GALILEO GOES TO JAIL

AND OTHER MYTHS ABOUT SCIENCE AND RELIGION

Edited by Ronald L. Numbers

HARVARD UNIVERSITY PRESS
Cambridge, Massachusetts & London, England 2009

MYTH 3

THAT MEDIEVAL CHRISTIANS TAUGHT THAT THE EARTH WAS FLAT

Lesley B. Cormack

In Christendom, the greater part of this long period [Ptolemy to Copernicus] was consumed in disputes respecting the nature of God, and in struggles for ecclesiastical power. The authority of the Fathers, and the prevailing belief that the Scriptures contain the sum of all knowledge, discouraged any investigation of Nature . . . This indifference continued until the close of the fifteenth century. Even then there was no scientific inducement. The inciting motives were altogether of a different kind. They originated in commercial rivalries, and the question of the shape of the earth was finally settled by three sailors, Columbus, Da Gama, and above all, by Ferdinand Magellan.

—John William Draper, *History of the Conflict between Religion and Science* (1874)

With the decline of Rome and the advent of the Dark Ages, geography as a science went into hibernation, from which the early Church did little to rouse it . . . Strict Biblical interpretations plus unbending patristic bigotry resulted in the theory of a flat earth with Jerusalem in its center, and the Garden of Eden somewhere up country, from which flowed the four Rivers of Paradise.

—Boise Penrose, *Travel and Discovery in the Renaissance* (1955)

A Europe-wide phenomenon of scholarly amnesia . . . afflicted the continent from AD 300 to at least 1300. During those centuries Christian faith and dogma suppressed the useful image

of the world that had been so slowly, so painfully, and so scrupulously drawn by ancient geographers.

—Daniel J. Boorstin, *The Discoverers* (1983)

Did people in the Middle Ages think that the world was flat? Certainly the writers quoted above would make us think so. As the story goes, people living in the "Dark Ages" were so ignorant (or so deceived by Catholic priests) that they believed the earth was flat. For a thousand years they lingered in ignorant obscurity, and were it not for the heroic bravery of Christopher Columbus and other explorers, they might well have continued in this ignorance for even longer. Thus, it was the innovation and courage of investors and explorers, motivated by economic goals and modern curiosity, that finally allowed us to break free from the shackles forged by the medieval Catholic church.[1]

Where does this story come from? In the nineteenth century, scholars interested in promoting a new scientific and rational view of the world claimed that ancient Greeks and Romans had understood that the world was round, but that this knowledge was suppressed by medieval churchmen. Pro-Catholic scholars responded by making the argument that medieval thinkers did know the world was round.[2] Critics, however, dismissed such opinions as mere apologetics. Why did the battle rage over this particular issue? Because a belief in the flat earth was equated with willful ignorance, while an understanding of the spherical earth was seen as a measure of modernity; the side one defended became a means of condemning or praising medieval churchmen. For scholars such as William Whewell or John Draper, therefore, Catholicism was bad (since it promoted a flat-earth view), while for Roman Catholics, Catholicism was good (since it promoted modernity). As we'll see, neither of these extremes describes the true state of affairs.[3]

This equation of rotundity with modernity also explains why nineteenth-century American historians claimed it was Columbus

and the early mercantilists who proved the earth was round and thereby ushered in modernity—and America. In fact, it was a biography of Columbus by the American author Washington Irving, the creator of "Rip Van Winkle," that introduced this idea to the world.[4]

But the reality is more complex than either of these stories. Very few people throughout the Middle Ages believed that the world was flat. Thinkers on both sides of the question were Catholics, and for them, the shape of the earth did not equate with progressive or traditionalist views. It is true that most clerics were more concerned with salvation than the shape of the earth—that was their job, after all. But God's works in nature were important to them as well. Columbus could not have proved that the world was round, because this fact was already known. Nor was he a rebellious modern—he was a good Catholic and undertook his voyage believing he was doing God's work. A transformation was taking place in fifteenth-century views of the earth, but it had more to do with a new way of mapping than with a move from flat earth to round sphere.

Scholars in antiquity developed a very clear spherical model of the earth and the heavens. Every major Greek geographical thinker, including Aristotle (384–322 B.C.), Eratosthenes (third century B.C.), and Ptolemy (second century A.D.), based his geographical and astronomical work on the theory that the earth was a sphere. Likewise, all of the major Roman commentators, including Pliny the Elder (23–79 A.D.), Pomponius Mela (first century A.D.), and Macrobius (fourth century A.D.), agreed that the earth must be round. Their conclusions were in part philosophical—a spherical universe required a sphere in the middle—but were also based on mathematical and astronomical reasoning.[5] Most famous was Aristotle's proof of the sphericity of the earth, an argument used by many thinkers in the Middle Ages and Renaissance.

If we examine the work of even early-medieval writers, we find that with few exceptions they held a spherical-earth theory.

Among the early church fathers, Augustine (354–430), Jerome (d. 420), and Ambrose (d. 420) all agreed that the earth was a sphere. Only Lactantius (early fourth century) provided a dissenting opinion, but he rejected all pagan learning since it distracted people from their real work of achieving salvation.[6]

From the seventh century to the fourteenth, every important medieval thinker concerned about the natural world stated more or less explicitly that the world was a round globe, many of them incorporating Ptolemy's astronomy and Aristotle's physics into their work. Thomas Aquinas (d. 1274), for example, followed Aristotle's proof in demonstrating that the changing positions of the constellations as one moved about on the earth's surface indicated the spherical shape of the earth. Roger Bacon (d. 1294), in his *Opus Maius* (ca. 1270), stated that the world was round, that the southern antipodes were inhabited, and that the sun's passage along the line of the ecliptic affected climates of different parts of the world. Albertus Magnus (d. 1280) agreed with Bacon's findings, while Michael Scot (d. 1234) "compared the earth, surrounded by water, to the yolk of an egg and the spheres of the universe to the layers of an onion."[7] Perhaps the most influential were Jean de Sacrobosco, whose *De Sphera* (ca. 1230) demonstrated that the earth was a globe, and Pierre d'Ailly (1350–1410), archbishop of Cambrai, whose *Imago Mundi* (written in 1410) discussed the sphericity of the earth.[8] Both of these books enjoyed great popularity; Sacrobosco's book was used as a basic textbook throughout the Middle Ages, while d'Ailly's book was read by early explorers like Columbus.

The one medieval author whose work has sometimes been interpreted to demonstrate belief in a disk-shaped rather than spherical earth is Isidore of Seville (570–636), a prolific encyclopedist and natural philosopher. Although he was explicit about the spherical shape of the universe, historians have remained divided on his portrayal of the shape of the earth itself.[9] He claimed that everyone experienced the size and heat of the sun in the same manner, which could be interpreted to mean that sunrise was

seen at the same moment by all the earth's inhabitants and that therefore the earth was flat; but the statement more likely implies that the sun's shape did not alter as it progressed around the earth. Much of his physics and astronomy can only be understood to depend on a spherical earth, as does his interpretation of lunar eclipses. While it is not necessary to insist on absolute consistency, it does seem that Isidore's cosmology is only consistent with a spherical earth.[10]

Many popular vernacular writers in the Middle Ages also supported the idea of a round earth. Jean de Mandeville's *Travels* to the Holy Land and to the Earthly Paradise beyond, written in about 1370, was one of the most widely read books in Europe from the fourteenth to the sixteenth century. Mandeville was quite explicit in stating that the world was round and navigable:

> And therefore I say sickerly that a man myght go all the world about, both above and beneath, and come again to his own country . . . And alway he should find men, lands, isles and cities and towns, as are in their countries.[11]

Likewise, Dante (1265–1321) in the *Divine Comedy* described the world as a sphere several times, claiming that the southern hemisphere was covered with a vast sea. And in "The Franklin's Tale" Chaucer (ca. 1340–1400) spoke of "This wyde world, which that men seye is round."[12]

The one medieval writer explicitly to deny the sphericity of the earth was Cosmas Indicopleustes, a sixth-century Byzantine monk who may have been influenced by contemporary Jewish and Eastern flat-earth traditions. Cosmas developed a scripturally based cosmology, with the earth as a tableland, or plateau, placed at the bottom of the universe. It is hard to know how influential he was during his lifetime. Only two copies of his treatise exist today, one of which may have been Cosmas's personal copy, and only one man in the Middle Ages is known to have read his work, Photius of Constantinople (d. 891), widely regarded as the best-read man of his age.[13] In the absence of positive evidence, we cannot use

Cosmas to argue that the Christian church suppressed knowledge of the rotundity of the earth. Cosmas's work merely indicates that the early-medieval scholarly climate was open to debates on the subject.

With the exceptions of Lactantius and Cosmas, all major scholars and many vernacular writers interested in the physical shape of the earth, from the fall of Rome to the time of Columbus, articulated the theory that the earth was round. The scholars may have been more concerned with salvation than with geography, and the vernacular writers may have displayed little interest in philosophical questions. But, with the exception of Cosmas, no medieval writer denied that the earth was spherical—and the Catholic church never took a stand on the issue.

Given this background, it would be silly to argue that Columbus proved the world was round—or even argued so. However, popular accounts continue to circulate the erroneous story that Columbus fought the prejudiced and ignorant scholars and clerics at Salamanca, the home of Spain's leading university, before convincing Queen Isabella to let him try to prove his position. Columbus's proposal—that the distance from Spain west to China was not prohibitively great and that it was shorter and safer than going around Africa—was greeted with incredulity by the group of scholars informally assembled to advise the king and queen of Spain. Since no records remain of that meeting, we must rely on reports written by Columbus's son Fernando and by Bartolemé de las Casas, a Spanish priest who wrote a history of the New World. Both tell us that the learned men at Salamanca were aware of the current debates about the size of the earth, the likelihood of inhabitants in other parts of the world, and the possibility of sailing through the torrid zone at the equator. They challenged Columbus on his claim to having knowledge superior to that of the ancients and on his ability to do what he proposed. They did not, however, deny that the earth was spherical, but rather used its sphericity in their arguments against Columbus, arguing that the round earth was larger than

Columbus claimed and that his circumnavigation would take too long to complete.[14]

When Peter Martyr praised the achievements of Columbus in his laudatory preface to *Decades of the New World* (1511), he was quick to point out that Columbus had proven the equator was passable and that there were indeed peoples and lands in those parts of the globe once thought to have been covered with water. Nowhere, however, did he mention proving the sphericity of the earth.[15] If Columbus had indeed proved the point to doubting scholars, Peter Martyr surely would have mentioned it.

Those who want to preserve Columbus as an icon for the historic moment when the world became round might appeal to the common people. After all, weren't Columbus's sailors afraid of falling off the end of the earth? No, they weren't. According to Columbus's diary, the sailors had two specific complaints. First, they expressed concern that the voyage was taking longer than Columbus had promised. Second, they were frightened that, because the wind seemed to blow constantly due west, they would be unable to make the return voyage eastward.[16]

As we have seen, there is virtually no historical evidence to support the myth of a medieval flat earth. Christian clerics neither suppressed the truth nor stifled debate on this subject. A good son of the church who believed his work was revealing God's plan, Columbus didn't prove the earth was round—he stumbled on a continent that happened to be in his way.

MYTH 4

THAT MEDIEVAL ISLAMIC CULTURE WAS INHOSPITABLE TO SCIENCE

Syed Nomanul Haq

The pious Muslim . . . was expected to avoid . . . [rational] sciences with great care because they were considered dangerous to his faith. . . . The *'ulūm al-awā'il* [sciences of the (non-Muslim) ancients] are pointedly described as "wisdom mixed with unbelief." . . . They can only lead in the end to unbelief and, in particular, to . . . the stripping away of all positive content from God.

—Ignaz Goldziher, "Stellung der alten islamischen Orthodoxie zu den antiken Wissenschaften" (1916)

. . . possession of all of this [Greek] "enlightenment" did not prompt much intellectual progress within Islam, let alone eventuate in Islamic science. . . . The result was to freeze Islamic learning and stifle all possibility of the rise of an Islamic science, and for the same reasons that Greek learning stagnated of itself: fundamental assumptions antithetical to science.

—Rodney Stark, *For the Glory of God* (2003)

Alas, Islam turned against science in the twelfth century. The most influential was the philosopher Abu Hamid al-Ghazzali who argued . . . against the very idea of laws of nature, on the ground that any such laws would put God's hands in chains. . . . The consequences are hideous.

—Steven Weinberg, "A Deadly Certitude" (2007)