Third doubt. Are the sun and the stars fixed in the sky and so move with the motion of the sky, or do they themselves move while the sky remains still? 232r St. Augustine (De Genesi, II, 10) leaves the question in double 48, but Chrysostom (sixth homily on Genesis) 49, Procopius (commenting the same text), Diodorus, Eusebius Emenescus and Theodoretus, all of them quoted by Luigi Lippomano in his Catena in Genesis, 50 posit as a necessary truth of Scripture that the stars are not fixed. In fact, as it is written that God placed the heavenly bodies in the firmament of heaven, so it is written later on that God placed man in paradise and it is certain that man was not fixed at one point in paradise. 51 But be that argument valid or not, if we wish to hold that the heaven of the stars is one only and formed of an igneous or airy substance, an hypothesis which we have declared more than once to be more in accord with the Scriptures, we must then of necessity say that the stars are not transported with the movements of the sky, but they move of themselves.
like the birds of the air and the fish of the water. In fact, it is known that the motion of the planets is diverse: one is faster, the other slower, and it is clear to everyone that one same heaven cannot move at the same time with diverse velocities. Against this theory there exists only one argument of any weight. In fact, the one of Aristotle in De Coelis. I. If whereby the heavenly bodies do not move of their own accord because they do not have feet, is laughable not everything that has autonomous motion makes use of feet, but only those objects which move by taking steps. The serious argument is rather the one whereby the stars appear to us to be endowed with two motions, one from east to west with a period of 24 hours, the other from west to east with different velocities for the different heavenly bodies: the moon completes its orbit in a month, the sun in a year, etc.

In response to this argument first of all I say it is not the task of the theologian to analyze this order of phenomena especially when the controversies over the explanations are still lively among astronomers. In fact some attribute this movement to the moon to the earth, all of the earthly bodies being still. Others have recourse to the hypothesis of epicycles and eccentricities; others to the autonomous motion of the heavenly bodies. Thus it is possible for us to select among them the one which best corresponds to the Sacred Scriptures. If then one ascertained with evidence 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 cannot be in contrast with any other truth, philosophical or astrological. Secondly I say that it appears to me, as I have based on the 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. Such an apparent motion comes from the fact that velocity differs from one heavenly body to another. For example, if at the ninth hour, at vespers time, the moon appears in conjunction with another heavenly body, for instance Venus or Mars or some other body, an observation made tomorrow at the same time will show the moon at a distance from the object in the east direction. Some then deduce from this that the moon, while it goes ahead together with the other heavenly objects, at the same time moves from west to east with a motion of its own. We say instead that it does not have such retrograde motion but that its own motion is simply not so fast as to have it cover an orbit in the same time in which the other object, which is faster, covers. This is the case, we say that in 24 hours the moon completes a retrograde motion of 12 degrees, we say that in 24 hours it comes to lack 12 degrees to the completion of its orbit. While others say that in 24 hours the sun covers a degree retrograde motion, we say that in 24 hours it comes to lack one degree to the completion of its orbit; the same thing can be said for the other heavenly objects. The fact, then, that the sun and the other planets seem to move on an oblique circle called the zodiac, at which one time seems to lean to the north and another to the south, comes from the circumstance that the sun and the planets do not have an exactly circular motion but one in a spiral. Thirdly I say that the thesis of the astronomers that the heavenly bodies are moved by
the heavens, does not appear to be valid at present because many laughable
and incredible consequences come from it: 1) it would be necessary to say that
some stars have orbits with periods of 30,000 or 40,000 years, but the world
will not last that long. 2) it would be necessary to say that one and the
same star describes contrary movements, a notion difficult to clarify and even
more so to uphold. 3) it would be necessary to say that one heaven brings
about the rotation of two others, and this is incomprehensible because
considered in themselves the heavens are contiguous, not continuous, and
there does not exist in them any supports or glue whereby they would adhere
to one another; 4) such complex and extraordinary structures as epicycles
and eccentricities are dreamed up so that even the astrologers are reticent to
speak about them.

Fourth doubt. Whether, the sun apart, the moon is the largest of the
heavenly bodies. Mt response is that this is the thing which appeared most
probable to the Holy Fathers of the Church, both because the Scripture called
these two bodies “luminaria magna” and because the moon appears to our
senses incomparably larger than any of the other heavenly bodies. Augustine in
De Genesi, II, 16 is of this opinion. Basil (sixth homily on the six days) do not especially support it
but they seem to suppose it as most certain; in fact they say that the sun and
the moon are called “luminaria magna” not so much in comparison with the
other heavenly bodies, but as the sea is absolutely large, and the
heavens large, etc. The astrologers have a different opinion because they
believe that the sun is the largest of the heavenly bodies and, with the
exception of Mercury, that the moon is the smallest. The basis of their
argument is that they suppose the existence of huge intervals between the
moon and the other heavenly bodies. But this can be easily denied, especially
if one assumes the existence of a single sidereal heaven.
in the meridian appear, it is evident, to be carried by the heavens, and in the intermediate regions they make the longest circles, at the extremities, the shortest" (Scheiner 1626 1630, 78).

65. This consideration was dear to Bellarmine. He repeated it many times up to the time of the EmSSION in psalmos (Bellarmine 1611, 19v). It was probably not original because it could have been read by him in some of the Fathers quoted in the Lattine (for example, Theodoret, P. G. LXXX, 91 and Chrysostom, P. G. VIII, 41). Aquinas had already taken it from Chrysostom in the same place of the Summa (I, 78, 4) on which Bellarmine is commenting.

66. Genesis, I, 20, 22, 26, 3, 6 ("Vocavitque Deus Firmamentum, Caelum"). Ps. CXV, B, 16.

67. Cor. II, 2, 2: "Scio hominem in Christo ante annos quattuordecim, ut in corpore nescio, ut extra corpus necem, Deus est, raptum hucusque ad tertium caelum".

68. Hom. II, 8 (P. G. XXIX, 47-51).

69. Hom. III, 8 (P. G. XXIX, 71-74).


71. The analysis with certain precision fixes upon the following points: (1) the existence of distinct heavens, atmospheric, sidereal and empyrean is accepted, mainly on the basis of Scripture; (2) the distinction between the first two heavens, justified a little before in terms of optics, would also have a physical content: the first consists of air, the second of fire; (3) the empyreum does not seem to be considered as a non-place in which matter and physical space cease (as often in Scholasticism), Bellarmine follows a pre-scholastic tradition which attributes to the empyreum both a spatial nature and at least one physical property, that of reflecting light (luciditas); (4) having admitted the existence of both the first and the third heaven, the one through sensory evidence, the other through Scriptural evidence, the second heaven is defined as an intermediate region with a thickness and an internal structure not further specified; (5) the question, quid sunt ponendi caeli, arises, therefore, and properly so, as a question about the internal state of the second heaven or the astronomical heavens. The question, according to Bellarmine has not yet received from philosophers and astronomers a definitive and convincing answer. Such an answer cannot be deduced from truths about God, but only from an analysis of important phenomena. The implication seems to be that the content of the answer is essential from a technical point of view, but not from a theological point of view. Thus the religious connection between God and the world would be conceptually unrelated to the structure of the world. Consistent with this point of view, Bellarmine will discuss a little further along in the Lattine, in purely astronomical terms, the structure of the second heaven, by delineating those hypotheses which years later, in the letter to Cesi, he will recognize as technically inadequate.

72. Timaevus, 40 a.

73. See note 15.

74. See note 7.
83. See note 8.

84. S. P. N. Jurati (Chrysostomum. I. m. liisar XXI de statu ad populum Antonianum habitan. IX., 4 (P. G. XIX. 1083) c. 2 (XIX. 112).

85. See note 9.

86. See note 11.

87. See note 47.


89. Hom. III. 7 (P. G. XXIX. 67. 71).

82. The religious conviction about the end of the world implies in Bellarmine's thought a rather specific and characteristic chronology and as such becomes a criterion for choosing between various analyses of celestial phenomena. See note 95.

83. A widely accepted historical thesis holds that the problem a quo motu venit plenitudo, fundamental after Kepler, had little importance in Prolemaic astronomy, because there the rotation of the spheres, by definition continuous and uniform, was considered to be a sufficient explanation. The position of Bellarmine shows, however, that there are three issues implicit in the problem:

(a) The mathematical composition of the orbits;
(b) The kinematical composition of irregular motions with uniform circular motions;
(c) The dynamical origin of circular motions or, if these are rejected, the acceleration of the planets in their apparent orbits. Bellarmine admitted (a) as a logical possibility but not as a physical reality. Therefore (b) has no interest for him while (c) has a considerable interest. This conceptual situation, in its general lines, is closer to that of Kepler than to that of Galilei.


86. Lippomano 1546, 30a.

87. This linguistic argument is taken from Chrysostomum, Hom. VI. 5 (P. G. LIII. 59), a text already cited in the Lociiems. Lippomano had already presented it in the same citation as in note 86.

88. This image is not a chance one. In those days Jesuit philosophers and mathematicians often used it ironically to discredit the thesis which Bellarmine supports. Pierre (1591, 13) presented the thesis that: "movet stellas per ciecum, ut piscis per aquam, et aves per aerem" (for the stars to move through the heavens as fish in water or birds in the air) is something which "repugnant manifestis experimentis et rationibus philosophiae" (contradicts manifest experiments and philosophical conclusions). Cluvius wrote in the Commentarios in Sermoom (1581, 41): "auts non per se moventur, ut piscis in aqua, vel aves in aer" (Stars do not move by themselves, like fish in water or birds in the air). To deny that the surroundings had a dynamic role in the motions of the stars implied that they were at rest and that they were not sold nor subdivided into spherical regions. These aspects are logically connected and it is difficult to establish which was primary in driving the young author of the Lociems to his unorthodox reflections.

89. The reference is to De Coeli (Bk. IV. 280. 290; 18) Bellarmine's attention to be move forces the text, which does not consider "fect" of the stars could still be determination or prevention. The second possibility is even in spherical bodies which nature "has deprived of all means by which away as possible from being endowed with organs of motion:"

90. It is known that a distinction between theological discourse and tradition of the universities and then into the doctrinal and institutional usage of the Church, and later numerous documents of the Congregation of the Index a particular relationship between philosophy and theology as presented by others, according to whom the distinction between the two areas of discourse is not so radical as it is, for example, in Ockham. Therefore, the only explanation for certain assertions of the Lociems and for the position taken by Bellarmine towards the Copernicanism of 1613-1616, while a more radical position would have been inconsistent with them.
reveal, in the one who wrote them, a certain sequence of cosmological belief and not others. In this regard, we note that Bellarmine’s evaluation of Biblical cosmology was without doubt more adequate than the common interpretation of Genesis by the scholastics (for cosmological ideas in the Bible see Schiaparelli 1903). But one must be careful not to apply strict philology to those times when scriptural expressions were meant to be much more closely connected to divine inspiration than to human meditation.

The ideas of Bellarmine on scriptural exegesis are given primarily in his Contraversiae and specifically in Contraversiae Generali de 1 liber Dei (Bellarmine 1721, v. 1, Book III, chapters 1 and 3). He distinguishes the form and the content of the text and for each he lists the difficulties for interpretation. Following tradition he allows a literal and a spiritual or mystical sense of the text and the literal sense may be either simple (“simplex”) or figurative (“figuratus”). He notes that in the Bible we find “oraciones figuratae numeratae,” and therefore in general for him the figurative sense is not contrary to the exegetical approach later championed by Galileo but already given by the Church Fathers (Bellarmine 1721, v. 1, 64). He makes clear, however, that while every Biblical passage has a literal sense, not every one has a spiritual sense and he leans towards the belief that Mosaic books of the Old Testament have an historical sense and, therefore, a simple (“simplex”) literal sense (Bellarmine 1721, v. 1, 64-71). In the Prima Contraversiae de Canidas, et Ecclesia Militante he writes that “in Scriptura nullus potest esse error, sive agatur de fide, sive de moribus, et sive affirmatur aliquae generalis... sive aliquud particulare”, because in it “non solum sententiae, sed verba omnia, et singula ad fidem pertinent.” Gredanus enim nullum esse verbum in Scriptura fruitor, ut non recte positurum” (Bellarmine 1721, II 43). All of those affirmations together appear to show that Bellarmine was convinced that at least some of the passages implying geocentrism had a simple (“simplex”) literal sense and where, therefore, explicit divine teachings. This conviction was strengthened by the fact that the symmetry of a geocentric cosmos was in perfect agreement with the belief in the separation in space of heaven and hell: “conscientiam est rationi ut locus Daemorum et hominum impiorum et reprehensorum longissime distet ab eo loco, in quo Angelos et beatos homines perpetus futuros non dubitamus: locus autem beatorum... coelum est; a coelo vero nihil abest longius, quam terrae centrum”; “si locus beatorum est in summo caelo, locus damnatorum (est) in loco remississimo a coelo, nihil autem remissum centro terrae” (Bellarmine 1721, I, 222, II, 310).

At times in the Lectiones, when Bellarmine 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. Thus, when Galileo reproposed the Copernican hypothesis, the principle of equivalence of hypotheses came to be subordinated to the principle of conformity with the Bible. This explains perhaps the changing attitude of Bellarmine in the years 1611 to 1616 and above all his tenacity in assigning a purely hypothetical value to Copernicanism. If this is correct, the usual judgement of the reasons for the first process against Galileo, namely an alteration of scholasticism from the new science, requires some restriction. The decisive factor was rather something less specific and much less susceptible to reform, that is, a radical way of understanding revelation. One might add, as emphasized recently by Pedersen (1983), that the Copernican crisis broke out at an historical moment when the scholastic systematization of theology had become rigid as a consequence of the Protestant question. Thus anything that even remotely threatened scholasticism was seen as a challenge to the faith. 93 This principle, already given by Aquinas, is the theological counterpart to the familiar scholastic axiom. One truth cannot contradict another. In theology this could be broadly applied, including the requirement of conformity to Scripture which we have discussed in note 92. We know that Galileo also drew from traditional exegesis, almost certainly from Pereira, the principle of the agreement of Scripture and nature, but he proposed to treat the cases where they apparently differed by means of a Patristic concept, that of the metaphorical and simplifying character of certain biblical assertions. But Galileo, desirous to show that “the Moses physics” was comparable with heliocentrism, was forced to employ it for statements whose genetic and geostatic meaning had always appeared beyond doubt. Furthermore, another well established exegetical practice was that of attributing an historical character to Genesis considering it to be a narration of real events which occurred in the manner and time sequence given therein (Pereira 1599, 11). This historical character was threatened by the proposal of Galileo on the metaphorical and simplifying character of certain Biblical statements. The general religious culture of the time, and not only the Catholic culture, would not admit such an overall metaphorical interpretation. Proof is given by the writings of Bellarmine after 1616 which assert more explicitly than the Lectiones that the Earth is static (Expositio in Psalmus 95, 101, 75-5-6, De Assumpta 55-6, 156-8). In the letter to Foscarini he reafirms the requirement that “recte intelligitur Scriptura, ut cum... perspectiva veritatis non pugnent” but he denies outright that Copernicanism is physically a veritas perspectiva.

94 Since previous arguments were based on Scripture, the refusal to interpret the apparent motions as resulting from many uniform circular motions could still be considered a theological thesis. Now, however, Bellarmine goes to the terrain of astronomy, for which there had been for a long time an interest in his family (Baldini 1984). Having renounced the hypothesis of the spheres but keeping the Earth immobile, he was forced to deny the distinction between daily and annual motion and to interpret these two motions as coming from an erroneous analysis of one complex motion which each heavenly body followed about the earth with common East-West motions, but with different periods and orbits. The small difference of each period with respect to that of the fixed stars, when summed up over time, produces that which has been traditionally interpreted as a second revolution contrary to the first. The joining together of the successive positions of the heavenly body with respect to the stars and the time which it employed to return to its initial position are what have been called the orbit...
of that body and the period of the orbit. This model produces a complex real motion for the sun and much more complex ones in the case of the planets. The sun would describe a spiral alternating about the earth's axis and contained between the latitudes of the solstices. It was precisely this motion which the Ptolemaic system and the Copernican system considered to be only apparent and not real.

As for the planets, Bellarmine seems to think that the irregular motions which they have in his model are physically possible through the fluidity of the matter which fills space. Still it is clear that they could not be explained by him in terms of a constant motive force and they required postulating something like a continuous miracle. Even though it may have provided a certain fascination for biblical fundamentalism and the mystical tendency of Bellarmine, its physical plausibility was minimum and so too was the possibility of a mathematical model being developed. Besides the structure of the fixed stars appeared to show the existence of a sphere (see note 64) and this, as Bellarmine will write many years later to Cesi, convinced him not to develop his ideas.

But there are proofs that he still held the convictions of the Lociiones. Besides the letter to Cesi and the evidence referred to by Scheiner in Rerum Utriusque there is a document which shows that he manifested these convictions to the mathematicians of the Roman College in the years of crisis, 1611-1616. In 1616 the successor to Clavius, C. G. Grienberger, examined a book not yet published, written by another Jesuit, G. Biancani, professor of mathematics at college of Parma, where only one heavenly sphere, that of the stars was allowed. He wrote: "Id... mihi semper visum est probabilissimum... et scio communem omnium placere. Inpraestantissimi Bellarmini, qui etiam a motu planetarum extra orbem reales, et solidos necquaquam abhorret et corruptibilismem in coelestes autem notoritus, putate opinionem hanc confirme am eum sacris litteris, earumque exposituribus." ("This always seemed most probable to me and I know it is a thesis which has general approval. Among its most decisive supporters there is the illustrious Cardinal Bellarmine, who moreover is not at all against admitting that the planets move independently of material spheres and even admits that heavenly objects might be corruptible, maintaining that this point of view is in keeping with Sacred Scripture and those who interpret it"). Grienberger added that, instead of supposing so many spheres for each heavenly body: "nulla ratio sauderet vel saltarem convincere videtur astra non posse immediate per se vel per intelligentiam ensis lineis descriptisque: si ad motum pluriem orbium circumdeditum patentur nam etiam hic nulla ratione dici potest regula astra pluralibus simul motibus moveri, sed uno tantum eoque irregulare ex omnibus ills vel composito vel potius resultantem qualis est motus spiralis in Sole" (no argument seems to make plausible much less to prove, that the heavenly bodies could not, by their own power or by the intervention of heavenly intelligences travel those same orbits in heaven which they would in fact trace out under the hypothesis that they were moved by the rotation of more than one sphere. In this case no argument proves that the heavenly bodies are subject at the same time to more than one motion, it being irregular put together from or either resulting from all the motions. Such a motion is the spiral one of the Sun) [ARS], 1: 655, 115f]. The concept of annus muta irregularis and the use of the Sun as an example are identical to what Bellarmine held.

Thanks to Grienberger and Biancani the thesis of Bellarmine survived even after his death at the two principal scientific centers of the Society of Jesus in Italy, the Roman College and the College of Parma. In general the mathematicians at these colleges continued to propose the Ptolemaic model and the one of Brahe, but they presented them only as hypotheses and justified them only on the basis of their mathematical simplicity and their usefulness for making predictions. On the other hand, in the writings of the philosophers and in the theses of their students these mathematical models were seen as simply abstract analyses of a physical reality identical to that given by Bellarmine, though he was not explicitly mentioned. For the Roman College see Giustinian (1653, 416-621); Caproni (1653, 167-648); Pellici (1676, 451; he did not teach at Rome but followed Giustinian); for the College of Parma see Rocca (1627, 30-40) and Cabeo (1646, 218-222).

These two traditions, which might be called mathematical-astronomical and physical, converged in the work of the best Italian Jesuit astronomer of the 17th century, G. B. Riccioli, a student of Biancani and Cabeo. He followed completely the mathematical tradition as to the composition of the planetary orbits with uniform circular motions and, as a matter of fact, his model is a modification of that of Brahe (Riccioli: 1651, 1. 2, 288-289). Although this is well known, historians have paid little attention to his theory or the motion of the sun (Riccioli 1665, 1. 65-69). By placing the earth immobile at the center and supposing the orbits of the inferior planets to be circles with the sun at the center, he is forced to have the sun move in a spiral, just as hypothesized by Bellarmine. Riccioli was the last to discuss this spiral motion and after the middle of the century the ideas of Bellarmine were abandoned.

95. The elapsa stellae are the fixed stars, distinct from the planets. Their cursus is precession, for which Bellsphine recalls the Ptolemaic period (one degree per century giving 36,000 years) and the Alphomne period (one degree in 136 years giving 49,000 years). It is very characteristic that as a theologian he considered the cursus to be ridiculous and inadmirable solely because of its duration. That opinion comes from both a calculation, based on the Bible, of the since the creation and from a prediction of the future duration of the world, inspired by the traditions of millenarianism. The implied logical step appears to be that God with 1638 did not have created a cyclic motion which could not complete its course because its period would have been much longer than the duration of the universe itself. How much greater? Bellarmine discusses the age of the universe in several of his writings. Already in the Lociiones (in a passage not given here, 239v in the margin) be cites favorably the thesis of the Fathers of the Church and theologians that mundum duraturum sex millibus annum after Adam, and in his edited works he presents that opinion as plausible, but he does not say certain. His biblical chronology is arranged by computing about 4000 years from the creation to the birth of Christ (Bellarmine 1613, xen 1936, 50-71).
Thus if the precession were real then during the whole age of the world the equinoctial point would travel at most 60 degrees along the ecliptic, that is, only one sixth of its predicted course. This estimation of the age of the world was not personal to Bellarmine but was rather due to the fusion of two elements of which at least the first (the number of years from Adam to Christ) had been handed down with small variations from the Patriarchs to the Scholastic period and to the theologians of the Roman College, Peraea among them (Wallace 1977, 258-9; 1981, 221-3). It is worth noting that the estimate of 4000 years from Adam to Christ, later confirmed by the chronology of the 17th century, from J. Decker and Kepler to Newton, did not agree with the tradition of the Tabular Alphominae, in which the number of years from Adam to Alphonse X of Castille (about 1250) was said to be 6984. This second value appears to have been rejected by the mathematicians of the Roman College, while the former was accepted by the theologians and philosophers. In correspondence with Biancani, to show that the age of the Universe did not exclude the possibility of changes in heaven, Grienberger recalled that the world "had not yet reached 8000 years old" (ARSI, P. G. 555, 114).

96. This objection concerns the possibility that a heavenly body could follow many movements simultaneously. Naturally for Bellarmine, as for all philosophers of the Society of Jesus in those years, mechanics meant Aristotelian mechanics, in which the principle of simplicity of motion was dominant, whereby astronomers attributed one motion only to each heavenly body, a motion relative to the medium in which it moved. The medium itself could move with respect to another medium and so on, but Bellarmine excluded this possibility.

97. The transmission of the motion of the outer spheres to the inner ones had been a presupposition in all the variants of spherical astronomy. But it had never been spelled out in terms compatible with the exact parameters of each sphere’s motion, nor had it really been justified, as Bellarmine points out, by the material characteristics of the spheres themselves. It is strange that Bellarmine does not recall here the thesis of the medieval theologians that there were angelic intelligences associated with each sphere. It may be that Bellarmine shared the idea of Grienberger (see the letter to Biancani, note 94) that if one admits angelic intelligences it is more proper to put them in each heavenly body rather than in the respective spheres. Also in the letter to Cesi to the Cardinal (Scheiner 1626-1630, 781) the motion of the planets in a fluid medium was attributed to angelic intelligences in each body. The fact that in his response Bellarmine did not object to this may indicate that he shared the hypothesis.

98. It is the common consensus of historians that between the end of the 16th century and the first decades of the 17th astronomical theory had become artificial and incoherent, and this is cited as the incentive to search for a more comprehensive interpretation of celestial phenomena (Kuhn 1957, chapter 5). While this judgment is common in Clavis, Grienberger and the mathematicians of the period, it is rather exceptional to see it expressed by philosophers and theologians such as Bellarmine, since they were more occupied with the acceptability of the metaphysics rather than the technical adequacy of the models.


100. Hom. VI, 10-11 (P. G., XXIX, 141-148).


102. In 17th century Italy a wide-spread series of the measured diameters of the planets (expressed in earth diameters) was the one of F. Masiolico, reproduced by Clavis (1581, 187): Saturn 45, Jupiter 46, Mars 1.2, Sun 5.5, Venus 0.33, Mercury 0.033, the Moon 0.29.

103. In other works Bellarmine frequently uses astronomical measurements as a means to a mystical feeling of wonder for the infinite divine power. Here, however, he is offering a critique of astronomical models. Up until the work of Brahe the estimate of the diameters of the heavenly bodies was almost completely conjectural. This was due in part to inexact data and methods and in part to the adopted theories. Bellarmine presupposes that the elimination of the multiplicity of the spheres will substantially reduce the estimated distances to the stars. In the absence of an observable paradox and excluding the existence of empty spaces between the spheres, this distance is equivalent to the sum of the thickness of all the aether, from the moon to Saturn. In this way the distance of the stars from the earth was calculated by Al Parghoni to be 22021.5 earth radii and this was accepted by Clavis (1581, 211). Bellarmine shows a certain scepticism about the traditional measurements of distances and astronomical sizes as indicated by his critique of traditional astronomical models, even in his late works. In the Convivio (Bellarmine 1617, 465) he wrote: ‘Neque obieceris mihi Astronomorum decreta, qui Lunam pene minima stellarum esse voluit. Pirum enim neque ipsi id facile demonstras, neque nos, si negare id voluerimus, praeterea Haereticus erimus, praesteream cum Moyse s quam speres dicas, f ascite Deum duum luminarium magnar luminum maius, videlicet Solarum, ut praecesset dies, et luminum minus hoc est Lunam, ut praecesset noxii’ (here Bellarmine cites Genesis, 1, 10). Deinde D. Augustinus csp. 16 ibi, 21 super Genaem nonne aperitisse doctcr, multo esse melius scripture divinse de Lunae magnitudine, quam Astronomi credere, cum ipsi non solum Luna, sed etiam Sole stellaris aliquos maiorisque esse contining: Quod, ut in loco idem Augustinos sit, nisi absurdissime dici non potest... Verum quippe de haec controversia vanendum sit, neque enim Astronomorum inimicitias gerendas mihi esse urquam putaviti...” (Do not claim that the judgement of the astronomers is in contrast to mine. They hold that the moon is the smallest of the heavenly bodies. First of all it would not be easy for them to demonstrate this nor would one be a heretic for denying it, especially since Moses said quite explicitly: “God made two great luminaries, the greater to look over the day, the lesser the night.” Besides did not St. Augustine (De Genesi ad litteram XXI, 16) say that it is much better to believe the scriptures than the astronomers with respect to the size of the moon, since the astronomers hold that certain stars are not only larger than the moon but also larger than the Sun? As St. Augustine says on that point: you can only consider it most absurd. But whatever the truth is on this unresolved question, I have never wanted to enter into hostilities with the astronomers).
Two comments are in order. First, it confirms what we have said about the characteristic points of his critique of traditional astronomy. He notes that the methods of measuring depend upon hypothetical models which partially control the phenomena. He wishes to substantiate these hypotheses constructed models with one, not divorced necessarily from the phenomena, but based upon Scripture rather than upon science. Secondly, the contrast between biblical expressions and astronomical measurements, which Bellarmine resolves in favor of the former, is treated differently in the more scholastic express of Perekon, who quotes Exegesis for whom the biblical phrase means that the Sun and Moon are the largest bodies. He writes, however (Perekon, 1590, 93.95) that such is described by the *mensuratur rationem mathematicam* by which the first magnitude stars have volumes equal to 10^7 earth volumes; the volume of the Sun is equal to 160 earth volumes and 659 moon volumes; the moon is the smallest planet, except for Mercury. Perekon found these measurements in Clavius (1581, 185) who had taken them from Maurolico. The contrast between the two Jesuit theologians, colleagues at the Roman College, reveals a complex situation. Philosophically Bellarmine was closer to the truth and some of his criticisms of the physics of the Ptolemaic system are acute. His concept, however, of the relation between revelation and human investigation, 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. On the other hand Perekon's position, since he avoided a rigid literal interpretation of many biblical passages, assured in principle a greater freedom of research. But this was at the price of projecting into the Bible Aristotelian and Ptolemaic concepts, which took on thereby a theological value. Although Bellarmine intuitively 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 others, was part of the Hebrew cosmology and thus also part of the Bible. This circumstance led him to share in the opposition to Copernicanism and in the decision of 1616. This should not, however, hide the fact that he thought differently than the scholastics and that he tried in some original way to reformulate the classical picture of the cosmos.