

studi

Galileo, Science and the Bible

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1. The relationship between the Bible and Science in Galileo's thought: common interpretations

In the front of his own copy of the *Dialogue Concerning the Two Chief World Systems*, Galileo wrote the following:

«Take care, theologians, that in wishing to make matters of faith of the propositions attendant on the motion and stillness of the sun and the earth, in time you probably risk the danger of condemning for heresy those who assert the earth stands firm and the sun moves; in time, I say, when sensately or necessarily it will be demonstrated [*quando sensatamente o necessariamente si fusse dimostrato*] that the earth moves and the sun stands still»¹.

In this we find both Galileo's commitment to demonstrations in science and his admission that there is not yet such a demonstration for the motion of the earth. The passage also reaffirms a key principle Galileo set forth in the *Letter to the Grand Duchess Christina*: that when investigating physical questions one should not begin with biblical texts. Galileo warns the theologians to avoid acting imprudently, lest they be

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¹ G. GALILEI, *Dialogo sopra i due massimi sistemi del mondo*, a cura di L. Sosio, Einaudi, Torino 1970, p. 554: «Avvertite, teologi, che, volendo fare materia di fede le proposizioni attenenti al moto ed alla quiete del sole e della Terra, vi esponete a pericolo di dover forse col tempo condannar d'eresia quella che asserissero, la Terra star ferma muoversi di luogo il sole: col tempo, dico, quando sensatamente o necessariamente si fusse dimostrato, la Terra muoversi e 'l sole star fisso».

faced with the unpleasant task of condemning as heretical those propositions which they now declare to be orthodox.

Galileo's theological acumen, especially concerning the relationship between the Bible and science, has been celebrated by diverse commentators. In his famous work, *The Crime of Galileo*, Giorgio di Santillana offered effusive praise for Galileo as theologian:

«In his concern with enduring things, in his confessional simplicity, Galileo spans the centuries [...] The elaborate baroque formulas of submissiveness do not prevent the reader from feeling that here is someone like Ambrose, Augustine, or Bonaventure, reprehending sleepy shepherds and degenerate epigones. He speaks in the name of the community of the faithful which joins the ancient dead to the yet unborn [...] He deserves heeding no less than Aquinas himself».

«He was not wrong either, as a matter of record. The content of his spurned and incriminated theological letters has become official Church doctrine since 1893. Had there been in Rome, at the time of the first crisis of 1616, a youthful Aquinas to take up his lead, instead of an aged Bellarmine – but there was no Aquinas, and there was no time»².

In the early 1980's, Owen Gingerich wrote that the Catholic Church should *now* accept «Galileo's arguments about the reconciliation of science and scripture». Gingerich acknowledged that the theological principles enunciated by Galileo have «long since» been adopted by Protestant and Catholic theologians, but he still thought it would be useful for the Catholic Church to make an official pronouncement confirming Galileo's theological arguments³.

On several occasions Pope John Paul II has praised the astuteness of Galileo's theological observations on the relationship between science and scripture. In ceremonies commemorating the 100th anniversary of the birth of Einstein (1979), the Pope, referring to the fundamental compatibility between science and the Bible, quoted approvingly from Galileo's *Letter to the Grand Duchess Christina*, in which Galileo observed that God is author of all truth, both the truth of nature and the truth of Scripture. In 1992, as part of an official ceremony in which he accepted the findings of a commission of historical and theological inquiry into the Galileo affair, the pope noted that the theologians of the Inquisition failed to reexamine their criteria of scriptural interpretation in the context of «the new science». Galileo, «a sincere believer», paradoxically «showed himself to be more perceptive» in his biblical hermeneutics «than the theologians who opposed him»⁴.

Richard Blackwell, who has described well the theological context of the “Galileo Affair”, especially Galileo's indebtedness to the arguments of Counter-Reformation Catholic theologians, nevertheless concludes: «In modern times the Catholic Church has reasserted his [Galileo's] exegetical principles and their Augustinian roots»⁵. Blackwell thinks that the failure of the Inquisition to use the Church's exegetical inheritance, «even after pointed out by Galileo, can be only understood as an aberration due to the

² G. DI SANTILLANA, *The Crime of Galileo*, 1955, pp. x-xi.

³ *Scientific American*, August 1982.

⁴ Address to the Pontifical Academy of Sciences, 31 October 1992, *Origins*, Vol. 22, N. 12 (November 12, 1992), p. 372.

⁵ R. J. BLACKWELL, *Galileo, Bellarmine, and the Church*, University of Notre Dame Press, Illinois

excessively defensive mind-set of the Counter-Reformation. The Principle of Authority so strongly focused attention against private interpretation that it overshadowed a much more complex situation»⁶. As we shall see, some of Galileo's exegetical principles were not part of the Church's tradition, nor have they been reasserted by the Church today.

Occasionally, Galileo's exegetical sophistication *vis-à-vis* his theological opponents is compared to their sophistication in matters scientific. Walter Brandmüller remarks that, paradoxically, whereas the Inquisition erred in matters of biblical interpretation, Galileo was wrong in his claims for the truth of the new astronomy⁷. Paul Feyerabend praises the Inquisition for its caution and sees its position as an anticipation of contemporary attempts «to temper the totalitarian and dehumanising tendencies of modern scientific objectivism»⁸.

In the last several years there have been extensive studies of Galileo's understanding of the relationship between the Bible and science⁹. The most detailed analysis of Galileo's principles of biblical exegesis is the work of Mauro Pesce of the University of Bologna¹⁰, for whom Galileo represents a missed opportunity for the Church in the

1991, p. 83. Annibale FANTOLI makes the same point in *Galileo: For Copernicanism and for the Church*, tr. by G. Coyne, Vatican Observatory Publications, 1991, p. 217.

⁶ *Ibidem*, p. 84.

⁷ W. BRANDMÜLLER, *Galilei e la Chiesa ossia il diritto ad errare*, Libreria Editrice Vaticana, Città del Vaticano 1992, p. 196: «Ci troviamo così di fronte al paradosso di un Galilei che sbaglia nel campo delle scienze e di una Curia che sbaglia nel campo della teologia. Viceversa, la Curia ha ragione nel campo scientifico e Galilei nella interpretazione della Bibbia». J. LANGFORD, *Galileo, Science and the Church*, University of Michigan Press, 1966, p. 78, makes a similar claim: «Simply put, the paradox was this: Galileo was right theologically in holding that the Bible was not a science text book. Bellarmine was right 'scientifically' in demanding that a hypothesis remain only a hypothesis until proven as a fact. But both Galileo and Bellarmine were wrong in conceding absolute authority to Scripture if contrary physical arguments were only probable. They were both bowing to a black or white alternative. Bellarmine refused to settle for the traditional interpretation [of passages in the Bible concerning the motion/immobility of the sun and the earth] as [only] the more probable exegesis pending further proof. Galileo appears to have been unwilling to consider his theory as an unproven hypothesis until he could strengthen his scientific arguments. Therein lie the seeds of the whole unfortunate conflict».

⁸ P. FEYERABEND, *Galileo and the Tyranny of Truth*, in *Farewell to Reason*, Verso, London 1987, p. 259. See also Feyerabend's *Wider den Methodenzwang*, Frankfurt 1986³.

⁹ See the works by Richard Blackwell, Ugo Baldini, Jean-Robert Armogathe, William Shea, Mauro Pesce, Giorgio Stabile, Paolo Lombardi, Rinaldo Fabris, Jean D. Moss, I. Kelter, Giovanni Leonardi, and Walter Brandmüller, cited in these footnotes.

¹⁰ M. PESCE, *L'interpretazione della Bibbia nella lettera di Galileo a Cristina di Lorena e la sua ricezione. Storia di una difficoltà nel distinguere ciò che è religioso da ciò che non lo è*, «Annali di storia dell'esegesi», 4 (1987), pp. 239-284; *Momenti della ricezione dell'ermeneutica biblica galileiana e della Lettera a Cristina nel XVII secolo*, «Annali di storia dell'esegesi», 8/1 (1991), pp. 55-104; *Una nuova versione della lettera di G. Galilei a Benedetto Castelli*, «Nouvelles de la République des Lettres», (1991 - II), pp. 89-122; *Le redazioni originali della lettera "copernicana" a B. Castelli*, «Filologia e Critica», 2 (1992), pp. 394-417; *Il Consensus veritatis di Christoph Wittich nella distinzione tra verità scientifica e verità biblica*, «Annali di storia dell'esegesi», 9/1 (1992), pp. 53-76; and *L'indisciplinabilità del metodo e la necessità politica della simulazione e della dissimulazione in Galilei dal 1609 al 1642*, in *Disciplina dell'anima, disciplina del corpo e disciplina della società tra medioevo ed età moderna*, edited by P. PRODI, Il Mulino, Bologna 1994, pp. 161-184.

seventeenth century to discover a *modus vivendi* between modernity and religion [*una convivenza tra modernità e religione*]. According to Pesce, it was not until Pope Leo XIII's encyclical, *Providentissimus Deus*¹¹, in 1893, that the Church would accept, even in an attenuated form, the principles enunciated by Galileo. For Pesce, the fundamental issue from 1616 to 1893 was not really the acceptance of Copernican astronomy, but rather the unwillingness of the Church to accept Galileo's hermeneutical principle that the truth of Scripture is religious and not scientific¹². Pesce claims that it was this distinction between science and religion which constituted the core of Galileo's understanding of the Bible, and, furthermore, that it was the rejection of this distinction which lies behind the condemnation of heliocentric astronomy¹³.

An examination of Galileo's understanding of the relationship between the Bible and science raises important questions not only about Galileo's encounter with the Inquisition but also about the place of Galileo in the rise of what is commonly seen as modern culture. Galileo's theological arguments concerning the relationship between science and Scripture are found principally in a series of letters and notes he writes from 1613 to 1615. The letters, circulated privately but widely, were designed to influence influential churchmen and scholars. In the letters to Benedetto Castelli, Piero Dini, and the Grand Duchess Christina, Galileo offers a systematic response to objections from academic and theological opponents: priests and professors who were convinced that Copernican astronomy and its apparent implications for Aristotelian physics, cosmology, and metaphysics, presented a serious threat to the traditional interpretation of the Bible as well as to the whole edifice of Catholic theology.

Despite such wider implications for the relationship between Aristotelian thought and Christian faith, the debate which raged in the second decade of the 17th century had as its focus the Bible and the compatibility of the new astronomy with certain passages in

¹¹ C. CARLEN, *The Papal Encyclicals, 1878-1903*, McGrath, Wilmington, N.C. 1981, pp. 334-335: «If dissension should arise between them [the theologian and the physicist], here is the rule also laid down by St. Augustine, for the theologian: "Whatever they can really demonstrate to be true of physical nature, we must show to be capable of reconciliation with our Scriptures; and whatever they assert in their treatises which is contrary to these Scriptures of ours, that is to Catholic faith, we must either prove it as well as we can to be entirely false, or at all events we must, without the smallest hesitation, believe it to be so". To understand how just is the rule here formulated we must remember, first, that the sacred writers, or to speak more accurately, the Holy Ghost "Who spoke by them, did not intend to teach men these things (that is to say, the essential nature of things of the visible universe), things in no way profitable to salvation". Hence they did not seek to penetrate the secrets of nature, but rather described and dealt with things in more or less figurative language, or in terms which were commonly used at the time, and which in many instances are in daily use at this day, even by the most eminent men of science».

¹² M. PESCE, *Momenti della ricezione...*, cit., p. 56: «[...] tra il febbraio 1616 [...] e il 1893, esiste una continuità di rifiuto ufficiale della proposta galileiana di accordo tra religione e scienza».

¹³ «[...] il punto fondamentale della questione non riguarda l'accettazione o meno del copernicanesimo da parte dell'autorità ecclesiastica, ma l'accettazione o meno della tesi ermeneutica per la quale la verità della Scrittura non è scientifica bensì soltanto religiosa. Questa era la tesi che Galileo difese nella Lettera al Castelli e perfezionò nella Lettera a Cristina. Ed è il rifiuto di questa ermeneutica che portò alla censura delle due proposizioni copernicane nel 1616» (*ibidem*). G. STABILE, *Linguaggio della natura e linguaggio della scrittura in Galilei dalla Istoria sulle macchie solari alle lettere copernicane*, «Nunciator», I (1994), pp. 37-64, makes the same claim.

the Bible. The debate took on a special urgency in that, in the previous century, in response to the challenges of Protestant thinkers, the Council of Trent had forbidden Catholics to interpret the Bible contrary to the sense of the sacred text which the Church affirms or contrary to the unanimous teachings of the Church Fathers:

«The council further decrees, in order to control those of unbalanced character, that no one, relying on his personal judgment [*suae prudentiae innixus*] in matters of faith and morals [*in rebus fidei et morum*] which are linked to the establishment of Christian doctrine [*ad aedificationem doctrinae christianae pertinentium*], shall dare to interpret the sacred scriptures either by twisting its text to his individual meaning [*ad suos sensus contorquens*] in opposition to that which has been and is held by holy mother church, whose function is to pass judgment on the true meaning and interpretation of the sacred scriptures [*iudicare de vero sensu et interpretatione scripturarum sanctorum*]; or by giving it meanings [*interpretari audeat*] contrary to the unanimous consent of the fathers [*unanimem consensum patrum*], even if interpretations of this kind were never intended for publication»¹⁴.

Cardinal Roberto Bellarmino¹⁵ reminded Galileo of precisely the requirement to adhere to the unanimous teachings of the Fathers when he wrote to Paolo Foscarini and to Galileo in April 1615: «And if [you] would read not only their works [i.e., the works of the Church Fathers] but the commentaries of modern writers [...] you would find that all agree in expounding literally [*ad literam*] that the sun is in the heavens and remains motionless in the center of the world. Now consider in all prudence», Bellarmino continued, «whether the Church could support the giving to Scripture of a sense contrary to the holy Fathers and all the Greek and Latin expositors».

The cardinal, one of the leading figures in the Inquisition and an outstanding Jesuit theologian, was well aware that the injunction of the Council of Trent referred to the interpretation of Scripture concerning matters of faith and morals (*in rebus fidei et morum*). But Bellarmino observed that one could not simply say that the new astronomy was not a matter of faith and morals and thus exempt from the strictures of the decree of Trent: for even if not a matter of faith with respect to its subject (*ex parte obiecti*), it was, he noted, a matter of faith in that God is the unerring author (*ex parte dicentis*) of all of Scripture, including those passages which describe astronomical phenomena. Thus one could not deny what texts from *Psalms* and the *Book of Joshua* said about the immobility of the earth and the mobility of the sun because in doing so one would challenge the divine authorship of the Bible.

Nevertheless, Bellarmino was willing to reject the traditional reading of the Bible «if there were a true demonstration [*ci fusse una vera dimostrazione*] that the sun was in the center of the universe [...] and that the sun did not go around the earth but the earth went around the sun». If there were such a scientific demonstration, Bellarmino admitted that it would then «be necessary to use careful consideration in explaining the Scriptures that

¹⁴Fourth Session, *Decrees of the Ecumenical Councils*, Norman Tanner, S.J., editor/translator, Sheed and Ward, 1990, Vol. II, p. 664. R. BLACKWELL, o.c., pp. 5-14, offers an excellent analysis of this decree.

¹⁵Throughout this essay I use the Italian form of Bellarmino's name. In quotations I leave the spelling of his name as it appears.

seemed contrary, and we should rather have to say that we do not understand them than to say that something is false which has been proven»¹⁶.

Galileo recognized the concerns enunciated by Cardinal Bellarmino. Nearly two years before, in a brief letter to Benedetto Castelli, his protégé and at the time professor of mathematics at the University of Pisa, Galileo sketched in outline what would become the full-blown treatise ostensibly addressed to Christina, Grand Duchess of Tuscany¹⁷. Since 1610, when Galileo first published the results of his astronomical observations and began his long, public defense of Copernican astronomy he had to counter the arguments of those who appealed to the Bible to defend traditional geocentric cosmology. Galileo was chief mathematician and philosopher in the Medici court in Florence and in his letter to the Grand Duchess, penned after Bellarmino sent his letter in April 1615, we find Galileo's response to the arguments advanced by his opponents.

Throughout the *Letter to the Grand Duchess*, and in his earlier letters and notes on this subject, Galileo maintains two general principles. First, there can be no contradiction between the truths of science and the truths of faith. God is the author of all truth: both the truth known through revelation and the truth known through reason alone. Galileo quotes the observation in the words of the sixteenth century Spanish theologian, Pereira: «Cum verum omne semper cum vero congruat, non potest veritas Sacrarum Literarum veris rationibus et experimentis humanarum doctrinarum esse contraria»¹⁸.

Recently Paolo Lombardi has claimed that, even though Galileo uses the traditional formula that truth cannot contradict the truth, Galileo means something quite different from what had been generally accepted: whereas Pereira, for example, underscored an analogy between nature and the Bible, Galileo used the formula to justify the possibility of autonomous scientific activity¹⁹. According to Lombardi, Galileo's reference to two truths which cannot contradict one another involves a denial of the traditional hierarchy of knowledge which had been an obstacle to the development of science²⁰. Lombardi

¹⁶For the full text of Bellarmino's letter to Foscarini, see M. FINOCCHIARO (ed.), *The Galileo Affair: A Documentary History*, University of California Press, 1989, pp. 67-9. In the first paragraph of the letter, Bellarmino urges Foscarini and Galileo to argue for Copernican astronomy simply as a hypothesis which saves the appearances. Such prudential advice ought not to be interpreted as Bellarmino's thinking that all arguments in astronomy (or in the natural sciences in general) are only models. As is apparent in the third paragraph of the letter, Bellarmino addresses (and admits, despite great doubts) the possibility of a scientific demonstration that the earth moves and the sun stands still. It is important to note that were Bellarmino to have thought that the immobility of the earth was a matter of faith he could not admit the theoretical possibility of a contrary demonstration, since he would then have to admit that truth could contradict truth.

¹⁷The Letter was published for the first time in 1636, and then in 1710 in Napoli as an appendix to the *Dialogo*.

¹⁸G. GALILEI, *Lettere*, a cura di F. Flora, Einaudi, Torino 1978, p. 134.

¹⁹P. LOMBARDI, *La Bibbia contesa. Tra umanesimo e razionalismo*, La Nuova Italia, Firenze 1992, pp. 214-215: «Va da sé che lo scienziato toscano interpretava quest'accordo tra Bibbia e dottrina fisica in modo molto diverso dal gesuita spagnolo, giacché quest'ultimo aveva inteso sottolineare l'analogia esistente tra natura e Scrittura, mentre il matematico pisano voleva piuttosto giustificare la possibilità di un'indagine scientifica autonoma».

²⁰*Ibidem*, p. 215: «[...] una gerarchia dei saperi che comprimeva e ostacolava la ricerca scientifica nelle pastoie di una immagine metafisica già prefissata; giustamente si è parlato [E. Garin] di «liberazione» a proposito del significato dell'esperienza galileiana».

recognizes that Galileo denies the principle of authority in matters scientific; whereas an appeal to authority plays a central role in the interpretation of the Bible. He thinks that Galileo's affirmation of the autonomy of the natural sciences represents a decisive break with the «*analogia tra rivelazione scritturale e rivelazione naturale*», since each of these two realms of truth «*disvelando verità differenti, che esigono metodi differenti: l'esegesi biblica un approccio storico, l'interpretazione della natura un approccio matematico*»²¹. Accordingly, Galileo's position is a *rottura dell'antica unità culturale* which anticipates the "two cultures" of the modern world²².

It seems to me that Lombardi offers an anachronistic reading of Galileo's position. Galileo, himself, does not reject the principle of the hierarchy of knowledge, although he does reject certain claims as to what that hierarchy involves: especially with respect to the notion of theology as the queen of the sciences. Furthermore, the recognition that the natural sciences have an autonomy of their own is part of traditional Catholic teaching, although not always unanimously affirmed.

The views that truth does not contradict truth and that rational inquiry has a competence of its own are hardly alien to Catholic culture. Augustine and Aquinas admit as much, as did Cardinal Bellarmino. As we have seen, the cardinal observed that were there to be a demonstration that the earth moved, then the Church could not maintain that the Bible revealed the opposite. Indeed, Cardinal Bellarmino and Galileo shared the same Aristotelian understanding of what a demonstration in science is. Science for them was necessary knowledge in terms of causes. William Wallace, who has contributed so much to our understanding of Galileo's participation in a progressive Aristotelian tradition, has observed:

«The Aristotelian ideal of scientific knowledge is that of *cognitio certa per causas*, that is, knowledge that is certain through causes, or knowledge that cannot be otherwise because it is based on the causes that make things be the way they are [...] Galileo employed the terms *scientia* and *scienza* repeatedly throughout his entire life, from the earliest drafts of his treatises to his masterful *Two New Sciences* that marked the summit of his intellectual achievement, but never once did he depart from this ideal of certain and irrevocable knowledge as the goal of his investigations. He had many arguments with the Aristotelians of his day, and often accused them of faulty and fallacious reasoning when their conclusions were at variance with his own. But never once did he question the ideal by which he judged their contributions... And whether he was arguing about the movement of the earth or about laws that govern the motion of falling bodies, his claim was invariably for objectivity and certitude in the conclusions to which he came»²³.

²¹ *Ibidem*, p. 216.

²² Galileo, in fact, sees «un rapporto di reciproca illuminazione tra ermeneutica biblica e indagine naturale, ma risolveva questo rapporto a favore dell'indagine naturale, che una volta conclusasi nella certezza, può fornire luci a molti passi biblici» (*ibidem*).

²³ W. A. WALLACE, *Galileo and His Sources*, Princeton University Press, 1984, p. 99. See also: P. DEAR, *Jesuit Mathematical Science and the Reconstruction of Experience in the Early Seventeenth Century*, «*Studies in History and Philosophy of Science*», vol. 18, n. 2 (1987), pp. 133-175; A. CARUGO-A.C. CROMBIE, *The Jesuits and Galileo's Ideas of Science and of Nature*, «*Annali dell'Istituto e Museo di Storia della Scienza di Firenze*», vol. VIII, n. 2 (1983), pp. 3-67; U. BALDINI, «*Legem Impone Subactis*»: *Studi su filosofia e scienza dei gesuiti in Italia, 1540-*

Galileo, in sketching his response to Bellarmino's letter to Foscarini, writes:

«The motion of the earth and the stability of the sun could never be against Faith or Holy Scripture, if this proposition were correctly proved to be physically true by philosophers, astronomers, and mathematicians, with the help of sense experience, accurate observations, and necessary demonstrations [*quando ella fosse veracemente, con esperienze sensate, con osservazioni esquisite e con dimostrazioni necessarie, provata esser vera in natura da filosofi, astronomi e matematici*]. However, in this case, if some passages of Scripture were to sound contrary [*paressero sonare in contrario*], we would have to say that this is due to the weakness of our mind, which is unable to grasp the true meaning [*il suo vero sentimento*] of Scripture in this particular case. This is the common doctrine, and it is entirely right [*dottrina commune e rettilissima*], since one truth cannot contradict another truth. On the other hand, whoever wants to condemn it judicially must first demonstrate it to be physically false by collecting the reasons against it [...] If the earth de facto moves, we cannot change nature and arrange for it not to move. But we can rather easily remove the opposition [*la repugnanza*] of Scripture with the mere admission that we do not grasp its true meaning [*il suo vero senso*]. Therefore the way to be sure not to err is to begin with astronomical and physical investigations, and not with scriptural ones»²⁴.

The second general observation by Galileo concerning the relationship between the Bible and science is that the main purpose of God's revelation in Scripture is not to teach natural philosophy but to lead all to salvation. What so many see as particularly modern in Galileo's understanding of the relationship between the Bible and science is, in this instance, but the reaffirmation of traditional Catholic thinking. Despite Galileo's explicit claim that he is only appealing to "the common doctrine", Pesce, Lombardi, Giorgio Stabile, and others think that Galileo's hermeneutical principles were as unacceptable to the Church "as they were new". In particular, they claim that Galileo denies to the Bible any authority in determining truths of nature and that this denial is a radical departure from traditional Catholic thinking²⁵.

1632, Bulzoni, Roma 1992), especially pp. 19-73; and R. FELDHAY, *Galileo and the Church*, Cambridge University Press, 1995, especially pp. 245ff. The complex questions concerning the details of Galileo's scientific methodology and its relationship to the Aristotelian tradition — or, better, traditions — do not really challenge the fundamental point that Galileo, like Aristotle, thought that scientific knowledge was a certain, true account of the world. For an examination of Galileo's specific methodology which differs in some respects from Wallace's analysis, see R. MARTÍNEZ, *Il significato epistemologico del caso Galileo*, «Acta Philosophica», vol. 3, 1 (1994), pp. 45-74. For a good recent survey of Galileo the scientist as well as of his encounter with the Inquisition, see M. SHARRATT, *Galileo: Decisive Innovator*, Blackwell, Oxford 1994.

²⁴ G. GALILEI, *Considerazioni circa l'opinione copernicana*, EN, vol. V, pp. 364-5 (cf. M. FINOCCHIARO, *The Galileo Affair*, cit., pp. 80-82).

²⁵ G. STABILE, o.c., pp. 62-3: «La proposta esegetica di Galileo è tanto ineccepibile quanto nuova [my emphasis], ed è esattamente quella già implicitamente presupposta (si nota il concetto di *repugnanza*) dai brani censurati delle Lettere sulle macchie solari. Provenendo da un'unica fonte, cioè il Verbo, sia il linguaggio della scrittura sia il linguaggio della natura, ma essendo l'uno accomodato a racchiudere un significato "molte volte recondito e molto diverso da quello che suona il puro significato delle parole", mentre l'altro, "osservantissimo esecutore degli

Mauro Pesce argues that Galileo deviates from both Augustine or Aquinas in that, when he observes that the Book of Nature is read quite differently from the Book of Scripture, he makes an epistemological claim in distinguishing science from religion. Thus Galileo, at least implicitly, lays the groundwork for a modern conception of religion²⁶. The point Galileo makes is that whereas the Bible must be written in language which everyone can understand, since its purpose is to lead all to salvation, nature:

«[...] is inexorable and immutable, never violates the terms of the laws imposed upon her, and does not care whether or not her recondite reasons and ways of operating are disclosed to human understanding; but not every scriptural assertion is bound to obligations as severe as every natural phenomenon [*non ogni detto della Scrittura è legato a obblighi così severi com'ogni effetto di natura*]; finally, God reveals Himself to us no less excellently in the effects of nature than in the sacred words of Scripture»²⁷.

Passages such as this lead Pesce, Lombardi, and Stabile to see the *Letter to the Grand Duchess* as one of the charter documents of the modern world: a call for the emancipation of scientific reflection from the forces of traditional religion and authority²⁸.

Although Galileo does emphasize more than do his contemporaries the distinction between the essentially religious purpose of the Bible and other truths which it may

ordini” è immutabile e inesorabile; nel momento in cui, *de facto*, la sensata esperienza ci pone innanzi agli occhi, e, *de jure*, le necessarie dimostrazioni ci concludono della verità di un effetto, esso non potrà essere revocato in dubbio “per luoghi delle Scritture ch’havesser nelle parole diverso sembante”. A essere revocato in dubbio semmai dovrà essere il senso della Scrittura, non la natura. E ciò in ragione della diversa portata obbligatoria dei due linguaggi: “poi che non ogni detto della Scrittura è legato a obblighi così severi come ogni effetto di natura” (*Letter to Castelli*, EN, vol. V, p. 283). In tal modo Galilei rovesciava sui teologi l’onere della prova, e nelle divergenze tra dettato scritturale e natura, attribuiva a quest’ultima il ruolo di autorità dirimente: non è la *factio* verbale che può falsificare la realtà dell’effetto, ma esattamente il contrario. *L’interpretatio scripturae*, che lavora sui significati del linguaggio biblico, dev’essere assoggettata all’*interpretatio naturae*, che indaga direttamente sui significati naturali, tutte le volte che i due ordini interferiscono [the contradiction is only apparent] tra contenuto incontrovertibilmente fattuale del Verbo reificato ed erronea interpretazione del Verbo profferito [a distinction Stabile drew before]».

²⁶M. PESCE, *Momenti della ricezione...*, cit., p. 57: «Ho allora [in his 1987 article] sostenuto che Galileo distingue la natura dalla Scrittura da un punto di vista essenzialmente epistemologico e perviene così non solo a distinguere scienza da religione, ma ad individuare, seppure implicitamente, la natura propria di ciò che è religione»; cfr. *L’interpretazione...*, cit., pp. 246-261.

²⁷M. FINOCCHIARO, *The Letter to the Grand Duchess Christina*, o.c., p. 93; G. GALILEI, *Lettere*, cit., pp. 130-1.

²⁸The Letter is «uno degli strumenti di lotta nella battaglia per permettere che la libertà di ricerca e la libertà di divulgare pubblicamente i risultati della scienza potessero convivere con la religione tradizionale e con l’autorità ecclesiastica che ne era depositaria». Galileo’s hope, according to PESCE (*Momenti della ricezione...*, cit., p. 58), was «di instaurare un sistema di rapporti [between science and religion] nuovo», and Galileo was «ben consapevole che la posta in giuoco era di portata estremamente vasta perché riguardava la possibilità di un nuovo assetto del potere intellettuale, pur senza uscire dal sistema della Controriforma, il che sarebbe stato realisticamente impossibile».

contain, he does *not* really *anticipate* a *radical* separation between religious truths and other truths in the Bible. As we examine this question more fully, we will see that there is far less of a difference between Galileo and the theologians of the Inquisition than is generally thought.

Galileo's excursion into biblical exegesis had a practical end. He sought to persuade the Church not to condemn Copernican astronomy, especially since he was convinced that he was on the verge of proving that the earth moves. Galileo knew that his telescopic observations were insufficient to prove that the earth moves. By 1615 he had begun to write a treatise on the tides, expecting to show that the only way to account for their ebb and flow was for the earth to be rotating on its axis and revolving about the sun. In January 1616 he sent a copy of his treatise to Cardinal Alessandro Orsini in Rome²⁹. In the attempt to protect the new astronomy from the charge of heresy, Galileo appealed to theological principles which were shared by the theologians of the Inquisition. In fact, Richard Blackwell has shown how Galileo uses arguments found in Melchior Cano (1509-1560) and Benito Pereira (1535-1610), whose works were fundamental for Counter-Reformation Catholicism³⁰.

Benito Pereira, a Spanish Jesuit, was the author of a very influential commentary on *Genesis*³¹. Pereira notes the difficulties in understanding texts in Genesis and provides four interpretative rules for the task:

«First rule: The teaching of Moses [the presumed author of Genesis] about the creation of the world is clearly historical [...]»³².

«Second rule: In discussing and explaining this teaching of Moses, one should not appeal without cause to miracles and to the absolute power of God... For in the creation of the world and the first arrangement of all things, one should not consider what God absolutely and simply could do, but rather that He made the world according to his wisdom and that He made things in accordance with their own natural powers, dispositions, and harmony [...]».

«Third Rule: Be careful that you do not immediately fall in love with and embrace your own opinion, and not only hold it fast and defend it tenaciously, but also contend that it is the correct meaning of Scripture, with the result that you would claim that any different and opposed view is contrary to the Scripture. They abuse Scripture who wish to force and confine it within the narrowness of their own opinions and imagination, for Scripture is clearly very broad by its very nature and is open to various readings and interpretations [...]».

«Fourth Rule: This also must be carefully observed and completely avoided: in dealing with the teachings of Moses, do not think or say anything affirmatively and

²⁹ *Le opere di Galileo Galilei*, Edizione Nazionale (EN), 20 vols., edited by A. Favaro (1890-1909), vol. 5, pp. 377-395. Henceforth, references to these volumes will be indicated by EN.

³⁰ In the *Letter to the Grand Duchess*, Galileo makes explicit reference to Pereira, Paolo di Burgos (1353-1435), Alfonso Tostado, bishop of Avila (1400-1455), and Diego de Zuñiga (1536-1584), in addition, of course, to Augustine, Jerome, Aquinas, and Pseudo-Dionysius.

³¹ B. PEREIRA, *Commentariorum et disputationum in Genesim tomi quatuor* (1591-1595).

³² Pereira was especially concerned to guard against the danger of an Origenist allegorical interpretation of the story of creation, especially since *creation ex nihilo* was a central dogma of the faith.

assertively which is contrary to the manifest evidence and arguments of philosophy or the other disciplines. For since every truth agrees with every other truth, the truth of Sacred Scripture cannot be contrary to the true arguments and evidence of the human sciences³³.

Galileo includes the fourth rule, *verbatim*, in the *Letter to the Grand Duchess*. He also uses three of the same quotations from Augustine that Pereira uses. Blackwell thinks that it is reasonable to conclude that Pereira is the source of most of Galileo's views on the relationship between the Bible and science³⁴.

When Pereira comments on the passage from *Genesis* (I, 6-8) concerning God's placing the firmament in the midst of the waters, with waters above and below, he concludes that the passage must be taken either metaphorically or as describing a miracle since it must not be read as contrary to Aristotle's doctrine of the natural place of water³⁵. In his *Quaestio Quarta de Numero Coelorum* (145-147), Pereira discusses the apparent inconsistency between biblical cosmology and Aristotle's account of the plurality of the heavens: «Even though a precise number of heavens is never indicated in Sacred Scripture, since philosophers and mathematicians with obvious and conclusive arguments prove that there are eight, nine, or even more heavens, the theologian or Scriptural exegete who would condemn or refute their opinion as contrary or extraneous to Sacred Scripture would be without foresight, not to say foolish»³⁶.

Paolo Foscarini, in his defense of the compatibility between the Bible and Copernican astronomy, used arguments from Melchior Cano's *De locis theologicis*³⁷. Cano was clear in recognizing that traditional interpretations of the Bible — even those found in the Church Fathers — do not invalidate the arguments of the natural sciences.

«When the authority of the saints, be they few or many, pertains to the faculties contained within the natural light of reason, it does not provide certain arguments [for theological discourse] but only arguments as strong as reason itself when in agreement with nature [...]».

«In the case of matters which pertain very little to faith, the authority of even all the saints creates a probable belief but not a certain one [...]»³⁸.

³³ *Commentariorum*, I, 10-13; quoted in BLACKWELL, o.c., pp. 21-22. Pereira remarks that we must reject the arguments of those [Origen, Lactantius, and Chrysostom] who say that, according to the Bible, the heavens are neither spherical nor immobile: since we know, he says, that such views are false on the basis of manifest experiences and necessary demonstrations. This final phrase Galileo will use often. See R. FABRIS, *Galileo Galilei e gli orientamenti...*, cit., pp. 29-33.

³⁴ R. BLACKWELL, o.c., p. 22, n. 26.

³⁵ B. PEREIRA, *Commentaria et Disputationes in Genesim*, I (1599), 57-71; cited in U. BALDINI-G. COYNE, *The Louvain Lectures of Bellarmine and the Autograph Copy of his 1616 Declaration to Galileo*, Vatican Observatory Publications, 1984, p. 35, n. 53.

³⁶ *Ibidem*.

³⁷ *Foscarini's Defense of his Letter*, in R. BLACKWELL, o.c., p. 256.

³⁸ *De locis theologicis*, VII, 3; quoted in R. BLACKWELL, o.c., pp. 18-19.

2. The exegetical principles in Galileo's Letters

Galileo does not claim that the Bible is silent about the world of nature. He observes that when we seek to examine what the Bible says about the physical world we must remember that, although the Bible cannot err, this inerrancy concerns the Bible's true meaning (*il suo vero sentimento*) and not what «its bare words» may signify (*che suona il puro significato delle parole*). A slavish adherence to the «unadorned grammatical meaning» (*nel nudo suono letterale*) of any particular passage may lead to follies, error, and heresy. One may come to think, for example, that God has hands, feet, eyes, that He gets angry and is subject to other emotions. The Bible often contains passages written in a mode «to accommodate» these passages to «the capacities of the common people, who are rude and unlearned» (*per accomodarsi alle capacità del vulgo assai rozzo e indisciplinato*)³⁹.

Too many translators of (as well as commentators on) these texts miss an important distinction. When Galileo refers to *il nudo* or *il puro significato delle parole, il nudo suono letterale*, or similar phrases, he does not mean the literal sense of scripture⁴⁰. As Aquinas and others had observed, the literal sense of the Bible, which is always true, is «what the author intended, but the author of Sacred Scripture is God»⁴¹. Galileo, observing this same distinction between what we might call a literalistic and a literal reading of the Bible, distinguishes between a naive literalism and *il vero sentimento* of the text. The literal sense is not always the same as what the bare words signify. Galileo, thus, is embracing, not challenging, a traditional Catholic principle of biblical exegesis. It is a principle affirmed not only by Augustine and Aquinas, but by all sixteenth and seventeenth century Catholic theologians⁴². Cardinal Bellarmino, for example, was well aware of the difficulties in discovering the truths in Scripture. Every sentence in the Bible has a literal or historical meaning, i.e., «the meaning which the words immediately present» The literal meaning is either *simple*, «which consists of the proper meaning of the words», or *figurative*, «in which words are transferred from their natural signification

³⁹ M. FINOCCHIARO, o.c., p. 92; G. GALILEI, *Lettere*, o.c., p. 130.

⁴⁰ Finocchiaro translates *il nudo suono letterale* as «pure literal meaning» (*The Galileo Affair: A Documentary History*, cit., p. 92); *il puro significato delle parole* as «the literal meaning of the words» (p. 92). He translates *i puri e ristretti significati delle parole* as «the literal and narrow meaning of the words» and *al nudo significato delle parole* as «of the literal meaning of the words» (p. 93). One Spanish translation consulted (*Cartas del Señor Galileo Galilei*, Alhambra, Madrid 1986) renders these same two phrases as: *la significación estrictamente literal de las palabras* and *la significación literal de los términos* (p. 30). With respect to similar phrases from the 1613 letter to Castelli, Finocchiaro will use «the literal meaning of the words» (pp. 49-50) for both *il nudo senso delle parole* and *nel puro significato delle parole*. S. DRAKE, *Galileo at Work*, University of Chicago Press, 1978, renders these two phrases as «the literal meaning of the words» and «the bare senses of the words», respectively (p. 224). The Spanish translators write: *en sentiendo literal* and *al pie de la letra* (p. 70).

⁴¹ THOMAS AQUINAS, *Summa theologiae*, I, q. 1, a. 10; see also I, q. 68, aa. 2-3; q. 69 a. 2 ad 3; q. 70 a. 1 ad 5; q. 74 a. 2 ad 2, a. 3 ad 3. Aquinas will also speak of the «accommodated sense» of Scripture.

⁴² On the history of this «principle of accommodation», especially in the Middle Ages, see A. FUNKENSTEIN, *Theology and the Scientific Imagination from the Middle Ages to the Seventeenth Century*, Princeton University Press, 1986, pp. 213-271.

to another". When the Bible refers to "the right hand of God", the simple literal sense would mean a part of God's body; whereas the figurative literal sense means God's power⁴³. There are as many different types of figurative meaning as there are types of literary figures, but all these figurative meanings are part of the literal sense of Scripture. Blackwell notes that Bellarmino distinguishes between the literal sense (with all its senses) and the "spiritual" or "mystical" sense, which involves a reference to something else other than what the words immediately signify. The spiritual sense is in addition to the literal sense, not a substitute for it. Bellarmino distinguishes three distinct spiritual senses: 1) the allegorical (signifies something pertaining to Christ or the Church); 2) the tropological (signifies something which pertains to morality); and 3) the anagogical (signifies something which pertains to eternal life)⁴⁴.

When Paolo Lombardi examines Galileo's claims concerning the way to read biblical passages concerning physical matters, he concludes that the Church was not able to accept Galileo's arguments to interpret allegorically (*allegoricamente*) those passages of the Bible which appeared to contradict the hypotheses of Copernicus, since the Church reserved such allegorical interpretations to the heavens, whereas biblical references to terrestrial realities were taken only in the literal sense. According to Lombardi, the leaders of the Inquisition feared that for the Church to concede to Galileo's hermeneutical principles would involve a return to the heresies of Origen⁴⁵. But the "allegorical sense" to which Lombardi refers, when he invokes Galileo's arguments, is equivalent to what Bellarmino calls the figurative sense of the literal.

On the basis of the distinctions between what the bare words signify and the true sense of the Bible (and notice that the examples Galileo uses concern passages in the Bible which attribute certain human attributes to God, and with which obviously Bellarmino would agree), with rhetorical deftness Galileo advances a *wider* argument:

«[...] whenever the Bible has occasion to speak of any physical conclusion [*alcune conclusioni naturali*] (especially those which are very abstruse and hard to understand), the rule has been observed of avoiding confusion in the minds of the common people which would render them contumacious toward the higher mysteries [...] Who, then, would positively declare that this principle [of accommodation] has

⁴³ Bellarmino, of course, thinks that, since God does not have a body, the passage must be read according to the figurative literal sense.

⁴⁴ R. BLACKWELL, o.c., pp. 33-34. See also, R. FABRIS, *Galileo Galilei e gli orientamenti esegetici del suo tempo*, Città del Vaticano 1986, pp. 34-36. Bellarmino had argued (1586) that serious exegetical errors can arise «either by reading figuratively what should be taken as simply literal or by reading as simply literal what should be taken as figurative». The Cardinal was always careful to note that we must distinguish between *res quae dicuntur* and *modus quo dicuntur*. In this respect he was following a tradition which can be seen from Augustine on. In a dispute concerning divine inspiration, with a professor (Estius) at Douai, Bellarmino rejects the view that there is a single literal/historical sense. In defending his view of the plurality of literal senses, Bellarmino liked to quote Augustine's observation about his [Augustine's] own reading of Scripture: *in ipsis sanctis Scripturis multo nescio plura quam scio*. J.R. ARMOGATHE, *La vérité des Ecritures et la nouvelle physique*, in *Le Grand Siècle et la Bible*, Beauchesne, Paris 1989, p. 50: «[...] Bellarmin, dans la tradition augustinienne, précise bien qu'elles [les deux Testaments] sont susceptibles de *plusieurs* sens littéraux (figurés)».

⁴⁵ P. LOMBARDI, *La Bibbia contesa...*, cit., p. 217.

been set aside, and the Bible has confined itself rigorously to the bare and restricted sense of its words [*i puri ristretti significati delle parole*], when speaking but casually of the earth, of water, of the sun, or of any other created thing? [...]».

«[Therefore] in discussions of physical problems [*problemi naturali*] we ought to begin not from the authority of scriptural passages [*non si dovrebbe cominciare dalle autorità di luoghi scritte*], but from sense experience and necessary demonstrations [*ma alle sensate esperienze e dalle dimostrate necessarie*] [...] It is necessary for the Bible, in order to be accommodated to the understanding of every man [*per accomodarsi all'intendimento dell'universale*], to speak many things which appear to differ from the absolute truth [*dal vero assoluto*] so far as the bare meaning of the words [*al nudo significato delle parole*] is concerned⁴⁶.

Ugo Baldini thinks that Galileo's wider application of the principle of accommodation was unacceptable to Bellarmino because the cardinal embraced a "Mosaic physics" rather than adhering strictly to Aristotelian cosmology⁴⁷. Baldini also thinks that in Galileo's extension of the principle of accommodation to biblical

⁴⁶G. GALILEI, *Lettere*, o.c., p. 130. See also S. DRAKE (ed.), *The Discoveries and Opinions of Galileo*, p. 182; M. FINOCCHIARO, *The Galileo Affair*, cit., pp. 92-3.

⁴⁷U. BALDINI, *L'astronomia del cardinale Bellarmino*, in P. GALLUZZI (ed.), *Novità celesti e crisi del sapere*, Giunta, Firenze 1984, pp. 303-4: «La lettura fondamentalistica del *Genesi* e di altri testi biblici che autorizzava la scissione tra 'fisica mosaica' e cosmologia aristotelica imponeva dunque al cardinale il rifiuto della più radicale tra le innovazioni astronomiche, il principio eliocentrico. Questo rifiuto fu il denominatore comune tra le sue idee e lo scolasticismo ortodosso dei teologi di Curia, e per esso la sua figura è divenuta emblematica d'una 'cultura inquisitoriale' dalla quale, invece, si differenziò in punti altamente significativi per la questione galileiana [...] Le proposte galileiane non potevano non entrare in rotta di collisione con la visione bellarminiana del nesso Scrittura-scienza: per Galileo i passi biblici di contenuto astronomico andavano interpretati in modo da risultare congruenti con risultati ottenuti per via scientifica, che così costituivano un *prius* logico; se non consentivano simile interpretazione quei passi erano da considerare metafore, o casi di adeguamento ad espressioni consuete.[...] come per Galileo, anche per il cardinale la concordanza tra Scrittura e natura era un assioma, ma l'indagine umana sulla seconda (fallibile, come mostrava il collasso del cosmo aristotelico) trovava un fondamento di verità in espressioni non equivoche della prima [...]».

U. BALDINI and G. COYNE (o.c., p. 20) have edited and commented upon Bellarmino's lectures at the University of Louvain (1570-72). In these lectures Bellarmino rejects certain conclusions of Aristotelian cosmology. In commenting on various astronomical theories, the young Bellarmino notes that it is «not the task of the theologian» to analyze the complex details of celestial motions. He also observes that there is considerable disagreement among astronomers as to what these motions really are: «[...] some [astronomers] attribute these phenomena to the movement of the earth [*per motum terrae*], all of the heavenly bodies being still; others have recourse to the hypothesis of epicycles and eccentrics [*figmenta epyclicorum, et eccentricorum*]; others to the autonomous motion of heavenly bodies. Thus it is possible for us to select among them the one which best corresponds to the sacred Scriptures [*id quod videtur scripturis sanctis conformius*]. If then one ascertained with evidence [*Si vero aliquando evidenter constiterit*] that the motions of the heavenly bodies are not autonomous, but they follow those of the heavens, one would have to consider a way of interpreting the Scriptures which would put them in agreement with the ascertained truth: for it is certain that the true meaning of Scripture [*verum sensum scripturae*] cannot be in contrast with any other truth, philosophical or astronomical [*cum nulla alia veritate sive philosophica, sive astrologia pugnare*]».

Bellarmino thinks that Scripture suggests that heavenly bodies do move autonomously, that is,

discussions of physical phenomena there is a clear break with the hermeneutical principles of Bellarmino. According to Baldini, Bellarmino places physical phenomena in the same category as historical events and, thus, will not grant the possibility of biblical references being interpreted in a figurative sense⁴⁸. Baldini does admit, ultimately, that Bellarmino and Galileo do share common ground in their exegetical stances, but Bellarmino, concerned with defending the authority of the Church (and the traditional interpretation of Scripture) was not well-disposed to entertain sympathetically Galileo's arguments⁴⁹. Bellarmino's rejection of specific conclusions in Aristotelian cosmology (such as the denial that heavenly bodies are embedded in crystalline spheres but move "autonomously") involves neither a rejection of the Aristotelian ideal of scientific demonstration nor of the *principles* of Aristotelian physics⁵⁰. Furthermore, in his Louvain lectures Bellarmino uses astronomical arguments to support his conclusions, even if he also relies on biblical texts.

they are not connected to crystalline spheres, as Aristotle thought. He writes: «[...] it appears to me, also based on Scripture, that the heavenly bodies do not possess other than their own motion, that is the one from east to west and that the other is not real but only apparent [*apparentem*]» (*ibidem*). Baldini and Coyne point out that «at times in the *Lectiones*, when Bellarmino uses biblical statements to deny scholastic cosmology, he takes the literal sense of the text to be the correct interpretation and, therefore, the one that corresponds to natural truth» (*ibidem*, p. 40, n. 92).

Bellarmino's understanding, «while it left free the exploration of the technical aspects, bound him, as to the real structure of the phenomena, to a literal sense of scripture, which he assumed to be outside discussion because divinely inspired [...] Although Bellarmino intuited that much of what traditional astronomy presented as facts were really just logical constructs, he was not able to extend his intuition to seeing a construct in the immobility of the earth, because this construct, unlike the others, was part of the Hebrew cosmology and thus also a part of the Bible. This circumstance led him to share in the opposition to Copernicanism and in the decision of 1616» (*ibidem*, p. 46, n. 103).

When Bellarmino observes that it is not the task of theologians to examine the complex details of celestial motions, the criterion he enunciates «seems to indicate that, considering that the scope of theology is the clarification and conceptual ordering of the truths of faith, while that of natural philosophy and of applied mathematics is factual verification, the area of the first (supposed *a priori* to agree with the second) includes only a certain number of general enunciations which the positive sciences ought to have in common with the Christian vision of creation as deducible from Genesis» (*ibidem*, p. 39, n. 90).

⁴⁸ U. BALDINI, *Bellarmino tra vecchia e nuova scienza: epistemologia, cosmologia, fisica*, in G. GALEOTA (ed.), *Roberto Bellarmino: Arcivescovo di Capua, Teologo e Pastore della Riforma Cattolica*, Atti del Congresso Internazionali di Studi, Istituto Superiore di Scienze Religiose, Capua (1990), Vol. 2, pp. 660-1: «[...] essa porta a ritenere che, se una frase enuncia un evento nel suo puro senso fisico, e non in uno metaforico o simbolico, non è lecito attribuirle un significato diverso da quello che risulta dal contenuto designativo dei termini che la formano. Se altre interpretazioni fossero possibili, infatti, si dovrebbe ammettere che Dio non ha curato che la rivelazione fosse interpretabile univocamente, o perfino che essa include affermazioni non vere, cosa che le *Controversiae* [II, c. xii] escludono espressamente».

⁴⁹ *Ibidem*, p. 670. The principles of biblical exegesis affirmed by Galileo are «in una stessa gamma di atteggiamenti [with those of Bellarmino], dei quali il suo fissa l'estremo di massima elasticità, mentre l'altro di massima rigidità. Tale gamma, nel suo insieme, individua un atteggiamento che per brevità si può dire concordistico».

⁵⁰ The principles of Aristotelian physics include fundamental notions about nature, motion, change, time, and the like.

Although many passages from Galileo's 1613 letter to Benedetto Castelli also appear in the 1615 letter to the Grand Duchess, several changes indicate Galileo's awareness of subtle theological distinctions. If we compare the second passage from the letter quoted above with what Galileo wrote (in 1613) to Castelli, we see that Galileo uses almost the same words that he employs in 1615, save for the observation that «in physical disputes [*disputati naturali*] it [the Bible] should be reserved to last place [*ella dovrebbe esser riserbata nell'ultimo luogo*]»⁵¹. In the passage (above) written in 1615, Galileo argues that «we ought not to begin from the authority of scriptural passages». This change, from reserving the Bible to last place in discussing scientific questions to the admonition not to begin from the authority of scripture, is indicative of the rhetorical thrust of his *Letter to the Grand Duchess*. The real audience Galileo addresses is not the Grand Duchess, but theologians and Church officials in Rome, and we can see Galileo making the arguments more palatable to them. There is another interesting difference between the two parallel passages. In the letter to Castelli, Galileo writes that in the Bible there are propositions which, from the point of view of the nude signification of the words (*nudo significato delle parole*), have an aspect diverse from the truth (*hanno aspetto diverso dal vero*). In his *Letter to the Grand Duchess*, he writes that in the Bible there are «molte cose diverse, in aspetto e quanto al nudo significato delle parole, dal vero assoluto»⁵². This was one of the sentences in the letter to Castelli which was rendered differently in the text which the Inquisition had (and which was pointed to as troublesome by theological consultants in Rome). The text in the hands of the Inquisition read: «Che nella Santa Scrittura si trovano molte proposizioni false quanto al nudo significato della parole». Thus, officials in the Inquisition thought that Galileo wrote that the Bible contains false propositions (even though, in the text, “false” is restricted to the nude signification of the words)⁵³.

In explaining that the purpose of the Bible is to lead men to salvation and not to disclose information extraneous to that purpose, Galileo writes the following to Castelli in 1613:

«I should believe [*Io crederei*] that the authority of the Bible had *only* the aim of persuading [*l'autorità delle Sacre Lettere avesse avuto solamente la mira a persuadere*] men of those articles and propositions which, being necessary for salvation [*sendo necessarie per la salute loro*] and surpassing all human reason [*superando ogni umano discorso*], could not be made credible by another science, or by other means [*non potevano per altra scienza né per altro mezzo farcisi credibili*], than through the mouth of the Holy Ghost itself [*che per la bocca dell'istesso Spirito Santo*]»⁵⁴.

⁵¹ G. GALILEI, *Lettere*, o.c., p. 104.

⁵² *Ibidem*, pp. 104, 130.

⁵³ For an illuminating discussion of these differences see M. FINOCCHIARO, o.c., p. 331, n. 6 and M. PESCE, *Una nuova versione della lettera di G. Galilei a Benedetto Castelli*, o.c., pp. 89-122, and *Le redazioni originali della lettera “copernicana” a B. Castelli*, o.c. Even those scholars who discuss Galileo's principles of biblical exegesis in considerable detail (e.g., Blackwell, Pesce, Fabris, and Stabile) do not really distinguish between Galileo's arguments in the letter to Castelli and his arguments in the letter to the Grand Duchess.

⁵⁴ G. GALILEI, *Lettere*, o.c., p. 106.

In the letter of 1615, Galileo alters this passage; he writes:

«I should judge [*Stimerei*] that the authority of the Bible had the aim *principally* of persuading [*l'autorità delle Sacre Lettere avesse avuto la mira a persuadere principalmente*] men of those articles and propositions which, surpassing all human reasoning, could not be made credible by another science, or by other means, than through the mouth of the Holy Ghost»⁵⁵.

In 1613, Galileo wrote that the purpose of the Bible was *only* [*solamente*] to persuade men of those truths which surpassed human reason. In 1615, he changes the adverb to *principally* [*principalmente*]; thereby, he does not exclude from the purpose of the Bible the revelation of truths which are within the realm of human reason. Also, the 1615 text omits the phrase «being necessary for salvation», thus, in these changes Galileo eliminates a restriction concerning the subject of the articles and propositions which come under the «authority of the Bible». These changes are significant for two reasons. First, with Aquinas, Galileo could now allow that some truths about God and man necessary for salvation which can be known by reason are also revealed in Scripture. Second, he admits that there may be truths in the Bible which are not directly connected to the Bible's purpose of leading human beings to salvation. Mauro Pesce refers to this passage from the *Letter to the Grand Duchess* as an example of Galileo's radical break with traditional Catholic biblical exegesis. According to Pesce, Galileo rejects granting any authority to the Bible in matters scientific. Pesce seems to understand *principalmente* as *solamente*, but, as we have seen, Galileo himself changed *solamente* to *principalmente*⁵⁶. He also thinks that Galileo has a narrower interpretation of the decree

⁵⁵ *Ibidem*, p. 131: «Stimerei per questo che l'autorità delle Sacre Lettere avesse avuto la mira a persuadere principalmente a gli uomini quegli articoli e proposizioni, che, superando ogni umano discorso, non potevano per altra scienza né per altro mezzo farsi credibili, che per la bocca dell'istesso Santo Spirito». Stillman Drake's translation (*The Discoveries and Opinions of Galileo*, p. 183) of the 1615 text is: «I should judge that the authority of the Bible was designed to persuade men of those articles and propositions which, surpassing all human reasoning, could not be made credible by science, or by any other means than through the very mouth of the Holy Spirit». Drake misses completely the thrust of "principalmente", and he also omits the "altra" in "altra scienza", whereas he does not omit the "altra" in his translation of the 1613 letter. To use the adjective "altra" indicates that the Bible's *sacra dottrina* is a science/knowledge. In his translation of the letter to Castelli (1613) Drake does include "only" and the phrase "being necessary for our salvation". Cfr. S. DRAKE, *Galileo at Work*, o.c., p. 226. M. FINOCCHIARO, in his translations of these passages (*The Galileo Affair*, pp. 51 and 93), uses "merely" for "solamente" (1613 letter) and "chiefly" for "principalmente" (1615 letter). R. FABRIS (o.c., p. 16) quotes a major part of the above passage from the letter to Castelli with the following introduction: «l'intenzione *primaria* [my emphasis] della Scrittura è quella di enunciare "gli articoli concernenti alla salute e allo stabilimento della fede"; articoli o proposizioni "che essendo necessarie per la salute degli uomini e superando ogni umano discorso non potevano per altra scienza né per altro mezzo farsi credibili, che per la bocca dell'istesso Spirito santo"». Fabris conflates the two distinct passages from the letters to Castelli and the Grand Duchess and, accordingly, misses the very important change in the text.

⁵⁶ M. PESCE, *L'interpretazione della Bibbia...*, o.c., pp. 250-1: «L'affermazione è radicale: l'autorità della Scrittura riguarda "articoli e proposizioni" che *superano ogni umano discorso*, cioè: l'autorità della Scrittura riguarda *solo* [my emphasis] le verità *irraggiungibili* con la scienza umana. Tutto ciò che può essere dimostrato razionalmente viene sottratto all'autorità della

of the fourth session of the Council of Trent: limiting the authority of the Bible (and by extension, the Church) only to matters of faith and morals⁵⁷.

It is important to recognize the Catholic tradition in which Galileo participates. The letter to the Grand Duchess is richly laced with quotations from the Church Fathers, principally Augustine, all left in Latin: passages which lend authority to his arguments⁵⁸. The passages quoted reinforce the general principles of the complementarity of science and scripture, and the need to avoid naive, literalistic interpretations of the sacred text⁵⁹.

In the absence of a scientific demonstration for the motion of the earth, Cardinal Bellarmino had urged prudence: do not challenge the traditional readings of those biblical passages which have been interpreted as affirming the mobility of the sun and the immobility of the earth. The cardinal was acutely aware of Protestant challenges to the Catholic Church's claim to be the sole, legitimate interpreter of God's word. As we noted above, it seems that Bellarmino was more concerned with maintaining the authority of the Church to be the authentic interpreter of Scripture than he was in refining principles of biblical exegesis⁶⁰. Nevertheless, on the level of fundamental principles concerning the relationship between science and scripture, Cardinal Bellarmino and Galileo were in agreement, just as they were in agreement concerning the Aristotelian requirements for scientific knowledge⁶¹.

Bibbia». Thus, for Pesce, Galileo affirms a «disomogeneità epistemologica tra Scrittura e natura che non si può usare la Scrittura nelle “dispute di problemi naturali” [...] In sostanza, la Scrittura è limitata in due modi convergenti: negli argomenti, e cioè fede costumi salvezza, e per il modo di conoscenza, perché non rientra sotto la sua autorità tutto ciò che può essere dimostrato scientificamente». *Ibidem*, pp. 252-3: «Rivediamo in sintesi la proposta galileiana: la Bibbia: fonte di una verità solo religiosa, svelata solo mediante lo Spirito santo e creduta per fede; la natura: conosciuta mediante le sensate esperienze e le necessarie dimostrazioni. Ambedue queste verità procedono da Dio e perciò non possono contrariarsi. Nel caso di contrasto si troverà sicuramente lo scioglimento dell'equivoco, ma lo scioglimento non consisterà mai nel negare la verità scientifica dimostrata in modo sicuro, ma nel trovare il senso recondito nascosto sotto l'affermazione letterale scritturistica in contrasto con la verità scientifica. Ciò porta alla delimitazione di due ambiti: uno "religioso" o di fede, su cui ha competenza la chiesa e uno non "religioso", non di fede, su cui la chiesa non ha autorità».

⁵⁷ *Ibidem*, p. 249: «Galileo interpreta in senso restrittivo ed esclusivo la proposizione tridentina: egli limita *solo* alle materie di fede e di costumi l'autorità della Bibbia (e perciò anche della chiesa), laddove forse il Concilio voleva semplicemente asserire che in quelle materie non ci potesse essere discussione sull'interpretazione ecclesiastica».

⁵⁸ There are 27 citations of authors; 15 from Augustine (all from *De Genesi ad litteram*); see Pesce (o.c., p. 255) for a discussion of these citations.

⁵⁹ Galileo (*De Genesi ad litteram*, I, 36) quotes Augustine's advice that one should be prudent in interpreting those passages of Scripture which deal with «matters that are obscure and far beyond our vision since different interpretations are sometimes possible without prejudice to the faith we have received. In such a case, we should not rush in headlong and so firmly take our stand on one side that, if further progress in the search for truth justly undermines this position, we too fall with it. That would be to battle not for the teaching of Holy Scripture but for our own, wishing its teaching to conform to ours, whereas we ought to wish ours to conform to that of Sacred Scripture».

⁶⁰ See R. BLACKWELL, o.c., p. 24. See also, R. FABRIS, *Galileo Galilei e gli orientamenti...*, cit., pp. 43-44.

⁶¹ Recently, R. FELDHAY, *Galileo and the Church...*, cit., has shown the dangers in failing to recognize significant differences between Jesuit and Dominican theologians in their responses to Copernicanism and to Galileo. She has also explained various philosophical and theological

There is something more in Galileo's arguments, more than the traditional affirmation that God is the author of the book of nature and the book of scripture and that the truths of nature and the truths of scripture cannot really be in conflict. In the *Letter to the Grand Duchess* there is an additional argument, not well-developed in his earlier letters on the subject: an argument which concerns the role of science in discovering the true sense of those scriptural texts which address scientific questions.

«When one is in possession of knowledge about questions of nature which are not matters of faith, based on indubitable demonstrations or sensory experience, since such knowledge is also a gift from God, one must apply it to the investigation of the true meanings [*veri sensi*] of Scripture in those places which apparently seem to read differently. These senses would unquestionably be discovered by wise theologians [*indubitabilmente saranno penetrati da' sapienti teologi*], together with the reasons for which the Holy Ghost sometimes wished to veil itself under words with a different meaning [*velare sotto parole di significato diverso*].»

«[...] having become certain of any physical conclusions [*venuti in certezza di alcune conclusioni naturali*], we ought to utilize these as the most appropriate aids in the true exposition [*alla vera esposizione*] of the Bible and in the investigation of those meanings which are necessarily contained therein [*quei sensi che in loro necessariamente si contengono*], for these [meanings] must be concordant [*concordi*] with demonstrated truths [*le verità dimostrate*].»

«[Since] two truths cannot contradict one another [*due verità non possono contrariarsi*] [...] it is the function of wise expositors [of Scripture] to seek out the true senses [*i veri sensi*] of scriptural texts. These will unquestionably accord [*indubitabilmente saranno concordanti*] with the physical conclusions [*conclusioni naturali*] of which we are already certain and sure [*certi e sicuri*] through manifest sense or necessary demonstrations [*senso manifesto o le dimostrazioni necessarie*].»⁶².

Galileo argues that there is not simply a complementarity between the Bible and science, in that the truth of one cannot contradict the truth of the other, but that there also must be a concordance between science and those passages in the Bible which appear to make claims about the physical nature of the universe.

It is important to recognize the authority Galileo grants to the Bible in questions concerning natural phenomena:

«[...] even in those propositions which are not articles of faith, the authority of the same Holy Writ should have priority over the authority of any human writing

differences among Jesuit thinkers. She thinks that the controversy *De auxiliis Divinae Gratiae*, especially as it concerned questions of primary and secondary causality, divine omnipotence, epistemological scepticism, and the status of hypothetical realities, provides a crucial intellectual setting for the Galileo Affair.

⁶²G. GALILEI, *Lettere*, o.c., pp. 131, 134, 145; S. DRAKE, *Discoveries and Opinions...*, cit., pp. 183, 186, 199; and M. FINOCCHIARO, o.c., pp. 93, 96, and 105. In the final quotation, Finocchiaro translates “*velare sotto parole di significato diverso*” as “words with a different literal meaning;” the Alhambra Spanish translation, noted above, reads: “el Espíritu Santo los ha presentado de ese modo” (p. 51). Note how the Spanish translation avoids the problem. Galileo uses the two different spellings: *indubitabilmente* and *indubitabilmente*.

containing pure narration or even probable reasons [*con pura narrazione o anco con probabili ragioni*], but no demonstrative proofs [*non con metodo dimostrativo*]; this principle should be considered appropriate and necessary [*tanto convenevole e necessario*] inasmuch as divine wisdom surpasses all human judgment and speculation»⁶³.

Since God has given human beings intellect and sense experience, it would be wrong to deny the truth «of those physical conclusions which are placed before our eyes and intellect by our sensory experience or by necessary demonstrations [*dalle sensate esperienze o dalle necessarie dimostrazioni*]». He notes that this is particularly the case when it comes to astronomy and other sciences which are not the principal concern of the authors of the Bible. After quoting Augustine's advice that we should reject as false any interpretation of the Bible which contradicts demonstrated truths about nature (*De Genesi ad litteram*, I:21), Galileo draws the following conclusion:

«In the books of worldly authors are contained some propositions about nature which are truly demonstrated [*dimostrate veracemente*] and others which are simply taught [*semplicemente insegnate*]; in regard to the former, the task of wise theologians is to show that they are not contrary to Holy Scripture; as for the latter (which are taught but not demonstrated with necessity [*insegnate ma non necessariamente dimostrate*]), if they contain anything contrary to the Holy Writ, then they must be considered indubitably false [*si deve stimare indubitatamente falsa*] and must be demonstrated such by every possible means [*in ogni possibil modo*]»⁶⁴.

Galileo, of course, expects to present very shortly a demonstration for the motion of the earth which would put Copernican astronomy in the first category and, accordingly, would mean that wise theologians would have to show that it is not contrary to the Bible. Before concluding that a particular proposition is contrary to the Bible, one must show that it is «not conclusively demonstrated [*non sia dimostrata necessariamente*]» Galileo, thus, sets a task for his opponents who wish to condemn Copernican astronomy. But, on Galileo's own principles, if the new astronomy is shown to be "not conclusively demonstrated", then it may very well be judged to be contrary to the Bible. This is exactly the conclusion reached by the theologians of the Inquisition.

Galileo makes a further distinction concerning biblical texts which concern physical propositions which have not been demonstrated. Such non-demonstrated propositions fall into two categories: 1) those about which «any human speculation and reasoning [*con ogni umana specolazione e discorso*] can *only* attain a probable opinion and a verisimilitude conjecture [*probabile opinione e verisimil congettura*]», and which cannot constitute «a certain and demonstrated science»⁶⁵, 2) those about which either one has or «may firmly believe that it is possible to have complete certainty on the basis of experiments, long observations, and necessary demonstrations [*che aver si possa, con esperienze, con lunghe osservazioni e con necessarie dimostrazioni, indubitata certezza*];

⁶³ M. FINOCCHIARO, o.c., p. 94; G. GALILEI, *Lettere*, o.c., p. 131.

⁶⁴ *Ibidem*, pp.101-102; G. GALILEI, *Lettere*, o.c., p. 141.

⁶⁵ The example he gives is whether stars are animate.

examples are whether or not the earth and the sun move and whether or not the earth is spherical»⁶⁶.

«As for the first type, I have no doubt at all that, where human reason cannot reach [*dove gli umani discorsi non possono arrivare*], and where consequently one cannot have a science, but only opinion and faith, it is appropriate piously to conform absolutely to the *puro senso*⁶⁷ of Scripture. In regard to the others, however, I should think that it would be proper to ascertain the facts first, so that they could guide us in finding the true meaning [*i veri sensi*] of Scripture; this would be found to agree absolutely with demonstrated facts [*li quali assolutamente si troverebbero concordi col fatto dimostrato*], even though *prima facie* the words [*le parole nel primo aspetto*] would sound otherwise, since two truths could never contradict each other. This doctrine seems to me very correct and certain, inasmuch as I find it exactly written in St. Augustine»⁶⁸.

Richard Blackwell correctly observes that the problem we are left with, given Galileo's analysis, concerns the criteria to be employed to distinguish between those undemonstrated scientific propositions which are in principle not subject to demonstration and those which are demonstrable. «Galileo gives us no clues as to what criteria he would suggest»⁶⁹. But there is no doubt into which category Galileo places the claims of the new astronomy. He could point to the fact that his telescopic observations had rendered false certain features of Ptolemaic astronomy, but as he himself admitted they were insufficient to demonstrate the truth of Copernican astronomy.

There is yet another complication that needs to be addressed, albeit only briefly here: *viz.*, the status of astronomy. Mathematical astronomy simply “saved the appearances”, it could not in principle arrive at the truths of heavenly motions. The distinction between “hypothetical” and “true”, and the confusion concerning different senses of “hypothetical”, play an important role in Galileo's encounter with the Inquisition. In Bellarmino's letter to Foscarini (1615), which we have already discussed in part, the cardinal drew a distinction between mathematical astronomers who speak hypothetically (*ex suppositione*) and “save the appearances” by using epicycles, deferents, and the like, and physicists who have as their goal the discovery of the true structure of the cosmos. Bellarmino, following Thomas Aquinas⁷⁰, was well aware that Ptolemaic astronomy fell into the former category. Epicycles and eccentrics are geometric devices to describe observed celestial motions and as such were “hypotheses”. Geometric entities could not serve as necessary, physical causes of the observed motions of the heavens. Bellarmino noted that since such hypotheses could not, in principle, constitute a true science of the heavens, there was no danger of their being in conflict with biblical truths. As we have seen, Bellarmino does not deny that there can be scientific knowledge about the heavens; he does not think, however, that mathematical astronomy is such a science.

⁶⁶ M. FINOCCHIARO, o.c., p. 104; G. GALILEI, *Lettere*, cit., p. 144.

⁶⁷ Finocchiaro translates this as “literal meaning”.

⁶⁸ *Ibidem*.

⁶⁹ R. BLACKWELL, o.c., p. 82.

⁷⁰ THOMAS AQUINAS, *In II De Caelo*, lec. 17.

Rivka Felday and Guido Morpugo-Tagliabue have shown that there was considerable ambiguity in the use of the term “hypothetical” in the early seventeenth century. Thus, when different interlocutors (Galileo, Bellarmino, Pope Urban VIII, officers of the Inquisition) use this term they do not always mean the same thing. In addition to the Thomistic tradition, in which Bellarmino participated, there was another one according to which the “hypothetical” status of claims about nature reflected a scepticism about human intelligence: the tendency, that is, to view any claim about human knowledge as “hypothetical” Feldhay observes: «This emphasis on the ephemeral, uncertain character of knowledge of the world was [...] reinforced by the voluntaristic theology and nominalistic philosophy of the fourteenth century»⁷¹. To affirm divine omnipotence required, so it seemed, the denial of the possibility of human knowledge of the world. Since science, in the traditional Aristotelian sense, was knowledge of a necessary nexus between cause and effect, it seemed that to argue that this type of knowledge is possible was to necessitate God, and hence to deny divine omnipotence. Cardinal Agostino Oregio (1577-1635) a colleague and friend of Maffeo Barberini (later Pope Urban VIII), reports a conversation Barberini had with Galileo sometime in 1615 or 1616. Barberini defended the view that, given God’s omnipotence and omniscience, we ought not to «bind divine power and wisdom» by claiming that any human science knows for sure the way things are⁷². It was Pope Urban VIII who told Galileo in the early 1620s that he could write on Copernican astronomy as long as he restricted his analysis to the realm of the hypothetical. The pope confided to one of his cardinals that there ought to be no fear about Copernican astronomy since no one could possibly demonstrate it to be necessarily true⁷³. Feldhay notes: «Everyone agreed that it was permissible to use this teaching [Copernican astronomy] as a hypothesis. The epistemological status of a hypothesis, however, was related to the major scientific, philosophical, and theological debates of the period. The interpretation of the concept ‘hypothetical knowledge’ thus became dependent on the theological and philosophical orientation of the interpreter»⁷⁴.

If the arguments of Copernicus are only in the realm of mathematical astronomy (and not in physical astronomy), as many thought, then such arguments could not contain necessary demonstrations about the heavens. When the Inquisition completed its emendation of Copernicus’ *De revolutionibus* in 1620, the instructions introducing the changes noted that, by making all of Copernicus’ claims “hypothetical”, truth would be protected:

«[...] this emendation can be made without compromising truth or Holy Scripture; because the subject which Copernicus is dealing with is astronomy, whose distinctive method is to use false and imaginary principles for saving appearances and celestial phenomena, as is established by the epicycles, eccentric, equants, apogees, and perigees of the ancients. If certain of Copernicus’ passages on the motion of the earth are not hypothetical, make them hypothetical [*fiant hypotheticala*]; then they will not

⁷¹ R. FELDHAY, o.c., p. 37.

⁷² *De Deo uno* (1629), p. 193; quoted in FELDAY, o.c., p. 209. See F. MINAZZI, *Galileo “filosofo geometra”*, Rusconi, Milano 1994, pp. 142-144.

⁷³ «[...] non era da temere che alcuno fosse mai per dimostrarla necessariamente vera». Cited in MORPURGO-TAGLIABUE, *I processi di Galileo e l’epistemologia*, Armando, Roma 1981, p. 76.

⁷⁴ R. FELDHAY, o.c., p. 38.

be against either the truth or the Holy Writ. On the contrary, in a certain sense, they will be in agreement with them, on account of the false nature of suppositions, which the study of astronomy is accustomed to use as its special right»⁷⁵.

Throughout his work Galileo is always clear to indicate that he (following Copernicus) sought to distinguish his astronomy from that which merely sought to save the appearances: «Two kinds of suppositions have been made... by astronomers: some are primary and with regard to the absolute truth in nature [*all'assoluta verità in natura*]; others are secondary, and these are posited imaginatively to render an account of the appearances in the movements of the stars [*sono state immaginate per render ragione dell'apparenze ne i movimenti delle stelle*]». According to Galileo, these latter suppositions, designed to save the appearances, are «chimerical and fictive [...] false in nature, and introduced only for the sake of astronomical computation»⁷⁶. In his first *Letter on Sunspots* (1612) Galileo described his task and that of other *astronomi filosofi* as the discovery of the «true constitution of the universe [*la vera costituzione dell'universo*]», an understanding which is «unique, true, real, and which cannot be other than it is [*un modo solo, vero, reale ed impossibile ad esser altramente*]»⁷⁷.

3. Galileo's interpretation of the biblical passages about the natural world

We can see Galileo's functioning as biblical exegete in a letter he writes to Monsignor Piero Dini, a friend in Rome, and in his interpretation of the story of Joshua's commanding the sun to stand still which he includes in his letter to the Grand Duchess. Galileo had sent to Dini a copy of his letter to Castelli because he feared that misleading copies of the letter were circulating. On 7 March 1615 Dini writes to Galileo to report the reaction in academic and ecclesiastical circles in Rome to Galileo's letter to Castelli. He tells Galileo that there are two principal objections of which he needs to be aware. Christopher Grienberger, Jesuit priest and successor to Clavius as professor of mathematics at the Collegio Romano, remarked, so Dini reports, that he «would have liked you [Galileo] first to carry out your demonstrations and then get involved in discussing the Scripture». Dini also reports on a meeting with Cardinal Bellarmino, who, according to Dini, did not think that the new astronomy will be prohibited, but did observe that Galileo would be advised always to speak of Copernican astronomy as simply saving the appearances. This is the same point the cardinal will make in his letter to Foscarini (and to Galileo) the following month. Grienberger and Bellarmino were concerned about the proper role for a scientist in discussing these questions.

⁷⁵Codex Barberiniano XXXIX, 55, transcribed by J. Hilgers, *Der Index der Verbotener Bücher*, Freiburg 1904, pp. 541-2. O. GINGERICH has produced an English translation in *The Censorship of Copernicus' De revolutionibus*, *Annali dell'Istituto e Museo di Storia della Scienza di Firenze*, VI (1981), fasc. 2, pp. 51-56. For a recent discussion of these emendations, see M. BUCCIANTINI, *Contro Galileo: Alle Origini dell'Affaire*, Olschki, Firenze 1995, pp. 143-147. Bucciantini points to the important role of Francesco Ingoli in the preparation of the emendations.

⁷⁶EN, vol. 5, p. 360.

⁷⁷EN, vol. 5, p. 102.

Dini also tells Galileo that Bellarmino thought a principal scriptural objection to Copernicus is found in two verses of *Psalms* 18 (19: 5-7 in the King James version):

«High above, he pitched a tent for the sun,
who comes out of his pavilion like a bridegroom,
exulting like a hero to run his race.
He has his rising on the edge of the heaven,
the end of his course is its furthest edge,
and nothing can escape his heat»⁷⁸.

These verses were traditionally interpreted as attributing motion to the sun. Dini reports that when he remarked to the cardinal that «even this [these verses] could be explained in terms of our usual way of understanding these things [by the principle of accommodation or the difference between simple and figurative literal senses]», the cardinal answered that one must be careful not to rush into such a new interpretation.

In a letter to Dini (23 March 1615), Galileo addresses both issues. He rejects the view that Copernican astronomy ought only to be treated as saving the appearances as though Copernicus were not concerned with discovering the true constitution of the universe. With respect to Grienberger's urge to delay, Galileo claims that «when sacred texts have to be reconciled with new and uncommon physical doctrines it is necessary to be completely informed about such doctrines, for one cannot tune two strings together by listening to just one»⁷⁹. He notes that «I find that some passages of the Holy Writ fit very well [*molte convenienze*] with this [Copernican] world system, whereas they do not seem to sound equally well in the popular philosophy [*che nella vulgata filosofia non così ben mi pare che consuonino*]».

Galileo then offers an analysis of the two verses from *Psalms* 18, based on his understanding of the sun and its role in the movements of the planets:

«[...] it seems to me that there is in nature a very spirited, tenuous, and fast substance [*una sostanza spiritosissima, tenuissima e velocissima*] which spreads throughout the universe [*diffondendosi per l'universo*], penetrates everything without difficulty [*penetra per tutto senza contrasto*], and warms up, gives life, and renders fertile all living creatures [*riscalda, vivifica e rende feconde tutte le viventi creature*]. It also seems to me that the senses show us [*il senso stesso ci dimostri*] the body of the sun to be by far the principal receptacle for this spirit [*il corpo del Sole esserne ricetta principalissimo*], and that from there an immense amount of light spreads throughout the universe [*espandendosi un'immensa luce per l'universo*] and, together with such a calorific and penetrating spirit [*accompagnata da tale spirito calorifico e penetrante*], gives life and fertility to all vegetable bodies».

⁷⁸ «In omnem terram exivit sonus eorum, Et in finis orbis terrae verba eorum. In sole posuit tabernaculum suum; Et ipse tanquam sponsus procedens de thalamo suo. Exsultavit ut gigas ad currendam viam». See R. BLACKWELL, o.c., p. 73.

⁷⁹ G. GALILEI, *Lettere*, o.c., p. 118; M. FINOCCHIARO, o.c., pp. 62-63: «[...] quando si abbino a concordar luoghi sacri con dottrine naturali nuove e non comuni, è necessario aver intera notizia di tali dottrine, non si potendo accordar due corde insieme col sentirne una sola».

Galileo thinks that this calorific spirit is different from light, since «it penetrates and spreads [*penetra e si diffonde*] through all corporeal substances [*per tutte le sostanze corporee*]». When heat and light [*calore e luce*] emanate from a fire, it is heat which penetrates all bodies; «similarly, the emanation of the sun is luminous and calorific, and the calorific part is the more penetrating one».

Galileo “tunes the string” of his scientific analysis with an appeal to *Genesis*: «It seems to me that from the Holy Writ we can acquire evident certainty that the solar body is, as I have said, a receptacle and reservoir of this spirit and this light, which it receives from elsewhere, rather than being their primary font and source from which they originally derive»⁸⁰. After all, *Genesis* refers to the Spirit, with its caloric and fertile power, brooding over the waters, a fecundity, which is also «for future generations». Light is created on the first day; the sun on the fourth. «Thus, we may affirm with great verisimilitude that this fertilizing spirit and this light diffused throughout the world come together to unite and be strengthened in the body of the sun, which because of this is located at the center of the universe; then, having been made more intense and vigorous, they are again diffused»⁸¹.

Galileo argues that *Psalms* 73:16 supports his view when it refers to the primordial light as «morning light» or dawn, a suggestion that the light created before the sun is weaker than that which is «received, fortified, and again diffused by the solar body». In support of his claim about the power of the sun he quotes from *The Divine Names* of Pseudo-Dionysius the Areopagite.

On the basis of this background of scientific and exegetical argumentation, Galileo turns to the verses in *Psalms* 18 which seemed to trouble Cardinal Bellarmine:

«So I am inclined to believe that the passage in the Psalm could have this meaning, namely, that God has “pitched a tent for the sun” [18.6] as the most noble seat in the whole sensible world. Then where it says that he, as a bridegroom “comes out of his pavilion, exulting like a hero to run his race”, I should understand this as referring to the radiating sun, namely to the light and the already mentioned calorific spirit, which fertilizes all corporeal substances and which, starting from the solar body, spreads very fast throughout the world; all the words correspond exactly to this meaning [*al qual senso si adattano puntualmente tutte le parole*] [...] The words “comes out of his pavillion”, confirm that this emanation and motion must refer to the solar light and not to the solar body itself [...]»⁸².

As Galileo continues his exegesis he introduces conclusions from his telescopic observations of the sun: especially the “constant generation” of sunspots. «By constantly

⁸⁰G. GALILEI, *Lettere*, o.c., p. 119; M. FINOCCHIARO, o.c., p. 62: «Che poi di questo spirito e di questa luce il corpo solare sia, come ho detto, un ricetto e, per così dire, una conserva che *ab extra* gli riceva, più tosto che un principio e fonte primario dal quale originariamente si derivino, parmi che se n’abbia evidente certezza nelle Sacre Lettere [...]».

⁸¹*Ibidem*, pp. 119-120: «Onde molto verisimilmente possiamo affermare, questo spirito fecondante e questa luce diffusa per tutto il mondo concorrere ad unirsi e fortificarsi in esso corpo solare, per ciò nel centro dell’universo collocato, e quindi poi, fatta più splendida e vigorosa, di nuovo diffondersi».

⁸²*Ibidem*, pp. 121-2; M. FINOCCHIARO, o.c., pp. 65-66.

observing these dark substances, I have demonstrated how the solar body necessarily [*per necessità*] turns on itself [*si rivolge in sé stesso*], and I have also speculated how reasonable it is to believe that the motions of the planets around the sun depend on such turning [*e di più accennato sia ragionevol il creder che da tal rivolgimento dependino i movimenti de' pianeti intorno al medesimo Sole*]⁸³. The Psalmist, after singing praises to the sun, «and without being ignorant that it makes all the moveable bodies in the world turn around itself [*e non gli essendo occulto che egli fa raggirarsi intorno tutti i corpi mobili del mondo*]», refers to the greater prerogatives of the divine law when he says that «the law of the Lord is unspotted [*Lex Domini immaculata*]» and possesses the power to convert souls [*convertens animas*]. The comparison is effective, according to Galileo, since God's law, being spotless [*sparso di macchie*] and having the power to move souls [i.e., incorporeal entities], is higher than the power of the spotted sun, which can only make corporeal bodies move about it.

Thus, Galileo not only rejects an appeal to *Psalm* 18 as affirming that the sun moves through the heavens; he also shows how one can read the *Psalm* in the light of some scientific arguments about solar power and his own telescopic observations. Furthermore, he attributes such scientific knowledge to the psalmist. A year and a half earlier, in the letter to Castelli, Galileo had used a much briefer version of this analysis of *Psalm* 18 to support his interpretation of the story of Joshua's commanding the sun to stand still.

In the final section of the *Letter to the Grand Duchess*, we find Galileo's most extensive treatment of the story from the *Book of Joshua*. Galileo notes that if one were to understand Joshua's words, viz., the command that the sun stand still, in a straightforward sense [*il puro significato delle parole*]⁸⁴, it would be impossible to make sense of the passage were one to assume that Ptolemaic astronomy were true:

«For the sun's motion along the ecliptic takes place in the order of the signs of the zodiac, which is from west to east; this is contrary to the motion of the Primum Mobile from east to west, which is what causes day and night; therefore, it is clear that if the sun stops its own true motion [*suo vero e proprio movimento*], the day becomes shorter and not longer and that, on the contrary, the way to prolong it would be to speed up the sun's motion; thus, to make the sun stay for some time at the same place above the horizon, without going down toward the west, it would be necessary to accelerate its motion so as to equal the motion of the Primum Mobile [in the opposite direction]... Hence, if Joshua had wanted his words to be taken in their pure sense [*lor puro e propriissimo significato*]⁸⁵, he would have told the sun to accelerate its motion by an amount such that, when carried along by the Primum Mobile, it would not be made to set».

But the words of Joshua are adapted to the knowledge of his listeners and were spoken in accordance with their understanding «because he did not want to teach them

⁸³ *Ibidem*, p. 122.

⁸⁴ Finocchiaro translates this phrase as “literal meaning” (p. 114) and also (the same phrase) in the letter to Castelli (p. 52).

⁸⁵ Finocchiaro translates this phrase as “their literal and most proper meaning” (p. 155); for the Italian text see G. GALILEI, *Lettere*, o.c., p. 157.

about the structure of the spheres but to make them understand the greatness of the miracle of the prolongation of the day»⁸⁶.

Galileo claims that Pseudo-Dionysius, Augustine, and others, have interpreted this passage from Joshua as meaning that the Primum Mobile stopped, and that as a consequence of its stopping, all other celestial spheres also stopped⁸⁷. Galileo's point is that, if we were to assume that Ptolemaic astronomy were true, «it is necessary to interpret the words in a way different from what they seem to say on the surface»⁸⁸.

Galileo argues that if we turn to the Copernican system and to his own discoveries about sunspots and the rotation of the sun we understand the same miracle «in a way more in accordance with what we read [*più conforme a quanto leggiamo in Giosuè*]». Galileo incorporates the argument he had used in his letter to Dini: not only is the sun the source of light for all the planets (including the Moon and the earth),

«but insofar as it is the greatest minister of nature and, in a way, the heart and soul of the world, it transmits to the surrounding bodies not only light but also (by turning on itself) motion; thus, just as all motion of an animal's limbs would cease if the motion of its heart were to cease, in the same way if the sun's rotation stopped then all planetary revolutions would also stop [...] Therefore, given that the sun is both the source of light and the origin of motion [*principio de' movimenti*], and given that God wanted the whole world system to remain motionless for several hours as a result of Joshua's order, it was sufficient to stop the sun [*bastò fermare il Sole*], and then its immobility stopped all the other turnings [*conversioni*], so that the earth as well as the moon and the sun (and all the other planets) remained in the same arrangement [*medesima costituzione*]; and during that whole time night did not approach, and the day miraculously got longer. In this manner, by stopping the sun, and without changing or upsetting at all the way the other stars appear or their mutual arrangement, the day on the earth could have been lengthened in perfect accord with the literal sense of the sacred text»⁸⁹.

Galileo also points out that some interpreters have had difficulty with the story since they thought that, when Joshua asked for the prolongation of the day, the sun had to be close to setting. The reason for such a conclusion is that, since the battle occurred about the time of the summer solstice and the sun at the meridian, there would be so much day left that there would be no reason to lengthen the day. But the author of the passage says

⁸⁶ *Ibidem*.

⁸⁷ For an insightful analysis of Galileo's use of Augustine's references (from *De Genesi ad Litteram*, II) to the astronomical measure of time in his account of *Joshua X*, see E. REEVES, *Augustine and Galileo on Reading the Heavens*, «Journal of the History of Ideas », (1991), pp. 563-579.

⁸⁸ G. GALILEI, *Lettere*, o.c., p. 158. Finocchiaro translates the final phrase as «their literal meaning». He translates the next sentence: «Guided by St. Augustine's very useful prescriptions, I should say that the best nonliteral interpretation is not necessarily this, if anyone can find another which is perhaps better and more suitable». But there is no textual reference in the Italian for «nonliteral interpretation», just another and better, or more accommodated interpretation: accommodated to the *puro significato* of the words. M. FINOCCHIARO, o.c., p. 115.

⁸⁹ This is one of the few places that Galileo uses the expression «*senso literale*»: *conforme equisamente al senso literal del sacro testo*. He uses the same expression in the next sentence.

that the sun was «in the midst of heaven» [*in medio caeli*], which requires a convoluted interpretation were the miracle to occur near sunset. Triumphantly, Galileo concludes:

«We can remove this and every other implausibility [*durezza*], if I am not mistaken, by placing the sun, as the Copernican system does and it is most necessary to do [*si come è necessarissimo di porvelo*], in the middle, namely, at the center of the heavenly orbs and the planetary revolutions; for at any hour of the day, whether at noon or in the afternoon, the day would have been lengthened and all heavenly turnings [*tutte le conversioni celesti*] stopped by the sun's stopping in the middle of the heavens, namely at the center of the heavens, where it is located⁹⁰.

Many scholars ignore the details of Galileo's exegesis of *Psalms* and the *Book of Joshua*. They consider them to be mere digressions (or perhaps clever rhetorical plays), unimportant to the central principles of the relationship between the Bible and science which Galileo affirms. In many ways, however, Galileo's exegesis reveals his commitment to a concordance between the Bible and science. It confirms the view that for Galileo the Bible contains scientific truths.

4. Conclusion: Galileo and Counter-Reformation theologians

Galileo concludes his exegesis of the story of Joshua's commanding the sun to stand still by pointing out that theologians who now find biblical statements contrary to Copernican astronomy do so only because they consider the new astronomy to be false. But these theologians, who consider such passages incapable of being interpreted consistently with the new astronomy because they regard it to be false [*mentre la reputan falsa*], would find highly congenial interpretations for these passages [*ne troverebbono interpretazioni molto ben congruenti*], if the new astronomy were known to be true and demonstrated [*quando ella fusse conosciuta per vera e dimostrata*]. Such congenial or concordant interpretations would surely follow if these theologians «were to add some knowledge of the astronomical sciences to their expertise about Holy Writ»⁹¹.

The key for theologians in Rome — as well as for astronomers and philosophers — is Galileo's conditional statement: *quando ella fusse conosciuta per vera e dimostrata*. In the absence of such a demonstration, how ought the theologians to proceed? Despite all the rhetoric of necessary demonstrations throughout the *Letter to the Grand Duchess*⁹²,

⁹⁰G. GALILEI, *Lettere*, o.c., p. 160; M. FINOCCHIARO, o.c., p. 118.

⁹¹R. HOOYKAAS, *Religion and the Rise of Modern Science*, Scottish Academic Press, Edinburgh 1972, p. 126, sees Galileo's exposition of passages from the Old Testament as exhibiting principles of biblical exegesis which were also held by those who condemned Copernican astronomy: «In Galileo's view then, Scripture, which at first sight was accommodating itself to the vulgar opinion on the world system, was using this opinion as a veil through which the learned could perceive scientific truth. At the same time he entrusted the final exegesis of such biblical texts to the hand of enlightened scientists. The supposed conformity of the two Books, Scripture and Nature, which led literalists to the condemnation of the Copernican system, served Galileo for its verification, and in this respect he used the same method as his opponents».

⁹²For an excellent analysis of Galileo's rhetoric, see J. DIETZ MOSS, *Novelties in the Heavens: Rhetoric and Science in the Copernican Controversy*, University of Chicago Press, 1993.

Galileo never offers (in this letter) a demonstration for the motion of the earth and the stability of the sun⁹³.

Many years ago, Ernan McMullin noted that there was an inconsistency between Galileo's claim that the Bible is not relevant to the natural sciences and Galileo's use of passages from the Book of Joshua to support Copernican astronomy⁹⁴. But as we have seen, Galileo does not deny all authority to the Bible in discovering the truths of nature. He only says that the Bible does not have as its principal purpose the discussion of material not directly related to salvation⁹⁵. Furthermore, we must remember the rhetorical or strategic unity in the letter. Galileo was employing every argument at his disposal to persuade the Inquisition not to condemn the new astronomy⁹⁶. Similarly, when Galileo notes that unproven physical propositions which contradict biblical passages ought to be rejected (on the grounds that truth cannot contradict truth), he is convinced that he is on the verge of demonstrating the truth of Copernican astronomy.

Galileo's confidence in discovering the true senses of biblical passages concerning

⁹³There is considerable disagreement about Galileo's ultimate judgment concerning his proposed demonstration for the motion of the earth based on the phenomena of the tides. In 1615 and 1616 he was convinced that such a demonstration would work. William Wallace argues that by the time Galileo writes the *Dialogo* he has come to recognize the inadequacy of the argument: «Only when one holds [...] that his [Galileo's] proofs [in the *Dialogo*] were not conclusive and he himself was aware of this, does one give proper credit to his intelligence and to his character, to both his intellect and his will. He was intelligent enough to recognize the limitations of his argumentation, skillful though it was, and he was honest enough, as a believer, to acquiesce to the Church's interpretation of the Scriptures when he lacked 'necessary demonstrations' to show it could be otherwise» (*Galileo and Aristotle in the Dialogo*, «Angelicum», vol. 60, n. 3 (1983), p. 329).

⁹⁴E. McMULLIN (ed.), *Introduction: Galileo, man of science*, in *Galileo, Man of Science*, Basic Books, New York 1967, pp. 32-35. See also: ID., *How Should Cosmology Relate to Theology*, in A.R. PEACOCKE (ed.), *The Sciences and Theology in the Twentieth Century*, University of Notre Dame Press, 1981, pp. 22-25. Recently, M. SHARRATT, o.c., p. 124, has made the same point.

⁹⁵The passage quoted by McMullin, to support his claim that Galileo does affirm that it is not the purpose of the Bible to provide scientific truths, is the translation by Drake which omits the adverb "principalmente" and thus reads «the authority of the Bible was designed to persuade men of those articles and propositions which, surpassing all human reason». S. DRAKE (ed.), *Discoveries and Opinions...*, o.c., p. 183.

⁹⁶M. PESCE, *Una nuova versione della lettera di Galilei a Benedetto Castelli*, cit., p. 105, observes that the inconsistencies [or alleged inconsistencies] in the letter to Christina need to be seen as part of a "funzione tattica". Pesce thinks that the principal problem is the concordist position at the very end of the letter when Galileo uses the story of Joshua to support Copernican astronomy. But Pesce does not seem to recognize the concordist principles that Galileo had already enunciated. Pesce is correct, I think, to recognize that «[a]l criterio della coerenza interna va sostituito quello della coerenza strategica, senza però rinunciare affatto a individuare un nucleo più autenticamente galileiano nel pensiero ermeneutico delle lettere». Despite the rhetorical strategy in the letter, Pesce thinks that Galileo remains committed to the fundamental distinction between the religious purpose of the Bible and science, ID., *L'interpretazione della Bibbia...*, cit., p. 260: «L'ermeneutica della Lettera a Cristina rimane come una proposta chiara, indipendente delle motivazioni soggettive di chi l'ha prodotta e costituisce una lucida e articolata proposta di coordinare l'autonomia della scienza, in tutta la sua radicale portata conoscitiva, al sistema teologico tridentino salvaguardato nel suo nucleo religioso». See D. CANTIMORI, *Galileo e la crisi della Controriforma*, in *Storici e storia. Metodo, caratteristiche, e significato del lavoro storiografico*, Torino 1971, p. 658.

natural phenomena sets Galileo apart from the more circumspect positions of Augustine and Aquinas. It is a confidence shared by Galileo's opponents in the Inquisition, although they reached a different conclusion when they examined the particular case of Copernican astronomy⁹⁷. The theologians of the Inquisition concluded [1616] that the claim that the sun was immobile and at the center of the universe was «foolish and absurd in philosophy, and formally heretical since it explicitly contradicts in many places

⁹⁷ That the theologians of the Inquisition came to a conclusion different from the one reached by Galileo concerning a reading of the Bible in the light of Copernican astronomy does not mean that they did not share fundamentally the same principles of biblical interpretation, especially the principle of accommodation. In addition to the general analysis of R. Hooykaas and the extensive discussion by R. Blackwell (both already cited), see I.A. KELTER, *The Refusal to Accommodate: Jesuit Exegetes and the Copernican System*, «Sixteenth Century Journal», vol. 26, n. 2 (1995), pp. 273-283; F. LAPLANCHE, *Herméneutique biblique et cosmologie mosaïque*, in *Les églises face aux sciences du Moyen Age au XX^e siècle*, Librairie Droz, Genève 1991, pp. 29-51; and G. LEONARDI, *Verità e libertà di ricerca nell'ermeneutica biblica cattolica dell'epoca galileiana e attuale*, in *Galileo Galilei e Padova: Libertà di Indagine e Principio di Autorità – Atti del Convegno e del Simposio Novembre 1982-Gennaio 1983*, Studia Patavina: Rivista di Scienze Religiose, pp. 109-147.

In addition to the texts noted above and elsewhere in this essay, the following address Catholic theological tradition(s) of biblical exegesis at the time of the Galileo affair: W. ASHWORTH, *Catholicism and Early Modern Science*, in D. LINDBERG-R. NUMBERS (eds.), *God and Nature*, The University of California Press 1986, pp. 136-166; M. BALDINI (ed.), *Galileo Galilei: Le Lettere Copernicane*, Armando, Roma 1995; F. BARONE, *Diego de Zuñiga e Galileo Galilei: Astronomia Eliostatica ed Egesi Biblica*, «Critica Storica», vol. 19, n. 3 (1982), pp. 319-334; M. BIAGIOLI, *Jesuit Science Between Texts and Contexts*, in *Studies in History and Philosophy of Science*, vol. 25, n. 4 (1994), pp. 637-646; B. CARRARA, *La Sacra Scrittura, i Santi Padri e Galileo*, Milano, 1914; G. DOMENICI, *La genesi, le vicende ed i giudizi della Controversia*, «Gregorianum», Vol. II (1921), pp. 513-542; G. V. COYNE-M. HELLER-J. ZYCINSKI (eds.), *The Galileo Affair: A Meeting of Faith and Science*, Specola Vaticana, 1985; A. M. DUBARLE, *Les principes exégétiques et théologiques de Galilée concernant la science de la nature*, «Revue des sciences philosophiques et théologiques», vol. 50, n. 1 (1966), pp. 67-87; M. FINOCCHIARO, *The Methodological Background to Galileo's Trial*, in W.A. WALLACE (ed.), *Reinterpreting Galileo*, The Catholic University of America Press, 1986, pp. 241-272; S. MUÑOZ IGLESIAS, *El decreto tridentino sobre la Vulgata y su interpretación por los teólogos del siglo*, «Estudios Bíblicos», vol. 5 (1946), pp. 137-169; H. KARPP, *Der Beitrag Keplers und Galileis zum neuzeitlichen Schriftverständnis*, «Zeitschrift für Theologie und Kirche», vol. 67 (1970), pp. 40-55; O. LORETZ, *Galilei und der Irrtum der Inquisition. Naturwissenschaft-Wahrheit der Bibel-Kirche*, Kevelaer, 1966; C.M. MARTINI, *Gli esegeti del tempo di Galileo*, in *La Parola di Dio alle origini della chiesa*, Università Gregoriana Editrice, Roma 1980, pp. 67-87; R. DE MAIO, *Galileo e la competenza dei teologi*, «Il Centauro», vol. 1, n. 2 (1981), pp. 3-11; P.G. NONIS, *Galileo e la religione*, in *Nel quarto centenario della nascita di Galileo Galilei*, Pubblicazioni dell'Università Cattolica del S. Cuore, III, Scienze e Storie 8, Milano 1966, pp. 125-152; O. PEDERSON, *Galileo and the Council of Trent*, Vatican Observatory Publications, 1983; M. PITASSI, *Le monde catholique face aux sciences aux XVII^e et XVIII^e siècles. Entre refus et récupération*, in O. FATIO (ed.), *Les églises face aux sciences du Moyen Age au XX^e siècle*, Librairie Droz, Genève 1991, pp. 91-107; P. REDONDI, *Galileo Heretic*, tr. by R. Rosenthal, Princeton University Press, 1987 [ed. it.: *Galileo eretico*, Einaudi, Torino 1983]; P. REDONDI, *Dietro l'immagine. Rappresentazioni di Galileo nella cultura positivista*, «Nuncius», IX (1994), fasc. 1, pp. 65-116; P. ROSSI, *Galileo Galilei e il Libro dei Salmi*, in *La scienza e la filosofia dei moderni. Aspetti della rivoluzione scientifica*, Torino, 1989, pp. 67-89; P. ROSSI, *Immagine di Galileo*, «Nuncius», IX (1994), fasc. 1, pp. 3-14; R.J. RUSSELL, *Catholic Astronomers and the Copernican System after the Condemnation of Galileo*, «Annals of

the sense of Holy Scripture, according to the literal meaning of the words and according to the common interpretation and understanding of the Holy Fathers and the doctors of theology». The theologians concluded as well that the claim that the earth moves was also foolish and absurd in philosophy and, «in regard to theological truth it is at least erroneous in faith»⁹⁸.

The first part of each of the two conclusions reached by the theologians of the Inquisition⁹⁹ is that Copernican astronomy «is false and absurd» [*stultam et absurdam*]

Science», vol. 46 (1989), pp. 365-386; G. SACCHI, *Sulla condanna del sistema copernicano*, Torino 1913; F. RUSSO, *Lettre à Christine de Lorraine Grande-Duchesse de Toscane (1615)*, «Revue d'histoire des sciences», 17 (1964), pp. 331-67, and a revised version as *Galileo and the Theology of His Time*, in CARDINAL P. POUPARD (ed.)-I. CAMPBELL (tr.), *Galileo Galilei: Towards a Resolution of 350 Years of Debate*, Duquesne University Press, 1987, pp. 103-124; W. SHEA, *La Controriforma e l'esegesi biblica di Galileo Galilei*, in A. BABOLIN (a cura di), *Problemi religiosi e filosofia*, La Garangola, Padova 1975, pp. 37-62; M. VIGANÒ, *Fede e scienza in Galileo*, in four parts, «La Civiltà Cattolica», 116/I (1965), pp. 36-44 and 228-239, 116/II (1965), pp. 35-47 and 447-455; R.S. WESTFALL, *Essays on the Trial of Galileo*, Vatican Observatory Publications, 1989; R.S. WESTMAN, *The Copernicans and the Churches*, in D. LINDBERG-R. NUMBERS (eds.), *God and Nature*, pp. 76-113; and E. ZOFFOLI, *Galileo: fede nella Ragione; ragioni della Fede*, Edizioni Studio Domenicano, Bologna 1990.

⁹⁸ S. PAGANO, *I Documenti del Processo di Galileo Galilei*, Vatican City, 1984, p. 99 [punctuation added]: «Omnes dixerunt dictam propositionem [that the sun is at the center and is motionless] esse stultam et absurdam in philosophia, et formaliter haereticam, quatenus contradicit expresse sententiis sacrae Scripturae in multis locis secundum proprietatem verborum et secundum communem expositionem et sensum Sanctorum Patrum et theologorum doctorum. Omnes dixerunt, hanc propositionem [the second, concerning the earth's motion] recipere eandem censuram in philosophia; et spectando veritatem theologiam, ad minus esse in fide erronea». M. FINOCCHIARO, *The Galileo Affair...*, o.c., p. 344, note 35, observes that the original Vatican mss (folio 42r) has a semicolon after "philosophia" and Favaro's EN of the works of Galileo (19: 321) has a comma. Pagano's transcription «conveys the impression that biblical contradiction is being given as a reason for ascribing both philosophical-scientific and theological heresy». When M. PESCE, *L'interpretazione della Bibbia...*, cit., p. 264, quotes this text he omits any punctuation. The expression "*in fide erronea*" distinguishes the second condemnation from the first. The scriptural affirmations concerning the stability of the earth permit a broader interpretation than do those concerning the motion of the sun. This same distinction can be found in a letter to Galileo from Cardinal Conti (1613) [EN, XI: 354-355] concerning the relationship between Scripture and Copernican astronomy: «et questa pare meno conforme alla Scriptura: perché, se bene quei luoghi dove si dice la terra sii stabile et ferma, si possono intendere della perpetuità della terra, nondimeno dove si dice che il sole giri e i cieli si muovono, non puole havere altra interpretazione, se non che parli conforme al commun modo del volgo; il quale modo di interpretare *senza gran necessità non si deve ammettere*» (emphasis added). Note how similar this is to Bellarmino's observation in his letter to Foscarini and Galileo (1615) that «if there were a demonstration [...]».

⁹⁹ The conclusions of a committee of theological consultants do not constitute Church doctrine. Cardinal Bellarmino informed Galileo of these conclusions and admonished him to abandon his support for Copernican astronomy. The disciplinary decree given to Galileo in 1616 is an important piece of evidence for Galileo's trial before the Inquisition in 1633. The only official act of the Church in 1616 was the decree of the Index of Forbidden Books which, among other things, ordered the suspension of the publication of Copernicus' *De revolutionibus* until it could be emended. It is interesting to note that this public decree does not use the word "heresy;" rather, it refers to «the false Pythagorean doctrine [i.e., the views of Copernicus], altogether contrary to Holy Scripture» [*falsam illam doctrinam Pithagoricam, divinaeque Scripturae omnino adversantem*] (S. PAGANO, *I Documenti del Processo di Galileo Galilei*, cit., p. 103).

philosophically. Why should the theological experts of the Inquisition care whether Copernican astronomy is false scientifically? First of all, there is the ancient Catholic commitment to the safeguarding of reason since, as Aquinas would say, reason is a way to God. Aquinas, himself, refers to those propositions about God, such as that He exists, which serve as preambles to faith. More importantly for our analysis is that these theologians were committed to the complementarity between science and scripture. In reaching the conclusion that Copernican astronomy *contradicts* the Bible, the theologians accepted as incontrovertibly true a particular geocentric cosmology, and, on the basis of such an acceptance, they insisted that the Bible be read in a certain way¹⁰⁰. Thus, in part, they subordinated scriptural interpretation to a physical theory. They proceeded in this manner because, like Galileo, they were convinced that the Bible contained scientific truths and that, on the basis of what is known to be true in the natural sciences, one could discover the same truth in related biblical passages¹⁰¹. Although Catholic theologians at the time of Galileo had at their disposal a rich tradition of biblical exegesis, they were not particularly concerned about probing the relationship between the natural sciences and the Bible, since they were preoccupied with those questions of biblical interpretation raised by the Protestant Reformation¹⁰².

¹⁰⁰FANTOLI, o.c., p. 218, notes that the theologians of the Inquisition excluded «*a priori* the possibility of any and all scientific proofs in favor of Copernicanism».

¹⁰¹W. BRANDMÜLLER, o.c., pp. 195-6, points out that Galileo's theological opponents failed to interpret the literal sense of Scripture in an adequate way, even though they had at their disposal both a tradition (from Augustine and Aquinas) and the views of contemporary exegetes which would have been sufficient for the task. «L'errore dell'Inquisizione fu proprio questo. Prigioniera dell'assolutizzazione della lettera biblica, la maggior parte degli esegeti di quel tempo non fu in grado di fare propria, per esempio, la posizione già presa dal cardinale Tommaso De Vio, detto il Gaetano, oppure di presagire i risultati dell'ermeneutica biblica del secolo XX. Non si faceva ancora parola dei diversi modi di esprimersi della Bibbia: i cosiddetti *generi letterari*». Recognizing that Galileo invokes principles of biblical interpretation that have their origin in Augustine, Brandmüller unfortunately (so it seems to me) continues: «[...] Galileo aveva proposto un metodo di interpretazione che oggi qualunque teologo, per quanto riguarda l'essenza, potrebbe tranquillamente sottoscrivere».

R. FABRIS, o.c., p. 39, observes that the «orientamento concordista nell'interpretare i testi biblici» was characteristic of theologians contemporary with Galileo. He notes that Nicolò Serario (1555-1609), Giovanni De Pineda (1558-1637), and Cornelius a Lapide (1567-1637), for example, when they discussed briefly Copernican astronomy declared «tale opinione non solo contrasta con la filosofia, ma anche con la sacra Scrittura». Above all, however, «nell'applicazione di tale criterio ermeneutico [i.e., to discover the literal sense of the Bible] nell'esegesi dei testi prevale la prospettiva teologica, acuita dalle preoccupazioni apologetiche e contraversistiche. All'interno di questa prospettiva appare ancora confusa la linea di demarcazione tra l'affermazione di fede e l'interpretazione storico-culturale della realtà. Alle soglie del metodo e sapere scientifico non appare chiara la distinzione tra concezione ideologica e formula scientifica. Parimenti agli inizi dell'esegesi storico-critica non è distintamente definito il confine tra formulazione storico-culturale del testo biblico e la sua valenza religiosa-teologica» (*ibidem*, p. 44).

¹⁰²R. FABRIS, *ibidem*, p. 36, observes that these «nuovi orientamenti, pur valendosi delle nuove acquisizioni filologiche e linguistiche, per l'impianto teorico si richiamano da una parte alla tradizione dei padri, in particolare ad Agostino e Girolamo, e dall'altra all'autorità dei teologi e commentatori medievali, Tommaso d'Aquino e Nicola da Lyra. Se si esclude la breve premessa del Pereira nel commento al Genesi, gli autori che affrontano la questione di ermeneutica e di metodologia, non trattano il problema del rapporto tra Scrittura e scienze naturali. Il campo

Galileo's theological claims are part of the traditional heritage of Catholicism, and, further, they are a part of the theological environment of the Counter Reformation Church¹⁰³. The Council of Trent's injunctions concerning the proper reading of Scripture are accepted by both Galileo and the Inquisition. A crucial feature of the disputes of the Reformation was the calling into question by the Reformers of the very criterion of truth by which one resolves theological questions, *viz.*, the Catholic Church's claim to be the authentic judge of all such disputes. Although Protestants and Catholics would disagree about the role of the Church as a criterion of truth, they could, however, and they did, appeal to a common text, the Bible: a text, which, in a sense, standing alone, served as the only common ground from which to argue. Both sides, thus, were encouraged to find in the Bible evidence for their respective theological conclusions. The Bible, therefore, came to be treated as a reservoir of conflicting theological propositions, of proof-texts to be used in arguments against one's opponents. As a result of such a "propositiona- lization" of the Bible, Protestants and Catholics tended to treat the Bible as a theological text book: a compendium of syllogisms or dogmatic propositions¹⁰⁴. One of the obvious dangers in viewing the Bible as a text book in theology is a literalistic reading of the text: a literalism which was all too apparent in the Inquisition's reaction to the perceived threat of the new astronomy. Do we not see a similar tendency in Galileo's insistence that we can discover scientific propositions in the Bible? Armed with scientific demonstrations we, or at least wise expositors, possess the key to discover those scientific propositions which are contained in the Bible. Thus, Galileo does not anticipate some modern distinction between the religious character of the Bible and the claims of science; rather, he embraces ancient traditions of Catholic theology and also affirms principles of biblical exegesis characteristic of Counter Reformation Catholicism.

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Abstract: *L'analisi di Galileo sulla relazione tra la scienza e la Bibbia spesso è stata considerata come anticipatrice della moderna comprensione della natura essenzialmente religiosa della Sacra Scrittura, e quindi come un invito all'emancipazione della scienza dall'autorità della Bibbia. Galileo, tuttavia, pensava che la Bibbia contenesse verità scientifiche e che fosse possibile scoprire il vero significato di quei passaggi biblici che riguardano i fenomeni naturali. Galileo e i teologi dell'Inquisizione condividevano gli stessi comuni principi, non solo per ciò che riguarda la nozione aristotelica di dimostrazione scientifica, ma anche per ciò che concerne l'esegesi biblica. Galileo riafferma l'interpretazione tradizionale cattolica della relazione tra la Bibbia e la scienza e, sotto molti aspetti, condivide il modo di intendere questa relazione caratteristica del cattolicesimo della Controriforma.*

degli interessi è dominato dalla prospettiva teologica che diventa preoccupazione apologetica nel confronto e dibattito con i riformatori. In tale contesto il fondamentale problema, dopo aver definito i vari sensi della Scrittura, è quello di stabilire qual è l'istanza ultima ed autorevole nella definizione del "senso vero e autentico" di un testo biblico».

¹⁰³R. Blackwell, R. Fabris, G. Leonardi, and C. Martini, cited in notes above, are particularly useful in describing the Catholic exegetical tradition at the end of the seventeenth century.

¹⁰⁴We see here a danger characteristic of seventeenth century theology: to insist on reducing all religious truth to dogmatic propositions. In such an environment it is easy for errors to become heresies. On the other hand, a danger characteristic of twentieth century theology is to exclude dogmatic propositions from the arena of religious truth.