



Science and the Early Christian Church

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CRITIQUES & CONTENTIONS

The discipline of history of science continues to expand. The need becomes obvious for synthetic articles that will review the specialist literature of a given field or problem area and report on expert opinion, to keep us abreast of the growing flood of work remote from our own specialties.

Fortunately, this need is matched by new opportunities made possible by the ongoing Fund Drive of the History of Science Society. We are now in a period of transition, in which we hope to see a revived *Osiris* stand alongside a newly invigorated *Isis*. That new *Isis* will seek from time to time to offer the review articles and synthetic essays which we all need.

The following essay may serve as a precursor of this new *Isis* genre. There is no field of more obvious relevance—not only to those of us who teach, but to all of us as citizens and intellectuals—than that of science and religion. One's understanding of this larger subject depends directly on one's perceptions about science and the early church. *Isis* is therefore pleased to present, by way of experiment, David Lindberg's authoritative discussion.

—A.T.

Science and the Early Christian Church

By David C. Lindberg

The pagan party . . . asserted that knowledge is to be obtained only by the laborious exercise of human observation and human reason. The Christian party asserted that all knowledge is to be found in the Scriptures and in the traditions of the church; that, in the written revelation, God had not only given a criterion of truth, but had furnished us with all that he intended us to know. . . .

The Church thus set herself forth as the depository and arbiter of knowledge; she was ever ready to resort to the civil power to compel obedience to her decisions. She thus took a course which determined her whole future career; she became a stumbling block in the intellectual advancement of Europe for more than a thousand years.¹

THUS WROTE JOHN WILLIAM DRAPER (1811–1882) in a polemic against the excesses of organized Christianity, especially Catholicism. In so doing, he gave shape to what has become a very widespread (probably the dominant) interpretation of the relationship between science and the early church: that the church, if it did not entirely stamp out science, surely retarded its progress. This

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¹ John William Draper, *The Conflict between Religion and Science*, 7th ed. (London: Henry S. King, 1876), pp. 51–52. On Draper and his career, see Donald Fleming, *John William Draper and the Religion of Science* (Philadelphia: Univ. Pennsylvania Press, 1950).

theme was echoed near the end of the nineteenth century by Andrew Dickson White (1832–1918). After quoting Augustine on the necessity of yielding to Scriptural authority, White commented: “Following this precept of St. Augustine there were developed, in every field, theological views of science which have never led to a single truth—which, without exception, have forced mankind away from the truth, and have caused Christendom to stumble for centuries into abysses of error and sorrow.”² Draper and White believed that Christianity waged war on science in two ways. First, the early church fathers denigrated the investigation of nature for its own sake: with the kingdom of heaven just around the corner, there was no time or energy to waste on irrelevancies. Second, whatever truth was discovered through patient observation and reasoning was forced to yield to the puerile opinions extracted by dogmatic churchmen from sacred writings. The result was a tyranny of ignorance and superstition that “perverted” and “crushed” true science.³

The thesis of Draper and White has given way to a spectrum of scholarly opinion in the twentieth century. Some scholars continue to affirm, although (in most cases) somewhat less militantly, the Draper-White view.⁴ Others have gone to the opposite extreme, arguing that Christianity was good for science—indeed, that modern science would not have come into existence without it.⁵ And some have sought middle ground.⁶ But this is scholarship; in popular opinion the Draper-White view still prevails. It frequently appears in books aimed at the general reader; moreover, Draper’s and White’s own works continue to be reprinted, purchased, and presumably read and believed.⁷

This essay will reassess the evidence, while shunning as far as possible the

² Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols. (New York: Appleton, 1896), Vol. I, p. 325. On White, see the biography by Glenn C. Altschuler, *Andrew D. White—Educator, Historian, Diplomat* (Ithaca: Cornell Univ. Press, 1979); also the excellent historiographical essay by James R. Moore, *The Post-Darwinian Controversies* (Cambridge: Cambridge Univ. Press, 1979), Ch. 1.

³ See White, *Warfare*, Vol. I, pp. 97, 376.

⁴ E.g., George Sarton, *Introduction to the History of Science*, 3 vols. (Baltimore: William & Wilkins, 1927–1948), Vol. I, pp. 17, 21; Sir William Dampier, *A History of Science and its Relations with Philosophy and Religion* (Cambridge: Cambridge Univ. Press, 1929), pp. 66–73; Charles Singer, *Religion and Science Considered in their Historical Relations* (New York: Robert McBride, [1932]), pp. 52–56; J. D. Bernal, *Science in History*, 4 vols. (London: C. A. Watts, 1954), Vol. I, pp. 258–262; Ernst Mayr, *The Growth of Biological Thought: Diversity, Evolution, and Inheritance* (Cambridge, Mass.: Belknap Press of Harvard Univ. Press, 1982), pp. 307–309.

⁵ R. Hooykaas, *Religion and the Rise of Modern Science* (Grand Rapids: Eerdmans, 1982); Eugene M. Klaaren, *Religious Origins of Modern Science: Belief in Creation in Seventeenth-Century Thought* (Grand Rapids: Eerdmans, 1977); Stanley L. Jaki, *The Road of Science and the Ways to God* (Chicago: Univ. Chicago Press, 1978). None of these authors addresses himself in any serious way to the patristic period, but since their larger view is that Christianity was a necessary condition for the development of science, it follows that the advent of Christianity was a necessary first step.

⁶ Marshall Clagett, *Greek Science in Antiquity* (London: Abelard-Schuman, 1957), pp. 130–145; E. J. Dijksterhuis, *The Mechanization of the World Picture*, trans. C. Dikshoorn (Oxford: Clarendon Press, 1961), pp. 89–95; G. E. R. Lloyd, *Greek Science after Aristotle* (London: Chatto & Windus, 1973), pp. 167–171. Lloyd, however, does regard Christianity as having had an overall detrimental effect on science.

⁷ See Will Durant, *The Age of Faith* (Story of Civilization, Vol. IV) (New York: Simon & Schuster, 1950), pp. 78–79; Thomas Goldstein, *Dawn of Modern Science: From the Arabs to Leonardo da Vinci* (Boston: Houghton Mifflin, 1980), p. 43. Between them, Draper’s and White’s books have gone through more than eighty editions. Draper’s book has been translated into Spanish, French, German, Polish, and Russian; White’s into French, Italian, Swedish, and Japanese. Draper’s book was last published in 1970; White’s is still in print.

polemical and ideological goals that motivated Draper and White and continue to motivate many discussions of early Christianity and science. Instead of using the historical problem as an occasion for attacking or defending Christianity for its detrimental or beneficial affects on science, we must endeavor to understand the complexity and subtlety of their interaction.

Discussions of our subject have frequently suffered from the assumption that in antiquity there was an intellectual discipline having more or less the same methods and the same lines of demarcation as modern science, to which the term "science" can be properly and unambiguously applied. Thus it was modern science, or its immediate antecedent, that Draper and White and their followers hold Christianity to have retarded. But the truth is far more complicated. Several of the subdivisions of modern science did exist as recognizable disciplines in antiquity, for example, medicine (with some associated biological knowledge) and mathematics (including astronomy and other branches of mathematical science). But there was nothing in antiquity corresponding to modern science as a whole or to such branches of modern science as physics, chemistry, geology, zoology, and psychology. The subject matters of these modern disciplines all belonged to natural philosophy and thus to the larger philosophical enterprise. Even such distinctions as existed (for example, that between natural philosophy and mathematics) could be easily overlooked, since the disciplines thus distinguished did not represent clearly defined social roles or professions.⁸ The natural philosopher and the mathematician were often the same person, and professionally he would probably have identified himself neither as natural philosopher nor as mathematician, but simply as a teacher; and his teaching would likely have extended beyond mathematics and natural philosophy to all manner of other philosophical issues. It is true that there were always professional physicians, but even here the lines of demarcation were fuzzy, since many a physician was also a philosopher. The world of the intellect had a unity in antiquity that it does not have today.

The methodology of this scholarly enterprise has often been misrepresented. Members of the Draper-White School (as the opening quotation instances) have portrayed ancient philosophy as an early version of modern scholarship—the embodiment of the ideals of rationality, objectivity, and whatever other traits they find praiseworthy in themselves. There were indeed ancient philosophers and philosophical schools for which such a characterization is more or less apt, and the rationalism of Greek thought was surely one of the great achievements of antiquity.⁹ But in late antiquity philosophy was changing. The philosophical classics of the past continued to be available and influential, but within

⁸ On the classification of theoretical knowledge see James A. Weisheipl, O.P., "The Nature, Scope, and Classification of the Sciences," in *Science in the Middle Ages*, ed. David C. Lindberg (Chicago: Univ. Chicago Press, 1978), Ch. 14. On the organization of science in antiquity, see Ludwig Edelstein, *Ancient Medicine: Selected Papers* (Baltimore: Johns Hopkins Univ. Press, 1967), pp. 429–439 (the final section of an article "Recent Trends in the Interpretation of Ancient Science," rpt. from *Journal of the History of Ideas*, 1952, 13:573–604); G. E. R. Lloyd, *Early Greek Science: Thales to Aristotle* (London: Chatto & Windus, 1970), pp. 125–130; and Thomas W. Africa, *Science and the State in Greece and Rome* (New York: Wiley, 1968).

⁹ On Greek rationalism, see Bruno Snell, *The Discovery of the Mind: The Greek Origins of European Thought* (Cambridge, Mass.: Harvard Univ. Press, 1953); E. R. Dodds, *The Greeks and the Irrational* (Berkeley: Univ. California Press, 1951); G. E. R. Lloyd, *Magic, Reason and Experi-*

the living, contemporary tradition the focus of attention was shifting toward ethics, metaphysics, and theology; and, in some of its manifestations, philosophy was becoming progressively more like a religion, based on inspired authorities, with mystical illumination and personal salvation among its principal goals. Thus Neoplatonic authors such as Porphyry, Iamblichus, Proclus, and Damascius (third through sixth centuries) accepted the *Chaldean Oracles* (esoteric religious writings, devoted to theurgy, demonology, and other forms of magic) as an authoritative source of revealed truth, beyond the reach of rational discussion and debate.¹⁰ Those who would characterize the early Christian tradition as “superstitious” must apply the same term to aspects of contemporary pagan philosophy.

There is also a tendency, within the Draper-White tradition, to see pagan philosophy as tolerant, committed to a free market of ideas—in contrast to the intolerance of Christians. Indeed, those who regret the triumph of Christianity frequently view the struggle between Christianity and pagan philosophy as a battle for freedom of thought. But this too is a misconception. One need only recall that Plato demanded solitary confinement (and, in extreme cases, execution) for those who denied the existence of the gods and their involvement in human affairs.¹¹ Intolerance was (and is) a widely cultivated trait, shared about equally by pagans and Christians. Moreover, each party was capable of employing coercive measures when it possessed the political power to do so; Christians, in fact, appear to have yielded to the temptation less often than did pagans.¹²

This is the pagan philosophical culture that the early church confronted. It comprised both a contemporary philosophical tradition and a collection of philosophical classics; it dealt with an enormous range of philosophical issues, covering the spectrum from epistemology to politics; and it furnished the technical tools for reasoned discourse. It did not look very much like modern science. Although we will eventually focus our attention on that portion of its content that pertained to nature, we must (if we wish to understand the church’s response) begin by considering it as a whole. We must ask: How did the early church regard pagan intellectual culture? How and to what extent did Christians make use of it? Was Christian theology ever a rational enterprise, employing the tools of Greek philosophy, or did it always involve a retreat from philosophy into the claims of revelation? How were Christian thought and the pagan philosophical tradition affected by their encounter? We must, in short, begin by examining the problem of reason and revelation—the question raised by Tertullian when he inquired: “What has Athens to do with Jerusalem?”

ence: *Studies in the Origins and Development of Greek Science* (Cambridge: Cambridge Univ. Press, 1979).

¹⁰ Hans Lewy, *Chaldean Oracles and Theurgy: Mysticism, Magic, and Platonism in the Later Roman Empire* (Cairo: Institut Français d’Archéologie Orientale, 1956), pp. 67–76; John J. O’Meara, *Porphyry’s Philosophy from Oracles in Augustine* (Paris: Etudes Augustiniennes, 1959); Richard Walzer, *Galen on Jews and Christians* (London: Oxford Univ. Press, 1949), pp. 55–56; Henry Chadwick, *The Early Church* (Harmondsworth: Penguin, 1967), p. 112. E. R. Dodds, *Pagan and Christian in an Age of Anxiety* (Cambridge: Cambridge Univ. Press, 1965), p. 122, points out that while Christians were substituting reason for authority, pagans were substituting authority for reason.

¹¹ Plato, *Laws* 10.

¹² This can be gathered from Chadwick, *Early Church*, pp. 171–173.

ATHENS AND JERUSALEM

Christianity spread rapidly outward from Jerusalem and surrounding Judaea during the first century of the Christian era, particularly to the north and west, into Syria, Asia Minor, and as far as Rome. Beginning as a Jewish sect appealing largely to Hellenized Jews, it first broadened its reach into the Gentile world through the efforts of the Apostle Paul. It was too insignificant to attract serious attention from the Roman authorities until Christians were blamed by the Emperor Nero for the great fire that destroyed Rome in A.D. 64. Considered anti-social for their unwillingness to participate in the traditional religious practices, Christians thereafter attracted sporadic persecution through the third century—persecution that seems to have contributed to the growth rather than the decline of Christianity. The conversion of the Emperor Constantine early in the fourth century marked the beginning of a radical change in the political fortunes of Christianity; by the end of the fourth century it had become the state religion.¹³

From the beginning Christianity attracted converts from a wide social and intellectual spectrum. The Apostle Paul is representative of highly educated Hellenized Judaism; one finds within his writings ample evidence of familiarity with Greek philosophical systems. As people committed to sacred writings, Christians were in need of literacy and therefore at least elementary education, but it was not until the second century that Christianity, under the influence of doctrinal dissent within and attack from without, developed a significant intellectual tradition. The first major Christian apologist was Justin Martyr, of Greek descent, born in Samaria near the beginning of the second century and martyred in Rome between 162 and 168. Justin studied Stoic, Aristotelian, Pythagorean, and Platonic philosophy, finding satisfaction only in the latter. Later he converted to Christianity and became convinced of the fundamental compatibility between Christian doctrine, Platonic metaphysics, and Stoic ethics. He firmly rejected pagan polytheistic religion, but welcomed such pagan philosophy as was consistent with Biblical teaching. Justin explained the impressive parallels between Christianity and pagan philosophy (particularly Platonism, which not only could be construed as monotheistic, but also taught the immortality of the soul and the formation of the world at a point in time) by proposing that the Greek philosophers had studied the Old Testament, and also that all of humankind, insofar as it thinks rightly, does so through participation in the universal rational power, the divine *logos*, Christ. Justin thus expressed deep confidence in the power of reason—a divine gift.¹⁴

The apologetic work begun by Justin was continued by Athenagoras, Theophilus of Antioch, Clement of Alexandria, Origen, and others. There were varieties of opinion among these apologists, of course, but all were familiar with

¹³ See Chadwick, *Early Church*, an excellent short history. Longer histories are innumerable; I have made greatest use of Louis Duchesne, *The Early History of the Church*, 3 vols. (New York: Longmans, Green & Co., 1914–1924).

¹⁴ On Justin, see Henry Chadwick, *Early Christian Thought and the Classical Tradition: Studies in Justin, Clement, and Origen* (New York: Oxford Univ. Press, 1966), Ch. 1; Chadwick, "The Beginning of Christian Philosophy: Justin: The Gnostics," in *The Cambridge History of Later Greek and Early Medieval Philosophy* (henceforth *Cambridge History*), ed. A. H. Armstrong (Cambridge: Cambridge Univ. Press, 1970), Ch. 9; Frederick Copleston, S.J., *A. History of Philosophy*, 9 vols. (Westminster, Md.: Newman Press, 1946–1975), Vol. II, pp. 16–18.

Greek philosophy, esteemed portions of it, particularly Platonic philosophy (for its many affinities with Christian theology), and put it to apologetic use whenever possible. Clement (d. between 211 and 215), a teacher in the catechetical school in Alexandria, regarded Greek philosophy as absolutely essential for the defense of the faith against heresy and skepticism and for the development of Christian doctrine. Central to Clement's thought was the doctrine that truth is one—that ultimately all truth, wherever it may be encountered, is God's truth.¹⁵ In his *Stromateis* he claimed that "barbarian and Greek philosophy have torn off a piece of the eternal truth . . . from the theology of the Logos who eternally is. And he who brings together again the divided parts and makes them one, mark well, shall without danger of error look upon the perfect Logos, the truth."¹⁶ Like Justin, he argued that Greek philosophy partook of the truth because it was plagiarized from the Old Testament, and also because pagan philosophers employed their God-given rational capacities to obtain a portion of divine truth. Thus did Clement endeavor to rescue Christianity from the charge of intellectual obscurantism (already leveled against it in antiquity, as discussed below) by affirming the value of Greek philosophy.

The attitude of Origen (ca. 185–ca. 254) toward Greek philosophy, particularly Platonic, was even more liberal than Clement's. Origen, also an Alexandrian teacher, possessed a thorough knowledge of Greek philosophy—Aristotelian, Platonic, Stoic, and Epicurean. He adopted the basic elements of Plato's theology, cosmology, and psychology, while borrowing his terminology and definitions from Aristotle. His student Gregory Thaumaturgus, commenting on Origen's teaching methodology, reveals Origen's remarkable openness to pagan philosophical sources:

He required us to study philosophy by reading all the existing writings of the ancients, both philosophers and religious poets, taking every care not to put aside or reject any . . . , apart from the writings of the atheists. . . . He selected everything that was useful and true in each philosopher and set it before us, but condemned what was false. . . . For us there was nothing forbidden, nothing hidden, nothing inaccessible. We were allowed to learn every doctrine, non-Greek and Greek, both spiritual and secular, both divine and human; with the utmost freedom we went into everything and examined it thoroughly, taking our fill of and enjoying the pleasures of the soul.¹⁷

But not all Christians shared the opinion of Justin, Clement, and Origen. Tatian, a Syrian Christian who apparently studied under Justin, was skeptical of the value of Greek philosophy and launched an attack on the teaching of the

¹⁵ E. F. Osborn, *The Philosophy of Clement of Alexandria* (Cambridge: Cambridge Univ. Press, 1957), pp. 117–126. On Clement see also Chadwick, *Early Christian Thought*, Ch. 2; Charles Bigg, *The Christian Platonists of Alexandria* (Oxford: Clarendon Press, 1886), Lect. 2; H. B. Timothy, *The Early Greek Apologists and Greek Philosophy, Exemplified by Irenaeus, Tertullian, and Clement of Alexandria* (Assen: Van Gorcum, 1973), pp. 59–80, 88–98.

¹⁶ Quoted by Osborn, *Philosophy of Clement*, p. 124.

¹⁷ Gregory Thaumaturgus, *In Origenem Oratio*, quoted by M. L. Clarke, *Higher Education in the Ancient World* (London: Routledge & Kegan Paul, 1971), pp. 126–127 (with minor changes in punctuation). On Origen's borrowings see Dodds, *Pagan and Christian*, pp. 127–129; Charles N. Cochrane, *Christianity and Classical Culture: A Study of Thought and Action from Augustus to Augustine* (Oxford: Clarendon Press, 1940), p. 226. See also Chadwick, *Early Christian Thought*, Ch. 3; Bigg, *Christian Platonists*, Lects. 4–6.

pagan schools.¹⁸ In the third century the author of the *Didascalía apostolorum* warned Christians against the dangers of pagan literature: "Shun all heathen books. Of what concern to you are strange ideas or laws or pseudo-prophets, which often lead inexperienced men into error? What is lacking to you in God's word, that you should turn to that heathen nonsense?" And in the fourth century John Chrysostom, who was willing to concede that pagan schools were not without value, nevertheless pointed out that "the study of eloquence requires good morals, but good morals do not require eloquence."¹⁹ Whether or not such views were typical of Christians, they were portrayed as such by pagan opponents. Celsus (fl. ca. 177–180) accused Christians of enjoining: "Let no one educated, no one wise, no one sensible draw near. For these abilities are thought by us to be evils. But as for anyone ignorant, anyone stupid, anyone uneducated, . . . let him come boldly."²⁰ Eusebius, probably reporting Porphyry's view, refers to those who "have supposed that Christianity has no reason to support itself but that those who desire the name confirm their opinion by an unreasoning faith and an assent without examination." And the Emperor Julian, who promoted a restoration of paganism in the fourth century, argued as follows against the Christians (at the same time giving paganism somewhat more than its due): "Ours are the reasoned arguments and the pagan tradition which comprehend at the same time due worship of the gods; yours are want of reason and rusticity, and all your wisdom can be summed up in the imperative 'Believe.'"²¹

The church father who is generally taken to epitomize the anti-intellectualism of the early church is Tertullian (ca. 155–ca. 230), whose views we must therefore consider with some care. Tertullian was a native of Carthage in Roman Africa, of pagan parentage, well educated in philosophy, medicine, and law, and able to write in either Greek or Latin. Etienne Gilson has portrayed him as an implacable foe of pagan philosophy, the archetype of those Christian theologians who wished to substitute faith for reason.²² In a celebrated denunciation of philosophy, Tertullian exclaims:

What indeed has Athens to do with Jerusalem? What concord is there between the Academy and the Church? What between heretics and Christians? Our instruction comes from "the porch of Solomon," who had himself taught that "the Lord should be sought in simplicity of heart." Away with all attempts to produce a mottled Christianity of Stoic, Platonic, and dialectic composition! We want no curious disputation after possessing Christ Jesus, no inquisition after enjoying the gospel! With our faith, we desire no further belief. For once we believe this, there is nothing else that we ought to believe.

¹⁸ Copleston, *History of Philosophy*, Vol. II, p. 18; Etienne Gilson, *Reason and Revelation in the Middle Ages* (New York: Scribners, 1938), pp. 11–12.

¹⁹ Quoting *Didascalía et constitutiones apostolorum* 10, ed. Franciscus X. Funk, Vol. I (Paderborn: Ferdinand Schoeningh, 1905), pp. 12–14; and Chrysostom from M. L. W. Laistner, *Christianity and Pagan Culture in the Later Roman Empire* (Ithaca: Cornell Univ. Press, 1951), p. 53 (for another trans. of the *Didascalía* see *ibid.*, p. 50).

²⁰ Origen, *Contra Celsum*, trans. Henry Chadwick (Cambridge: Cambridge Univ. Press, 1953), p. 158.

²¹ Both quoted by Walzer, *Galen on Jews and Christians*, p. 54.

²² Gilson, *Reason and Revelation*, pp. 5–11; cf. Cochrane, *Christianity and Classical Culture*, pp. 227–230.

Elsewhere Tertullian attacks vain curiosity about nature:

Now, pray tell me, what wisdom is there in this hankering after conjectural speculations? What proof is afforded to us, notwithstanding the strong confidence of its assertions, by the useless affectation of a scrupulous curiosity, which is tricked out with an artful show of language? It therefore served Thales of Miletus quite right, when, star-gazing as he walked with all the eyes he had, he had the mortification of falling into a well. . . . His fall, therefore, is a figurative picture of the philosophers; of those, I mean, who persist in applying their studies to a vain purpose, since they indulge a stupid curiosity on natural objects, which they ought rather [intelligently to direct] to their Creator and Governor.²³

There can be no doubt that Tertullian was not an enthusiast for secular learning; but neither was he the uncompromising opponent of reasoned discourse that these passages, if allowed to stand alone, might seem to imply. It was apparent to him that philosophy led easily to heresy, especially the Gnostic heresy (a dualistic system, which radically separated the transcendent deity from a dark and evil material world). What he therefore opposed was not philosophy generally, but heresy or the philosophy that gave rise to it.²⁴ When not engaged in polemic against heresy, he could express quite a favorable view of mankind's rational capacities. On one occasion he argued that "reason . . . is a thing of God, inasmuch as there is nothing which God the Maker of all has not provided, disposed, ordained by reason—nothing which He has not willed should be handled and understood by reason." He even defended the possibility of rational knowledge of divine things: "One may no doubt be wise in the things of God, even from one's natural powers. . . . For some things are known even by nature: the immortality of the soul, for instance, is held by many; the knowledge of our God is possessed by all."²⁵ Tertullian is frequently quoted as having said, of the resurrection of Christ, "I believe it because it is absurd." However, scholars have adequately established, first, that this is a misquotation; but more importantly that Tertullian was simply making use of a standard Aristotelian argumentative form, maintaining that the more improbable an event, the less likely is anybody to believe that it has occurred without specific supporting evidence; therefore, the very improbability of an alleged event, such as Christ's resurrection, is evidence in its favor.²⁶ Thus, far from seeking the abolition of reason, Tertullian must be seen as appropriating Aristotelian rational techniques and

²³ Tertullian, *On Prescription against Heretics* 7 (my own translation of the final sentence) and *Ad Nationes* 2.4, both trans. Peter Holmes, in *The Ante-Nicene Fathers*, ed. Alexander Roberts and James Donaldson, 10 vols. (New York: Scribners, 1896–1903), Vol. III, pp. 246, 133.

²⁴ This theme is nicely developed by Robert H. Ayers, *Language, Logic, and Reason in the Church Fathers* (Hildesheim: Georg Olms, 1979), pp. 25–34. For another useful discussion of Tertullian, see Timothy, *Early Greek Apologists*, pp. 40–58.

²⁵ Tertullian, *On Repentance* 1, trans. S. Thelwall, and *On the Resurrection of the Flesh* 3, trans. Peter Holmes, both in *The Ante-Nicene Fathers*, Vol. III, pp. 657, 547. I was led to a number of the quotations from Tertullian by Ayers.

²⁶ That is, resurrection of the dead is so improbable an event that the apostles would not have believed in the resurrection of Christ if they had not been faced with incontrovertible evidence that indeed, on this occasion, the improbable had occurred. This truth makes the resurrection of Christ more probable than some other event, the occurrence of which might have been accepted merely on the basis of general plausibility. See Ayers, *Language, Logic, and Reason*, pp. 21–24; Robert Grant, *Miracle and Natural Law in Graeco-Roman and Early Christian Thought* (Amsterdam: North-Holland, 1952), pp. 194, 209; and Aristotle, *Rhetoric* 2.23.22.

putting them to apologetic use. Philosophy, despite its dangers, had a place in the armory of the Christian. But Tertullian never forgot to put first things first.

In the long run, the most influential statement of the Christian attitude toward philosophy and reason was that of Augustine (354–430). Augustine obtained a rich classical education, heavily literary in its orientation, in the North African schools of Thagaste, Madaura, and finally Carthage. In his early manhood Augustine yielded to the appeal of Manichaean religion, with its dualism between good and evil and its unwavering rationalism; later he discovered the works of Plotinus and became deeply imbued with Neoplatonic philosophy. Meanwhile he converted to Christianity and began the effort, which occupied him through much of his life, of accommodating Neoplatonism and Christianity.²⁷

Augustine's position has frequently been misunderstood as an attempt to substitute faith for reason. But this was surely never his purpose: philosophy and the philosophical life were not to be replaced or repudiated, but to be Christianized.²⁸ Esteem for human rational capacities pervades Augustine's writings. Reason is a divine gift, which distinguishes humankind from brutes, and its exercise is to be assiduously cultivated. In a letter to Consentius, Augustine spoke of his wish "to arouse your faith to a love of understanding, to which true reason conducts the mind and for which faith prepares it." He went on to point out that heretical reasoning about the Trinity "is to be shunned and detested, not because it is reasoning, but because it is false reasoning; for if it were true reasoning, it would surely not err. Therefore, just as you would be ill advised to avoid all speaking because some speaking is false, so you must not avoid all reasoning because some reasoning is false." Reasoning is indispensable if the faith is to be defended and its content understood; it is also required if one is to grasp that portion of truth that has not been revealed. Augustine's letter to Consentius is a remarkable expression of these themes:

You say that truth is to be grasped more by faith than by reason. . . . Therefore, according to your rule you ought in this matter . . . to follow only the authority of the saints and not seek understanding by asking me for reasons. For when I begin . . . to lead you to an understanding of such a great mystery, . . . I will simply be giving you reasons, insofar as I am able. But if it is not unreasonable for you to beg me or some other teacher to help you to understand what you believe, then you ought to correct your rule—not to the point of overturning faith, but of permitting you to discern in the light of reason what you already firmly hold by faith.

Heaven forbid that God should hate in us that by which he made us superior to the other animals! Heaven forbid that we should believe in such a way as not to accept or seek reasons, since we could not even believe if we did not possess rational souls. Therefore, in certain matters pertaining to the doctrine of salvation that we cannot yet grasp by reason—though one day we shall be able to do so—faith must precede reason and purify the heart and make it fit to receive and endure the great light of reason; and this is surely something reasonable. Thus it is reasonable for the Prophet [Isa. 7:9] to have said: "Unless you believe, you will not understand." Here he was doubtless distinguishing between these two things and advising us first to

²⁷ See Peter Brown, *Augustine of Hippo: A Biography* (Berkeley: Univ. California Press, 1969); on Augustine's education, see Ch. 3. On Augustine's Neoplatonism, see esp. A. H. Armstrong, *St. Augustine and Christian Platonism* (Villanova, Pa.: Villanova Univ. Press, 1967); reprinted in Armstrong, *Plotinian and Christian Studies* (London: Variorum Reprints, 1979), Ch. 11. Late in his career Augustine moved away from Neoplatonic assumptions.

²⁸ See Cochrane, *Christianity and Classical Culture*, which has deeply influenced me.

believe, so that afterwards we might understand what we believe. It is thus reasonable to require that faith precede reason. . . . If, therefore, it is reasonable for faith to precede reason in certain matters of great moment that cannot yet be grasped, surely the very small portion of reason that persuades us of this must precede faith.²⁹

Despite his reference in the final lines of this passage to reason that precedes faith, Augustine usually stresses the movement from faith to reason or understanding. Without faith, there will be no understanding; once faith is achieved, the quest for understanding is obligatory.

Can we then say that Augustine subordinates reason to faith? Yes, in the sense that ultimate authority rests with revelation. Augustine had no hesitation in proclaiming his resolve “never to deviate in the least from the authority of Christ.”³⁰ But to concentrate exclusively on the question of authority is to adopt a modern perspective and to overlook Augustine’s. Augustine viewed faith not as a taskmaster to which reason must submit, but as the condition that makes genuine rational activity possible. Christian faith provides the foundation, the blueprint, and the materials, without which no sound philosophical structures can be built. Philosophy thus finds its fulfillment within the framework of faith. For Augustine the highest goal is understanding: “Our Lord . . . says to believers, ‘Seek and ye shall find’ [Matt. 7:7]. But one cannot speak of that being found which is believed without knowledge.” The relationship between faith and reason is therefore that between the precondition and the ultimate objective, the means and the end; in that sense, we find in Augustine the subordination not of reason to faith, but of faith to reason.³¹

What, then, has Athens to do with Jerusalem? No uniform answer will suffice for all of the fathers of the Christian church. There was a spectrum of attitudes toward pagan culture, from deep mistrust to high enthusiasm. But few would have rejected pagan philosophical culture totally. For the great majority, whether or not to philosophize was no issue; the question was rather how and about what to philosophize. The classic answer given by Augustine and destined for enormous influence set philosophy to work on revelation and the content of Christian belief. But this required philosophical education. Christians were thus committed to education—and in practical terms this meant secular education, since no Christian educational system was developed until much later. Gregory of Nazianzus (329–389) revealed how liberal the Christian position could be, when he wrote:

I take it as admitted by men of sense, that the first of our advantages is education; and not only this our more noble form of it, which disregards rhetorical ornaments and glory, and holds to salvation, and beauty in the objects of our contemplation: but even that external [i.e., pagan] culture which many Christians ill-judgingly abhor, as treacherous and dangerous, and keeping us afar from God. For as we ought not

²⁹ Augustine, Letter 120, ed. A. Goldbacher, in *Corpus scriptorum ecclesiasticorum latinorum*, Vol. XXXIV (Vienna: F. Tempsky, 1895), quoting pp. 708, 709, 705–707.

³⁰ Augustine, *Against the Academics* 3.20.43; quoted from *Fathers of the Church*, Vol. I (Washington: Catholic University of America Press, 1948), by Vernon J. Bourke, *The Essential Augustine* (New York: New American Library, 1964), p. 25.

³¹ Quoting Augustine, *On Free Choice* 2.2.6, trans. Carroll Mason Sparrow, as quoted by Burke, *The Essential Augustine*, p. 25. On faith as a condition for understanding, see Cochrane, *Christianity and Classical Culture*, Ch. 10–11; Brown, *Augustine of Hippo*, Ch. 10.

to neglect the heavens, and earth, and air, and all such things, because some have wrongly seized upon them, and honour God's works instead of God: but to reap what advantage we can from them for our life and enjoyment, while we avoid their dangers; not raising creation, as foolish men do, in revolt against the Creator, but from the works of nature apprehending the Worker, and, as the divine apostle says, bringing into captivity every thought to Christ: and again, as we know that neither fire, nor food, nor iron, nor any other of the elements, is of itself most useful, or most harmful, except according to the will of those who use it; and as we have compounded healthful drugs from certain of the reptiles; so from secular literature we have received principles of enquiry and speculation, while we have rejected their idolatry, terror, and pit of destruction. . . . We must not then dishonour education, because some men are pleased to do so, but rather suppose such men to be boorish and uneducated, desiring all men to be as they themselves are, in order to hide themselves in the general, and escape the detection of their want of culture.³²

There are no data to permit a judgment regarding the average educational levels of pagans and Christians, but it is clear that the Christian intelligentsia were at least as well educated as, and the intellectual equals of, their pagan opponents.³³

THE CHURCH AND NATURAL SCIENCE

Although science was neither an autonomous discipline nor a profession during the patristic period, we can nonetheless investigate the relationship between Christianity and those aspects of the philosophical enterprise that were concerned with nature. Did science (in this limited sense) benefit or suffer from the appearance and triumph of Christianity? Did Christianity, with its other-worldliness and its emphasis on Biblical authority, stifle interest in nature, as the old stereotype proclaims? Or was there a more ambiguous and subtle relationship?

We must begin our inquiry by briefly surveying the state of science in late antiquity. Was there, in fact, a decline of science for which Christianity might be held responsible? The answer is not simple. Surely there are instances of important scientific work in the early centuries of the Christian era. Ptolemy's work in astronomy and Galen's in medicine (both in the second century A.D.) and Diophantus's mathematical efforts (in the third century) are outstanding examples. And, as we shall see, John Philoponus presented a major and important reassessment of Aristotelian physics and cosmology as late as the sixth century. Nevertheless, it is agreed by most historians of ancient science that creative Greek science was on the wane, perhaps as early as 200 B.C., certainly by A.D. 200. Science had never been pursued by very many people; it now attracted even fewer. And its character shifted away from original thought toward commentary and abridgement. Creative natural science was particularly scarce in the Roman world, where scholarly interests leaned in the direction of ethics and

³² Gregory of Nazianzus, *The Panegyric on St. Basil*, trans. Charles G. Browne and James E. Swallow, in *A Select Library of Nicene and Post-Nicene Fathers of the Christian Church*, Ser. 2, 14 vols., ed. Philip Schaff and Henry Wace (New York: Christian Literature Company, 1890–1900), Vol. VII, pp. 398–399.

³³ A. H. Armstrong, "Reason and Faith in the First Millennium A.D.," in *Scholasticism in the Modern World* (Proceedings of the American Catholic Philosophical Association, 40) (Washington, D.C.: American Catholic Philosophical Association, 1966), p. 107; rpt. in Armstrong, *Plotinian and Christian Studies*, Vol. XII.

metaphysics; such natural science as Rome possessed was largely confined to fragments preserved in handbooks and encyclopedias.³⁴

Can Christianity be held responsible in any way for this decline? Let us first consider Christian other-worldliness. In antiquity there was a broad spectrum of attitudes toward the material world. At one end of the spectrum was pagan cosmic religion, constructed from a mixture of Pythagorean, Platonic, Aristotelian, and Stoic doctrines. This religion saw the material cosmos, or at least its upper, heavenly part, as a perfect expression of divine creativity and providence, "the supreme manifestation of divinity," and indeed itself a divine being. Moreover, study and contemplation of the cosmos were judged the only ways to God; natural philosophy and theology had been merged. At the other end of the spectrum was the Gnostic attempt to equate the material world with evil. The cosmos was viewed by "pessimistic" Gnostics as a disastrous mistake, the scene of disorder and sin, the product of evil forces, the antithesis of the divine, and a prison from which the soul must escape in order to make its way to its true home in the spiritual realm.³⁵ Finally, between these extremes there was Platonic philosophy (or, in the hands of certain Neoplatonists, Platonic religion), which distinguished clearly between the transcendent world of eternal forms and their imperfect replication in the material cosmos. Neoplatonists by no means considered the world to be evil; it was the product of divine intelligence and, as A. H. Armstrong puts it, the "best possible universe that could be produced under difficult circumstances."³⁶ Contemplation of it was even held to play a positive, albeit small, role in leading the soul upward to the eternal forms. Nevertheless, Neoplatonism was fundamentally other-worldly; the material world for all its beauty, remained the scene of imperfection and disorder; and it had to be escaped before humanity could achieve its highest good, the contemplation of eternal truths.

There was, of course, no unitary Christian view of the material world. But orthodox Christianity, as it developed, emphatically rejected the extremes; nature was neither to be worshipped nor to be repudiated. Christianity was deeply influenced by Neoplatonic philosophy, and most Christian thinkers adopted some form of the Neoplatonic attitude. Gregory of Nyssa (ca. 331–ca. 396) believed deeply in the unreality and deceitfulness of the material world and yet recognized that it could provide signs and symbols that would lead mankind upward to God.³⁷ Augustine insisted that sin is situated not in the body, but in the will. This was a point of extraordinary importance, because it helped to

³⁴ The best histories of ancient science are by G. E. R. Lloyd: *Early Greek Science: Thales to Aristotle* (cit. n. 8) and *Greek Science after Aristotle* (cit. n. 6). On science in late antiquity, see Lloyd, *Greek Science after Aristotle*, Ch. 10; Claggett, *Greek Science in Antiquity*, Chs. 8–11. (Benjamin Farrington, *Greek Science* [Harmondsworth: Penguin, 1961], would put the decline of Greek science even earlier, in the 4th century B.C.) On Roman science, see William Stahl, *Roman Science: Origins, Development, and Influence to the Later Middle Ages* (Madison: Univ. Wisconsin Press, 1962).

³⁵ For cosmic religion I have closely followed A. H. Armstrong, "The Material Universe," Ch. 4 of Armstrong and R. A. Markus, *Christian Faith and Greek Philosophy* (London: Darton, Longman & Todd, 1960); see esp. pp. 31–33, 39–40; quoting here p. 31. On Gnosticism, see Hans Jonas, *The Gnostic Religion*, 2nd ed. (Boston: Beacon Press, 1963); Robert M. Grant, *Gnosticism and Early Christianity*, 2nd ed. (New York: Columbia Univ. Press, 1966).

³⁶ Armstrong, "Material Universe," p. 34.

³⁷ I. P. Sheldon-Williams, "St. Gregory of Nyssa," in *Cambridge History*, ed. Armstrong, pp. 447–456.

liberate western Christendom from the notion that the soul is contaminated by its contact with the body—and therefore that matter and flesh must be inherently evil.³⁸ Nevertheless, in a well-known passage from the *Enchiridion*, Augustine expressed serious doubt 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 manner of those whom the Greeks called “physicists.” Nor should we be dismayed if Christians are ignorant about the properties and the number of the basic elements of nature, or about the motion, order, and deviations of the stars, the map of the heavens, the kinds and nature of animals, plants, stones, springs, rivers, and mountains; about the divisions of space and time, about the signs of impending storms, and the myriad other things which these “physicists” have come to understand, or think they have. . . . For the Christian, it is enough to believe that the cause of all created things, whether in heaven or on earth, whether visible or invisible, is nothing other than the goodness of the Creator, who is the one and the true God.³⁹

Yet, 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 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, to use the common expression, east is from west, the unbeliever can scarcely restrain himself from laughing.⁴⁰

A view broadly the same as Augustine’s was presented by Pope Leo the Great (440–461). Leo argues that the material world is not to be denigrated:

Man, awake, and recognize the dignity of your own nature. Remember that you were made in the image of God; and though it was spoilt in Adam, it has been remade again in Christ. Use these visible creatures as they ought to be used, as you use earth, sea, sky, air, springs and rivers; and praise and glorify the Creator for everything fair and wonderful in them.

But neither should the material creation be allowed to occupy the center of attention:

Do not devote yourself to the light in which birds and snakes, beasts and cattle, flies and worms delight. Feel bodily light with your bodily senses and clasp with all the strength of your mind that true light which “lightens every man coming into this

³⁸ Armstrong, *Augustine and Christian Platonism*, p. 11. Despite Augustine’s influence, the tendency to denigrate the flesh persisted in medieval (especially early medieval) Christendom.

³⁹ Augustine, *Enchiridion* 3.9, trans. Albert C. Outler (*The Library of Christian Classics*, 7) (Philadelphia: Westminster Press, 1955), pp. 341–342. The qualification contained in the opening line of this passage (“what we ought to believe *in matters of religion*”) is often overlooked by those who quote it.

⁴⁰ Augustine, *De genesi ad litteram* 1.19; quoted by Meyrick H. Carré, *Realists and Nominalists* (London: Oxford Univ. Press, 1946), p. 19.

world." . . . For if we are the temple of God, and the Spirit of God dwells in us, what everyone of the faithful has in his own soul is more than what he admires in the sky. We are not, of course, . . . telling you this to persuade you to despise the works of God, or to think that there is anything against your faith in the things which the good God has made good; but so that you may use every kind of creature, and all the furniture of this world, reasonably and temperately. . . . So, since we are born to the things of this present life but reborn to those of the future life, let us not devote ourselves to temporal goods but be set on eternal ones. . . .⁴¹

The material world is not to be loved, but to be used; it is not an end in itself, but a means to the contemplation of higher things.

What were the implications of this attitude for the scientific enterprise? If we employ as a standard of comparison some sort of ideal world, a scientist's nirvana, in which social values and resources are all marshaled in support of scientific research, Christianity may be judged harshly: the church was certainly not calling for the establishment of scientific research institutions, nor urging able young men to undertake scientific careers. Most of the pejorative pronouncements regarding the early church in relation to science seem to spring from the anachronistic application of precisely such criteria. But what we must realize is that the early church was thus expressing values obtained from the pagan environment. On a spectrum of *pagan* values, from cosmic religion to Gnostic repudiation of the cosmos, the church fathers chose a middle position. There can be no doubt that Biblical teaching about the creation as God's handiwork was decisive in determining where on the spectrum Christians would land, and therefore it is clear that their Christianity was highly relevant to the issue; but it must be recognized that the alternatives from which they chose were of pagan origin.

It seems unlikely, therefore, that the advent of Christianity did anything to diminish the support given to scientific activity or the number of people involved in it. The study of nature held a precarious position in ancient societies; with the exception of medicine and a little astronomy, it served no practical function and was rarely seen as a socially useful activity. As a result, it received little political patronage or social support, but depended on independent means and individual initiative.⁴² With the declining economic and political fortunes of the Roman Empire in late antiquity, people of independent means decreased in number, and initiative was directed elsewhere. Moreover, changing educational and philosophical values were diverting attention from the world of nature. Inevitably the pursuit of science suffered. Christianity did little to alter this situation. If anything, it was a little less other-worldly than the major competing ideologies (Gnosticism, Neoplatonism, and the mystery religions) and offered slightly greater incentive for the study of nature.⁴³ Christianity regarded science

⁴¹ Leo, *In nativitate Domini sermo VII*; quoted by Armstrong, "Material Universe," pp. 36–37.

⁴² Edelstein, *Ancient Medicine*, pp. 434–435; Lloyd, *Early Greek Science*, pp. 125–130.

⁴³ It is true that cosmic religion attached great importance to the visible world as a manifestation of the divine being, but its preoccupation with the heavenly bodies and its tendency to venerate them precluded its becoming a major patron of scientific activity; indeed, as Armstrong has pointed out, cosmic religion had its own "curious kind of materialized other-worldliness" ("Material Universe," p. 33). Armstrong has also pointed out that the tendency of cosmic religion to merge science and theology was probably not beneficial for either enterprise (*ibid.*, pp. 39–40). Cf. Armstrong, *St. Augustine and Christian Platonism*, pp. 9–24; and Armstrong, "Man in the Cosmos: A Study of

as important only insofar as it served the faith; but at least on occasion it served the faith.

PRACTITIONERS OF SCIENCE

We have been proceeding at the theoretical level. What did Christian involvement in science or natural philosophy amount to in practical terms? How much science was known? What did Christians contribute to its preservation and further development? And how did it interact with their theology? These are extraordinarily difficult questions, because the basic research that would make it possible to answer them has, in general, not yet been undertaken. Nevertheless, let us take some preliminary steps toward answers by considering briefly the work of three Christians representing different degrees of involvement in natural philosophy—Basil of Caesarea, Augustine, and John Philoponus.

Basil (ca. 330–379) was from Cappadocia in eastern Asia Minor, where, in the last decade of his life, he became Bishop of Caesarea. In his *Homilies on the Hexaemeron* (the six days of creation), he brought to bear what natural philosophy he could in defense and elucidation of the Biblical account of creation. Basil begins by attacking the materialists (undoubtedly the Ionians and atomists), who have failed to see that the cosmos is a beautiful and purposeful creation, the work of an intelligent Creator. Basil's own philosophical preferences become clear when he identifies the Creator with Plato's Demiurge and accepts a Platonic hierarchy of celestial intelligences. Also, against the materialists and in concert with Christian and Platonic teaching, he defends a temporal cosmos—that is, one that had a beginning and will have an end.⁴⁴

A good bit of Aristotelian cosmology and physics appears in the *Homilies*—much of it reported (without endorsement) as the useless imaginings and empty noises of the philosophers. Basil accepts the doctrine of the four elements and reports the arguments for a fifth celestial element. He refers to the opinion (of Anaximander and Democritus) that there is an infinity of worlds, but counters with Aristotle's denial, on geometrical grounds, of the possibility of more than a single world.⁴⁵ He inquires regarding the position of the earth in the cosmos and recounts the Aristotelian doctrine of a fixed, central earth, situated in the place to which all heavy bodies naturally descend; it is implicit in this account, moreover, that the earth is spherical. However, according to his custom, Basil

Some Differences between Pagan Neoplatonism and Christianity," in *Romanitas et Christianitas*, ed. Willem den Boer et al. (Amsterdam: North Holland, 1973), pp. 5–14; reprinted in Armstrong's *Plotinian and Christian Studies*, Vol. XXII. My conclusions about Christian attitudes toward nature are remarkably similar to those recently expressed by Darrel W. Amundsen in regard to Christian attitudes toward secular medicine; see his "Medicine and Faith in Early Christianity," *Bulletin of the History of Medicine*, 1982, 56, 326–350.

⁴⁴ Basil, Homily I, in *Select Library*, ed. Schaff and Wace (cit. n. 32), Vol. VIII, pp. 53–55. See also I. P. Sheldon-Williams, "St. Basil of Caesarea," in *Cambridge History*, ed. Armstrong, pp. 432–438; Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York: Columbia Univ. Press, 1923–1948), Vol. I, pp. 481–494; and Frank E. Robbins, *The Hexaemeral Literature: A Study of the Greek and Latin Commentaries on Genesis* (Chicago: Univ. Chicago Press, 1912).

⁴⁵ Basil, Homily IV and Homily I (elements), Homily III (worlds), in *Select Library*, Vol. VIII, pp. 74–75, 58, 66.

refuses to commit himself to the truth of this scheme—although he apparently does not think it improbable. He declares simply that we should direct our admiration toward the source, rather than the details, of cosmic order:

If there is anything in this system which might appear probable to you, keep your admiration for the source of such perfect order, for the wisdom of God. Grand phenomena do not strike us the less when we have discovered something of their wonderful mechanism. Is it otherwise here? At all events let us prefer the simplicity of faith to the demonstrations of reason.⁴⁶

One cannot help being impressed by Basil's considerable command of basic Greek cosmology and natural philosophy—most of it obtained, no doubt, from handbooks and compendia, rather than from the original sources. But he is not overcome with admiration for pagan authors. He sometimes labels their arguments "ridiculous" and refers repeatedly to their inability to agree among themselves: "Why torment ourselves to refute the errors of philosophers, when it is sufficient to produce their mutually contradictory books and, as quiet spectators, to watch the war?"⁴⁷ Above all, he is adamant in denying these matters any importance for their own sake.

We can learn more about the way in which Biblical doctrine and pagan philosophy interacted in Basil's thought by considering his discussion of the various heavens. The problem is the apparent discrepancy between Aristotle, who had argued that beyond the planetary spheres there is a single heaven (bearing the fixed stars), and the opening verses of Genesis 1, where reference is apparently made to two heavens, one created on the first day and another on the second. The relevant passage reads:

In the beginning God created the heaven and the earth. . . . And there was evening and there was morning, one day. And God said, "Let there be a firmament in the midst of the waters, and let it separate the waters from the waters." And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And God called the firmament Heaven. And there was evening and there was morning, a second day.⁴⁸

Basil, who refuses to accept an allegorical interpretation of the passage (and, indeed, attacks his Christian predecessors for so doing),⁴⁹ feels compelled to acknowledge the existence of two heavens and, moreover, of a body of super-celestial water between the two. In the long run Basil's distinction among three separate heavenly entities was to give rise to the medieval scheme of three heavens: the outermost or empyreum, which served as the abode of angels, then the aqueous or crystalline heaven, composed of crystallized water, and finally the firmament, to which the stars are affixed.⁵⁰ We see clearly how Biblical claims could intrude into natural philosophy and shape cosmological theory.

Augustine, who flourished fifty years after Basil, had a much fuller command

⁴⁶ Basil, Homily I, *ibid.*, p. 57.

⁴⁷ Basil, Homily III, *ibid.*, p. 70; cf p. 67.

⁴⁸ Genesis, 1:1, 5–8, Revised Standard Version.

⁴⁹ Basil, Homily III, in *Select Library*, Vol. VIII, p. 71.

⁵⁰ See Francis S. Benjamin, Jr., and G. J. Toomer, eds., *Campanus of Novara and Medieval Planetary Theory: Theorica planetarum* (Madison: Univ. Wisconsin Press, 1971), pp. 393–394; Edward Grant, "Cosmology," in *Science in the Middle Ages*, ed. Lindberg, pp. 275–278.

of pagan natural philosophy than did his predecessor. His works reveal a man broadly educated in the full range of the liberal arts. In his *Confessions* he recalls his discovery of Aristotle's *Categories* and reports reading in his youth all the books on the liberal arts that he could obtain, including works on rhetoric, logic, geometry, arithmetic, and music.⁵¹ In *De ordine*, written early in his career, he develops an educational program that includes mathematics and mathematical sciences as studies preparatory to philosophy. And in his *Retractions* he reports that he once intended to write manuals on all of the liberal arts, including arithmetic, geometry, music, and the elements of philosophy.⁵² References to many pagan sources are scattered throughout his writings.

Despite his studies, Augustine came in the long run to view natural knowledge (for its own sake) with no greater enthusiasm than had Basil. We are, he advised, to set our hearts on things celestial and eternal, rather than earthly and temporal. Nevertheless, the temporal could serve the eternal, and Augustine frequently acknowledged the utility of natural knowledge for the elucidation of Christian doctrine and the exegesis of scripture. Fragments of Greek natural philosophy are thus sprinkled throughout his works. A good example (but only one among many) is his frequent use of Greek ideas on light and vision for the development of his own theology and epistemology. Augustine employs the Neoplatonic doctrine of emanation, explained by analogy with the radiation of light, to reveal the nature of the trinity.⁵³ He puts the phenomena of illumination to epistemological use, arguing that just as the sun must illuminate corporeal things in order that they may be seen by the corporeal eye, so intelligible things must be illuminated with a divine light if they are to be grasped by the intellect:

But distinct from these objects [of intellectual vision] is the light by which the soul is illumined, in order that it may see and truly understand everything, either in itself or in the light. For the light is God himself, whereas the soul is a creature. . . . And when it tries to behold the Light, it trembles in its weakness and finds itself unable to do so. Yet from this source comes all the understanding it is able to attain.⁵⁴

This epistemological use of light is a Platonic motif, taken over and Christianized by Augustine. In the course of his many discussions of the psychology and epistemology of perception, Augustine clearly commits himself to the extramission theory of vision, according to which light emerges from the observer's eye to perceive its object. In his *Literal Commentary on Genesis*, for example, he remarks that

surely the emission of rays from our eyes is an emission of a certain light. And it can be gathered that this [light] is emitted, since when we look into the air adjacent

⁵¹ Augustine, *Confessions* 4.16. It is important to realize that Augustine's education, like that of almost every other educated man of the period, was heavily literary in orientation. There might be some attention to quadrivial studies (arithmetic, geometry, astronomy, and music), but among Christians and non-Christians alike these would be heavily overshadowed by concern with grammar, rhetoric, and literary classics.

⁵² See Henri-Irénée Marrou, *Saint Augustin et la fin de la culture antique*, 4th ed. (Paris, De Boccard, 1958), pp. 187–197; Brown, *Augustine of Hippo*, pp. 121–126. Only the manual on music survives; the others, Augustine notes in *Retractions* 1.5, were only begun and then lost.

⁵³ See Augustine, *De trinitate* 4.20.

⁵⁴ Augustine, *De genesi ad litteram* 12.31.59, trans. J. H. Taylor, S.J.; rpt. in Bourke, *The Essential Augustine*, p. 97.

to our eyes we observe, along the same line, things situated far away. . . . Nevertheless, this light that is in vision is shown to be so scanty that unless it is assisted by an exterior light, we cannot see anything.⁵⁵

Once again Augustine's sources are Platonic.

A second example of Augustine's use of natural knowledge and efforts to deal with natural questions is his doctrine of *rationes seminales*, or "seedlike principles." The problem is to reconcile the Biblical notion that God created everything in the beginning of time with the observational fact that there is a progressive development of natural (particularly biological) forms. To resolve the difficulty, Augustine calls on a Stoic notion, which Plotinus also appropriated, according to which nature contains germs or seedlike principles that direct and determine its subsequent unfolding. According to Augustine, God created all things in the beginning, some actually and some potentially—the latter as seedlike principles, which later developed into mature creatures, much as a seed develops into a mature plant. Augustine thus uses Greek natural philosophy to resolve an exegetical problem—maintaining that God's creative activity is truly completed in the beginning, and yet taking full account of observational and commonsense notions regarding the development of natural things. It is noteworthy that Augustine applies the doctrine of seedlike principles even to the origin of Adam and Eve.⁵⁶

R. A. Markus has pointed out that from Augustine's doctrine of seedlike principles there follows a conception of natural law. This implication of the theory was acknowledged by Augustine himself in his *Literal Commentary on Genesis*:

All the normal course of nature is subject to its own natural laws. According to these all living creatures have their particular determinate inclinations . . . and also the elements of non-living material things have their determinate qualities and forces, in virtue of which they function as they do and develop as they do. . . . From these primordial principles everything that comes about emerges in its own time and in the due course of events.

Each thing behaves according to its God-given inclination—the law of its own nature. From this it is but a short step to the distinction between God as first cause and a created order of secondary causes:

It is one thing to build and to govern creatures from within and from the summit of the whole causal nexus—and only God, the Creator, does this; it is another thing to

⁵⁵ Quoted by David C. Lindberg, *Theories of Vision from al-Kindi to Kepler* (Chicago: Univ. Chicago Press, 1976), p. 90. On Augustine's theory of divine illumination, see R. A. Markus, "Augustine: Reason and Illumination," in *Cambridge History*, ed. Armstrong, pp. 362–373; Etienne Gilson, *The Christian Philosophy of Saint Augustine*, trans. L. M. Lynch (New York: Random House, 1960), pp. 77–96. On Augustine's optical knowledge and use of light metaphors, see also François-Joseph Thonnard, "La notion de lumière en philosophie augustinienne," *Recherches Augustiniennes*, 1962, 2, 125–175; and Lindberg, *Roger Bacon's Philosophy of Nature* (Oxford: Clarendon Press, 1983), pp. xxxix–xli.

⁵⁶ Eugène Portalié, S.J., *A Guide to the Thought of St. Augustine*, trans. Ralph J. Bastian, S.J. (Chicago: Henry Regnery, 1960), p. 139. On the seedlike principles, see R. A. Markus, "Augustine: God and Nature," in *Cambridge History*, ed. Armstrong, pp. 398–399; Gilson, *Christian Philosophy of Augustine*, pp. 206–208; Jules M. Brady, S.J., "St. Augustine's Theory of Seminal Reasons," *New Scholasticism*, 1964, 38, 141–158; Christopher J. O'Toole, *The Philosophy of Creation in the Writings of St. Augustine* (Washington, D.C.: Catholic Univ. America Press, 1944).

apply externally forces and capacities bestowed by him in order to bring forth at such and such a time, or in such and such a shape, what has been created. For all things were created at the beginning, being primordially woven into the texture of the world; but they await the proper opportunity for their appearance.⁵⁷

There is a kind of double causation: on the one hand, things change and develop according to the natures that God has given them; on the other, God governs His creation "from the summit of the whole causal nexus."

This brings us to the question of miracles. Augustine is not perfectly consistent on the subject. On one occasion he argues that an event is miraculous if caused by direct divine intervention, in violation of the natural pattern embodied in the created secondary causes. More frequently Augustine points out that God's decision to violate the usual order is no less natural (and no more miraculous) than his decision to abide by it: "Just . . . as it was possible for God to create any natures He chose to create, so it is no less possible for Him to change any qualities He chooses to change in any natures He chose to create." Ultimately everything is of divine origin, and the concept of miracle, if it has any meaning at all, represents merely the violation of our expectations:

A portent means, in ordinary parlance, "something contrary to nature," although, in fact, such happenings are not really contrary to nature, for the simple reason that nothing that happens by the will of God can be "contrary to nature." The "nature" of any particular created thing is precisely what the supreme Creator of the thing willed it to be. Hence, a portent is merely contrary to nature as known, not to nature as it is.⁵⁸

A final example of Augustine's relationship to pagan natural philosophy is his opinion of astrology. In the *City of God*, Augustine mounts a vigorous attack on the science of astrology, particularly its fatalistic teachings. He argues over and over that if twins, conceived at the same instant and born at almost the same time, differ dramatically in personality, character, and course of life, it surely cannot be sensibly maintained that the stars determine a person's fate.

[The astrologers] have never been able to explain why twins are so different in what they do and achieve, in their professions and skills, in the honors they receive, and in other aspects of their lives and deaths. In all such matters, twins are often less like each other than like complete strangers; yet, twins are born with practically no interval of time between their births and are conceived in precisely the same moment of a single sexual semination.

Augustine can admit stellar influence on physical things, but the human will must be left untouched; only thus can its freedom be preserved. There was, we can see, a theological motivation underlying the discussion. A final question: if the stars do not determine human fate, if astrologers are the perpetrators of

⁵⁷ Augustine, *De genesi ad litteram* 9.17.32 and *De trinitate* 3.9.16; quoted by Markus, "Augustine: God and Nature," pp. 399, 400. I owe Markus not only the basic point of this paragraph, but also the quotations.

⁵⁸ Augustine, *City of God* 21.8, trans. Gerald G. Walsh, S.J., and Daniel J. Honan, in *Fathers of the Church*, ed. R. Deferrari et al., Vols. I–VIII (New York: Fathers of the Church; Washington: Catholic Univ. America Press, 1947–), Vol. VIII, pp. 362, 359. On Augustine's view of miracles, see Markus, "Augustine: God and Nature" pp. 400–402; Brown, *Augustine of Hippo*, pp. 415–418.

fraud, how can the occasional astrological success be explained? Successful astrological predictions, Augustine maintains, have nothing to do with the casting of horoscopes, but depend on the promptings of evil spirits, "whose business it is to persuade men, and keep them persuaded, of the false and dangerous opinion that men's destinies are settled by the stars."⁵⁹

The last figure in our study is John Philoponus, an Alexandrian Christian of the first half of the sixth century, who illustrates the compatibility between Christianity and very intense involvement in natural philosophy. Philoponus was a professional teacher, holder of a chair in philosophy in the school of Alexandria, and one of the last great ancient commentators on Aristotle. He wrote commentaries on several of Aristotle's logical works, as well as on the *Physics*, *Meteorology*, *On the Soul*, and *On Generation and Corruption*—works in which he undertook a major attack on Aristotelian natural philosophy. Philoponus's central goal was to deny Aristotle's dichotomy between the celestial and terrestrial regions. To that end he argued that different stars are of different colors, that difference of color implies variations in composition, that composition implies the possibility of decomposition and decay, from which it follows that the heavens are no more exempt from decay than are things in the terrestrial region. He argued that the sun is composed of fire (a terrestrial substance) rather than a fifth celestial substance, the quintessence, and that astronomy (he clearly has Ptolemaic astronomy in mind) destroys the Aristotelian notion that heavenly bodies possess simple motion about the center of the universe. It follows that the heavens are not divine, and this enabled Philoponus to draw a radical distinction between the Creator and all of his creation (heaven as well as earth). A central Aristotelian doctrine thus fell before Christian doctrine. But this does not mean that the attack was philosophically frivolous; on the contrary, Philoponus proceeded intelligently, with considerable rigor, and (historians of science have been quick to point out) with notable benefit for the future course of cosmology.⁶⁰

There was much more to Philoponus's campaign against Aristotelian philosophy. He attacked Aristotle's doctrine of the eternity of the world. He attempted a reassessment of Aristotle's theory of light.⁶¹ And he undertook a major assault on Aristotelian dynamics, denying that in a medium a body falls with a speed proportional to its weight, that speed of descent would be infinite in a void, and that a projectile is maintained in motion through the action of the medium after it loses contact with the projector. It is noteworthy that Philoponus's attack on Aristotelian dynamics rested not on any kind of theological foundation, but to a very considerable extent on arguments from experience.⁶² Philoponus's ef-

⁵⁹ Augustine, *City of God* 5.1, trans. Demetrius B. Zema, S.J., and Gerald G. Walsh, S.J., in *Fathers of the Church*, Vol. VI, pp. 243, 254. The "twins" argument against astrology was not original with Augustine. On Augustine's view of astrology, see also Theodore O. Wedel, *The Mediaeval Attitude toward Astrology, Particularly in England* (New Haven: Yale Univ. Press, 1920), pp. 20–24; Thorndike, *History of Magic*, Vol. I, pp. 504–522.

⁶⁰ On Philoponus see S. Sambursky, "John Philoponus," *Dictionary of Scientific Biography* (New York: Scribners, 1970–1980), Vol. VII, pp. 134–139; Sambursky, *The Physical World of Late Antiquity* (London: Routledge & Kegan Paul, 1962), pp. 154–175 and passim; and I. P. Sheldon-Williams, "The Reaction against Proclus," in *Cambridge History*, ed. Armstrong, pp. 477–483.

⁶¹ Jean Ann Christensen, "Aristotle and Philoponus on Light" (Ph.D. diss., Harvard University, 1979).

⁶² For translations of some of the relevant documents, see Morris R. Cohen and I. E. Drabkin,

forts, some of them motivated by Christian belief and some of them not, clearly confute the claim that Christianity and serious natural philosophy were fundamentally and necessarily antagonistic.

CONCLUSIONS

A sober view of the relationship between Christianity and science in the patristic period has proved remarkably difficult to obtain. One reason for this is that studies of the problem have so often been undertaken with polemical or apologetic purposes in view, as expressions of religious preference. Critics of Christianity have seized upon instances of Christian displeasure with pagan learning and inflated them into a systematic rejection by the religious establishment of the scientific enterprise. Defenders of Christianity, playing the same game, have exaggerated Christian contributions to science into representative episodes and symbols of a positive relationship between Christianity and science. But the true relationship was far more complex than either of the extreme positions reveals.

Our attempt to characterize that relationship must begin with a qualification. When we speak of the Christian position, we mean the "center of gravity" of a distribution of Christian opinion, for great variety existed. The church was not monolithic, and there was no universal Christian view of pagan philosophy or natural science. Christian attitudes toward classical culture were perhaps as diverse as the comparable attitudes of pagans. In each community there were people who valued philosophy and others who denigrated it, people who thought natural science useful and those who considered it a waste of time or even a detriment. Such attitudes were determined not merely by the claims of theology, but by other forces as well. In late antiquity there were social and intellectual forces tending to discourage and alter the character of philosophical discourse, particularly to divert attention from the impracticalities of natural philosophy toward the quest for true happiness and other matters of ultimate concern.⁶³ Christians, of course, responded differently to these forces, just as they responded differently to the claims of Christian theology.

How, then, should Christian involvement in science or natural philosophy be characterized? Few Christians regarded study of the natural world as of more than secondary, perhaps even tertiary, importance. Next to salvation and the development of basic Christian doctrine, it was decidedly insignificant. There is no cause for alarm, Augustine pointed out, if the Christian "should be ignorant of the force and number of the elements. . . . It is enough for the Christian to believe that the only cause of all created things . . . is the goodness of the Creator."⁶⁴ It would be crude distortion to maintain that Christianity offered major stimulus to scientific activity.

But it would also be distortion to create the impression that there was no Christian involvement in natural philosophy or that the church retarded or crushed science. Many fathers of the church not only possessed a significant

A Source Book in Greek Science (Cambridge, Mass.: Harvard Univ. Press, 1948), pp. 217–223; for analysis, see Clagett, *Greek Science in Antiquity*, pp. 169–176.

⁶³ Many scholars have pointed out that in antiquity the term "philosophy" came increasingly to denote the quest for happiness or salvation.

⁶⁴ Augustine, *Enchiridion* 3.9 (cit. n. 39).

body of natural knowledge, but also considered it useful for scriptural exegesis and defense of the faith. Augustine, in his efforts to formulate a Christian world view, put considerable portions of Greek natural philosophy (particularly Platonic) to work. Thus the church fathers used Greek natural science, and in using it they transmitted it. We must count this transmission as one of the major Christian contributions to science. Until the twelfth century, when a wave of translation brought an abundance of new sources to the Latin-speaking West, patristic writings constituted a major repository of scientific learning.

What the church transmitted, it also altered—and had its own doctrines altered in return. Christian doctrine and Greek natural philosophy must be viewed not as independent, unchangeable bodies of thought, situated side-by-side in the patristic period, with an occasional exchange of fisticuffs, but as interacting and mutually transforming views of the world. Christianity first transformed the philosophical tradition by performing a selective function. Because the church fathers had a strong preference for Platonic philosophy, they helped to determine that Plato's view of the world would prevail for a thousand years, until direct access to Aristotelian philosophy was gained in the twelfth century. But transformation could also occur when revelation impinged directly on natural questions. For example, the Scriptures directly addressed the eternity of the world, and we have seen how Basil's understanding of the opening verses of Genesis led to the multiplication of celestial spheres. The heavens were also de-divinized as a result of the encounter between natural philosophy and Christian theology. In return, Christians learned to read the Bible with Greek, particularly Platonic, eyes; and Christian theology became thoroughly imbued with Greek metaphysics and cosmology.⁶⁵ The extent of this mutual transformation was probably unrecognized by the participants and unwanted, but unless we take cognizance of it we cannot begin to understand the subsequent course of Western theology, philosophy, and science.

⁶⁵ For discussions of the influence of Greek thought on Christian doctrine, see Edwin Hatch, *The Influence of Greek Ideas on Christianity*, ed. Frederick C. Grant (New York: Harper, 1957); Timothy, *Early Christian Apologists*, pp. 81–98.