

PLANETS,  
STARS, AND ORBS

*The Medieval Cosmos, 1200–1687*

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*In remembrance*

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Amicus appears to have interpreted the degree of difference between the worlds before and after Judgment Day as sufficiently great to warrant new divine regulations for the eternal perpetuation of the altered world. Does this imply that he further believed that the prejudgment and postjudgment worlds were substantially different? If so, he would have differed radically from his contemporary, Aversa, who, as we saw, viewed the differences between those worlds as only accidental. Amicus and Aversa seem to represent the two basic interpretations toward which scholastic opinion gravitated.

### V. Medieval ambivalence

The debate over the eternity of the world concerned both ends of the temporal spectrum. At the front end, so to speak, the question posed was whether the world was a temporal creation or was without a beginning. At the back end, the question focused on whether a supernaturally created world could endure forever and, if so, whether God intended to let it do so. Conventional views of scholastics prepare us for a simple, direct response to these questions: the world was created in time and would come to an end on the Day of Judgment. The actual responses to these difficult questions, however, subvert our ordinary expectations. We are surprised to find a considerable sentiment for a world that might be logically conceived as coeternal with God or for one that would have been without a beginning, "naturally speaking," if God had not created the world supernaturally. It seems no exaggeration to suggest that medieval natural philosophers sought to have both faith and Aristotle simultaneously. The outcome of this ambivalence generated the kinds of arguments that we have examined in this chapter.

## 5

# The creation of the world

On one aspect of the creation account, Genesis is explicit: the world was created in six days, and God rested on the seventh. Despite the apparent straightforwardness of the account of a six-day creation, numerous commentators on Genesis, beginning with the commentaries of Philo Judaeus (in Greek) and Saint Augustine (in Latin), imposed radically different interpretations on the seemingly plain text. The widespread medieval belief in syncategorematic infinities and in the possibility of an eternal and created world, described in Chapter 4, may already have alerted readers to expect something other than a literal exposition.

### I. Was creation simultaneous, in six days, or both?

The various interpretations of the creation may be reduced to three basic types, all deriving from the first five centuries of Christianity. The first was a literal interpretation in which God was assumed to have created the world in six successive, natural days of twenty-four hours. The second assumed that the world and all the things in it were created simultaneously and instantaneously. The third opinion combined the first two by assuming the creation of an elementary, unformed matter at the beginning which was subsequently formed into our world over a period of six days.<sup>1</sup> We must now investigate the manner in which scholastic natural philosophers and theologians interpreted the six days of creation.

The departure from the literal account was given Church sanction in the first of seventy canons that issued from the Fourth Lateran Council, presided over by Pope Innocent III in 1215. In the relevant canon, the faithful were told that thereafter they were to believe that God was "the creator of all visible and invisible things, spiritual and corporeal, who, by His omnipotent power created each creature, spiritual and corporeal, namely angelic and mundane, at the beginning of time simultaneously [*simul*] from nothing; and then [*deinde*] made man from spirit and body."<sup>2</sup>

1. My tripartite division follows that of William A. Wallace, tr., in Thomas Aquinas, *Summa theologiae*, 1967, vol. 10, app. 7: "Hexaemeron: Patristic Accounts," pp. 203-204.
2. "Pater generans . . . creator omnium invisibilium et visibilium, spiritualium et corporalium, qui sua omnipotentia virtute simul ab initio temporis utramque de nihilo condidit creaturam, spiritualement et corporalem, angelicam videlicet et mundanam, ac deinde humanum quasi communem ex spiritu et corpore constitutam." Hefele, 1913, 1324.

Although the council of 1215 seems at first glance to have proclaimed a simultaneous creation for everything, both corporeal and spiritual, it then spoke of the advent of man as a subsequent creation, in which "spirit and body" were combined. The proclamation of a simultaneous creation at the council indicates not only the probable influence of the book of Ecclesiasticus but also that of Saint Augustine. In the former we are told: "He that lives forever created all things together [*simul*]" – that is, at the same time, or instantaneously.<sup>3</sup> Was there not a conflict between Ecclesiasticus and Genesis, which describes a creation spread over six days, not one made simultaneously? Augustine took note of the seeming dilemma when he declared that "In this narrative of creation Holy Scripture has said of the Creator that He completed His works in six days; and elsewhere, without contradicting this, it has been written of the same Creator that He created all things together."<sup>4</sup> What exegesis did Augustine employ to avoid what seems a straightforward contradiction between a simultaneous creation and one extending over six days? Augustine explained that God did indeed create all things simultaneously but chose to narrate the creation day by day, because "those who cannot understand the meaning of the text, *He created all things together*, cannot arrive at the meaning of Scripture unless the narrative proceeds slowly step by step."<sup>5</sup>

But it was not merely for our convenience that the scriptural narrative specifies six days. Augustine insisted that God not only created all things simultaneously but also in six days – that is, "the creation of things took place all at once" but there was also a "before" and "after."<sup>6</sup> For despite the simultaneity, God followed the order described in Genesis. To illustrate how this might be envisioned, Augustine invokes the rising Sun. Although we see the rising Sun in a virtually instantaneous moment, the ray that goes from our eyes to the Sun passes over all the intervening spaces – that is, passes over things in a certain order, nearer things first and then more remote things until it reaches the Sun. And so it was with the creation of the world. All things were created in the order described in Genesis, but in an instant, so quickly that "before" and "after" were indistinguishable.<sup>7</sup>

3. Eccles. 18.1: "Qui vivit in aeternum creavit omnia simul." From the Latin of the Vulgate Bible.
4. Augustine, *Genesis*, bk. 4, ch. 33, 1982, 1:142. In a note to this passage, the editor (Taylor) explains (1:254, n. 69) that "the word *simul* ('at one time,' 'all together') in the Latin version seems to be a mistranslation of the Greek κοινῇ ('commonly,' 'without exception'). A more accurate translation, therefore, would probably be: 'He who lives forever created the whole universe.'"
5. Augustine, *ibid.*
6. *Ibid.*, ch. 34, 1:143–145. The title of chapter 34 is "All things were made both simultaneously and in six days."
7. God effected a simultaneous creation by first creating seeds, or *rationes seminales*, of everything all at once and then allowing each of them to develop later at different times. For example, in *The Literal Meaning of Genesis* (bk. 7, ch. 28), 1982, 2:30–31, Augustine declares: "I have been let to hold that God first created all things simultaneously at the beginning of the ages, creating some in their own substances and others in pre-existing causes. Hence the all-powerful God has made not only what is existing at the present, but also what is

Of the three basic interpretations of the creation that I have mentioned, Augustine's seems to approximate most closely to the third. All things were created simultaneously in the seeds, or *rationes seminales*, and these came into being in the order described in Genesis.

As is obvious, the Fourth Lateran Council did not rigorously follow Ecclesiasticus or Saint Augustine. In the council's statement, the creation of man is said to have followed the creation of everything else. Without mentioning six days, this statement did at least allow for successive creations: the first, of everything except man; the second, of man. Indeed, it could even be taken as supporting creation in six days, as it was by Pedro Hurtado de Mendoza.<sup>8</sup> Perhaps because of its vagueness, the council's brief statement about creation did not become doctrine, and various opinions were tolerated.<sup>9</sup>

Augustine's conception of a simultaneous creation of all things was probably the most widely held opinion on creation during the Middle Ages. Theologians of the stature of Peter Lombard, Alexander of Hales, Saint Bonaventure, and Thomas Aquinas supported it. Although Peter Lombard seems to have upheld simultaneous creation, he does report that although Augustine held that belief, others (such as Gregory, Jerome, and Bede) assumed that God first created a crude matter composed of a mixture of the four elements from which the different kinds of corporeal things were formed according to their proper species.<sup>10</sup>

to be." Frederick Copleston explains (1957, 77) that "In this way, God created in the beginning all the vegetation of the earth before it was actually growing on the earth, and even man himself. He [Augustine] would thus solve the apparent contradiction between Ecclesiasticus and Genesis by making a distinction. If you are speaking of actual formal completion, then Ecclesiasticus is not referring to this, whereas Genesis is: if you are including germinal or seminal creation, then this is what Ecclesiasticus refers to." Augustine describes the *rationes seminales* in his commentary on Genesis, books 5 and 6. From the time of Augustine, Ecclesiasticus 18.1 was frequently cited in contrast to Genesis. For example, see Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 74, art. 2, 1967, 10:154 (Latin).

8. Hurtado de Mendoza [*De coelo*, disp. 3, sec. 1], 1615, 376, col. 2; 377, col. 2; 378, col. 1. Hurtado argues that the relevant text from the Fourth Lateran Council supports the opinion that "the world was produced successively in six natural days" (377, col. 2) and was not simultaneous and instantaneous. As evidence of a successive creation, he cites the use of the adverbs *simul* and *deinde* in the council's text. These terms, he argues, "always signify the priority and posteriority of time." Thus Hurtado took the separate creations as equivalent to a successive, six-day creation and thus completely ignored the significance of *simul*.
9. The description of creation issued by the Fourth Lateran Council was frequently quoted in the seventeenth century in a number of contexts. Thus Matrius and Bellutus [*De coelo*, disp. 1, qu. 5, art. 1], 1727, 3:484, col. 2, par. 40, declare that the temporal creation of the world "is had from ch. 1 of Genesis and is defined in the Lateran Council and in the chapter *Firmiter*"; Franciscus Bonae Spei [comment. 3, *De coelo*, disp. 3, dub. 3], 1652, 6, col. 2, cites the Fourth Lateran Council in support of the claim that contrary to the opinions of Aristotle and Averroës, the world was created in time (on Bonae Spei, see this volume, Appendix II, n. 3). Finally, Illuminatus Oddus [*De coelo*, disp. 1, dub. 5], 1672, 9, col. 1, invokes the text to uphold the judgment that the world had its existence from God and not from itself (on Oddus, see Appendix II, note 5).
10. Peter Lombard, *Sentences*, bk. 2, dist. 2, ch. 5, 1971, 340, for what appears to be his



Figure 5. God, with compass in hand, designing the universe. (Österreichische Nationalbibliothek, Vienna, Latin MSS, MS. 2554, fol. 1r. See also Murdoch, 1984, 330.)

In apparent agreement with Saint Augustine, Alexander of Hales believed that the world was created simultaneously. Alexander distinguishes between “the making” (*factio*) and “the creation” (*creatio*) of something. The former

acceptance of simultaneous creation and bk. 2, dist. 12, ch. 2, 385, for the different opinions.

concerns distinct forms that produce all the essential features of things. The addition of forms to matter involves a temporal process – a before and after. By contrast, a creation concerns unformed matter and does not involve before and after. Therefore it lies outside of time and is simultaneous. Alexander believed that God first created the unformed matter from nothing<sup>11</sup> and then created the material and visible heavens and the earth from that unformed, or prime, matter.<sup>12</sup> He also asks whether “all created things were created in one indivisible ‘now’ [*nunc*] or in more, or whether each thing was created in a particular now.”<sup>13</sup> Alexander concludes that “all things were created in a single ‘now,’ ” because God’s power is more readily manifest by creating many things in one “now” than many things in more “nows” or only one thing in each “now.”<sup>14</sup> Alexander of Hales has obviously adopted a version of Augustine’s concept of a simultaneous creation.

Although Thomas Aquinas adopted a similar position on simultaneous creation, he sought to reconcile Augustine’s interpretation more explicitly with the literal six days of creation in Genesis. Thomas held that God created all things simultaneously with respect to their unformed substance but did not create them simultaneously with respect to their differentiation and ornamentation, which occurred over the six days.<sup>15</sup> God could, of course, have differentiated and ornamented all things simultaneously but chose instead to follow an ordered pattern. “And thus,” Thomas explains, “there was good reason that different days be made to serve for the different states of the world.”<sup>16</sup>

Over the centuries, variations on the theme of simultaneous creation appeared. In the seventeenth century, Bartholomew Amicus observed ([*De caelo*, tract. 2, qu. 4, dubit. 3, art. 2], 1626, 84, col. 2) that those who believe in a simultaneous creation are divided on how it occurred. Some think that all things, both simple (i.e., elemental) and mixed, were created simultaneously in an instant; others hold that all the simple bodies were produced in an instant and all the mixed bodies were produced in time. Still others believe that all things were created successively, but all in one day, while others deny a simultaneous creation, whether in an instant or in a day, and insist that the world was created in real time over six days.

11. For these ideas, see Alexander of Hales, *Summa theologica*, inquis. 3, tract. 1, qu. 1, ch. 3 (“*Utrum omne res corporales sint simul creatae*”), 1928, 313, col. 2, and tract. 2, qu. 1, ch. 4 (“*Utrum omnia naturalia sint facta simul in genere vel in specie*”), 321, col. 2; also tract. 1, ch. 2 (“*Utrum eadem sit informis materia caeli et terrae*”), 311, col. 2, for the statement about creation from nothing.
12. *Ibid.*, 311, col. 2–312, col. 1.
13. *Ibid.*, inquis. 3, tract. 1, qu. 1, ch. 3 (“*Utrum omnes res corporales sint simul creatae*”), 314, col. 1.
14. “*Quod concedimus quod omnia creata sunt in unico ‘nunc’ et illud ‘nunc’ non est aeternitatis nec ‘nunc’ temporis, sed ‘nunc’ aevi. Et hoc dicimus, tum quia magis manifestatur Dei potentia creando in uno ‘nunc’ multa.*” *Ibid.*, col. 2.
15. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 74, art. 2, 1967, 10:161.
16. *Ibid.* Indeed, Thomas seems here to follow a Greek tradition that derived from Philo Judaeus and Saint Basil and passed into Latin with Gregory the Great.

In the opinion he eventually adopted, Amicus argued (*ibid.*, art. 3, 85, cols. 1–2) that the things produced on the first day – the heavens and the elements with all their places and properties – were created in an instant. All other things were created on subsequent days. Moreover, the six days of creation are real, natural days, not spiritual entities (*ibid.*, 87, cols. 1–2). This is evident from Exodus 20.11, where it is said that “in six days the Lord made heaven and earth, the sea, and all that is in them.”<sup>17</sup> But why were some things made simultaneously and others not? Amicus confesses ignorance and invokes the free will of God. Basic things like the elements were made in the first instant, but mixed bodies composed of those elements were made later (*ibid.*, 85, col. 2).

In one or another of its various guises, medieval and Renaissance scholastics found Augustine’s idea of a simultaneous creation congenial. Although it found its strongest support during the thirteenth century, when Augustine’s theology and philosophy shaped the thought of conservative Franciscans, it continued to play a significant role. Like Thomas Aquinas and Bartholomew Amicus, however, most sought to reconcile it more closely with the six days of creation. Thus Amicus confined simultaneous creation to the things created on the first day. Indeed, between the thirteenth and seventeenth centuries many would have agreed with him that, whatever the order of created things, the creation was made over six natural days. In the 1230s, William of Auvergne argued against simultaneous creation when he declared that “the blessed creator does not say that things are done otherwise than they are done. Indeed he says that everything is done in its time, order, and place.”<sup>18</sup> Bartholomaeus Mastrius and his coauthor Bonaventura Bellutus declared that “with respect to permanent beings, the world could have existed from eternity, although not with respect to successive things. But in fact it was produced by God in time at the vernal equinox and in six days.”<sup>19</sup> Theologians who commented on the six days of creation, whether responding to the second book of Peter Lombard’s *Sentences* or another work, had little choice but to treat the days sequentially, as if each was an ordinary day.<sup>20</sup>

17. Translation from the *New English Bible* (1976).

18. “Creator benedictus non aliter dixit res fieri quam factae sint. Immo dixit unumquodque fieri sub tempore, ordine, et loco.” William of Auvergne, *De universo*, pt. 1 of pt. 1, ch. 22, 1:617, col. 2. On page 617, column 1, William declares that “not all things could be made simultaneously” (non omnia simul effici potuerunt).

19. Mastrius and Bellutus, *De coelo*, disp. 1, qu. 5, art. 1, 1727, 3:484, col. 2, par. 39. In summarizing Walter Burley’s definitions of *res permanens* and *res successiva*, Wilson, 1956, 32–33, describes the former “as a thing all the parts of which can exist at one time” and the latter, by contrast, as something “such as a motion or time, the different parts of which must exist at different times.”

20. Those who followed Saint Augustine would not have thought of the six days of creation as ordinary days determined by the Sun’s course. Augustine observed that God did not create the heavenly bodies until the fourth day. Therefore the first three days could hardly have been “ordinary.” Because he thought it would be inappropriate that the fourth through seventh days should be different from the first three, Augustine concluded that all seven days were identical and in no way ordinary (see Augustine, *Genesis*, bk. 4, ch.

## II. Was creation from nothing?

That creation was “from nothing” (*ex* or sometimes *de nihilo*) had become part of Christian belief perhaps as early as the second century, when “both the notion and the formula of the creation *ex nihilo*” are found in Theophilus of Antioch’s (fl. 181) apologetic treatise *To Autolytus*, “for the first time in words which preclude all hesitation on the meaning of the doctrine” (Gilson, 1955, 20). As Gilson explains, “The God of Theophilus is not a Greek ‘maker’ of the world; he is its creator” (*ibid.*). Indeed, some defined the creative act as the “production of something from nothing.”<sup>21</sup>

Despite the early shift to the concept of a creation from nothing, no explicit statement in the Jewish, Christian, or Muslim Scripture declares that creation was out of nothing – that is, *ex nihilo*.<sup>22</sup> According to Harry Wolfson, the phrase *ex nihilo* derives ultimately from the Second Book of Maccabees, 7.28,

where God is said to have made heaven and earth and all that is therein οὐκ ἐξ ὄντων, “not from things existent”, on the basis of which Church Fathers, to mention only the earliest one, the Pastor of Hermas, and the latest one, John of Damascus, in their formulation of the doctrine of creation, describe creation as being “from the nonexistent” (ἐκ τοῦ μὴ ὄντος). From the context, however, it can be shown that by “non-existent” they mean “nothing”.<sup>23</sup>

Although certain biblical passages suggested a world created from a preexisting chaos,<sup>24</sup> the *ex nihilo* doctrine triumphed. Its victory is perhaps at-

26, 1982, 1:134). Were the seven days each created in turn? Augustine denied this, because he could not account for the creation of the seventh day, on which God rested. If God did not create on the seventh day, how was the seventh day created? Augustine concluded that God created only one day, the first, and then multiplied it to produce each of the remaining six days (*ibid.*, chs. 20–21, 1:127–129).

21. In the seventeenth century, Sigismundus Serbellonus ([*De caelo*, disp. 1, qu. 1], 1663, 2:1, col. 2), in an article titled “What is creation” (Quid sit creatio), said that “creation is commonly called the production of a thing from nothing” (Communiter dicitur creatio productio rei ex nihilo). (On Serbellonus, see Appendix II, n. 4.) Much the same definition is offered by the Conimbricenses (“Creatio est alicuius e nihilo productio”) in Conimbricenses [*Physics*, bk. 8, ch. 2, qu. 1, art. 1], 1602, col. 417, where they cite as sources John Damascene’s *De fide orthodoxa*, ch. 8, and Augustine’s *De civitate Dei*, bk. 12, ch. 25. Neither, however, presents the definition in this succinct version. I have not found it in the Middle Ages.

22. Wolfson, 1976, 355.

23. *Ibid.* The translation of 2 Maccabees 7.28 in the *New English Bible* (1976) reads: “I beg you, child, look at the sky and the earth; see all that is in them and realize that God made them out of nothing, and that man comes into being in the same way.” In a note, the translators say that “this is the first biblical mention of creation from nothingness.” Wolfson’s point appears to be that the assertion that God made them “not from things existent” does not, strictly speaking, imply that the world was made from nothing, although it is easy to see how the Church Fathers could have adopted that interpretation. Sorabji, 1983, 194, believes that the opening lines of Genesis “strongly” suggest a beginning of the material universe.

24. Job, 28 and 38; Wisdom of Solomon 11.17 (Sorabji, 1983, 194).

tributable to a powerful inner dynamic that made creation *ex nihilo* almost irresistible. A deity who could create a world from nothing would have, *prima facie*, appeared more powerful than one who could only create it from preexistent matter. We may plausibly assume that Church Fathers from Hermas to John of Damascus found some form of this argument appealing. Thus was creation *ex nihilo* widely adopted long before it was made explicit Christian doctrine in the first canon of the Fourth Lateran Council in 1215. Despite frequent repetition of the doctrine of creation *ex nihilo* by medieval and early modern scholastic natural philosophers, considerable ambivalence toward it is detectable by the strong arguments in favor of a beginningless world, which avoided creation *ex nihilo*. Nicole Oresme's interpretation was probably typical (*De celo*, bk. 1, qu. 10, 1965, 149 [Latin], 150 [English]): naturally speaking, the world should be eternal, because no natural agent could be invoked to account for a beginning of it. Nevertheless, it was created by the will of God from nothing.

### III. Scriptural exegesis: Augustine and Thomas Aquinas

Before we consider the days of creation, it will prove helpful to describe an important attitude toward medieval biblical interpretation and exegesis that was proposed by Saint Augustine and repeated by Thomas Aquinas and which was probably characteristic of scholastic attitudes over the entire period covered by this study.

As a biblical exegete who analyzed the creation account in Genesis, Thomas is a valuable source because he often chose to summarize conflicting traditions and interpretations on particular issues. Not infrequently, he declined to choose between them. This approach may have been shaped by at least two attitudes toward Scripture, the importance of which for any description of the creation account is obvious. Thomas explains that

There are some things that are by their very nature the substance of faith, as to say of God that he is three and one, and other similar things, about which it is forbidden for anyone to think otherwise. . . . There are other things that relate to the faith only incidentally . . . and, with respect to these, Christian authors have different opinions, interpreting the Sacred Scripture in various ways. Thus with respect to the origin of the world, there is one point that is of the substance of faith, viz. to know that it began by creation, on which all the authors in question are in agreement. *But the manner and the order according to which creation took place concerns the faith only incidentally, in so far as it has been recorded in Scripture*, and of these things the aforementioned authors, safeguarding the truth by their various interpretations, have reported different things.<sup>25</sup>

25. Thomas Aquinas [Sentences, bk. 2, dist. 12, qu. 1, art. 2], 1929–1947, 2:305–306. Translated by William Wallace, in Thomas Aquinas, *Summa theologiae*, 1967, 10:222. The italics are mine. Thomas here echoes Augustine, who declared: “in matters that are obscure and

With these general guidelines, Thomas became more specific in his *Summa theologiae*, where, in discussing the question as to whether the firmament was made on the second day, he observes:

Augustine teaches that two points should be kept in mind when resolving such questions. First, the truth of Scripture must be held inviolable. Secondly, when there are different ways of explaining a Scriptural text, no particular explanation should be held so rigidly that, if convincing arguments show it to be false, anyone dare to insist that it is still the definitive sense of the text. Otherwise unbelievers will scorn Sacred Scripture, and the way to faith will be closed to them.<sup>26</sup>

Thomas's approach, drawn from Saint Augustine, may be taken as typical of medieval scholastic interpretations of creation and explains the proliferation of opinions concerning the different days of the creation account in Genesis. Although Augustine believed that the literal truth of the Scriptures should be accepted unless there were good and overriding reasons for abandoning the literal text, we saw earlier that he himself chose to ignore the clear intent of Genesis and to interpret the six days of creation as a simultaneous and instantaneous act of divine creation. Despite Augustine's failure to provide help in determining when the literal text should be abandoned in favor of an allegorical, metaphorical, or scientific interpretation, no serious problems arose until the Church and Galileo collided in the seventeenth century. In that conflict, the latent ambiguity in Augustine's position became apparent, as “both Galileo and his opponents called upon Augustine when the question arose whether the Copernican doctrine was invalidated by the frequent Scriptural mentions of the Sun's motion” (McMullin, 1970, 336).

### IV. On the first four days of creation

Of the six days of creation, only the first four are relevant for cosmology, and of these the first, second, and fourth are the most important. What specific entities were created on each of these days? On the first day, heaven (*caelum*), earth (*terra*), and light (*lux*); on the second, the firmament (*firmamentum*) that divides the waters above from those below and which God

far beyond our vision, even in such as we may find treated in Holy Scripture, 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 of truth justly undermines this position, we too fall with it.” *Genesis*, bk. 1, ch. 18, par. 37, 1982, 1:41.

26. *Summa theologiae*, pt. 1, qu. 68, art. 1, 1967, 10:71–73. Based upon Augustine, *Genesis*, 1982, vol. 1 (bk. 1, chs. 18–19, 21). In book 2, chapter 5, where Augustine discusses the water above the firmament, he declares that “whatever the nature of that water and whatever the manner of its being there, we must not doubt that it does exist in that place. The authority of Scripture in this matter is greater than all human ingenuity” (Augustine, *ibid.*, 1:52).



called "heaven" (*caelum*);<sup>27</sup> on the third day God turned his attention to the earth, where he gathered the seas together in one place, exposing the dry land on which he then placed plants and trees capable of reproducing themselves; and finally, on the fourth day, he made the physical light of the heavens by creating all the celestial bodies, assigning the Sun to provide the light of day and the Moon to provide the light of night.

Within these brief passages commentators were obliged to resolve some basic dilemmas, obscurities, and seeming inconsistencies. How, for example, does the heaven (*caelum*), or firmament, created on the second day, differ from the heaven (*caelum*) created on the first day? How does the light created on the first day compare to the light created on the fourth day? How could plants come forth on the third day if the Sun, whose warmth and light are required, was not created until the fourth day? What are the waters above and below the firmament? Do they differ?

And then there were problems that arose as a consequence of the need to reconcile the Christian creation account with contemporary physics and cosmology, which, in the period we are discussing, was overwhelmingly Aristotelian. How do prime matter and the four elements relate to creation? How do mixed, or compound, bodies formed from those elements fit into the creation account? What aspect of creation embraces Aristotle's celestial ether? And so on.

To obtain a reasonable sense of the range of opinions and the manner in which scholastic theologian-natural philosophers coped with these and similar questions, we shall focus on the responses of Thomas Aquinas in his commentary on the *Sentences* and, especially, in his *Summa theologiae*.<sup>28</sup> Thomas is an appropriate choice because, in the absence of clear-cut interpretations of most relevant scriptural passages, he frequently cited two or more alternative opinions, often declining to choose between them.

Thomas and other commentators on Genesis divided creation into three aspects or distinctions. On the basis of Genesis 2.1 ("So the heavens and the earth were finished and all the furniture of them"),<sup>29</sup> Thomas identifies the three distinctions as follows: "the work of creation" (*opus creationis*), in which heaven, water, and earth were made, though in an incomplete state; "the work of differentiation" (*opus distinctionis*), which involved the completion and ordering of heaven, earth, and water from the beginnings just described; and "the work of adornment" (*opus ornatus*), in which the elements were separated and things that move in heaven and on earth were produced.<sup>30</sup>

27. The Latin terms are from the Vulgate Bible.

28. Thomas composed his commentary on the four books of the *Sentences* in Paris, between 1252 and 1256 (Weisheipl, 1974, 358-359) and completed the first part of the *Summa theologiae*, which contains the section on creation, between 1266 and 1268 at Viterbo (ibid., 360-362).

29. Thomas quotes Genesis 2.1 in *Summa theologiae*, pt. 1, qu. 70, art. 1, 1967, 10:109.

30. Thomas describes the three aspects of creation most extensively in *Summa theologiae*, ibid.,

The work of creation occurred on the first day, when heaven, water, and earth were made. As evidence of the incompleteness of these three basic cosmic entities, Thomas observes that all three lacked a vital form: the heaven lacked light, for "darkness was on the face of the deep" (*tenebrae erant super faciem abyssi*); water was formless, because it is referred to as "the deep" (*abyssus*); and "earth was empty" or "invisible" (*terra erat inanis et vacua*) and also "void" or "uncomposed" (*vacua vel incomposita*), signifying that it was not only covered by waters and totally hidden but also lacked shrubs and plants.<sup>31</sup>

To complete – that is, distinguish or differentiate – heaven, water, and earth was the work of the first three days. Heaven was substantially completed on the first day, presumably by the creation of light, which produced night and day; water on the second day, when the firmament separated the waters above from those below; and earth on the third day, when dry land was exposed, following the gathering of the waters.

The next three days, the fourth through sixth of creation, were taken up with adornment, that is, with the placing of various inanimate and animate things that would fill the universe with moving things. Thus on the fourth day, the planets were placed in the firmament and thereby "adorned" it; on the fifth day, birds and fishes were made to move about and thus adorned the intermediate region comprised of air and water, which are treated as one; and on the sixth day animals were placed on earth to move about and adorn it.<sup>32</sup>

Let us examine further the first, or incomplete, phase of creation. In its incomplete state, earth was subject to different interpretations in which Aristotelian concepts were involved. Thomas explains that Augustine interpreted earth and water as primary matter, whereas other Church Fathers assumed that one or more (or even all) of the elements were already there. Indeed, although only earth and water are mentioned, Thomas seems to believe that all four elements were intended. That Moses omitted the elements air and fire is explicable by the fact that Moses spoke to the unlettered to whom "it was not so plain that these are bodies as it was that earth and water are."<sup>33</sup>

Thomas believed that those who considered matter as originally formless<sup>34</sup> really meant that matter was originally created with various

10:109-111, and to a lesser extent in qu. 66, art. 1, 10:29-33, and qu. 69, art. 1, 10:95-97.

31. For heaven and earth, see ibid., qu. 66, art. 1, 10:28 (Latin); for water, see qu. 69, art. 1, 10:95.

32. Despite these detectable distinctions in the six days of creation, Thomas, as we have seen, adopted Augustine's concept of *rationes seminales* and argued that "all bodies were created immediately by God," which Moses is alleged to have described when he said, "In the beginning God created heaven and earth." Ibid., qu. 65, art. 3, 10:17. Aquinas ([*Sentences*, bk. 2, dist. 13, qu. 1, art. 1], 1929-1947, 2:327) accepts the *rationes seminales*. The Vulgate text reads, "In principio creavit Deus caelum et terram."

33. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 66, art. 1, 1967, 10:31-33.

34. Ibid., 10:27.



substantial forms that would later be differentiated by accidental forms (of which light was the first).<sup>35</sup> Because God “produces being in actuality out of nothing,”<sup>36</sup> he did not create by bringing something from potentiality to actuality, as normally happens in nature. Thus from the general state of formlessness in the initial stages of creation – that is, from the things originally created with matter and substantial forms – things would be differentiated and made more specific.

The first of these accidental forms to alter the nature of the universe was light, which Thomas defines as “an active quality deriving from the substantial form of the Sun, or of any other body that is self-illuminating should any exist.”<sup>37</sup> As the quality of a primary body, the Sun, light was essential in shaping the universe and also was a common feature of lower and higher bodies. “It was right, therefore, that the orderliness of divine wisdom be manifested, with light, among the works of diversification, being produced first in that it is the form of a primordial body, and is something more general.”<sup>38</sup> Moreover, as Basil observed, light makes all things visible. It also seems that light had to be produced on the first day because “there can be no day without light.”<sup>39</sup>

If light is a quality of the Sun and the Sun was not created until the fourth day, what kind of light was created on the first day? Augustine’s theory of simultaneous creation, to which Thomas subscribed, provides the explanation. Since all things were in existence simultaneously, the substance of the Sun already existed, but in the course of the first day it had only a general power to illuminate. It was this general power that was utilized on the first day in order to separate day and night, which are produced by the daily motion, the most common motion of the entire heaven. Thus did light differentiate the heaven on the first day. Only with the creation of the luminaries – and all the planets – on the fourth day would the Sun assume its full powers, dividing the day and the night, as well as the seasons, days, and years.<sup>40</sup>

### V. What is the heaven created on the first day?

In the seventeenth century, Bartholomew Amicus mentioned two interpretations that were applied to the heaven created on the first day.<sup>41</sup> Both involved the empyrean heaven, which was conceived as an immobile orb

35. Ibid., qu. 67, art. 4, 10:67.

36. “Sed Deus producit ens actu ex nihilo.” Ibid., qu. 66, art. 1, 10:31 (Latin on p. 30).

37. Ibid., qu. 67, art. 3, 10:61.

38. Ibid., qu. 67, art. 4, 10:65–67.

39. Ibid., 10:67.

40. Ibid., 10:67–69; also Genesis 1.14.

41. Augustine, and those who followed him, held that the words “In the beginning God created heaven and earth” signified things that were created before the “beginning of days.” See Augustine, *Genesis*, bk. 1, ch. 9, 1982, 1:27.

surrounding the cosmos, wherein dwelled God and all the elect. One interpretation held that the empyrean heaven alone was created on the first day, while the other assumed that not only was the empyrean heaven created on the first day, but all the heavens, from the outermost movable sphere to the sphere of the Moon.<sup>42</sup> The latter interpretation, according to Amicus, was the most common scholastic opinion, drawn largely from Saint Basil, who understood by the creation of “earth” (*terra*) on the first day the creation of the four elements and by the creation of “heaven” (*caelum*) everything above the four elements, that is from the Moon outward.<sup>43</sup> Although the empyrean heaven is not explicitly mentioned in Genesis, most Christian authors not only agreed that it was the heaven created on the first day but also assumed its immobility. Because of the latter property and the importance of the empyrean heaven, I shall devote a separate chapter (Ch. 15) to it, emphasizing its unique cosmic role as an all-encompassing, immobile orb.

### VI. On the firmament of the second day

Commentaries on the second day of creation eventually generated two major orbs that were essentially theological in character, namely the crystalline orb and the firmament.<sup>44</sup> Let us examine the latter first and use Thomas Aquinas as our primary guide so that we may come to know some of the interpretations that were generated.

42. Amicus [*De caelo*, tract. 2, qu. 5 (“An caelum empyreum fuerit initio creatum”), dubit. 3, 1626, 94, col. 2–95, col. 1 and dubit. 4 (“An coeli aetheri fuerint creati primo die”), 95, col. 1–96, col. 1. Among those who assumed that only the empyrean sphere was signified by the creation of the heaven on the first day, Amicus mentions (*ibid.*, 95, col. 1) among early commentators, Bede, Origen, Anselm, and Bonaventure; in the sixteenth century, Pererius; and in the seventeenth century, Molina. Those who held the other opinion, which Amicus supports, are Basil and Thomas. Thomas, however, declares that Strabo, Bede, and Basil are the only authorities – presumably ancient authorities – who considered the heaven of the opening statement in Genesis to be the empyrean heaven. *Summa theologiae*, pt. 1, qu. 66, art. 3, 1967, 10:41. Thus Basil shows up as supporting both opinions. In truth, they are compatible. Although Amicus does not mention Augustine in this context, the latter held that “by the expression ‘heaven’ we must understand a spiritual created work already formed and perfected, which is, as it were, the heaven of this heaven which is the loftiest in the material world.” Augustine, *Genesis*, bk. 1, ch. 9, 1982, 1:27. Actually, Augustine identified the heaven created in the beginning with angels, hence its spirituality (see Taylor’s note, *ibid.*, 1:227, n. 33). On this, Thomas, mistakenly it seems, interprets Augustine to mean by heaven “a spiritual nature yet unformed.” *Summa theologiae*, pt. 1, qu. 67, art. 4, 1967, 10:65. If Augustine identified the heaven with angels, why should Thomas consider the spiritual nature of angels as unformed?

43. Amicus, *De caelo*, tract. 2, qu. 5, dubit. 4, 1626, 95, col. 1.

44. Based on Genesis 1.6–8 (King James Version): “[6.] And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters. [7.] And God made the firmament and divided the waters which were under the firmament from the waters which were above the firmament; and it was so. [8.] And God called the firmament Heaven. And the evening and the morning were the second day.”

Thomas explains that the *firmamentum* created on the second day can be understood in two ways: either as the sphere in which the fixed stars are located,<sup>45</sup> or "as that part of the atmosphere where clouds undergo condensation."<sup>46</sup> Within the first interpretation, in a manner reminiscent of Grosseteste's commentary on the creation, Thomas distinguishes three opinions as to the composition of the firmament. Some held that it was composed of the four elements, as did Empedocles; others that it was made of a single element (for example, Plato, who thought it was composed of fire); still others insisted that the firmament was composed of a fifth element different from the other four, as did Aristotle.<sup>47</sup>

Thomas judged all of these opinions compatible with the substantial formation of the firmament on the second day. None was sufficiently compelling, however, and he rested content merely to describe them.

### 1. The firmament as air

As for the second interpretation, that the firmament is "that part of the atmosphere where clouds undergo condensation," the term *firmamentum* is relevant "because of the density of the air in that part, since the dense and solid is said to be a firm body, to distinguish it from a mathematical body, as Basil observes."<sup>48</sup> Although he did not accept it as the final explanation, Thomas believed that identifying the firmament with the air was compatible with faith and compatible with the evidence. Minute drops of water could rise above the air and form clouds: here, then, were the waters above the firmament. When these fine vapors condensed to the point where the air could no longer support them in the form of drops, the latter would fall as rain and join the seas and rivers below: here were the waters below the firmament. Moreover, passages from Scripture speaking of "flying creatures of the heaven" (*volucres coeli*)<sup>49</sup> seemed to give further credibility to air as the firmament.<sup>50</sup>

Although Durandus de Sancto Porciano may have accepted the air as the

45. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 68, art. 1, 1967, 10:73–75. Although Thomas says only "uno modo, de firmamento in quo sunt sidera" (*ibid.*, 72), it is clear that he means fixed stars when he refers to the second interpretation of *firmamentum* and says: "Potest autem et alio modo intelligi, ut per firmamentum quod legitur secunda die factum, non intelligitur firmamentum illud in quo fixae sunt stellae, sed illa pars aeris in qua condensantur nubes." *Ibid.*, 74.

46. *Ibid.*, 75.

47. Robert Grosseteste had earlier described these same three opinions (*Hexaëmeron*, part. 3, ch. 6, 1, 1982, 106, lines 7–8). Whereas Thomas merely reported them, Grosseteste viewed them as a sign that "The philosophers write mutually contrary statements about these things" (*Scribunt enim super hiis philosophi sibi invicem contraria*). For my translation of the relevant passage, see Grant, 1987a, 165.

48. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 68, art. 1, 1967, 10:75.

49. See Richard of Middleton [*Sentences*, bk. 2, dist. 14, art. 1, qu. 1], 1591, 2:167, col. 1. For more on "flying creatures of the heaven," see note 68 of this chapter.

50. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 68, art. 1, 1967, 10:75.

firmament that divided the waters,<sup>51</sup> most scholastics rejected the air (or any part of it) as the firmament. Richard of Middleton thought that the theory conflicted with Scripture, which says that the firmament was made on the second day and the celestial luminaries were placed in it on the fourth day. Air, however, was made on the third day, and no stars were placed in it. That air alone could be the firmament was dubious also because, as Hurtado de Mendoza explained, Genesis speaks of the waters above the firmament. If the latter was air, how could waters – Hurtado specified "elemental" waters – lie above the air?<sup>52</sup> Moreover, when God made the firmament on the second day, there were no clouds and fog to divide the air from the sea. Indeed, God did not make the seas until the third day, when he commanded all the waters to gather in one place.<sup>53</sup> In a similar vein, Bartholomew Amicus insisted that "the lowest region of the air, which divides the clouds from the waters and rivers, is not understood by the name of *firmamentum*, because there was no rain during the six days of Scripture; therefore there were no clouds in the air, which are the matter of rain."<sup>54</sup> Echoing Richard of Middleton, Amicus argued that the lowest region of the air is not a candidate for the firmament, because God expressly placed the luminaries in the firmament – not in the air – on the fourth day.<sup>55</sup>

### 2. The firmament as a single heaven embracing all the planets and the fixed stars

It was natural to inquire about how the heaven (*caelum*) created on the first day was related to the heaven (*caelum*) created on the second day and specifically called the firmament. If one adopted the interpretation of John Chrysostom, it was not essential to distinguish between the two. By declaring that "In the beginning God created heaven and earth," Moses first proclaimed what God did and then elaborated its implications. As Thomas Aquinas explained, "this would be like saying, 'this builder made that house', and later to add, 'he first made the foundation, and afterward put up the walls, and thirdly placed the roof on top'. And thus we need not

51. In his *Sentences*, Durandus argued that if the firmament were composed of the fifth celestial element, no elementary waters could exist above the heavens, because such waters would suffer generation and corruption by rarefaction caused by the heat from the light of the celestial ether. But if the air, or more particularly that part of the air where the clouds are condensed, is taken as the firmament, elementary waters could indeed lie above the firmament, because the power of the Sun and stars can draw watery vapors up above the clouds. These clouds possess a certain thickness, which also makes it appropriate to call them a firmament. Thus the air can be considered as a proper and true firmament. Whether Durandus believed this is left ambiguous. Durandus [*Sentences*, bk. 2, dist. 14], 1571, 156r, col. 2.

52. Hurtado de Mendoza [*De coelo*, disp. 3, sec. 3, par. 43], 1615, 381, col. 1. In this argument, Hurtado takes for granted that in the natural scheme of things air lies above water, as Aristotle assumed.

53. *Ibid.*, 380, col. 2.

54. Amicus, *De caelo*, tract. 2, qu. 5, dubit. 4, 1626, 95, col. 2.

55. *Ibid.*, 96, col. 1.

maintain a difference between the heaven of which it is said 'In the beginning God created heaven and earth,' and the firmament of which it is said that it was made on the second day.<sup>56</sup>

But Thomas observes that differences between the heavens created on the first two days could be distinguished and proceeds to cite a number of opinions and their proponents.<sup>57</sup> For Augustine, the heaven created on the first day is of an unformed spiritual nature, whereas the heaven of the second day is the corporeal heaven. Venerable Bede and Walafrid Strabo interpreted the heaven of the first day as the empyrean heaven, while they construed the heaven of the second day as the sidereal heaven. By contrast, Damascene identified the heaven of the first day as a starless, transparent orb, which the philosophers called the "ninth sphere" (*nona sphaera*) and which was the first, or outermost, body in motion.<sup>58</sup> For Damascene and the philosophers, the heaven of the second day is the sidereal heaven. As was his custom, Thomas selected none of these opinions as his own but was content merely to report them.

Since God called the firmament heaven, what sense of heaven was assigned to the firmament? What celestial body (or bodies) did it embrace? Some were prepared to argue that there was only one heaven, just as there was only one earth.<sup>59</sup> According to Thomas, John Chrysostom considered the entire body above the earth and water as one heaven,<sup>60</sup> an opinion that found favor with some theologians because, as we shall see, it seemed to accord best with the scriptural text, though it clashed with Aristotle. Because it included air and fire and all the visible celestial bodies, Chrysostom's heaven linked, in Aristotelian terms, the mutable upper elements, air and fire, to the incorruptible celestial bodies. It was thus a combination that was unacceptable to Aristotelian natural philosophers but found favor with some theologians.

Thomas, one theologian who did not follow Chrysostom, kept the ter-

56. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 68, art. 1, 1967, 10:75. Thomas seems to have reversed the divine method of creation described by Chrysostom, who says that God "executes his creation in a way contrary to human procedures, first stretching out the heavens and then laying out the earth beneath, first the roof and then the foundation." *Homilies on Genesis* [Hill], homily 2, 1986, 35.

57. Thomas Aquinas, *ibid.*, 10:75-77.

58. Earlier, in the sixth century, John Philoponus had already identified the heaven of the first day with the ninth sphere (see Duhem, *Le système*, 1913-1959, 2:496-497).

59. Here again, I follow Thomas, *Summa theologiae*, pt. 1, qu. 68, art. 4, 1967, 10:87-91: "Is there only one heaven?" (*Utrum sit unum caelum tantum*).

60. In homily 4, Chrysostom insists (*Homilies on Genesis* [Hill], 1986, 56) that Scripture asserts unequivocally that the purpose of the firmament is to "keep one body of water from another." God then called this firmament heaven and therefore only one heaven, not many, can exist. Chrysostom does not, however, explicitly extend the firmament from the air to everything beyond, although he would clearly have meant it to include everything between the divided waters, a region that extended from the concave surface of the air to the convex surface of whatever celestial body (the fixed stars?) is in contact with the waters above. Galileo ([*De caelo*, qu. 1 (G)], 1977, 59) also cites Chrysostom as a supporter of a single heaven.

restrial elements distinct from the incorruptible celestial region.<sup>61</sup> If we take "heaven" (*caelum*) as "a particular sublime body, actually or potentially luminous, and by its nature indestructible," then, he explains that the term is used in Scripture in three ways:

The first, completely luminous, is called the "empyrean heaven." The second, completely transparent, is called the "aqueous or crystalline heaven." The third, partly transparent partly luminous, is called the "sidereal heaven"; it is divided into eight spheres, viz. the sphere of the fixed stars and the seven spheres of the planets, which collectively can be referred to as eight heavens.<sup>62</sup>

Thomas did not identify any of these heavens as the firmament but appears to have associated the firmament with the eighth sphere of the fixed stars. If so, then Thomas would have made the firmament a part of the sidereal heaven. For many others, however, from the Middle Ages to the seventeenth century, the sphere of the fixed stars and the seven planetary spheres together were identified as the firmament. The latter was thus equivalent to what Thomas called the sidereal heaven.<sup>63</sup>

Some years before Thomas wrote his *Summa theologiae*, Robert Grosseteste had already taken this step as he grappled with the problem of the biblical firmament. In his *Hexaëmeron*, Grosseteste declares that many have carefully investigated the nature of the firmament and the number of heavens contained in it. By *firmamentum* Grosseteste understood a heaven that "is extended in thickness from the lowest wandering of the Moon up to [the region just above] the fixed stars where the superior waters are gathered."<sup>64</sup> Thus it is clear that for Grosseteste, the firmament is a vast region that includes the Moon and the fixed stars and everything in between. When, earlier in the *Hexaëmeron*, Grosseteste declared that by the name *firmamentum* he understood "the heaven in which the stars [*sidera*] are located," he intended to signify by *sidera* not only the fixed stars but also the planets.<sup>65</sup> Grosseteste's *firmamentum* is thus equivalent to Thomas's sidereal heaven.

Others adopted the same interpretation. In the early fourteenth century, Aegidius Romanus included within the firmament the entire region from the Moon to the fixed stars, which he regarded as a single, continuous orb,

61. In his earlier commentary on the *Sentences* (bk. 2, dist. 14, qu. 1, art. 2, 1929-1947, 2:350), Thomas denied that the firmament was composed of the four elements, assuming instead that it was made from a fifth body or essence, as described by Aristotle.

62. Thomas Aquinas, *Summa theologiae*, pt. 1, qu. 68, art. 4, 1967, 10:89. Bartholomew the Englishman used the same threefold division. Like Thomas, he did not specifically mention the term *firmamentum*. Bartholomew the Englishman, *De rerum proprietatibus*, bk. 8, ch. 2, 1601, 373.

63. John Philoponus had also assumed that Moses was describing a single heaven or firmament that embraced all the planets and stars (see Ch. 13, Sec. I).

64. My translation, from Grosseteste, *Hexaëmeron*, part. 3, ch. 6, 1, 1982, 106.

65. "Verumtamen, iudicio eius et aliorum expositorum verius intelligitur nomine firmamenti celum in quo locata sunt sidera." Grosseteste, *ibid.*, ch. 3, 1, 103.

containing within it seven distinct and discontinuous cavities or channels through which the planets moved.<sup>66</sup> In the seventeenth century, versions of Aegidius's interpretation were adopted by Raphael Aversa, Matrius and Bellutus, and Hurtado de Mendoza.<sup>67</sup>

In his metaphysical disputations of 1597, Francisco Suarez followed not only the general tradition of Bede, Strabo, and Grosseteste in assigning to the firmament both planets and fixed stars – Thomas's sidereal heaven – but he also included the air and, presumably, the fire above it, thus specifically adopting the opinion of Chrysostom. Suarez thought it probable that by *coelum* Moses intended all celestial bodies plus the air, observing that in Scripture air was frequently included in the term "heaven."<sup>68</sup> It follows that when God called the firmament *caelum*, air must have been included. Thus a tradition existed in which firmament was interpreted broadly, embracing not only the entire heavens between the Moon and the fixed stars but even extending down (through fire) to the air itself.

### 3. The firmament as the sphere of the fixed stars

The demands of Aristotelian–Ptolemaic astronomy and cosmology produced the final candidate for the *firmamentum*: the eighth sphere of the fixed stars. Among those who identified the fixed stars with the firmament were John of Sacrobosco, Michael Scot, Vincent of Beauvais, Thomas Aquinas, Campanus of Novara, Gregor Reisch, Christopher Clavius, Matrius and Bellutus, and Giovanni Battista Riccioli.<sup>69</sup> Michael Scot explains the iden-

66. Aegidius declares that the Sun and the Moon and all the planets are in the firmament, because "all the spheres of the planets make one body with the eighth sphere [of the fixed stars], which [taken all together] is called the firmament. All such luminaries are in the firmament of the heaven." A few lines below, Aegidius adds: "it is appropriate that this whole region be called the firmament, because it was made between the waters and the waters" ("Ex hoc etiam magis concordamus cum Scriptura sacra dicente solem et lunam et omnes stellas esse in firmamento coeli, quia ex quo omnes sphaerae planetarum faciunt unum corpus cum octava sphaera, quod dicitur firmamentum, omnia huiusmodi luminaria sunt in firmamento coeli." Aegidius Romanus, *Opus Hexaemeron*, pt. 2, ch. 32, 1555, 49v, col. 1. And later he says, "Ideo congrue dicitur firmamentum esse factum inter aquas et aquas." *Ibid.*, 49v, cols. 1–2.)

67. For further discussion of Aegidius's ideas and the various adaptations of his interpretations, see Chapter 13, Section III.9.

68. "Imo probabile satis est nomine coeli comprehendisse [i.e., Moses] omnia corporea usque ad aera inclusive." Suarez, *Disputationes metaphysicae*, disp. 13, sec. 11, 1866, 1:448, col. 1, par. 26. Suarez cites (col. 2) the words "extendens coelum sicut pellem, qui tegis aquis superiora eius," from Psalm 103 (Vulgate), the relevance of which is hardly clear, since air is not mentioned. Without citing the texts, Suarez also says that Scripture mentions birds or a "flying creature of the heaven" (*volucrum coeli*), that is, of the air (in Psalm 8 of the Vulgate, we find the expression *volucres caeli* and in Psalm 8 according to the Hebrews *aves caeli*; see also note 49 of this chapter). He insists that *firmamentum* "is a certain part of the air, or includes air" (*firmamentum vel aeris pars quaedam est, vel aera includit*).

69. Sacrobosco, *Sphere*, ch. 1, 1949, 77 (Latin); 118 (English); Michael Scot [*Sphere*, lec. 4], 1949, 282; Vincent of Beauvais, *Speculum naturale*, bk. 3, ch. 102, 1624, 1:230 ("Hoc caelum id est firmamentum est octava sphaera, quae et dicitur stellata"); for Thomas, see Campanus of Novara, *Theorica planetarum*, 1971, 156, line 205; 208, line 697 and 385–

tification of the eighth sphere with the firmament when he declares that "according to all the astronomers, the seven inferior orbs of the planets are moved contrary to the firmament [i.e. the eighth sphere of the fixed stars]; therefore it [the firmament] is not one continuous body."<sup>70</sup> It is in fact distinct from the seven planetary orbs. In this interpretation, *firmamentum* no longer represents a single heaven ranging from the lunar sphere to the fixed stars.

In the seventeenth century, Pedro Hurtado de Mendoza ([*De coelo*, disp. 3, sec. 3], 1615, 381, cols. 1–2, pars. 44–45) reviewed the two interpretations just described and argued that the conception of the firmament as the eighth sphere of the fixed stars, a view he attributes to Fathers Pererius and Molina, was essentially inconsistent with Scripture. According to Hurtado, Pererius and Molina held that the firmament, or eighth sphere, separates the ninth heaven, which they described as an icy sphere and identified with the watery heaven above the firmament, from the elementary waters below. Of the five arguments Hurtado marshaled against this position, three will be described here.

Not only is the identification of waters with heavens contrary to Scripture, but, because the waters that were divided must have had the same composition, the waters above should not be considered as different from the waters below.<sup>71</sup> Thus the former ought not to be taken as an icy, solid mass while the latter are identified with elementary, fluid waters. Moreover, because God placed the Sun and Moon in the firmament on the fourth day, and neither the Sun nor the Moon is located in the eighth sphere, we may infer that the firmament includes more than the eighth sphere. Finally, although the eighth sphere separates and divides the bodies on each side of its two surfaces, it cannot divide the waters from the waters, because its surfaces are not in direct contact with the inferior waters. Indeed, many other bodies – at the very least all seven planets, and perhaps fire and air as well – lie between the eighth sphere and those inferior waters. "Therefore," Hurtado concludes, "the eighth sphere does not divide the ninth sphere from the elementary waters."

386, n. 39; Gregor Reisch, *Margarita philosophica*, 1517, 245 ("et octavum quod celum stellatum sive firmamentum appellant") and 248; Clavius [*Sphere*, ch. 1], *Opera*, 1611, 3:11; Matrius and Bellutus, *De coelo*, disp. 2, art. 2, 1727, 3:488, col. 1, par. 16 ("Whether above this heaven, called firmament [*coelum firmamentum vocatum*] because the stars firmly adhere to it, or [because] it is starred from the multitude of stars received in it, are assigned other heavens between this heaven and the empyrean"); and Riccioli, *Almagestum novum*, pars post., bk. 9, sec. 3, ch. 1, 1651, 273, col. 2.

Although Francisco Suarez included the planets, fixed stars, and even the air in his concept of the firmament (see this chapter, end of Sec. VI.2), he reports the opinion that "there are true waters above the firmament, that is, above the eighth and starry sphere" (*quod sunt verae aquae super firmamentum, id est, super octavam et stellatam sphaeram*). See Suarez, *Disputationes metaphysicae*, disp. 13, sec. 11, 1866, 1:440, col. 1, par. 6.

70. "Sed inferiores orbis septem planetarum moventur contra firmamentum secundum omnes astrologos, ergo non est unum corpus continuum." Michael Scot [*Sphere*, lec. 4], 1949, 282.

71. As will be obvious, few treated the waters above as identical with those below.



What, then, is the firmament? For Hurtado it is "an aggregation of bodies interjected between terrestrial and celestial waters, which [the celestial waters] are contiguous to the empyrean heaven. This aggregation includes all the mobile heavens, fire, and air." Like Suarez, then, Hurtado thinks of the firmament as a heaven that ranges from the air below up through fire and into the celestial region, extending all the way up to and including the eighth sphere. Hurtado describes this interpretation as "the more common exposition."<sup>72</sup> Only by such an interpretation could the firmament be compatible with the scriptural demand that it divide, and therefore separate and be in direct contact with, the waters above and below. According to Hurtado, the firmament separates the waters above and below by means of "the last [or concave] surface of air that is contiguous to the sea" and "the last convex surface of the starry heaven contiguous to the superior waters." Thus the firmament must extend from the air to the fixed stars and embrace both corruptible and incorruptible matter.

For most of the period of this study, it seems that the firmament was most frequently assumed to embrace at least the seven planetary orbs and the sphere of the fixed stars,<sup>73</sup> and for some it also embraced the spheres of fire and air below the Moon. Those who included the spheres of fire and air were apparently prepared to effect a drastic departure from Aristotle and the overwhelming majority of his medieval followers: they stretched the meaning of "firmament" to embrace both incorruptible and corruptible parts.

Proper regard for the biblical firmament led inevitably to difficulties with the requirements of Aristotelian-Ptolemaic astronomy. For scriptural reasons, the firmament had to be simultaneously in contact with both the waters above and those below it. It thus had to range from the concave surface of the air to the convex surface of the eighth sphere. For astronomical reasons, however, the contrary motions of the planets with respect to the sphere of the fixed stars made it unfeasible to assign a single orb or heaven to the firmament. With the planetary orbs dissociated from the eighth sphere of the fixed stars, the term *firmamentum* seemed to apply best to that very eighth sphere, because the latter bordered on the crystalline sphere, which was identified in some manner with the biblical waters above the heaven. That the eighth sphere was not contiguous to the waters below the firmament seems to have been conveniently ignored. For some, very likely a

72. "Communior est haec expositio." Hurtado de Mendoza, *De coelo*, disp. 3, sec. 3, 1615, 381, col. 2, par. 45. Although Hurtado included fire and air in his concept of the firmament and seems to have shared this opinion with Suarez, he also assumed seven eccentric channels through which the planets moved, thus aligning himself with the tradition stemming from Aegidius. However, we shall see (Ch. 13, Sec. III.9) that whereas Hurtado believed the planets were self-moving in their deferent channels, Aegidius and others believed that they were carried by epicycles.

73. According to Christopher Scheiner, Hieronymus Vielmus understood "by the term 'firmament' that it contains the whole mass of celestial bodies" (*Ait nomine Firmamenti totam caelestium corporum massam contineri*). Scheiner [*Rosa Ursina*, bk. 4], 1630, 648, col. 2.

minority of scholastic authors, especially in the seventeenth century, the needs of astronomy and cosmology took precedence over a consistent interpretation of Scripture. But, as we have seen, and shall see again, a popular compromise subsumed the seven planetary spheres as diverse elements within a single, continuous, material sphere extending from the Moon to the sphere of fixed stars. Despite major obstacles, the urge to see in the celestial region a single orb, embracing, at the very least, all the planets and stars, was powerful.

### VII. On the waters above the firmament: the crystalline heaven

From the time of the Church Fathers, the meaning and significance of the waters above the firmament were much debated. Because the account in Genesis spoke of waters above the firmament, Christian authors, following Augustine, were generally agreed on the necessity for a literal interpretation and were therefore committed to the existence of waters above the firmament.<sup>74</sup> Most scholastics were also certain that the suprafirmamental waters lay between the firmament and the empyrean, or last, heaven.<sup>75</sup> But what kind of waters? Thomas Aquinas insisted that they were material<sup>76</sup> but acknowledged that their nature was dependent on the composition of the firmament. As was his custom, he described the various possibilities.<sup>77</sup>

If the firmament signifies a sidereal heaven that is composed of the four elements, then the waters above the firmament could have the same nature as the ordinary element water. But if the sidereal heaven, or firmament, is not composed of the four elements, the waters above the firmament could not be identical with the element water. Under these circumstances, if the firmament divides the waters, the waters above the firmament must be different from the element water, for example, some kind of unformed matter.

On the assumption that the firmament is part of the atmosphere below the celestial region where clouds are formed, however, "then the waters that are above the firmament are the same as those that, when evaporated and taken up into the atmosphere, are the source of rain."

A question that frequently arose and was repeated by Thomas concerned the manner in which a fluid such as water could remain above the spherical firmament.<sup>78</sup> Two responses were frequently given, both cited by Thomas and attributed by him to Saint Basil. The first concerns the manner in which

74. For Augustine's assertion, see note 26 of this chapter.

75. See, for example, Richard of Middleton, *Sentences*, bk. 2, dist. 14, art. 1, qu. 1, 1591, 2:167, col. 1.

76. *Summa theologiae*, pt. 1, qu. 68, art. 2 ("Are there any waters above the firmament?"), 1967, 10:79.

77. What follows is drawn from *ibid.*, 77-83.

78. *Ibid.*, 77.

waters could remain stable on the convex surface of the firmament. Basil suggested that the outermost surface of the firmament may not be spherical. The fact that the concave surface of the firmament appears circular provides no warrant to infer that the convex surface is also circular; indeed it may be flat, just like the vaults of baths, which have a semicircular form in the interior but a flat surface on the roof.<sup>79</sup> Although repeated from time to time (for example, by Saint Ambrose, in his hexaemeral treatise) this explanation was not taken seriously.

The second response was. For here Thomas attributes to Basil, improperly it seems, the opinion that "the waters above the heavens are not necessarily fluid, but rather are crystallized around the heavens in a state similar to ice." This, says Thomas, "would be the crystalline heaven of some authors."<sup>80</sup>

Two contrasting opinions are discernible about the waters above the firmament: some thought of them as solid and hard; others considered them fluid.<sup>81</sup> This was perhaps the most significant issue concerning the crystalline orb. Since the hardness or fluidity of the latter forms part of the overall theme of the hardness or fluidity of all the heavens or orbs, the entire subject will be considered in Chapter 14 (especially Sec. IV).

### VIII. The celestial luminaries created in the firmament on the fourth day

On the fourth day God said, "Let there be lights in the firmament of the heaven" and not only created the stars and planets but also began the process of adornment (*ornatus*).<sup>82</sup> According to Thomas, Moses explains a threefold purpose of the celestial luminaries: (1) to provide light to the earth; (2) to provide the change of seasons; and (3) to serve as signs for the weather,

79. For Basil, see *Exegetic Homilies*, homily 3, 1963, p. 42.

80. For Basil's version, see *ibid.*, p. 43. In fact, Basil seems to deny that the suprafirmamental waters are hard like crystalline rock. Immediately after describing two interpretations of the term firmament, the second of which likened it to crystalline rock, Basil explains that "we compare the firmament to none of these things." Moreover, Basil explains that the term "has been assigned for a certain firm nature which is capable of supporting the fluid and unstable water" (*ibid.*). In the groupings that follow, I have placed Basil with those who argued for the fluidity of the waters above the firmament.

81. In the twelfth century, William of Conches avoided either opinion by denying outright the existence of waters above the firmament. He was especially annoyed with those who thought they were frozen, largely because he was convinced that congealed waters would be so heavy that "they must either descend to the earth by their natural heaviness or they must be moved. They cannot be moved, for motion cannot exist without heat. Thus, if they are moved, their movements generate heat in them, and if this happened they would be dissolved by that heat." William of Conches, *Glosae super Macrobian In somnium Scipionis*, translated in Helen Lemay, 1977, 229-230 (for the manuscripts used by Lemay see 235 n. 19).

82. For "adornment" and the other two distinctive phases of creation, see Section IV of this chapter.

which is important for various occupations.<sup>83</sup> But why, it was often asked, did God create them on the fourth day, after he had already allowed the production of plants on the third day, following the exposure of dry land? If plants depend for their growth on the Sun, why should they have been created before it? The answer: to reveal God's power to idolators and skeptics. The former would be humiliated to learn that plants could flourish without celestial bodies, which had been thought by many to be gods and essential to the production of plants, as Thomas reports; the latter, as Philo Judaeus (ca. 30 B.C.—after 40 A.D.) believed, would be confounded simply because reason would lead them to expect celestial bodies to be created before the plants that depended on them.<sup>84</sup>

With some exceptions, the nature and operation of those luminaries were not themes usually included in hexaemeral treatises and commentaries on the *Sentences*.<sup>85</sup> Such important matters were more appropriately considered elsewhere and are taken up later. On the assumption that the world was created, we shall now pursue certain questions that inevitably arose about that created world. Was it perfect? Was it finite or infinite? And if finite, what, if anything, might lie beyond it?

83. Thomas Aquinas, *Summa theologiae*, pt. I, qu. 70, art. 2, 1967, 10:117.

84. *Ibid.*, art. 1, 10:113, where Thomas cites Saint Basil's *Hexameron* (homily 5); for Philo, see Philo Judaeus, *De opificio mundi*, xiv.45, 1929, 1:35.

85. Henry of Langenstein (or Hesse) was a notable exception.