick Purnell, "Jacopo Mazzoni and Galileo," *Physis*, 3 (1972), 273–294.

differently than the strict meaning of its words, Nature should not be called into question because of particular biblical passages.

Galileo concludes this line of reasoning by quoting Tertullian: "God is known first through Nature, and then again, more specifically by doctrine; by Nature in his works and by doctrine in his revealed word" (pp. 181–183).

As one of the main supports in his refutation Galileo adroitly uses a theological argument, often called the accommodation theory. The Holy Spirit "accommodates" its language to the "capacities of the common people who are rude and unlearned." He returns to the same argument later in the letter and there he seeks to add further dignity to it by attributing it to St. Jerome and to St. Thomas Aquinas (pp. 200–201). Nevertheless the effect that the argument would have on his primary audience, regardless of such appeals to authority, is predictable. In their eyes it would be acceptable to apply the accommodation principle to selected texts if one were a theologian, but it would be improper, even presumptuous, for a non-theologian to advance it. Actually Bishop Dini had raised the possibility of such a defense in a conversation with Cardinal Bellarmine, as he himself informed Galileo, but the prelate warned against it. No doubt Bellarmine feared that some theologians would be incensed at a mathematician deciding that particular texts do not say what they patently mean.

Having given the reason for textual contradictions of physical truths, Galileo next explains why the Scriptures do not reveal the nature of physical reality. This explanation supplies the other main pillar of his refutation and is often referred to as the irrelevance theory. He quotes St. Augustine: "Hence let it be said briefly, touching the form of heaven, that our authors knew the truth, but the Holy Spirit did not desire that men should learn things that are useful to no one for salvation" (p. 185). Galileo adds the inescapable conclusion that since the Holy Spirit did not give us knowledge about the heavens because it is "irrelevant to our salvation," then belief about celestial bodies should not be made obligatory to faith. He inquires, "Can an opinion be heretical and yet have no concern with the salvation of souls?" Lightening the tone he quotes the words of Cardinal Baronijs, "the intention of the Holy Ghost is to teach us how one goes to heaven, not how heaven goes" (pp. 185–186).

In the matter that most troubled theologians, namely, the conflict

of Scripture with the Copernican system, Galileo has offered two important counterarguments, both drawn from the most highly respected Fathers of the Church: Aquinas, Jerome, and Augustine. The two arguments are today acceptable to the Roman Catholic Church and are in accord with Pope Leo XIII's encyclical of 1893, *Providentissimus Deus*, which outlines how Scripture should be interpreted.<sup>36</sup> And yet most theologians and philosophers of the seventeenth century were not persuaded by them. When Galileo advanced them in his letter they were not convincing, and this for a number of reasons: many resented his arrogant tone, his presumption in speaking about theological matters, and his crossing over from the world of mathematical astronomy into natural philosophy. The most important reason, however, was that first mentioned by Cardinal Bellarmine. For the Church to relinquish an authoritative theological position about the nature of the universe that might have vast repercussions on the faith of the people, a necessary demonstration of the physical realities would have to be presented. Galileo speaks at the beginning of the letter as if such demonstrations are available. Then, leaving this matter undeveloped, he leads the reader through the argument just reviewed regarding the twin truths of the Holy Spirit: Nature and Scripture. Having made these points with admirable logic, one would expect him to return to the reason for offering them in the first place: the physical evidence that eliminates the Scriptural difficulties.

Unfortunately the path of Galileo's reasoning has led his readers to an insurmountable wall, but through rhetorical magic he almost succeeds in making the wall disappear. Following his opening statement, previously noted, about "manifest experience and necessary demonstration" having shown the validity of Copernicus' views, he goes on to mention the importance of demonstration some twenty-five times, speaking as if such proofs exist.<sup>37</sup> Generally the terminol-

<sup>36</sup> Augustin Cardinal Bea, S.J., in fact, speaks of *Providentissimus Deus* as "the Magna Carta of biblical studies" for the Catholic Church; see his Foreword to *The Jerome Biblical Commentary*, Raymond E. Brown et al., eds. (Englewood Cliffs, N.J., 1968), the standard text now in use in Catholic seminaries.

<sup>37</sup> So frequently does Galileo refer to "necessary demonstration" and "sensible experience" throughout the *Letter* that these expressions form almost a litany to mesmerize his readers. A partial list of their occurrence, or that of equivalent expressions, follows: ". . . trattate con astronomiche e geometriche dimostrazioni, fondata prima sopra sensate esperienze ed accuratissime osservazioni" (*Opere* V, 313, lines 23–25);

ogy is introduced in the context of the need for new Scriptural interpretations. Galileo also introduces some sense observations, which he says should accompany necessary demonstration: his sightings of the great variations in position of the orbits of Venus and Mars relative to earth and the changes he saw in the appearance of Venus. But he makes no attempt to incorporate these into a demonstration. He claims, however, that they and other observations “can never be reconciled with the Ptolemaic system in any way, but are very strong arguments for the Copernican” (p. 196).

In this connection Galileo certainly must have known that they

“. . . cominciare . . . dalle sensate esperienze e dalle dimostrazioni necessarie” (p. 316, lines 24–25); “. . . effetti naturali che o la sensata esperienza ci pone dinanzi a gli occhi o le necessarie dimostrazioni ci concludono . . .” (p. 317, lines 1–2); “. . . venuti in certezza di alcune conclusioni naturali . . .” (p. 317, lines 12–13); “. . . in quelle conclusioni naturali, che o dalle sensate esperienze o dalle necessarie dimostrazioni ci vengono esposte innanzi a gli occhi e all’intelletto . . .” (p. 317, lines 29–31); “. . . delle infinite conclusioni ammirande che in tale scienza si contengono e si dimostrano . . .” (p. 318, lines 9–10); “. . . quanto nelle conclusioni naturali si devono stimar le dimostrazioni necessarie e le sensate esperienze . . .” (p. 319, lines 29–31); “. . . che indubitabilmente saranno concordanti con quelle conclusioni naturali, delle quali il senso manifesto o le dimostrazioni necessarie ci avessero prima resi certi e sicuri” (p. 320, lines 13–16); “. . . quelle conclusioni naturali, delle quali una volta il senso e le ragioni dimostrative e necessarie ci potessero manifestare . . .” (p. 320, lines 23–25); “. . . con molte osservazioni e dimostrazioni confermata . . .” (p. 321, lines 14–15); “. . . che sarebbe necessaria prima a capire . . . le dimostrazioni con le quali le acutissime scienze procedono . . .” (p. 321, lines 26–28); “. . . le conclusioni dimostrate circa le cose della natura e del cielo . . .” (p. 326, lines 18–19); “. . . alcune cose della natura dimostrate veracemente . . .” (p. 327, lines 13–14); “. . . o si ha, o si può credere fermamente che aver si possa, con esperienze, con lunghe osservazioni e con necessarie dimostrazioni, indubitata certezza, quale è, se la Terra e ’l Sole si muovono o no . . .” (p. 330, lines 17–20); “. . . si deva considerar se elle sono indubitabilmente dimostrate o con esperienze sensate conosciute . . .” (p. 332, lines 5–6); “. . . esquisite osservazioni e sottili dimostrazioni . . .” (p. 332, lines 12–13); “. . . dopo aver prima dimostrato che i movimenti li quali a noi appariscono esser [sic] del Sole o del firmamento son veramente della Terra . . .” (p. 334, line 24–335, line 1); “. . . l’esperienze, l’osservazioni, le ragioni e la dimostrazioni de’ filosofi ed astronomi . . .” (p. 338, lines 7–8); “. . . definire conclusioni naturali, delle quali, o con esperienze o con dimostrazioni necessarie, si potrebbe in qualche tempo dimostrare il contrario . . .” (p. 338, lines 33–35); “. . . negare l’esperienze e le dimostrazioni necessarie” (p. 339, line 19); “. . . aver molte esperienze sensate e molte dimostrazioni necessarie per la parte sua . . .” (p. 341, lines 32–33); “. . . oppugnar le manifeste esperienze o le necessarie dimostrazioni” (p. 342, lines 12–13). Only once in this long list does Galileo state that natural conclusions *might in time* (si potrebbe in qualche tempo, p. 338, line 35) be demonstrated to be contrary to the sense of Scripture; in all other cases he conveys the impression that demonstrations based on sense experience were or actually are available to determine the sense in which the Bible is to be understood.

could also be used as arguments for the Tychonian system.<sup>38</sup> As most historians of science are aware, no commonly accepted proof of the earth's diurnal rotation on its axis and its annual revolution around the sun was available until the early nineteenth century.<sup>39</sup>

In view of these facts, the best explanation for Galileo's argumentative strategy seems to be that he was convinced that the Polish astronomer was right and he so intensely desired to prove it that he must have believed that true demonstrations could soon be made.<sup>40</sup> Furthermore, as suggested earlier, since Christina was the nominal audience he must have decided that he could dispense with proofs and simply assure her that they existed.

Galileo does develop a lengthy defense of scientific demonstration in general. He establishes through references to the Church Fathers that scientific proofs have been highly regarded in the past and asks that they continue to be respected by theologians (pp. 186–187).

<sup>38</sup> See the many references to the work of Tycho Brahe throughout the National Edition, *Opere* XX, 98–99. In the Tychonian system the earth is posited as stationary at the center of the universe, but the planetary spheres rotate around the sun, and the whole ensemble, together with the moon, around the earth. Many were attracted to the theory, which had the advantage of not contradicting Scripture; on this ground it was clearly favored by Jesuit astronomers.

<sup>39</sup> The usual evidence cited is Foucault's experiments with pendulums swinging freely on the earth's surface and Bessel's measurements of stellar parallax, both of which date from the nineteenth century; see, however, Giorgio Tabbaroni, "Giovanni Battista Guglielmini e la prima verifica sperimentale della rotazione terrestre (1790)," *Angelicum*, 60 (1983), 462–486. All are agreed that Galileo's argument from the tides, hinted at in the *Letter to Christina* (*Opere* V, 311, lines 6–8; *Discoveries*, p. 177) and explained in his discourse addressed to Cardinal Orsini on 8 January 1616, *Del flusso e reflusso del mare* (*Opere* V, 377–395), and again in the *Dialogue* of 1632, is defective. On this matter, see William R. Shea, *Galileo's Intellectual Revolution: The Middle Period, 1610–1632* (New York, 1972), pp. 172–189, and the more recent analysis of Mario G. Galli, "L'argomentazione di Galileo in favore del sistema copernicano dedotta dal fenomeno delle maree," *Angelicum*, 60 (1983), 386–427.

<sup>40</sup> This interpretation has been advanced by W. A. Wallace in two recent articles: "Galileo's Science and the Trial of 1633," *The Wilson Quarterly*, 7 (1983), 154–164; and "Galileo and Aristotle in the *Dialogue*," *Angelicum*, 60 (1983), 311–332. Wallace's view differs from that of Finocchiaro, who argues on the basis of the *Dialogue* that Galileo never intended to produce demonstrative proofs but was content with plausible or rhetorical arguments from beginning to end. Wallace, on the other hand, notes a change in Galileo's aspirations after the decree of 1616 against Copernicus. Prior to the decree, as in the *Letter to Christina*, he spoke as if necessary demonstrations based on sense experience were already, or soon would be, available; after it, as in the *Dialogue*, he attenuated his claims considerably. For additional details, see Wallace's review of Finocchiaro's book, *Journal of the History of Philosophy*, 20 (1982), 307–309.



Then he turns his attention to the delicate problem of the relations between theology and physical astronomy. Here again he does not establish common cause with the academic theologians. Instead, he depicts them as obstinate in their desire to preserve their domain. They maintain that “theology is the queen of the sciences” and therefore she does not need to adjust herself to the findings of “less worthy sciences.” He next considers in what sense theology should be presumed to be queen, whether for the reason that her study contains the fruits of all the other sciences or because her subject matter “excels in dignity” and is “divulged in more sublime ways?” He concludes that it is the latter explanation, and suggests that if theology does not deign to descend to the “humbler speculations of the subordinate sciences” it would behoove her professors not to make pronouncements on subjects they have “neither studied nor practiced” (pp. 191–193). The major problem with these professors lies in their demand that astronomers retract their proofs as fallacious. But, he says, “this would amount to commanding that they not see what they see and not understand what they know, and that in searching they find the opposite of what they actually discover” (p. 193). Although the passage is a stirring defense of intellectual freedom, it is actually a misinterpretation of the Church’s position as Bellarmine presented it. His letter had asked only that until proof was at hand, astronomers refrain from making strong truth claims and present their results merely hypothetically.<sup>41</sup>

Following these assertions Galileo performs the most remarkable rhetorical feat of the letter. Almost imperceptibly he turns the tables on the theologians and ends by maintaining that *they* must offer proof

<sup>41</sup> The expression Bellarmine uses, which Drake translates as “hypothetically,” is the technical Latin phrase *ex suppositione* (*Opere* XII, 171, line 9<sup>2</sup>), which can take on a variety of meanings. In his examination of the various points made by Bellarmine in the letter to Foscarini, Galileo distinguishes two senses of *suppositio* (*supposizione*, in Italian), one of which would lead to a merely hypothetical conclusion, the other to a demonstrated result (*Opere* V, 357–359). Professor Wallace has shown in his *Prelude to Galileo* (Dordrecht, 1981) that Galileo was unable to authenticate the suppositions on which his proofs for the earth’s motion were based, whereas he was eventually successful in doing so for the demonstration of the law of falling bodies in the *Two New Sciences* of 1638 (pp. 129–159). For fuller details and documentation, see Wallace’s “Aristotle and Galileo” and his *Galileo and His Sources: The Heritage of the Collegio Romano in Galileo’s Science*, forthcoming from Princeton University Press.

that the astronomers are wrong. First he makes the distinction between truths that are merely stated and those that are demonstrated, echoing Bellarmine's words to Foscarini. He goes on to argue that if "truly demonstrated physical conclusions" do not have to be modified in light of the Bible but rather the Scripture must be reinterpreted, then before authorities condemn a physical proposition "it must be shown to be not rigorously demonstrated" (p. 194). Now he demands that a physical proposition be accepted even if it conflicts with Scripture unless it can be proved *false*! The most startling point follows: the proposition (not to say its demonstration) must be disproved "by those who judge it to be false" (p. 195). In support of this demand he reiterates the theme of his *captatio benevolentiae*, the words of St. Augustine mentioned above, which he now quotes at even greater length (p. 196). He returns to the same point a few pages later and adds a further crowning passage from *De Genesi ad litteram*, which he presents in the following way:

And later it is added, to teach us that no proposition can be contrary to the faith unless it has first been proven to be false: "A thing is not forever contrary to the faith until disproved by most certain truth. When that happens, it was not holy Scripture that ever affirmed it, but human ignorance that imagined it." (p. 206)

Near the close of the letter, continuing in the same vein, Galileo says "these men are wasting their time clamoring for condemnation of the motion of the earth and stability of the sun, which they have not yet demonstrated to be impossible or false" (pp. 210–211). In this passage Galileo clearly extends the intention of St. Augustine to maintain, in effect, that scientists do not have to prove their claims; it is up to others to prove them false.

Having disposed magisterially of the pretensions of the theologians, Galileo turns to an objection that Cardinal Bellarmine raised against the new astronomy: the necessity of following the consensus of the Fathers, as mentioned by the Council of Trent. Galileo contends that the Fathers were not in agreement; in fact, they never even debated the issue because it had not been raised. On the other hand, he adds, some theologians have lately begun to consider that the mobility of the earth is compatible with the Scriptures. He mentions as evidence a passage from the *Commentaries on Job* by Diego de Zuñiga (1584), where the author cites a significant text from that

book, “Who moveth the earth from its place” (p. 203).<sup>42</sup> Galileo next takes issue with the application of the ruling of the Council to the case of physical matters:

Besides I question the truth of the statement that the Church commands us to hold as matters of faith all physical conclusions bearing the stamp of harmonious interpretations by all the Fathers. I think this may be an arbitrary simplification of various council decrees by certain people to favor their own opinion. So far as I can find, all that is really prohibited is the “perverting into senses contrary to that of the holy Church or that of the concurrent agreement of the Fathers those passages, and those alone, which pertain to faith or morals, or which concern the edification of Christian doctrine.” (p. 203)

Today the words echo truly and bravely against the Vatican walls; we applaud the author’s insight, and take satisfaction in the fact that the Church at last follows these principles. But for the prelates of the time too much ground seemed to be yielding under attack, without the opportunity for slow and sober deliberation over all the implications. Moreover, how arrogant to ears accustomed to graceful compliments his tone must have sounded in the passage quoted and in the hortatory sentence that followed: “Hence it remains the office of grave and wise theologians to interpret the passages according to their true meaning” (p. 203). And he adds, they should do so after first “hearing the experiences, observations, and proofs of philosophers and astronomers on both sides (p. 205).

Galileo concludes his examination of the problem with an implicit *petitio* for liberty of thought directed to the ecclesiastical authorities. This is especially moving because of the ironic insight it offers in view of the trial and its creation of an adversary relationship between science and religion. People should not demand that the Church “flash her sword” just because it is within her power to do so, he says. “Such men fail to realize that it is not always profitable to do everything that lies within one’s power” (p. 206).

Although the tone and content of the letter offer an unmistakable challenge to prevailing Church authority, Cardinal Bellarmine

<sup>42</sup> This citation was unfortunate, for, unknown to Galileo, Zuñiga had been vigorously reprimanded by the Jesuit theologian Juan de Piñeda in his *Commentariorum in Iob libri tredecim* (Coloniae Agrippinae, 1600, p. 340). The latter’s work was well known and Bellarmine himself possessed a copy. Since Zuñiga’s *Commentaries on Job* was singled out for correction in the 1616 decree, Galileo’s citation may have actually had the effect of increasing the opposition to Copernicanism. Westman discusses this issue in his “The Copernicans and the Churches,” pp. 23–24, 39, 48, n. 46.

seems not to have allowed it to govern his treatment of its author. In his audience with Galileo concerning the ruling of the Holy Office with regard to Copernicus, he remained courteous and protective of the astronomer's reputation. According to the latter's testimony at the trial years later, Bellarmine furnished him with a letter after the audience that attested to his good standing in the Church. One might well wonder about the effect that Galileo's *Letter to Christina* may have had on more irascible men. Perhaps it is not going too far to suggest that much of the animosity exhibited during the trial may have been fired by its rhetoric.<sup>43</sup>

The fears that haunted academic theologians and the ecclesiastical hierarchy were raised in the same paragraph as the preceding plea to the Church for liberty of thought, even though the text was intended by Galileo to augment his theme. In attempting to show the negligible effect the Gospels would have upon infidels who knew more of astronomy than those who preach a naive and fallacious application of Scripture to the heavens, he asks:

And why should the Bible be believed concerning the resurrection of the dead, the hope of eternal life, and the Kingdom of Heaven, when it is considered to be erroneously written as to points which admit of direct demonstration or unquestionable reasoning? (p. 208)

This is just what the Church feared would occur in the case of uneducated believers.

Ahead of his time as he was in his advocacy of a more reasonable interpretation of the Scriptures, Galileo also shows himself to be bound by his era in the last part of the letter. Following the *petitio* is an appendix-like section in which he examines a passage from Joshua that the Grand Duchess Christina first questioned Dom Castelli about at dinner. The text is the one in which Joshua commands the sun to stand still, and Galileo is concerned to prove that the Copernican system accords better with the sense of the passage than does the Ptolemaic. In the process not only does he use Scripture to hallow a physical conclusion, a practice he criticizes in his opponents, but he develops his support in a thoroughly medieval way: he appeals to the authority of Dionysius the Areopagite, a sixth-century Neoplatonist

<sup>43</sup> One of the consultants to the Inquisition, Melchior Inchofer, regarded the *Letter to Christina* as prime evidence at the trial for Galileo's heretical teachings, *Opere* XIX, 349.

whose opinions on science he would not ordinarily entertain. He says that this author spoke of the “admirable power and energy of the sun,” whose energy is in turn the cause of the planets’ motion. Under the Copernican system if God willed the sun to stand still all the other motions of the planets would cease as well, since they are dependent upon it, whereas in the Ptolemaic system the text would make no sense at all (pp. 211–216). This somewhat contrived explanation would never have been convincing to his primary audience, though Christina may have been reassured.

In his *conclusio*, Galileo suggests that just as the passage from Joshua can be viewed as harmonious with what scientists have learned about the physical world, so other passages might be found by theologians that are also in accord with these discoveries. “Especially,” he says, “if they would add some knowledge of astronomical science to their knowledge of divinity.” He cites a text from Proverbs 8:26 suggesting that the theologians think of the earth’s poles as they read, “He had not yet made the earth, the river and the hinges of the terrestrial orb.” After all, the astronomer reminds them, “hinges would seem to be ascribed in vain to the earth unless it needed them to turn upon” (p. 216).

Rereading the *Letter to Christina* today is a poignant experience, poignant because we are gifted with hindsight; we know through the discoveries of modern science that Galileo was right. And it is poignant also because we know about the tragic sequel to the letter, the humiliation forced upon a brave yet imprudent spirit. But when we employ the device of rhetorical inquiry and examine the letter from the standpoint of the audience—its effect upon them, and their expectations of it—then we transport ourselves into a very different context. That context comprises a world-view very different from our own, where the effort is made to keep scientific and religious matters safely apart. Still the facts of human personalities and emotions are the same in both eras.

In concluding these rhetorical considerations, it would be well to look again briefly at the principal audience, to discern what we can about the attitudes of the men Galileo intended to address. We know of the goodwill his friends in Rome bore him: Bishop Dini, Monsignor Ciampoli, Prince Cesi. But what of the Cardinals Bellarmine and Barberini, to whom much of the correspondence preceding the letter refers, and of others who, like them, were part of the ecclesias-

tical power structure? Cardinal Bellarmine was a Jesuit who evidently respected Galileo and had a real interest in science, having lectured in his early years on astronomy. He did not believe that Copernicus' book would be condemned, and he urged Galileo not to exacerbate the situation which he judged to be quiescent. Some Jesuits even appeared to have favored Galileo's opinions, according to Dini.

Father Grassi, a Jesuit who was to become involved in a polemical exchange with Galileo some years later, might reflect the view of a number of his Order, and others as well, when he said:

As for Mr. Galileo's displeasure, I tell you most sincerely that I, too, am displeased. I have always had more love for him than he has for me. And last year at Rome [during the trial] when I was requested to give my opinion on his book on the motion of the earth, I took the utmost care to allay minds harshly disposed toward him and to render them open to conviction of the strength of his arguments, so much so, indeed, that certain people who supposed me to have been offended by Galileo . . . marveled at my solicitude. But he has ruined himself by being so much in love with his own genius, and by having no respect for others. One should not wonder that everybody conspires to damn him.<sup>44</sup>

And when the letter was written what was the frame of mind of Cardinal Barberini who was to become Pope Urban VIII and an implacable enemy of the astronomer? It was he who warned Galileo through Bishop Dini to use "greater caution in not going beyond the arguments used by Ptolemy and Copernicus" and thus exceed the "limitations of physics and mathematics." He had reminded him that "the explanation of Scripture is claimed by the theologians as their field, and if new things are introduced, even by a capable mind, not everyone has the dispassionate faculty of taking them just as they are said."<sup>45</sup>

Not all those who made up the primary audience were, then *initially* ill-disposed: some expressed a genuine interest, others found his views too novel and as yet unproved. Those who were opposed saw his theological and astronomical positions as eroding, even threatening, conclusions generally accepted in their own disciplines. An examination of key rhetorical aspects shows graphically why the

<sup>44</sup> Quoted by Pasquale M. D'Elia, *Galileo in China*. Rufus Suter and Matthew Sciasa, eds. and trs. (Cambridge, Mass., 1960), pp. 57–58.

<sup>45</sup> Quoted in Langford, p. 58.

letter was ineffective in its day. The *ethos* the author wished to project is undercut by his decision not to offer proof on the terms that were expected. The *pathos* he introduced because of his temperament led him to use appeals that must have rankled precisely those he needed to convince. Finally, the ultimate test of the argument for his primary audience was in the *logos*, the scientific demonstrations he implied but did not present. Instead he carried his argument into the courts of his opponents the theologians, who, unfortunately, made the rules of the game.

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