

The Late Birth of a Flat Earth

by Stephen Jay Gould

THE MORTAL REMAINS of the Venerable Bede (673-735) lie in Durham Cathedral, under a tombstone with an epitaph that must win all prizes for a “no nonsense” approach to death. In rhyming Latin doggerel, the vault proclaims: *Hac sunt in fossa, Baedae venerabilis ossa*—“The bones of the Venerable Bede lie in this grave.” (*Fossa* is, literally, a ditch or a trough, but we will let this gentler reading stand.)

In the taxonomy of Western history that I learned as a child, Bede shone as a rare light in the “Dark Ages” between Roman grandeur and a slow medieval recovery culminating in the renewed glory of the Renaissance. Bede’s fame rests upon his scriptural commentaries and his *Historia ecclesiastica gentis Anglorum* (*Ecclesiastical History of the English People*), completed in 732. Chronology sets the basis of good history, and Bede preceded his great work with two treatises on the reckoning and sequencing of time: *De temporibus* (*On Times*) in 703, and *De temporum ratione* (*On the Measurement of Times*) in 725.

Bede’s chronologies had their greatest influence in popularizing our inconvenient system of dividing recent time into B.C. and A.D. on opposite sides of Christ’s supposed nativity (almost surely incorrectly determined, as Herod had died by this time of transition, and could not have seen the Wise Men or slaughtered the innocent at the onset of year one). In his chronologies, Bede sought to order the events of Christian history, but the primary motive and purpose of his calculations centered on a different, and persistently vexatious, problem in ecclesiastical timing—the reckoning of Easter. The complex definition of this holiday—the first Sunday following the first full moon occurring on or after the vernal equinox—requires considerable astronomical sophistication, for lunar and seasonal cycles must both be known with precision.

Such computations entail a theory of the heavens, and Bede clearly presented his classical conception of the earth as a sphere at the hub of the cosmos—*orbis in medio totius mundi positus* (an orb placed in the center of the universe). Lest anyone misconstrue his intent, Bede then explicitly stated that he meant a three-dimensional sphere, not a flat plate. Moreover, he added, our planetary sphere may be considered as perfect because even the highest mountains produce no more than an imperceptible ripple on a globe of such great diameter.

I also once learned that most other ecclesiastical scholars of the benighted Dark Ages had refuted Aristotle’s notion of a spherical earth, and had depicted our home as a flat, or at most a gently curved, plate. Didn’t we all hear the legend of Columbus at Salamanca, trying to convince the learned clerics that he would reach the Indies and not fall off the ultimate edge?

The human mind seems to work as a categorizing device (perhaps even, as many French structuralists argue, as a dichotomizing machine, constantly partitioning the world into dualities of raw and cooked [nature vs. culture], male and female, material and spiritual, and so forth). This deeply (perhaps innately) ingrained habit of thought causes us particular trouble when we need to analyze the many continua that form so conspicuous a part of our surrounding world. Continua are rarely so smooth and gradual in their flux that we cannot specify certain points or episodes as decidedly more, interesting, or more tumultuous in their rates of change, than the vast majority of moments along the sequence. We therefore falsely choose these crucial episodes as boundaries for fixed categories, and we veil nature’s continuity in the wrappings of our mental habits.

We must also remember another insidious aspect of our tendency to divide continua into fixed categories. These divisions are not neutral; they are established for definite purposes by partisans of particular viewpoints. Moreover, since many continua are temporal, and since we have a lamentable tendency to view our own age as best, these divisions often saddle the past with pejorative names, while designating successively more modern epochs with words of light and progress. As an obvious example, many people (including yours truly) view the great medieval cathedrals of Europe as the most awesome of all human constructions. (For me—and I say this as a humanist and non-theist—Chartres is off scale, a place of mystery and magic, not truly of this world.) Yet we designate the style of these buildings “Gothic”—originally a pejorative term (traced to seventeenth-century origin in the *Oxford English Dictionary*) applied by self-styled sophisticates who viewed medieval times as a barbaric interlude between the classical forms of Greece and Rome, and their revival in Renaissance and later times. These cathedrals, after all, were not built by German tribes who had their heyday in the third to fifth centuries! The names of several peoples who conquered the waning classical world—Goths and Vandals in particular—became pejorative terms for anything considered rude or mean. For that matter, the word barbarian comes from the Latin term for “foreigner.”

Our conventional divisions of Western history are mired in these twinned errors of false categorization and pejorative designation. I know that professional historians no longer use such a taxonomy, but popular impression still supports a division into classical times (glory of Greece and grandeur of Rome), followed by the pall of the Dark Ages, some improvement in the Middle Ages, and an éclat of culture's rediscovery in the Renaissance. But consider the origin of the two pejorative terms in this sequence—and the relationship of taxonomy to prejudiced theories of progress becomes clear.

According to the historian J. B. Russell, Petrarch devised the term "Dark Ages" in about 1340 to designate a period between classical times and his own form of modernism. The term "Middle Ages" for the interval between classical fall and Renaissance revival originated in the fifteenth century, but gained popularity only in the seventeenth century. Some people consider everything from the fall of Rome to the Renaissance as Dark, others as Middle. Still others make a sequential division into an earlier Dark and later Middle, separated by Charlemagne or by the arbitrary millennial transition of 1000. Such uncertainty only shows the foolishness of attempting to define fixed categories within continua. In any case, the intent of Darks and Middles could not be more clear—to view Western history as possessing a Greek and Roman acme, with supposed loss as tragic, followed by the beginning of salvation in Renaissance rediscovery.

Such prejudicial tales of redemption require a set of stories to support their narrative. Most of these legends feature art, literature, or architecture, but science has also contributed. I write this essay to point out that the most prominent of all scientific stories in this mode—the supposed Dark and Medieval consensus for a flat earth—is entirely mythological. Moreover, when we trace the invention of this fable in the nineteenth century, we receive a double lesson in the dangers of false taxonomies—the second and larger purpose of this essay. For the myth itself only makes sense under a prejudicial view of Western history as an era of darkness between lighted beacons of classical learning and Renaissance revival—while the nineteenth-century invention of the flat earth, as we shall see, occurred to support another dubious and harmful separation wedded to another legend of historical progress—the supposed warfare between science and religion.

Classical scholars, of course, had no doubt about the earth's sphericity. Our planet's roundness was central to Aristotle's cosmology and was assumed in Eratosthenes' measurement of the earth's circumference in the third century B.C. The flat-earth myth argues that this knowledge was then lost when ecclesiastical darkness settled over Europe. For a thousand years of middle time, almost all scholars held that the earth must be flat—like the floor of a tent, held up by the canopy of the sky, to cite a biblical metaphor read literally. The Renaissance rediscovered classical notions of sphericity, but proof required the bravery of Columbus and other great explorers who should have sailed off the edge, but (beginning with Magellan's expedition) returned home from the opposite direction after going all the way round.

The inspirational, schoolchild version of the myth centers upon Columbus, who supposedly overcame the calumny of assembled clerics at Salamanca to win a chance from Ferdinand and Isabella. Consider this version of the legend, cited by Russell from a book for primary-school children written in 1887, soon after the myth's invention (but little different from accounts that I read as a child in the 1950s):

"But if the world is round," said Columbus, "it is not hell that lies beyond that stormy sea. Over there must lie the eastern strand of Asia, the Cathay of Marco Polo" ... In the hall of the convent there was assembled the imposing company-shaved monks in gowns ... cardinals in scarlet robes. ... "You think the earth is round ... Are you not aware that the holy fathers of the church have condemned this belief ... This theory of yours looks heretical." Columbus might well quake in his boots at the mention of heresy; for there was that new Inquisition just in fine running order, with its elaborate bone-breaking, flesh-pinching, thumb-screwing, hanging, burning, mangling system for heretics.

Dramatic to be sure, but entirely fictitious. There never was a period of "flat earth darkness" among scholars (regardless of how many uneducated people may have conceptualized our planet both then and now). Greek knowledge of sphericity never faded, and all major medieval scholars accepted the earth's roundness as an established fact of cosmology. Ferdinand and Isabella did refer Columbus's plans to a royal commission headed by Hernando de Talavera, Isabella's confessor and, following defeat of the Moors, Archbishop of Granada. This commission, composed of both clerical and lay advisers, did meet, at Salamanca among other places. They did pose some sharp intellectual objections to Columbus, but all assumed the earth's roundness. As a major critique, they argued that Columbus could not reach the Indies in his own allotted time, because the earth's circumference was too great. Moreover, his critics were entirely right. Columbus had "cooked" his figures to favor a much smaller earth, and an attainable Indies. Needless to say, he

did not and could not reach Asia, and Native Americans are still called Indians as a legacy of his error.

Virtually all major medieval scholars affirmed the earth's roundness. I introduced this essay with the eighth-century view of the Venerable Bede. The twelfth-century translations into Latin of many Greek and Arabic works greatly expanded general appreciation of natural sciences, particularly astronomy, among scholars—and convictions about the earth's sphericity both spread and strengthened. Roger Bacon (1220-1292) and Thomas Aquinas (1225-1274) affirmed roundness via Aristotle and his Arabic commentators, as did the greatest scientists of later medieval times, including John Buriden (1300-1358) and Nicholas Oresme (1320-1382).

So who, then, was arguing for a flat earth, if all the chief honchos believed in roundness? Villains must be found for any malfeasance, and Russell shows that the great English philosopher of science William Whewell first identified major culprits in his *History of the Inductive Sciences*, published in 1837—two minimally significant characters named Lactantius (245-325) and Cosmas Indicopleustes, who wrote his “Christian Topography” in 547-549. Russell comments: “Whewell pointed to the culprits ... as evidence of a medieval belief in a flat earth, and virtually every subsequent historian imitated him—they could find few other examples.”

Lactantius did raise the old saw of absurdity in believing that people at the antipodes might walk with their feet above their heads in a land where crops grow down and rain falls up. And Cosmas did champion a literal view of a biblical metaphor—the earth as a flat floor for the rectangular, vaulted arch of the heavens above. But both men played minor roles in medieval scholarship. Only three reasonably complete medieval manuscripts of Cosmas are known (with five or six additional fragments), and all in Greek. The first Latin translation dates from 1706—so Cosmas remained invisible to medieval readers in their own lingua franca.

Purveyors of the flat-earth myth could never deny this plain testimony of Bede, Bacon, Aquinas, and others—so they argued that these men acted as rare beacons of brave light in pervasive darkness. But consider the absurdity of such a position. Who formed the orthodoxy representing this consensus of ignorance? Two pipsqueaks named Lactantius and Cosmas Indicopleustes? Bede, Bacon, Aquinas, and their ilk were not brave iconoclasts. They formed the establishment, and their convictions about the earth's roundness stood as canonical, while Lactantius and colleagues remained entirely marginal. To call Aquinas a courageous revolutionary because he promoted a spherical earth would be akin to labeling Fisher, Haldane, Wright, Dobzhansky, Mayr, Simpson, and all the other great twentieth-century evolutionists as radical reformers because a peripheral creationist named Duane Gish wrote a pitiful little book during the same years called *Evolution, the Fossils Say No!*

Where then, and why, did the myth of medieval belief in a flat earth arise? Russell's historiographic work gives us a good fix on both times and people. None of the great eighteenth-century anticlerical rationalists—not Condillac, Condorcet, Diderot, Gibbon, Hume, or our own Benjamin Franklin—accused the scholastics of believing in a flat earth, though these men were all unsparing in their contempt for medieval versions of Christianity. Washington Irving gave the flat-earth story a good boost in his largely fictional history of Columbus, published in 1828—but his version did not take hold. The legend grew during the nineteenth century, but did not enter the crucial domains of schoolboy pap or tour-guide lingo. Russell did an interesting survey of nineteenth-century history texts for secondary schools, and found that very few mentioned the flat-earth myth before 1870, but that almost all texts after 1880 featured the legend. We can therefore pinpoint the invasion of general culture by the flat-earth myth to the period between 1860 and 1890.

Those years also featured the spread of an intellectual movement based on the second error of taxonomic categories explored in this essay—the portrayal of Western history as a perpetual struggle, if not an outright “war,” between science and religion, with progress linked to the victory of science and the consequent retreat of theology. Such movements always need whipping boys and legends to advance their claims. Russell argues that the flat-earth myth achieved its canonical status as a primary homily for the triumph of science under this false dichotomization of Western history. How could a better story for the army of science ever be concocted? Religious darkness destroys Greek knowledge and weaves us into a web of fears, based on dogma and opposed both to rationality and experience. Our ancestors therefore lived in anxiety, restricted by official irrationality, afraid that any challenge could only lead to a fall off the edge of the earth into eternal damnation. A fit tale for an intended purpose, but entirely false because few medieval scholars ever doubted the earth's sphericity.

I was especially drawn to this topic because the myth of dichotomy and warfare between science and religion—an important nineteenth-century theme with major and largely unfortunate repercussions extending to our times—received its greatest boost in two books that I own and treasure for their firm commitment to rationality (however wrong and ultimately harmful their dichotomizing model of history), and for an interesting Darwinian

connection with each author. (I have often said that I write these essays as a tradesman, not a polymath, and that my business is evolutionary theory.) Russell identifies these same two books as the primary codifiers of the flat-earth myth: John W. Draper's *History of the Conflict between Religion and Science*, first published in 1874; and Andrew Dickson White's *A History of the Warfare of Science with Theology in Christendom*, published in 1896 (a great expansion of a small book first written in 1876 and called *The Warfare of Science*).

Draper (1811–1882) was born in England, but emigrated to the United States in 1832, where he eventually became head of the medical school at New York University. His 1874 book ranks among the great publishing successes of the nineteenth century—fifty printings in fifty years as the best-selling volume of the International Scientific Series, the most successful of nineteenth-century publishing projects in popular science. Draper states his thesis in the preface to his volume:

The history of Science is not a mere record of isolated discoveries; it is a narrative of the conflict of two contending powers, the expansive force of the human intellect on one side, and the compressing arising from traditionary faith and human interests on the other ... Faith is in its nature unchangeable, stationary; Science is in its nature progressive; and eventually a divergence between them, impossible to conceal, must take place.

Draper extolled the flat-earth myth as a primary example of religion's constraint and science's progressive power:

The circular visible horizon and its dip at sea, the gradual appearance and disappearance of ships in the offing, cannot fail to incline intelligent sailors to a belief in the globular figure of the earth. The writings of the Mohammedan astronomers and philosophers had given currency to that doctrine throughout Western Europe, but, as might be expected, it was received with disfavor by theologians ... Traditions and policy forbade [the Papal Government] to admit any other than the flat figure of the earth, as revealed in the Scriptures.

Russell comments on the success of Draper's work:

The History of the Conflict is of immense importance, because it was the first instance that an influential figure had explicitly declared that science and religion were at war, and it succeeded as few books ever do. It fixed in the educated mind the idea that "science" stood for freedom and progress against the superstition and repression of "religion." Its viewpoint became conventional wisdom.

Andrew Dickson White (1832–1918) grew up in Syracuse, New York, and founded Cornell University in 1865 as one of the first avowedly secular institutions of higher learning in America. He wrote of the goals he shared with his main benefactor, Ezra Cornell:

Our purpose was to establish in the State of New York an institution for advanced instruction and research, in which science, pure and applied, should have an equal place with literature; in which the study of literature, ancient and modern, should be emancipated as much as possible from pedantry ... We had especially determined that the institution should be under the control of no political party and of no single religious sect.

White avowed that his decision to found a secular university reflected no hostility to theology, but only recorded his desire to foster an ecumenical religious spirit:

It had certainly never entered into the mind of either of us that in all this we were doing anything irreligious or unchristian ... I had been bred a churchman, and had recently been elected a trustee of one church college, and a professor in another ... my greatest sources of enjoyment were ecclesiastical architecture, religious music, and the more devout forms of poetry. So far from wishing to injure Christianity, we both hoped to promote it; but we did not confound religion with sectarianism.

But the calumnies of conservative clergymen dismayed him profoundly and energized his fighting spirit:

Opposition began at once ... from the good protestant bishop who proclaimed that all professors should be in holy orders, since to the Church alone was given the command "Go, teach all the nations," to the zealous priest who published a charge that ... a profoundly Christian scholar had come to Cornell in order to inculcate infidelity ... from the eminent divine who went from city to city denouncing the "atheistic and pantheistic tendencies" of the proposed education, to the perfervid minister who informed a denominational synod that Agassiz, the last great opponent of Darwin, and a devout theist, was "preaching Darwinism and atheism" in the new institution.

These searing personal experiences led White to a different interpretation of the “warfare of science with theology.” Draper was a genuine anti-theist, but he confined his hostility almost entirely to the Catholic Church, as he felt that science could coexist with more liberal forms of Protestantism. White, on the other hand, professed no hostility to religion, but only to dogmatism of any stripe—while his own struggles had taught him that Protestants could be as obstructionist as anyone else. He wrote: “Much as I admired Draper’s treatment of the questions involved, his point of view and mode of looking at history were different from mine. He regarded the struggle as one between Science and Religion. I believed then, and am convinced now, that it was a struggle between Science and Dogmatic Theology.” White therefore argued that the triumph of science in its warfare with dogmatism would benefit true religion as much as science. He expressed his credo as a paragraph in italics in the introduction to his book:

In all modern history, interference with science in the supposed interest of religion, no matter how conscientious such interference may have been, has resulted in the direst evils both to religion and to science, and invariably; and, on the other hand, all untrammelled scientific investigation, no matter how dangerous to religion some of its stages may have seemed for the time to be, has invariably resulted in the highest good both of religion and of science.

Despite these stated disagreements, White’s and Draper’s accounts of the actual interaction between science and religion in Western history do not differ greatly. Both tell a tale of bright progress continually sparked by science. And both develop and utilize the same myths to support their narrative, the flat-earth legend prominently among them. Of Cosmas Indicopleustes’s flat-earth theory, for example, White wrote, “Some of the foremost men in the Church devoted themselves to buttressing it with new texts and throwing about it new outworks of theological reasoning; the great body of the faithful considered it a direct gift from the Almighty.”

As another interesting similarity, both men developed their basic model of science vs. theology in the context of a seminal and contemporary struggle all too easily viewed in this light—the battle for evolution, specifically for Darwin’s secular version based on natural selection. No issue, certainly since Galileo, had so challenged traditional views of the deepest meaning of human life, and therefore so contacted a domain of religious inquiry as well. It would not be an exaggeration to say that the Darwinian revolution directly triggered this influential nineteenth-century conceptualization of Western history as a war between two taxonomic categories labeled science and religion. White made an explicit connection in his statement about Agassiz (the founder of the museum where I now work, and a visiting lecturer at Cornell). Moreover, the first chapter of his book treats the battle over evolution, while the second begins with the flat-earth myth.

Draper wraps himself even more fully in a Darwinian mantle. The end of his preface designates five great episodes in the history of science’s battle with religion: the debasement of classical knowledge and the descent of the Dark Ages; the flowering of science under early Islam; the battle of Galileo with the Catholic Church; the Reformation (a plus for an anti-Catholic like Draper); and the struggle for Darwinism. No one in the world had a more compelling personal license for such a view, for Draper had been an unwilling witness—one might even say an instigator—of the single most celebrated incident in overt struggle between Darwin and divinity. We all have heard the famous story of Bishop Wilberforce and T. H. Huxley duking it out at the British Association meeting in 1860 (for more on this incident, see essay 26 in my earlier book *Bully for Brontosaurus*). But how many people know that their verbal pyrotechnics did not form the stated agenda of this meeting, but only arose during free discussion following the formal paper officially set for this session—an address by the same Dr. Draper on the “intellectual development of Europe considered with reference to the views of Mr. Darwin.” (I do love coincidences of this sort. Sociologists tell us that we can touch anyone through no more than six degrees of separation, given the density of networks in human contact. But to think of Draper, taking the first degree just inches from Hooker, Huxley, and Wilberforce, can only be viewed as God’s gift to an essayist who traffics in connections.)

This essay has discussed a double myth in the annals of our bad habits in false categorization: (1) the flat-earth legend as support for a biased ordering of Western history as a story in redemption from classical to Dark to Medieval to Renaissance; and (2) the invention of the flat-earth myth to support a false dichotomization of Western history as another story of progress, a war of victorious science over religion.

I would not be agitated by these errors if they led only to an inadequate view of the past without practical consequence for our modern world. But the myth of a war between science and religion remains all too current, and continues to impede a proper bonding and conciliation between these two utterly different and powerfully

important institutions of human life. How can a war exist between two vital subjects with such different appropriate turfs—science as an enterprise dedicated to discovering and explaining the factual basis of the empirical world, and religion as an examination of ethics and values?

I do understand, of course, that this territorial separation is a modern decision—and that differing past divisions did entail conflict in subsequent adjustment of boundaries. After all, when science was weak to nonexistent, religion did extend its umbrella into regions now properly viewed as domains of natural knowledge. But shall we blame religion for these overextensions? As thinking beings, we are internally compelled to ponder the great issues of human origins and our relationship with the earth and other creatures; we have no other option but ignorance. If science once had no clue about these subjects, then they fell, albeit uncomfortably and inappropriately, into the domain of religion by default. No one gives up turf voluntarily, and the later expansion of science into rightful territory temporarily occupied by religion did evoke some lively skirmishes and portentous battles. These tensions were also exacerbated by particular circumstances of contingent history—including the resolute and courageous materialism of Darwin's personal theory, and the occupation (at the same time) of the Holy See by one of the most fascinating and enigmatic figures of the nineteenth century: the strong, embittered, and increasingly conservative pope Pio Nono (Pius IX).

But these adjustments, however painful, do not justify a simplistic picture of history as continual warfare between science and theology. Exposure of the flat-earth myth should teach us the fallacy of such a view and help us to recognize the complexity of interaction between these institutions. Irrationality and dogmatism are always the enemies of science, but they are no true friends of religion either. Scientific knowledge has always been helpful to more generous views of religion—as preservation, by ecclesiastical scholars, of classical knowledge about the earth's shape aided religion's need for accurate calendars, for example.

I began this essay with a story about the Venerable Bede's use of cosmology to set a chronology for the determination of Easter. Let me end with another story in the same mold—and another illustration of science's interesting and complex potential bond with religion. Two days before my visit to the Venerable Bede's tomb in Durham, I marveled at an intricate astronomical device prominently displayed in the Church of St. Sulpice in Paris. Precisely at noon each day, the sun's light shines through a tiny hole in a window high in the south transept, and illuminates a copper meridian laid into the floor of the transept and ending at an obelisk surmounted by a globe at the north wall.

The line and obelisk are appropriately marked so that the days of solstices and equinoxes can be determined with precision by the position of noon light. Why should such a scientific instrument be contained within a church? The inscription on the obelisk gives the answer—*ad certam paschalis* (for the determination of Easter), a calculation that requires precise reckoning of the vernal equinox. Interestingly, as a further illustration of complexities in the relationship between science and religion, St. Sulpice became a temple to humanism during the French Revolution, and most of the religious glass and statuary was smashed. The names of kings and princes, once carved on the obelisk, were thoroughly obliterated, but these fervid revolutionaries spared the beautiful blue marble balustrade of the choir because the copper meridian passes right through, and they did not wish to disrupt a scientific instrument.

I would not choose to live in any age but my own; advances in medicine alone, and the consequent survival of children with access to these benefits, should preclude any temptation to trade for the past. But we cannot understand history if we saddle the past with pejorative categories based on our bad habits for dividing continua into compartments of increasing worth toward the present. These errors apply to the vast paleontological history of life, as much as to the temporally trivial chronicle of human beings. I cringe every time I read that this failed business, or that defeated team, has become a dinosaur in succumbing to progress.

Dinosaur should be a term of praise, not opprobrium. Dinosaurs reigned for more than 100 million years and died through no fault of their own; *Homo sapiens* is nowhere near a million years old, and has limited prospects, entirely self-imposed, for extended geological longevity.

Honor the past at its face value. The city of York houses the next great cathedral south of Durham. As Durham displays some amusing Latin doggerel to honor the Venerable Bede, so does York feature a verse to illustrate this principle of respect for the past in the service of understanding. On the wall of the chapter house, we read,

*Ut rosa flos florum
Sic est domus ista domorum*

As the rose is the flower of flowers, so is this the house of houses.