

Mary Olson
Tuskegee University
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How Big Is Time?

The fact that we can ask this question of the Middle Ages and expect a considered answer is an indication of the differing ways in which our culture and medieval culture understand the nature of time and the cosmos, for medieval time has not only limits of duration, but physical limits as well. It is obvious that this is so from descriptions of the universe, and yet the question does not seem to have been directly addressed. My aim has been to try to extrapolate from commentaries on time and the cosmos an answer, or set of possible answers to the question. The task at first seems fairly simple: the temporal realm must coincide with the physical, the created *mundus*, and is therefore a sphere as large as the universe itself. But descriptions of the nature of the heavens, and even of time and eternity themselves vary from one time period to another, and from one writer to another. In particular, the task is made difficult because there seems to have been more than one kind of time, and more than one kind of eternity. It would not be possible within the limits of this paper, to do more than report general concepts, for the subject is vast and complex. I ask your indulgence if I oversimplify.

Let us begin with prevailing definitions of the terms time and eternity. Time is closely associated with movement. Aristotle says, "Time is the number of motion with respect to before and after," and according to William of Ockham: "Time is movement and movement is time, for movement and time are under the same thing (*proeodem supponunt*). There can be movement without time but not time without movement." (qtd. in Duhem 307) And Averroes writes: "The movement of the first mobile is the only movement that allows us to define time and the only one that can serve as clock (qtd. in Duhem 313). Time, then was thought to have been dependent on the movements of the heavenly bodies, and to have begun when they were created. In fact the day was fixed with exactitude. According to Bede, some claimed that the world began at the equinox, when God divided the light from the darkness, that is, on March 21. But Bede argues that time began when God created the luminaries to be signs for

seasons, days, and years, (on the fourth day), that is on March 18 (Bede 24-27). The view that time began with Creation was generally undisputed until the twelfth century when Aristotle's works became known. After this time, in the words of Edward Grant, Society's concept of the origin, structure, and operation of the world was drawn almost exclusively from the Aristotelian-Ptolemaic astronomical and cosmological tradition....All who learned to read and write absorbed at least the skeletal frame of scholastic cosmology, which was itself virtually synonymous and coextensive with medieval cosmology as a whole. (59)

Aristotle believed that time had no beginning or end (in Duhem 5), and that the world was eternal. His argument was not against the belief that the world was created from nothing (Grant points out that such an idea would not have occurred to him). Rather, he argued that the world was not generated from something else:

Our single world could not have been generated from any prior state of material existence. For if so, then the preceding material state which produced it would have terminated and therefore could not have been eternal; therefore it must have been generated, and we must seek for its generator. In this manner we would be led to an infinite regress of generations and never reach a first beginning. But if the prior state of material existence was of infinite duration, then it could not have been altered to produce our quite different world. (*De caelo* 1.10.20-31, Grant 64)

The contradiction between scripture and Aristotle's reasoned arguments caused disagreement and consternation. One of the condemnations of 1277 denounces the eternity of the world, specifically, "all species, time, motion, matter, agent, and what is effected by agent," although it is granted that some substances such as human intellect and celestial intelligences are eternal (Grant 64-65). Some tried to accommodate both positions, such as Thomas Aquinas who writes that one cannot demonstrate either that time is infinite or that it had a beginning—both are possible, but Creation is a matter of faith, not science (Grant 70). Others went farther. Alexander of Hales and Roger Bacon agreed that time began with the first motion, but they give a new definition to eternity: "the whole extension of time from the beginning of the motion of the sky, which could be made perpetual by the divine will." One can say that the world is eternal because there was never a *time* in which there was not motion. (Grant 71). (If this seems to you to be a circular argument, I would agree).

Likewise, there was disagreement about when or whether time would end. While it was generally believed that time would end at the Apocalypse with the end of the world, Aristotle's belief in the eternity of the world had to be refuted or accommodated to scriptural testimony. In both the case of the beginning and the end of time, the omnipotence of God was at stake. Those who claimed against Aristotle that the eternity of the world was not possible, were in danger of suggesting that God was powerless to endow the world with an eternal nature. On the other hand, to argue for the eternity of the world was to go against the tradition of faith and scripture. Scholastic philosophers wanted to show that God could make the world eternal, but not that he had or would. (Grant 107). A popular tradition said that the world had six ages beginning with Adam and ending with the end of the world, and the sixth would be followed by the seventh (the eternal Sabbath) and eighth (the age of the Resurrection). Bede gives no date for the end, although he says that some criticize him because they believe that each age is 1,000 years long and that the death of the world will occur after 6,000 years. Bede reminds his readers that the Bible says the hour is unknown (158).

While there seems finally to be a general consensus that the world (*mundus/cosmos*) was made *ex nihilo* with the creation of the luminaries and would end at some unknown time in the future, and that the duration of time corresponds to the duration of the world, the machinations that took place among scholastic philosophers in defending this position rationally resulted in some tortuous paths of reasoning that reveal differing definitions of time and eternity. We have already seen how Bacon and Hales change the definition of eternity to correspond to the duration of temporality. Boethius of Dacia, explaining those who argue for the eternity of the world writes:

There was not time before the world, since time follows upon the motion of the first mobile even as a *passio* follows upon its subject. Nor was there eternity before the world, because that which is preceded by an eternal duration never exists. If, therefore, before the world there was eternal duration, the world would have never existed (for before the world there was no time). (41)

The definition of eternity here is temporal—that is concerned with duration (which is function of temporality), both extending infinitely into the future, and extending infinitely into the past. Since he is using the term to produce rational arguments (or quoting those who do), he must be using infinite duration literally rather than

figuratively. In this definition, then, eternity is not the opposite of time (atemporality or absolute timelessness) but something in between. Does true atemporality exist anywhere in the *mundus*?

We are all familiar with the general geocentric model of the universe upon which there were a number of variations. For example, the number of spheres varied usually from eight to ten. This model is often called the Ptolemaic universe, although Ptolemy's scheme had eccentric spheres. Even Aristotle's model differed, having 55 spheres, several for each heavenly body. There were other models such as Hildegard of Bingen's which was oval, having a mixture of elements at the center, the fixed stars and inner planets and the moon in an area of ether, a shell of dark fire beyond the ether or dark skin (*umbrosa pellis*), bright fire beyond that in which were the Sun, Mars, Jupiter, and Saturn. (Grant 41-42). In Robert Grosseteste's version, the universe was made from light. The firmament was made first, then light from it affected the more dense matter below, and each sphere formed in turn from light above it. The power of the light diminished until the light from the moon couldn't rarify the sphere below it, so the earth is still able to be acted upon. (Grant 43). We are familiar with Dante's model which follows the traditional scheme, except that Purgatory is a mountain on the "uninhabited" side of the globe. In the Renaissance, Thomas Compton-Carleton concluded that the outer sphere must be square because the spherical shape is appropriate for moving forms, but the square is appropriate for immobile forms (Grant 121). However, scholastic philosophers took none of these variations seriously, and for most people the system of concentric spheres was the true model.

The Platonic view was that not only the earth, but the heavenly bodies as well, were made of the four elements, and therefore corruptible. Consequently, before the 12th century, the whole world/universe would be temporal.ⁱ However, Aristotle believed that only the sublunar sphere was made of earth, air, fire, and water. The planets and other heavenly bodies were composed of ether, sometimes called the fifth element. He seemed to think, however, that the ether was not of uniform quality; if it were, then the bodies would not differ so greatly or exert different influences (Grant 424). It is the interaction of conflicting characteristics in sublunar matter that causes generation and corruption, but this does not occur in the celestial bodies. Alexander of Hales claims that celestial bodies can have opposing qualities such as hot and cold if they do not exist together in the same body—it is the conflict that generates corruption

(425). Their lack of corruption is their greatest difference from sublunar material. Hugh of St. Victor differentiates among three kinds of things or beings in the universe:

Among things there are some which have neither beginning nor end, and these are named eternal;... there are others which have a beginning but are terminated by no end, and these are called perpetual (*perpetua*);... and there are yet others which have both beginning and end, and these are temporal (*temporalia*). (52)

God alone is in the first category—he draws his being from nothing else--the being and the thing are not separate. The second category is nature "which includes the whole world" –it draws its existence from something separate from itself. The second category has two parts--those things which came into being by the divine will and do not perish (*ousiai*) and the bodies of the sublunary world. Their forms change but nothing passes away. Third are those things which have both beginning and end--sensible objects begotten by "an artifacting fire" (53). "*Mathematici* (astronomers) call the superior world 'time' "because of the course and movement of the heavenly bodies in it, and the inferior world they call 'temporal' because it is moved in accordance with the movements of the superior." The upper regions are called *elysium* and the sublunar *infernum*" (54). Thus Hugh seems to differentiate between time and temporality.

Everything in the infernal region is corruptible (changeable) although its matter does not pass away, but changes form. According to Aristotle, matter represents the element of continuity, and form represents the element of discontinuity in substantial change (Haren 18). Aristotle thought the heavens behaved differently from things in the sublunar region, especially in their circular movement (closed, complete, perfect)-opposed to rectilinear movement (incomplete) of sublunar objects (Grant 191). Since the heavens do not appear to undergo change, and behave differently, are they made of matter (and therefore temporal)? If matter means quantity, then yes, says Grant. If matter means the subject of motion, then yes. But some (Buridan, Godfrey of Fontaines, Peter Aureoli, Albert of Saxony) say that is not how we define matter. Matter is only that which undergoes successive formal change, and the celestial realm does not (245). The sublunar realm features variability in size and form of animate and inanimate bodies, but the superlunaries do not vary (247). Averroes first believes that the celestial bodies do not have matter. Later he claims that celestial matter is "actualized," that while it has no potential for change, it does have potential for place. "Eternal things, which are not generable but are moved with a translatory motion, have matter; not,

however, generable matter, but only the matter of those things that are moved from place to place." (Grant 249) Thomas Aquinas states that the heavens are a composite of matter and form, but the matter is a different type than sublunar matter. (251). Avempace solves the problem by delineating two separate categories of bodies: 1. "elements that suffer generation and corruption, whose natural movement is a rectilinear, centripetal or centrifugal movement." and 2. Heavenly bodies-- incorruptible with uniform rotation. Celestial spheres have place from within, not without. (Duhem 141)

Another question arises as to the nature of the heavenly bodies: Do they have souls? Aristotle says yes in *De caelo* (Grant 469). There are several types of souls, and two can be eliminated: they cannot have a vegetative soul because they don't grow. They cannot have an animal soul because they are not perceptive. But they could have an intellective soul which has reasoning. Augustine believes it is possible, but most medieval philosophers do not think so (Grant 472-73). Thomas Aquinas is ambivalent (Grant 476), and there is overwhelming opposition from the 14th century on (Grant 479).

Although the heavenly bodies are incorruptible, we cannot say that they are outside the realm of temporality, since they have matter (of whatever type), have motion, and are the means by which time is measured. They are part of the created world, and although they have the potential for infinite duration, according to theology, they will pass away. But what of the outer spheres. Outside the spheres of the planets is the sphere of the fixed stars, then there are several others that vary depending on whose scheme one follows. In Neo-Platonic tradition, the eighth sphere is the location of Purgatory (North 32). To accommodate the biblical "waters over the earth" some believe that the ninth sphere is where these waters exist in a crystalline state, and some posit a separate sphere as the Primum Mobile, the source of motion for all of the other spheres. The outermost (tenth) sphere in most schemes is the Empyrean Heaven. It is mentioned early by Bede, Walafriid Strabo, and Alcuin, although the idea is not definitive until the 12th century. Anselm of Laon says that it is filled with light and angels. It was well accepted in the 13th century, when it had become the dwelling place of God and the elect (Grant 371-72). It receives its light from God rather than from the Sun, but it transmits no light. It is transparent "to enhance the pleasure of the blessed, so that each inhabitant could see friends in the same state." It is incorruptible

and immobile (because that is the only appropriate state for the blessed who are at rest) (Grant 374). Here is Campanus of Novara's description:

The empyrean heaven's convex surface has nothing beyond it. For it is the highest of all bodily things, and the farthest removed from the common center of the spheres, namely, the center of the earth; hence it is the common and most general place for all things having position, in that it contains everything and is itself contained by nothing. (Duhem 175)

While Aristotle does not suggest an Empyrean Heaven, he also claims that there is nothing beyond the outer sphere, not even a void, because a void would allow the possibility of something else being there.

Above the heavens, then, there is no place or void. There is no time either, for there is nothing corporeal, nothing capable of alteration or change. Where no change is possible, there is no passage from possibility to actuality—there is never any movement. With the absence of movement, time, the measure of movement, disappears. everything outside the last sphere occupies no place; so it is immaterial. Time does not age it, it is not corrupted, and it does not change; so it is eternal. (Grant 434)

Both of these writers seem to suggest that temporality ends with the boundary of the outermost sphere. There, we might say, at least to Aristotle, is absolute timelessness. Is the Empyrean Heaven, the place of eternal blessing and reward, part of the temporal realm? Part of the answer may be found in the dialog about whether or not the outer sphere is a place.

Aristotle's definition of place has three conditions:

1. Place is not any part of the thing, but its container
2. The place cannot be greater or smaller than the thing.
3. The place must be separable from the thing.

He then offers four possible definitions: 1. The shape of the body, 2. the matter of the body, 3. The extension or dimension that lies between the surfaces of the containing body, and 4. The surface of the containing body. Only the fourth definition meets the criteria (Grant 123). More particularly, it is "the boundary of the containing body in contact with the contained body, a contained body that can be moved by locomotion." (Duhem xxviii) Therefore in the world, the only proper place for a body would be within the surrounding surface of another body (Grant 123). This definition works acceptably well until one considers the outer sphere. It is suggested that since the outer

sphere has no other sphere containing it, that it cannot be a place. The problem is confused by the fact that some philosophers are referring to the eighth sphere (the sphere of the fixed stars) as the outermost, and some to the Empyrean. The eighth sphere revolves, but there is no linear movement as with the planets, and a great deal of argument is focused on whether circular motion counts in the definition of place.

Aquinas:

The parts of the supreme orb do not exist in actuality, but potentially. In the same manner they are not actually in a place, they are there potentially; if one were to distinguish a part from the rest of the orb, it would be in the totality of the orb in the same fashion as it would be in a place. Thus the ultimate sphere is in a place accidentally because of its parts, which are themselves lodged potentially; this manner of being in a place suffices for a movement of revolution. (Duhem 158).

And Graziadei of Ascoli:

Everything considered in itself and wholly has a determined order within the corporeal universe; therefore everything has a formal place. Everything has its own *ubi*, meaning it exists in a place taken formally. (Duhem 164)

But formal place is immobile, while material place can move.

Since the Empyrean is considered by some to have a place formally and not materially, it might have been considered outside of temporality in a way that the other heavens were not. However, it cannot be atemporal in the same sense as that nothingness outside of the universe. The Empyrean is the abode of saved souls who will live eternally, but eternity in heaven is always expressed in terms of either infinite duration or distorted time, never as atemporal. Again, we may suspect that endless time is a metaphor for timelessness, but there is no evidence that this is the case.

It has become obvious that there are two ways of experiencing/being in temporality—in one case change occurs through generation and corruption, and in the other, we have matter and motion but no physical change. The first kind of temporality extends from the earth to the sphere of the moon, the other to the limit of the outermost sphere. Therefore, we (or at least some of our medieval philosophers) can conclude that the Empyrean, since it is part of the *mundus*, partakes of the second kind of temporality, and that eternity in heaven involves perpetual duration rather than timelessness. The only instances of absolute timelessness are outside of the *mundus* and God himself.

But what of the realms of Hell and Purgatory? The philosophers have little to say about these. Do they also have a physical place within the *mundus*? There is evidence that both were believed to occupy a physical place, although there is much less agreement about exactly where they are.

Although the belief in Hell was accepted throughout the medieval period, the idea of Purgatory as a place developed over 250 years, becoming widely accepted only by the 13th century, as Jacques LeGoff has shown. In the earlier scheme there were, in addition to Hell, The bosom of Abraham (sometimes the same as the Limbo of the patriarchs), and the Limbo of children. By the time Purgatory was accepted, the Bosom of Abraham had disappeared, although the Limbo of children remained part of the scheme. The tradition of the location of Hell goes back to the Book of Enoch which places it on earth in a pit or narrow valley or on a mountain. There it is a place of waiting for Judgment Day. Ezra descends to Hell on a staircase with 70 steps. At the beginning of the Christian era, Jews placed Gehenna “beneath the abyss or beneath the earth, which serves as its cover. It can be reached from the bottom of the ocean, or by digging in the desert, or beyond the dark mountains. It connects with the earth through a small hole, through which the fires of Gehenna pass to heat the surface of the earth” (LeGoff 39). This tradition is evident in the medieval period. although exactly where in the earth Hell might be is vague. Albertus Magnus writes that Hell is a two-fold place, the outer Hell material and the inner where the damned are punished “wherever they may be located in the earth’s core” (LeGoff 257).

For Purgatory, the location is more often specified. It is associated with volcanoes, Especially Mt. Etna. St. Patrick’s Purgatory is a cave on an island (Station Island) in a lake in Ulster which pilgrims visit to this day. In the Sicily’s Lipari Islands, according to an 11th-century report, “the lamentations of the dead can be heard emerging from the crater of a mountain inside which the dead are purged” (LeGoff 201). Although some speculate that Purgatory might be in the heavens or that purging might take place at various locations on the earth, the majority place it under the earth. At least some writers assure us that it is a material place, such as Odo of Ourscamp who writes, “Since this fire is a material pain, it is in a place” (LeGoff 202). The idea that the fires of purgatory are material is founded in the belief that souls are material. Bonaventure, for example, claims that while the body and soul are both made of matter, they are matter of different kinds, the soul being made of “Spiritual matter” (Haren

169). In the scheme where there are two kinds of time, there are also two kinds of matter. The human soul, unlike those things made of physical matter, is eternal in that it does not die, nor will it be extinguished at the end time when the earth passes away.

What kinds of temporality or eternity, then, exist in Hell and Purgatory? From the many visions of Hell that exist in literature, we can assume that in Hell, eternity is of the endless duration type. People are observed undergoing repetitious tortures, at least until the Day of Judgment, if not beyond. Purgatorial temporality, on the other hand, is somewhat more ambiguous. Here worldly temporality intrudes, for the soul's time in Purgatory is not only limited, but may be shortened by the prayers of the living. LeGoff claims that most people thought of time in Purgatory as a combination of ordinary linear time and eschatological time (268). Time passes much more slowly in Purgatory: Le Goff writes that the proportionality of earthly time to purgatorial time "related two quantities unequal in magnitude and different in kind" (294). The idea of the separation of earth and heavens as corruptible and incorruptible, can be brought into accord with the relative timelessness of Hell and Purgatory which are located in the corruptible earth, because the earth itself, while created, is eternal (in that it has the potential to exist forever, even though it undergoes change, and Christians believed that it would be destroyed in apocalyptic times). At the Apocalypse the earth and heavens will pass away, and the souls in Heaven and Hell will continue to exist in some new way. Some kind of temporality, then, exists from the center of the earth to the outer surface of the Empyrean sphere.

In 1531 Campanus of Navara produced a table of distances in the *mundus* in which the distance from the earth to the convex surface of the eighth sphere is 73 million miles. He gives no measurements for the ninth and tenth, because they are not visible. If we were to take an average of twenty million miles for each sphere (they vary greatly), we would arrive at a diameter of 93 million miles for the universe.

This is not a definitive answer to the question "How big is time?" but one possible answer of many. The medieval structure of the cosmos and the afterlife is often thought to be a carefully structured, minutely coordinated edifice in which every thing has its place and every detail of correspondence is worked out minutely, and from some perspectives it does appear to be exactly that. But when one tries to pin down specific answers, one is likely to find that it is a huge, unwieldy amorphous thing, where some parts are in sharp focus and others vague, where meaning shifts from one

time to another, from one writer to another, where philosophers constantly seek both rational and theological answers to questions that are often unanswerable. Some values are constant: the omnipotence of God, the existence of an afterlife, the dependence of the world on God for its functioning, and the idea that outside of the *mundus* there is nothing. But for medieval philosophers and physicists who wrestled with the disjuncture between physics and theology, the search for answers often followed a tortuous and difficult path.

ⁱⁱ Grant comments that

In early commentaries by Macrobius, Martianus Capella, Bede, Cassiodorus, Isidore. etc. Cosmology was "meager, superficial, and often unreliable, largely because many of their authors lacked comprehension of the material they included, material that was itself derived from handbooks that were copies of earlier encyclopedic collections." (12)

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