**Studies in the History of Science and Christianity**

**Beyond War and Peace:
A Reappraisal of the Encounter between Christianity and Science"**

David C. Lindberg and Ronald L. Numbers

Department of History of Science
University of Wisconsin
Madison, Wisconsin

From*: Perspectives on Science and Christian Faith* **39.3:**140-149 (9/1987)

*During the last third of the nineteenth century Andrew Dickson White and others used military metaphors to describe the historical relationship between science and Christianity. Recent scholarship, however, has shown the "war- fare" thesis to be a gross distortion-as this paper attempts to reveal, employing illustrations from the patristic and medieval periods and from the Copernican and Darwinian debates. The authors argue that the interaction between science and Christianity was far too rich and varied to be covered by any simple formula.*

**O**n a December evening in 1869, with memories of civil war still fresh in their minds, a large audience gathered in the great hall of Cooper Union in New York City to hear about another conflict, still taking its toll- "with battles fiercer, with sieges more persistent, with strategy more vigorous than in any of the comparatively petty warfares of Alexander, or Caesar, or Napoleon." Although waged with 'pens rather than swords, and for minds rather than empires, this war, too, had destroyed lives and reputations. The combatants? Science and Religion.[1](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#1)

The bearer of this unwelcome news was Andrew Dickson White, a 37-year-old Episcopal-bred historian who had taught at the University of Michigan and served in the New York State Senate before becoming the first president of Cornell University at the age of thirty-three. His refusal as president to impose any religious tests on students and faculty and his declared intention of creating in Ithaca "an asylum for Science - where truth shall be sought for truth's sake, not stretched or cut exactly to fit Revealed Religion had aroused the enmity of pious New Yorkers, who accused the young president and his school of religious indifference and infidelity. When "sweet reasonableness" failed to placate his critics, White fired his Cooper Union broadside, accusing them of possessing the same kind of narrow minds and mean spirits that had led to the persecution of Vesalius, Kepler, and Galileo.[2](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#2)

History showed, White declared, that "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 Science, and invariably." To document this thesis, he surveyed "some of the hardest-fought battle-fields of this great war," illustrating how rigid biblical literalists and dogmatic theologians had stunted the growth of science and prostituted religion-only to lose in the end.[3](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#3)

Some of the bloodiest battles, White believed, had been fought during the sixteenth and seventeenth centuries, the period of the so-called Scientific Revolution, when powerful church leaders repeatedly tried to silence the pioneers of modern science. Nicolaus Copernicus, who dared to locate the sun at the center of the planetary system, risked his very life to publish his heretical views and escaped "persecution only by death. " Many of his disciples met a less happy fate: Bruno was "burned alive as a monster of impiety; Galileo tortured and humiliated as the worst of unbelievers; Kepler hunted alike by Protestants and Catholics." Andreas Vesalius, the sixteenth-century physician who laid the foundations of modern anatomy by insisting on careful first-hand dissection of the human body, paid for his temerity by being "hunted to death." The latest victim in the protracted war on science, said White in an obvious reference to his own experience, was a certain American university, denounced from pulpit and press as "godless" merely because it defended scientific freedom and resisted sectarian control. White no doubt felt that its president, too, deserved to be ranked among the martyrs of science for the persecution that he had endured.[4](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#4)

White's Cooper Union lecture appeared the next day as "The Battle-Fields of Science" in the *New-York Daily Tribune*. In the years following, White fleshed out his history of the conflict between science and religion with new illustrations, some drawn from con- temporary hostilities between creationists and evolutionists. Along the way he also narrowed the focus of his attack: from "religion" in 1869, to "ecclesiasticism" in 1876, when he published a little book entitled *History of The Warfare of Science*, and finally to "dogmatic theology" in 1896, when he brought out his fully documented, two-volume *History of the Warfare of Science with Theology in Christendom*. In this last version of his thesis he distinguished sharply between theology, which made unprovable statements about the world and took the Bible as a scientific text, and religion, which consisted of recognizing .. a Power in the universe" and living by the Golden Rule. Religion, so defined, fostered science; theology smothered it.5

No work-not even John William Draper's best- selling *History of the Conflict between Religion and Science* (1874)-has done more than White's to instill in the public mind a sense of the adversarial relationship between science and religion. His Warfare remains in print to the present day, having appeared also in German, French, Italian, Swedish, and Japanese translations. His military rhetoric has captured the imagination of generations of readers, and his copious references, still impressive, have given his work the appearance of sound scholarship, bedazzling even twentieth-century historians who should know better.

In recent decades, for example, the intellectual historian Bruce Mazlish certified White's thesis to have been established "beyond reasonable doubt," and the late George Sarton, a distinguished historian of science at Harvard found White's argument so compelling that he urged its extension to non-Christian cultures.[6](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#6)

Such judgments, however appealing they may be to foes of "scientific creationism" and other contemporary threats to established science, fly in the face of mounting evidence that White read the past through battle-scarred glasses, and that he and his imitators have distorted history to serve ideological ends of their own. Although it is not difficult to find instances of conflict and controversy in the annals of Christianity and science, recent scholarship has shown that the warfare metaphor to be neither useful or tenable in describing the relationship between science and religion.[7](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#7)

In the remainer of this paper, we wish to support this conclusion with a series of examples drawn from recent scholary studies - thereby giving White's thesis a more systematic critique than it has heretofore received.

**I**

White viewed the early centuries of the Christian era as as an unmitigated disaster for science. By his account the church fathers regarded all scientific effort as futile and required any crumbs of scientific knowledge acquired through patient observation and reasoning to yield to purile opinions extracted by dogmatic church leaders from sacred writings. Such "theological views of science," he wrote, have "without exception...forced mankind away from the truth, and have caused Christendom to stumble for centuries into abysses of error and sorrow."[8](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#8)The coming of Christianity thus "arrested the normal development of the physical sciences for over fifteen hundred years," imposing a tyranny of ignorance and superstition that perverted and crushed true science.[9](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#9)

It is true, of course, that few church fathers placed high value on science and that some spurned it altogether. Augustine expressed reservations about the value of natural science: "When it is asked what we ought to believe in matters of religion, the answer is not to be sought in the exploration of the nature of things, after the nature of those whom the Greeks called 'physicists.'...For the Christian, it is enough to believe that the cause of all things, whether in heaven or on earth, whether visible or invisible, is nothing other than the goodness of the Creator."[10](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#10)

One must not conclude from such remarks, however, that the church fathers totally repudiated scientific knowledge or demanded that it always conform to the dictates of scripture. The opening clause of the passage just quoted is often overlooked. Augustine is arguing only that in matters of religion there is little or nothing to be learned from the Greek physicists. In another context he argues that insofar as scientific knowledge is required, it must be taken from the pagan authors who possess it:

It frequently happens that there is some question about the earth, or the sky, or the other elements of this world, the movement, revolutions, or even the size and distance of the stars, the regular eclipses of the sun and the moon, the course of the years and seasons; the nature of the animals, vegetables and minerals, and other things of the same kind, respecting which one who is not a Christian has knowledge derived from the most certain reasoning or observation. And it is highly deplorable and mischievous and a thing especially to be guarded against that he should hear a Christian speaking of such matters in accordance with Christian writings and uttering such nonsense that, knowing him to be as wide of the mark as ... east is from west, the unbeliever can scarcely restrain himself from laughing.[11](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#11)

White and other writers on science and religion have suggested that science would have progressed more rapidly in the early centuries of the Christian era if Christianity had not inhibited its growth. Counterfactual speculations about what might have occurred had circumstances been otherwise are of questionable value. But it is worth pointing out that the study of nature held a very precarious position in ancient society; with the exception of medicine and a little astronomy, it served no practical function and generally failed to win recognition as a socially useful activity. As a result, it received little patronage from either pagan's or Christians, but depended for its existence on independent means and individual initiative. When the economic and political fortunes of the Roman Empire declined in late antiquity, people of wealth decreased in number, and the elites directed their initiative elsewhere. Moreover, changing educational and philosophical values were diverting attention from the world of nature. Inevitably the pursuit of science suffered.

Christianity did little or nothing to alter the situation. It contained more or less the same spectrum of attitudes toward natural science as did paganism. If there were differences, Christianity was perhaps a little less other- worldly than the major competing ideologies (Gnosticism, Neoplatonism, and the mystery religions) and afforded slightly greater incentive for the study of nature. The church fathers used Greek scientific knowledge in their defense of the faith against heresy and in the elucidation of scripture, thereby preserving and transmitting it during the social and political turmoil of the first millennium of the Christian era. Science was thus the handmaiden of theology-a far cry from its modern status, characterized by autonomy and intellectual hegemony, but also far from the victim of Christian intolerance that White portrayed. Science was not the enemy, but a valued (if not entirely reliable) servant.[12](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#12)

In addition to serving theology, Greek scientific knowledge occupied a prominent place in Christian world views, from the time of Basil of Caesarea and Augustine through the end of the Middle Ages and beyond. The notion that any serious Christian thinker would even have attempted to formulate a world view from the Bible alone is ludicrous. For example, contrary to popular belief (which White's*Warfare* has helped to shape), the church did not insist on a flat earth; there was scarcely a Christian scholar of the Middle Ages who did not acknowledge its sphericity and even know its approximate circumference. By the beginning of the thirteenth century, virtually all of the works of Aristotle had become available in Europe, and from this point onward we see a persistent effort to integrate Aristotelian natural philosophy, or science, with Christian theology. In the end, Christianity took its basic categories of thought, its physical principles, and much of its metaphysics and cosmology from Aristotle. By means of its power to organize and interpret human experience, Aristotelianism conquered Christendom.

But Christian theology impinged on science in return and altered its character. Certain aspects of Aristotelian natural philosophy, such as its determinism (everything that will occur must occur) and its denial of a creation, were diametrically opposed to central Christian doctrines. The ensuing struggles (which were not between Christianity and science, but rather, one must note, among Christians holding different views of the proper relationship between Christianity and science) led ultimately to a theological condemnation of these and other philosophical propositions in 1270 and 1277. The complexity of the encounter between Christianity and science is illustrated nicely by the aftermath of these condemnations.[13](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#13) The condemnations did place a lid on certain lines of scientific speculation; henceforth, philosophers or scientists were forbidden to uphold certain Aristotelian positions and forced to tread lightly whenever they approached theological territory. But while losing certain freedoms, they gained others. Theological condemnation of a considerable body of Aristotelian propositions weakened the heavy hand of Aristotelian authority and freed scientists to speculate in non- Aristotelian and anti-Aristotelian directions. Thus we see in the fourteenth century a steady stream of attacks on various Aristotelian doctrines and a veritable orgy of speculation about non-Aristotelian possibilities, including such notions as the rotation of the earth on its axis.

The condemnations affected the scientific enterprise in another way. One of the central themes of the condemnations was the proclamation of God's absolute sovereignty and omnipotence. From this doctrine follows the absolute contingency of nature-that the course of nature can be anything God chooses it to be and, therefore, that humankind's acquired knowledge of natural causes can be overturned simply by God's decision to do things otherwise. The condemnations thus generated a certain skepticism about the ability of the human mind to penetrate with certainty to the underlying causes of observed events; this attitude encouraged the view that science should restrict its attention to empirical fact and ignore the search for underlying causes, thus influencing the development of scientific methodology. Four hundred years later, the idea of God's absolute sovereignty and its corollary, the total passivity of matter, became central features of Isaac Newton's mechanistic world view.[14](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#14)

**2.**

 In 1543 Nicolaus Copernicus (1473-1543), a Catholic church administrator from northern Poland, announced a heliocentric astronomy that removed the earth from the center of the universe and led, ultimate- ly, to the overturning of the medieval world view. White's interpretation of these events is almost as wide of the mark as his understanding of the Middle Ages. White reports that Copernicus feared to publish his discoveries in Rome or Wittenberg-the centers, respectively, of Catholicism and Protestantism. Instead, the astronomer turned to Nuremberg, where his work was published with a "grovelling preface," written by the Lutheran clergyman Andreas Osiander (1498- 1552), which contained the "apologetic lie that Copernicus had propounded the doctrine of the earth's movement not as a fact, but as a hypothesis." "The greatest and most ennobling, perhaps, of scientific truths" was "forced, in coming before the world, to sneak and crawl."[15](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#15) Copernicus died within a few hours of receiving his first copy of the book and thus, in White's words, placed himself "beyond the reach of the conscientious men who would have blotted his reputation and perhaps destroyed his life."[16](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#16)

 White's picture of unremitting religious hostility to heliocentrism is no longer defensible-if, indeed, it ever was. If Copernicus had any genuine fear of publication, it was the reaction of scientists, not clerics, that worried him. Other churchmen before him- Nicole Oresme (a bishop) in the fourteenth century and Nicholas of Cusa (a cardinal) in the fifteenth-had freely discussed the possible motion of the earth, and there was no reason to suppose that the reappearance of this idea in the sixteenth century would cause a religious stir.[17](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#17)Indeed, various churchmen, including a bishop and a cardinal, urged Copernicus to publish his book, which appeared with a dedication to Pope Paul 111. Had Copernicus lived beyond its publication in 1543, it is highly improbable that he would have felt any hostility or suffered any persecution. The church simply had more important things to worry about than a new astronomical or cosmological system. Although a few critics noticed and opposed the Copernican system, organized Catholic opposition did not appear until the seventeenth century.[18](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#18)

 Concerning the Protestant response to the ideas of Copernicus, White claims that "all branches of the Protestant Church ... vied with each other in denouncing the Copernican doctrine as contrary to Scripture. "[19](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#19) He also maintains (and his account has been repeated endlessly) that the theologians Martin Luther, Philipp Melanchthon, and John Calvin all bitterly attacked the new theory. In fact, from Luther we have only a single off-the-cuff remark, made during a "table talk" in 1539 (four years before publication of Copernicus's book), in which he refers to "that fool who wants to overturn the whole art of astronomy." Melanchthon expressed early disapproval of heliocentrism as a description of reality but later softened his position. Calvin spoke out against the mobility of the earth in a sermon on 1 Corinthians 10 and II (dating from 1556), denouncing the propagators of such vain novelties for their contentious spirit, which undermines the quest for truth; however, it is likely that Calvin had in mind only the rotational motion of the earth as described in Cicero's Academica, and there is no convincing evidence that he was even acquainted with the heliocentrism of Copernicus. In any case, Calvin's dismissal of the earth's mobility is a passing remark, and it is clear that cosmological issues never entered systematically into his thought.[20](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#20)

Significantly, the first sustained response to Copernicus came from a group of young Lutheran mathematical astronomers who worked under Melanchthon's general patronage.[21](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#21)One of them, Georg Joachim Rheticus (1514-1574), spent two years with Copernicus shortly before the latter's death and persuaded the elderly astronomer to publish his book. Rheticus saw it through the press, with Osiander's help. Osiander's prefatory letter, maintaining that astronomy makes mathematical predictions but does not necessarily describe physical reality, was no "grovelling" apology, but an expression of deeply held convictions, shared by many astronomers-a sincere attempt to save Copernicus from unnecessary criticism. Rheticus himself accepted the physical reality of heliocentrism and, contrary to White's claim, proclaimed his position openly. How- ever, many of Rheticus's colleagues adopted Copernicanism simply as a mathematical reform, which offered a better way of predicting planetary positions, while overlooking or rejecting the radical thesis that the earth really moves. Their reasons for opposing the motion of the earth were both scientific and theological: heliocentrism violated the principles of Aristotelian physics and conflicted with the literal interpretation of certain biblical passages that seemed to teach the fixity of the earth. To the latter objection, beliocentrists replied that such passages were written in the language of everyday speech and should not be taken as statements of scientific truth. By the end of the century, then, Protestants held a variety of cosmological views, the merits of which they freely debated.

 The seventeenth century, according to White, produced a "new champion" of heliocentrism: the young Galileo, equipped with a new scientific instrument, the telescope. "Against him," White writes, "the war was long and bitter.... Semi-scientific professors, endeavoring to curry favour with the Church, attacked him with sham science; earnest preachers attacked him with perverted Scripture; theologians, inquisitors, congregations of cardinals, and at last popes dealt with him, and, as was supposed, silenced his impious doctrine forever. This dramatic tale has come, for many, to symbolyze the theological assault on science.

White experienced little difficulty identifying good and evil, truth and error, heroes and villains. Modern scholarship, however, offers a picture more subtle in its shadings. In order to grasp the events and understand why Galileo's fate differed from that of Copernicus, we must keep in mind the Counter-Reformation of the second half of the sixteenth century. Responding to the challenge of the Protestant Reformation, Catholicism grew more conservative and authoritarian; power became centralized, and ideological vigilance in- creased. One of the most sensitive issues was biblical interpretation, for Protestant rejection of the Catholic position that the church alone has the authority to interpret the Bible set the two sides in direct opposition. The Catholic church assumed a firm stance on this issue at the Council of Trent (1545-1563), forbidding the interpretation of scripture on any matter of faith or practice "contrary to the sense determined by the Holy Mother Church. "[23](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#23)The hermeneutic flexibility of the Middle Ages had become a thing of the past.

When Galileo burst on the scene in 1610, he came equipped not only with telescopic observations that could be used to support the heliocentric theory, but also with liberal arguments about how to interpret biblical passages that seemed to teach the fixity of the earth. Galileo argued that God spoke through both scripture and the "book of nature," that the two could not truly conflict, and that in physical matters authority should rest with reason and sense. Faced with demon- strative scientific proof, any scriptural passage to the contrary would have to be reinterpreted. Galileo was flirting with danger, not only by entering the domain of the theologians, but also by defending hermeneutic principles clearly at odds with the spirit of the Council of Trent. Moreover, Galileo lacked the convincing physical proof of the mobility of the earth that his own position demanded. Every one of his telescopic obser- vations was compatible with the modified geocentric system of Tycho Brabe, and Galileo's argument from the tides (that they represent a sloshing about of the oceans on a moving earth) convinced few. The trouble in which Galileo eventually found himself, and which led ultimately to his condemnation, then, resulted not from clear scientific evidence running afoul of biblical claims to the contrary (as White tells the story), but from ambiguous scientific evidence provoking an intra- mural dispute within Catholicism over the proper principles of scriptural interpretations dispute won by the conservatives at Galileo's expense.[24](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#24) Galileo never questioned the authority of scripture, merely the principles by which it was to be interpreted.

 The details of Galileo's condemnation need not detain us long.[25](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#25)Galileo's campaign on behalf of Copernicanism was halted abruptly in 1616, when the Holy Office declared the heliocentric doctrine heretical- though at the time Galileo faced no physical threat. Eight years later Galileo received permission from the new pope, the scholarly Urban VIII, to write about the Copernican system as long as he treated it as merely hypothesis. After many delays, Galileo's Dialogue Con- cerning the Two Chief World Systems appeared in 1632. In it, Galileo not only unambiguously defended the heliocentric system as physically true, but also made the tactical mistake of placing the pope's admonition about its hypothetical character in the mouth of the slow-witted Aristotelian, Simplicio. Although the official imprimatur of the church had been secured, Galileo's enemies, including the now angry Urban VIII, determined to bring him to trial. The inquisition ulti- mately condemned Galileo and forced him to recant. Although sentenced to house arrest for the rest of his life, he lived comfortably in a villa outside Florence. He was neither tortured nor imprisoned-simply silenced. The Galileo affair was a multi-faceted event. Certainly it raised serious questions about the relationship between reason and revelation and the proper means of reconciling the teachings of nature with those of scripture. Nonetheless, it was not a matter of Christianity waging war on science. All of the participants called themselves Christians, and all acknowledged biblical authority. This was a struggle between opposing theories of biblical interpretation: a conservative theory issuing from the Council of Trent versus Galileo's more liberal alternative, both well precedented in the history of the church. Personal and political factors also played a role, as Galileo demonstrated his flair for cultivating enemies in high places.[26](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#26)

**3.**

Throughout the nineteenth century, but especially after the publication in 1859 of Charles Darwin's Origin of Species, the hottest battles in White's warfare were fought over the biblical account of creation. These conflicts allegedly pitted the "great body of theologians" against a coalition of scientists drawn from the fields of astronomy, geology, biology, and anthropology who sought to substitute a dynamic, natural history of the world for the static, supernatural account found in Genesis. Each encounter, says White, followed a predictable pattern: theologians first marshaled biblical texts against the offending scientific doctrine, then sued for peace, after the development of a scientific consensus, by offering "far-fetched reconciliations of textual statements with ascertained fact."[27](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#27)

As an example of this process, White cites the reception given to the nebular hypothesis of Pierre Simon Laplace, who in 1796 proposed that the solar system had developed naturally from a contracting, rotating nebula. "Throughout the theological world," White writes, "there was an outcry at once against 'atheism,' and war raged fiercely." Later, after various discoveries had made the hypothesis scientifically respectable, the faithful decided that Laplace's conjecture was not atheistic at all, but corresponded marvelously with the biblical declaration that "in the beginning ... the earth was without form, and void" (Gen. 1: 1-2).[28](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#28)

In his zeal to describe the battle, White neglects to inform his readers that clergy were among the first to embrace and popularize the hypothesis-and that the most successful and influential of the "far-fetched" efforts to harmonize the Mosaic and Laplacian cosmogonies came not from over-imaginative biblical scholars but from two of America's most distinguished scientists, Arnold Guyot of Princeton and James Dwight Dana of Yale. Instead of illustrating the eager- ness of theologians to wage war on science, the history of the nebular hypothesis shows the extent to which orthodox Christians went to avoid conflict with science.[29](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#29)

The religious response to developments in historical geology provides another example of the fallacy of the science-versus-theology formula. As Charles C. Gillispie pointed out years ago, the problem in geology during the early nineteenth century was "one of religion (in a crude sense) in science rather than one of religion versus science." To illustrate the absurdity of pitting men of science against men of the cloth, we need only point out that the leading English geologists of the early nineteenth century-William Buckland, William Daniel Conybeare, and Adam Sedgwick- were all clergymen, as was the American geologist Edward Hitchcock. And for every theologian who labored to produce "more or less absurd" schemes for reconciling geology and Genesis, there were scientists-for example, the geologists Benjamin Silliman and John William Dawson-who did the same thing.[30](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#30)

**Had Copernicus lived beyond its publication in 1543,
it is highly improbable that he would have felt any hostility
or suffered any persecution.
The church simply had more important things to worry about
than a new astronomical or cosmological system.**

Geologists who argued for the antiquity of the earth, the existence of pre-Adamic life, and a limited Noa- chian flood inevitably generated heated debate. But when conflict erupted, it did not find geologists facing theologians. Rather, as James R. Moore recently has argued, professional geologists, who subscribed to Charles Lyell's admonition to study geology "as if the Scriptures were not in existence," joined with professional biblical scholars, who adopted Benjamin Jowett's advice to "interpret the Scriptures like any other book," in alliance against amateur geologists and exegetes who refused to accept these maxims.[31](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#31)

The appearance of Darwin Is controversial theory of organic evolution, which made humans animals and left God virtually unemployed, understandably stirred passionate debate. But White's polemical analysis con- fuses rather than clarifies the issues. According to White, Samuel Wilberforce, the Bishop of Oxford, launched the theological offensive against Darwin- and set the tone of the debate-by writing an essay for The Quarterly Review in which he condemned Darwinism for contradicting the Bible. Later, on 30 June 1860, in an address at Oxford before the British Association for the Advancement of Science, Wilberforce repeated his objections, this time congratulating him- self "that be was not descended from a monkey." Upon  hearing this remark, Darwin's friend the zoologist Thomas Huxley shot back: "If I had to choose, I would prefer to be a descendant of a humble monkey rather than of a man who employs his knowledge and eloquence in misrepresenting those who are wearing out their lives in the search for the truth "-a shot, says White, that "reverberated through England" and indeed the world.[32](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#32)

To White's credit, he refrained from passing on an even more sensational (and apocryphal) version of the story, according to which the bishop impertinently asked Huxley whether it was "on your grandfather's or grandmother's side that you claim descent from the apes." Replied the irreverent zoologist: "I would rather be descended from an ape than a bishop. " This is a dramatic and memorable story, but one, as J. R. Lucas and others have shown, that perpetuates many errors and places Wilberforce in a grossly unfair light.[33](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#33)

I In his essay for *The Quarterly Review*, which pro- vided the basis for his comments at Oxford, Wilberforce expressed concern about the theological implications of Darwinism, but he dwelt on the scientific, not the religious, objections to Darwin's theory. In fact, he professed a willingness to embrace the theory if it should be demonstrated to be correct:

If Mr. Darwin can with the same correctness of reasoning [as Newton] demonstrate to us our fungular descent, we shall dismiss our pride, and avow, with the characteristic humility of philosophy, our unsuspected cousinship with the mush- rooms ... only we shall ask leave to scrutinise carefully every step of the argument which has such an ending, and demur if at any point of it we are invited to substitute unlimited hypothesis for patient observation.... We have no sympathy with those who object to any fact or alleged facts in nature, or to any inference logically deduced from them, because they believe them to contradict what it appears is taught by Revelation,

These are hardly the ravings of an intransigent fundamentalist, as even Darwin recognized. Writing to a friend, Darwin called the bishop's review "uncommonly clever" and noted that his clerical critic "picks out with skill all the most conjectural parts [of the Origin], and brings forward well all the difficulties. "[34](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#34)

The Huxley-Wilberforce exchange, far from setting the tone of the Darwinian debate, went virtually unnoticed at the time. The botanist Joseph Hooker, who later endorsed the legend, reported to Darwin shortly after the meeting that he, not Huxley, had responded most effectively to the bishop. And a writer covering the meetings for *The Athenaeum* neglected even to mention Huxley's alleged riposte. Wilberforce and Huxley did, without doubt, exchange words, but the words became memorable only with the passage of time, as victorious Darwinians began reconstructing the history of their struggle for recognition. In their memories Huxley won the day at Oxford, but contemporary records indicate otherwise: Wilberforce's supporters included not only the majority of clerics and laypeople in attendance, but "the most eminent naturalists" as well.[35](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#35)

In recent decades, the encounter between William Jennings Bryan and Clarence Darrow at the Scopes trial in 1925 has achieved similar legendary status as a major turning point in the war between science and religion. According to common opinion, the evolutionists, though defeated on legal grounds, scored a stunning public-relations victory, halted the anti-evolution crusade, and exposed the bumbling Bryan as an ignoramus. A more careful look suggests that they did nothing of the sort. Even liberal contemporaries, Paul M. Wag- goner has shown, tended at first to view the trial as a disturbing fundamentalist victory, and the anti-evolution campaign continued to prosper for several years after the trial. By present standards, Bryan displayed remarkable openmindedness for a creationist. Publicly, he not only accepted the testimony of geologists regarding the antiquity of the earth, but conceded that the "days" of Genesis represented long periods of time. Privately, he allowed to friends that he had no quarrel with "evolution before man."[36](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#36)

White's seeming compulsion to reduce every episode in the history of science and Christianity to a simple warlike confrontation blinded him to the possibility that Darwin's critics might have been motivated by honest scientific objections or that his supporters might have been attracted for theological reasons. Thus he tells us that Harvard's venerable Louis Agassiz rejected evolution because he could not escape "the atmosphere of the little Swiss parsonage in which he was born" and that the Canadian geologist Sir William Dawson opposed Darwinism for theological reasons-ignoring in both cases their scientific complaints. Likewise, White overlooked the affinity between Darwinism and Calvinism that apparently encouraged such orthodox Christians as the botanist Asa Cray and the geologist- clergyman George Frederick Wright to accept natural selection.[37](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#37)

We are not suggesting that all was harmony-that serious conflict did not exist-only that it was not the simple bipolar warfare described by White. Recent scholarship suggests that Darwinism produced conflict in at least three different ways. According to James R. Moore, the Darwinian debates created conflict, not between scientists and theologians, but within individual minds experiencing a "crisis of faith" as they struggled to come to terms with new historical and scientific discoveries. It was, he writes, a "conflict of minds steeped in Christian tradition with the ideas and implications of Darwinism."[38](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#38)

Neal C. Gillespie has argued that the conflict involved competing systems of science or "epistemes," the older of which rested on theological assumptions while the newer one, associated with Darwin, rejected religion as a means of knowing the world and insisted on an interpretation of nature that involved only natu- ral, secondary causes. "Because the new episteme for science differed from the old in having within it no place for theology," he explains, "serious questions were thereby raised that made the conflict, sometimes dismissed as an illusion or a mistake, very real indeed." Such conflict, arising from transformations within science, had little to do with warring scientists and clerics.[39](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#39)

**By the end of the [sixteenth] century,
Protestants held a variety Of cosmological views,
the merits Of which they freely debated.**

Frank M. Turner has offered still a third way of viewing the Darwinian controversies. The "Victorian conflict between religious and scientific spokesmen," he claims, resulted not from hostility between progressive science and retrogressive theology, as White would claim, but from a "shift of authority and prestige ... from one part of the intellectual nation to another," as professionalizing scientists sought to banish the clergy from the scientific enterprise and end their control of education. According to Turner, the positivist episteme described by Gillespie

constituted both a cause and a weapon. The "young guard" agreed among themselves that science should be pursued without regard for religious dogma, natural theology, or the opinions of religious authorities.... The drive to organize a more professionally oriented scientific community and to define science in a more critical fashion brought the crusading scientists into conflict with two groups of people. The first were supporters of organized religion who wished to maintain a large measure of control over education and to retain religion as the source of moral and social values. The second group was the religiously minded sector of the preprofessional scientific community, which included both clergymen and laymen.

 In Turner's view, then, the conflict had a social as well as an intellectual dimension.[40](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#40)

This brief excursion to some of White's old battlefields has demonstrated that the historical relationship between science and Christianity-or, more properly, scientists and theologians-cannot be reduced simply to conflict or warfare. Additional examples would only strengthen this conclusion.[41](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#41)However, discrediting the warfare thesis represents only the beginning of the historical task confronting us. We also must construct a satisfactory alternative, for until we do, it is likely that the military metaphor will continue to dominate historical analysis. We require a fresh history of science and religion, free (or as free as we can make it) of the distortion of malice and self-interest. Reinterpreting something as complex as the encounter between Christianity and science is a delicate and arduous task that can hardly be accomplished within the scope of one paper. Nevertheless, we wish to offer a few caveats and suggestions that may help to define a suitable program. First, to insure that we will not be misunderstood, we wish to assert plainly that our displeasure with White's warfare thesis is matched by our aversion to its converse. That is, in denying that unremitting hostility and conflict have characterized the relationship between Christianity and science, we do not in any way mean to suggest that Christianity and science have been perennial allies. Such an interpretation, though widely held in some circles, particularly among Christian apologists, fails to pass historical muster.[42](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html%22%20%5Cl%20%2242)

Second, one of the great attractions of White's view is its simplicity; few qualifications and nuances detract from the clarity of his picture. The memorable imagery found in his writings helps to explain their remarkable longevity. Unfortunately, we will never find a satisfactory alternative of equal simplicity. Any interpretation that begins to do justice to the complexity of the interaction between Christianity and science must be heavily qualified and subtly nuanced-clearly a disadvantage in the quest for public recognition, but a necessity nonetheless.

Third, we are convinced that traditional categories- enemies versus allies, conflict versus consensus-are misleading, even pernicious, because they direct us toward the wrong questions. For more than a century historians of Christianity and science like White have wasted their time and dissipated their energies attempting to identify villains and victims, often with polemical or apologetic intent and always within a framework heavily laden with values. They have tacitly assumed that science has been, and continues to be, one of Western civilization's most valuable cultural artifacts-so valuable, indeed, that nothing should be allowed to interfere with it. Then they have proceeded to inquire why the most perfect expression of scientific activity (namely, modern science) was so long in coming into existence, as if its creation were a simple and inevitable matter; they have leapt quickly to the conclusion that science has suffered various indignities at the hand of assorted enemies, of which Christianity was chief. Such scientism must not pass unchallenged.

In offering these criticisms, we do not mean to question the significance or value of the scientific enterprise. We mean only to suggest that to start with scientistic assumptions is no way to understand the nature and genesis of science. If we are going to celebrate the rise of science, we are not apt to under- stand it. Besides, partisan historians of religion can play a similar game: by supposing religion to be the premier cultural property, to which everything else (including science) must be subordinate, they may discover that science has frequently interfered with the progress of religion. Both games, though seductive for their apologetic function, are of little merit to the historian, because the outcome is, in very large measure, predetermined by the value-laden rules of the game being played. Sound scholarship requires a more neutral starting point.[43](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#43)

 **It was not a matter of Christianity waging war on science.
All of the participants called themselves Christians,
and all acknowledged biblical authority.**

 Historical investigation to date has revealed a rich and varied interaction between science and Christian- ity. People of assorted scientific and theological persuasions and varieties of knowledge and commitment have, with varying degrees of skill and integrity, gone about the business of understanding themselves and their world, building institutions, creating careers, and pursuing sundry satisfactions. In the process, Christianity and science-as intellectual systems, as institutions, and as objects of personal commitment-have rubbed against each other, sometimes comfortably, sometimes with destructive force.[44](http://www.asa3.org/ASA/PSCF/1987/PSCF9-87Lindberg.html#44) In the future, we must not simply ask "Who was the aggressor?" but "How were Christianity and science affected by their encounter?" We are confident that research will show that the encounter has been multiform, the range of effects enormous. We will discover shifting alignments and dual memberships. We will uncover as much struggle and competition within the Christian and scientific communities as between them. Most important, we will see that influence has flowed in both directions, that Christianity and science alike have been profoundly shaped by their relations with each other. If, however, we fail to escape the trap of assigning credit and blame, we will never properly appreciate the roles of science and Christianity in the shaping of Western culture; and that will deeply impoverish our understanding.

**Notes**

1'First of the Course of Scientific Lectures-Prof. White on 'The Battlefields of Science,' " *New York Daily Tribune*, 18 Dec. 1869, p. 4.

2Bruce Mazlish, Preface to *A History of the Warfare of Science with Theology in Christendom*, by Andrew Dickson White (abridged ed., New York, 1965), p. 13; Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols. (New York, 1896), I:viii. On White, see Glenn C. Altschuler, A*ndrew D. White-Educator, Historian, Diplomat* (Ithaca, 1979).

3First of the Course of Scientific Lectures," p. 4.

41bid.

*5Ibid*.; Andrew Dickson White, *The Warfare of Science*(New York, 1876), p. 145; White, *A History of the Warfare*, I:ix,xii. Although hints of White's distinction between religion and theology appear in his earlier works, the focus on dogmatic theology in his 1896 volumes seems to have been more of an afterthoughts misleading effort to distance himself from John William Draper-than an essential premise. See Draper, *History of the Conflict between Religion and Science* (New York, 1874). Henry Guerlac corroborates this judgment in an unpublished memoir, "Sartoniane and Forward," where he notes that White had intended to entitle the 1896 book *A History of the Warfare of Science and Religion*, but was talked out of it by his collaborator, George Lincoln Burr.

6Mazlish, Preface, P. is; George Sarton, "Introductory Essay," in *Science, Religion and Reality*, ed. Joseph Needham (New York, 1955), p. 14.

7For a brilliant critique of the warfare metaphor, see James B. Moore, *The Post-Darwinian Controversies. A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870-1900* (Cambridge, 1979), pp. 19-22. See also David C. Lindberg and Ronald L. Numbers, eds. *God and Nature: Historical Essays on the Encounter between Christianity and Science*(Berkeley, 1986), passim; and Ronald L. Numbers, "Science and Religion," in *Historical Writing on American Science*, ed.. Sally Gregory Kohlstedt and Margaret W. Rossiter, *Osiris* 1, 2nd ser. (1985): 59-80.

8White, *A History of the Warfare*, 1:325. For a fuller account of science and the early church, see David C. Lindberg, "Science and the Early Church," in *God and Nature*, pp. 19-48. "

9White, A History of the Warfare, 1:375.

10Augustine, *Enchiridon* 3.9, trans. Albert C. Outler, Library of Christian Classics 7 (Philadelphia, 1955), pp. 341-342.

11Augustine, De genesi ad litteram 1.19, trans. Meyrick H. Carre, Realists and Nominalists (London, 1946), p. 19. For another translation, see Augustine, *The Literal Meaning of Genesis*, trans. John Hammond Taylor, S.J., 2 vols., Ancient Christian Writers 41-42 (New York, 1982), 1:42-43.

12The themes of this and the preceding paragraph are more fully developed in Lindberg, "Science and the Early Church," pp. 29-,33.

13For a good account of the effects of the condemnations, see Edward Grant, "The Condemnation of 1277, God's Absolute Power, and Physical Thought in the Late Middle Ages,"*Viator*10 (1979): 211-244; reprinted in Edward Grant's *Studies in Medieval Science and Natural Philosophy* (London, 1981), article 13.

14See Gary Deamn, "Reformation Theology and the Mechanistic Conception of Nature," in *God and Nature*, pp. 181-185.

15White, A History of the Warfare, 1: 123.

*16Ibid*., 1:123-124.

17Oresme's discussion is translated and analyzed in Marshall Clagett, *The Science of Mechanics in the Middle Ages*(Madison, 1959), pp. 600-609.

18On the sixteenth century Catholic response to Copemicanian, see Robert S. Westman, "Copernicanisrn and the Churches," in *God and Nature*, pp. 86-95.

19White, *A History of the Warfare*, 1:126. On the Protestant response to Copernicanism, see Westman, "Copernicanism and the Churches," pp. 81-85,89-98. '

20On Luther and Melanchthon, see B.A. Gerrish, "The Reformation and the Rise of Modern Science," in*The Impact of the Church Upon its Culture: Reappraisals of the History of Christianity,*ed. Jerald C. Brauer(Chicago, 1986), pp. 231-265. For recent discussion of Calvin's position, see R. Stauffer, "Calvin et Copernic," *Revue de I'histoire des religions* 179 (1971): 31-40; Robert White, "Calvin and Copernicus: The Problem Reconsidered," *Calvin Theological journal*15 (1980): 233-M; and Christopher B. Kaiser, "Calvin, Copernicus, and Castellio," *Calvin Theological journal*, 21 (1985): 5-31.

21Robert S. Westman, "The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory," *Isis* 66 (1976): 164-193.

*22*White, *A History of the Warfare*, 1:130-131.

23The text of the decree is given in Olaf Pedersen, "Galileo and the Council of Trent: The Galileo Affair Revisited," *Journal for the History of Astronomy* 14 (1983):28-29, n. 46.

24On the issues between Galileo and his critics within the church, see ibid.; also William R. Shea, "Galileo and the Church," in *God and Nature*, pp. 118-133.

25On the course of events, see (in addition to the works by Pedersen and Shea) Jerome J. Langford, *Galileo, Science, and the Church*(New York, 1966).

26The struggle over heliocentrism was not the only battle during the period of the scientific revolution identified by White. For his discussion of the biomedical sciences, see A History of the Warfare, 1:49-M. For contrasting views, we Ronald L. Numbers and Ronald C. Sawyer, "Medicine and Christianity in the Modern World," in *Health/Medicine and the Faith Traditions,* ed. Martin E. Marty and Kenneth L. Vaux (Philadelphia, 1982), pp. 134-136; and James J. Walsh, The Popes and Science (New York, 1908).

27White, *A History of the Warfare*, 1:22, 218.

*28Ibid*., 1:17-18.

29Ronald L. Numbers, *Creation by Natural Law: Laplace's Nebular Hypothesis in American Thought* (Seattle, 1977).

30Charles Coulston Gillispie, *Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology, and Social Opinion in Great Britain, 1790-I850* (Cambridge, Man., 1951); White, *A History of the Warfare*, 1:234. See also Nicolaas A. Rupke, *The Great Chain of History: William Buckland and the English School of Geology*, 1814-1849 (Oxford, 1983).

31James R. Moore, "Geologists and Interpreters of Genesis in the Nineteenth Century," in *God and Nature*, pp. 322-350. See also Martin J.S. Rudwick, "The Shape and Meaning of Earth History," *ibid*., pp. 296-321. "'

32White, *A History of the Warfare*, 1:70-71. '

33J.R. Lucas, "Wilberforce and Huxley: A Legendary Encounter," *The Historical Journal* 22 (1979): 313-330. See also Sheridan Gilley, "The Huxley- Wilberforce Debate: A Reconsideration, " in *Religion and Humanism,* ed. Keith Robbins, *Studies in Church History* 17 (Oxford, 1981), pp. 325-340. 3

34Quoted in Lucas, "Wilberforce and Huxley," pp. 317-320. "

*35Ibid*., pp. 313-330.

36Paul M. Waggoner, "The Historiography of the Scopes Trial; A Critical Be-evaluation," Trinity Journal, n.s. 5 (1984): 155-174; Ronald L. Numbers, "Creationism in 20th-Century America," *Science* 218 (1982): 538- 544. See also Edward J. Larson, *Trial and Error: The American Controversy over Creation and Evolution (New York*, 1985).

37White, *A History of the Warfare*, 1:68, 82. On the relationship between Darwinism and Calvinism, see Moore, *Post-Darwinian Controversies,* pp. 280-298, 334-340. White's interpretation of the Darwinian debates is rejected also by A. Hunter Dupree, "Christianity and the Scientific Community in the Age of Darwin," in *God and Nature*, pp. 351-368.

38Moore, *Post-Darwinian Controversies*, pp. 102-103.

39Neal C. Gillespie, *Charles Darwin and the Problem of Creation* (Chicago, 1979), pp. 12-13, 18, 53. See also Alvar Ellegird, *Darwin and the General Reader: The Reception of Darwin's Theory of Evolution in the British Periodical Press*, IM-1872 (G6teborg, Sweden, 1958), p. 337.

40Frank M. Turner, "The Victorian Conflict between Science and Religion; A Professional Dimension,"*Isi*s 69 (1978): M6-376. Owen Chadwick has argued that the conflict between science and religion "was hypostatized, necessarily, out of a number of conflicts"; *The Secularization of the European Mind in the Nineteenth Century* (Cambridge, 1975), pp. 163-164.

41See, for example, Edward E. Daub, "Demythologizing White's Warfare of Science with Theology," *American Biology Teacher* 40 (1978): 553-556.

42See, for example, Rfeiier Hooykaas, Religion and the Rise of Modern Science (Grand Rapids, Mich., 1972); and Stanley L. Jaki, *The Road of Science and the Ways to God*(Chicago, 1978).

43On the need for a neutral stance, see Martin Rudwick, "Senses of the Natural World and Senses of God: Another Look at the Historical Relation of Science and Religion," in *The Sciences and Theology in the Twentieth Century*, ed. A.R. Peacocke (Notre Dame, 1981), pp. 241-261.

44Although we are aware of the danger that some readers might interpret our use of the terms "science" and "Christianity" as an unwarranted reification of these entities, we have retained this terminology as a convenient way of designating the various manifestations of Christianity and science.