

# Overview

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## Science and Orthodox Christianity: An Overview

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**Abstract:** This essay offers an overview of the history of the relations between science and Eastern Christianity based on Greek-language sources. The civilizations concerned are the Byzantine Empire, the Christian Orthodox communities of the Ottoman Empire, and modern Greece, as a case study of a national state. Beginning with the Greek Church Fathers, the essay investigates the ideas of theologians and scholars on nature. Neoplatonism, the theological debates of Iconoclasm and Hesychasm, the proposed union of the Eastern and Western Churches, and the complex relations with

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This essay is based on the results of the research project NARSES (Nature and Religion in South Eastern European Space: Mapping Science and Eastern Christianity Relations in South Eastern Europe and Eastern Mediterranean), <http://narses.hpdst.gr>. The sources mentioned in the essay, biographies of the scholars involved, and an extensive bibliography can be found at the project's website. The proceedings of the NARSES final conference, *Science and Religion: International Conference, Athens, 3–5 September 2015* (Athens: NHRF, 2016), are in press and will be available (open access) on the NARSES website.

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542

the Hellenic past all had notable impacts on the conception of science held by the Byzantine Orthodox. From the sixteenth through the eighteenth centuries, the Christian Orthodox world did not actively participate in the making of the new science that was developing in modern Europe. It had to deal with the assimilation of scientific ideas produced by Western Christianity, and its main concern was the “legitimacy” of knowledge that did not originate directly from its own spiritual tradition. Finally, with regard to the Greek state, beyond the specific points of contact between the sciences and Orthodox Christianity—pertaining, for example, to materialism, evolution, and the calendar—the essay presents the constant background engagement with religion visible in most public pronouncements of scientists and intellectuals.

Because Eastern Christianity scarcely participated in the making of the new European science, researchers have not, until recently, focused on the relations between Orthodoxy and science. Seminal works in the study of the relationship between science and religion, the books of Andrew Dickson White and John William Draper, developed the “conflict thesis” mainly for the Catholic Church; the debates and issues considered in these works did not concern Eastern Christianity. In contrast to his view about the Catholic Church, Draper believed that Eastern Orthodoxy never came into conflict with the new science and that it respected rational explanations of nature:

As to the latter [the Orthodox Church], it has never, since the restoration of science, arrayed itself in opposition to the advancement of knowledge. On the contrary, it has always met it with welcome. It has observed a reverential attitude to truth, from whatever quarter it might come. Recognizing the apparent discrepancies between its interpretations of revealed truth and the discoveries of science, it has always expected that satisfactory explanations and reconciliations would ensue, and in this it has not been disappointed. It would have been well for modern civilization if the Roman Church had done the same.<sup>1</sup>

Even though Draper mentions the attitude of the Orthodox Church, his schematic point of view obscures rather than helps decode the complexities of the Orthodox world’s attitude toward science.

More than 130 years after Draper’s book, the main historical overviews on science and religion continue to neglect Orthodoxy. Influential books published after 2000 by renowned experts such as David Lindberg, Ronald Numbers, Gary Ferngren, Peter Harrison, Thomas Dixon, Geoffrey Cantor, Stephen Pumfrey, and John Hedley Brooke devote little or no attention to Orthodox Christianity, condemning it to a tacit isolation.<sup>2</sup> Building on recent histori-

<sup>1</sup> Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols. (New York: Appleton, 1896); and John William Draper, *History of the Conflict between Religion and Science* (New York: Appleton, 1874), p. x.

<sup>2</sup> David C. Lindberg and Ronald L. Numbers, eds., *When Science and Christianity Meet* (Chicago: Univ. Chicago Press, 2003); Gary B. Ferngren, ed., *The History of Science and Religion in the Western Tradition: An Encyclopedia* (New York: Garland, 2000); Numbers, ed., *Galileo Goes to Jail and Other Myths about Science and Religion* (Cambridge, Mass.: Harvard Univ. Press, 2009); Peter Harrison, ed., *The Cambridge Companion to Science and Religion* (Cambridge: Cambridge Univ. Press, 2010); Thomas Dixon, Geoffrey Cantor, and Stephen Pumfrey, eds., *Science and Religion: New Historical Perspectives* (Cambridge: Cambridge Univ. Press, 2010); John Hedley Brooke and Numbers, eds., *Science and Religion around the World* (New York: Oxford Univ. Press, 2011); and Harrison, *The Territories of Science and Religion* (Chicago: Univ. Chicago Press, 2014). A first overview of science–Orthodoxy relations was undertaken by Efthymios Nicolaidis, *Science and Eastern Orthodoxy: From the Greek Fathers to the Age of Globalization* (Baltimore: Johns Hopkins Univ. Press, 2011).

ography and the results of a research project on science–Orthodoxy relations, this essay aims to offer an overview of Eastern Christianity and science based on Greek-language sources.<sup>3</sup> It thus considers Byzantium, the Orthodox communities of the Ottoman Empire (whose main scientific language was Greek until the nineteenth century), and the (small) Greek independent state created in 1830.

Officially, the Orthodox Church became distinct from the Roman Catholic Church after the schism of 1054. This rupture, the outcome of a progressive distancing of the theological traditions and political ideologies of Western and Eastern Christendom, deepened with the Norman invasions of Byzantine possessions in Italy (1040–1185) and the aspirations to supremacy of a reformed papacy in the eleventh century, before reaching its peak with the tragic sack of Constantinople by the Crusaders in 1204.<sup>4</sup> Much earlier, however, the two languages used by the Fathers of the Church—Greek and Latin—had determined two different traditions and religious sensibilities: those of the Greek and Latin Fathers. Formulated in a space deeply penetrated by Hellenic culture, Eastern Christianity emanates from the tradition of the Greek Fathers; and although these figures are recognized by and have influenced the Catholic Church, their teaching has constituted a distinctive approach to the divine and its relation to the natural, created world. Notwithstanding its complexity and contradictions in its attitude toward secular knowledge and human cognition, this approach subsumed science in a larger spiritual and philosophical enterprise and became an authoritative model for Orthodoxy during the following centuries; its influence is felt among Orthodox theologians and thinkers to this day.

Political entities and state borders in Orthodoxy–science studies are variable. At the beginning the focus is the Eastern Roman, or Byzantine, Empire, especially after the recognition of Christianity as the official and exclusive religion of the empire by Theodosius I in 380. Later, Georgia, Russia, Ukraine, Bulgaria, Serbia, and the lands conquered by the Crusaders and Venetians from Byzantium will enter the picture. The Byzantine Empire would be consumed by the Ottomans after the fall of Constantinople in 1453, and the Orthodox world would take its final shape with the independent Orthodox national states emanating from the disintegration of the Ottoman Empire throughout the nineteenth century and the beginning of the twentieth century. Today, Orthodox geography stretches from southeastern Europe to Ukraine, Russia, and the Caucasus. The main cultures of the Orthodox world are those of the Greeks and the Slavs, the latter not initiated in classical Greek education. Even though the interaction of science and religion has been adapted to the different and changing aspects of the surrounding historical and political context of each area, in all these cultures a seminal role was played by Greek Byzantine culture, which has left indelible traces on mentalities pertaining to the relations of Orthodox Christian believers to the divine.

During the long Byzantine period, Orthodox scholars did not develop groundbreaking new scientific ideas; in fact, “innovation” had a rather pejorative connotation in late antiquity and the Middle Ages. They mainly taught and commented on the Greek science received from the past, adopting some elements of Islamic science as well. Byzantium contributed only indirectly to the European Renaissance, transmitting precious texts and knowledge through the mediation of eminent Byzantine scholars who moved to the West; it thereby lost its “chance

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<sup>3</sup> On the NARSES project see the unnumbered footnote, above.

<sup>4</sup> For an overview of the Great Schism see Steven Runciman, *The Eastern Schism: A Study of the Papacy and the Eastern Churches during the Eleventh and Twelfth Centuries* (Oxford: Oxford Univ. Press, 1955), esp. pp. 1–54; and Philip Sherrard, *Church, Papacy, and Schism: A Theological Enquiry* (London: Society for Promoting Christian Knowledge, 1978).

to participate in the shaping of the modern spirit.”<sup>5</sup> After the sixteenth century, the Christian Orthodox world did not actively participate in the making of the new science that was growing up in Europe. Therefore, in contrast to Western Christianity, the Orthodox Church was not confronted with revolutionary new scientific ideas developed by its believers. Instead, it had to deal with the reception and adoption of ideas produced by the often-hated “Latins,” promoting a distinct anthropological model that advanced the autonomy of rationality in the perception of the natural world while seeking its active manipulation.<sup>6</sup> Thus the study of the relations between Eastern Christianity and science has to respond to different questions than those that emerge in the study of the relations of Western Christianity and science. The main concern of Eastern Christianity was the “legitimacy” of knowledge that did not originate from its own spiritual tradition; depending on the period, this knowledge was mainly ancient Greek (pagan), Islamic, or Western European.

Gradually, from the first decades of the twentieth century, and especially since World War II, new elements originating from very divergent scientific and theoretical fields have converged to provide a better understanding of Orthodoxy, while also illuminating its ambivalent relations to science and secular knowledge. First, a revitalization of the Greek patristic tradition came from Russian theologians and thinkers of the Orthodox Diaspora in the West, providing what Father Georges Florovsky called a “neopatristic synthesis” that also targeted the dialogue of Eastern and Western philosophical and religious traditions.<sup>7</sup> Second, over the last decades the study of Byzantine philosophical sources and writers has been enriched by new editions of texts and new approaches concerning the history of science and the occult sciences, as well as the philosophy of nature and mathematics.<sup>8</sup>

From the ninth to the fifteenth century Byzantine philosophy remained “the science of cognition of fundamental truths on humanity and the world.”<sup>9</sup> Moreover, for medieval scholars the sciences were understood as a part of philosophy, on which they theoretically depend. What was called “science” came *from the external*, in contrast to “philosophy” *from within*—namely, theology. Byzantine philosophy developed its own methods and promoted the intellectual model of the polymath, the erudite master interested in the sciences of the *quadrivium* (astronomy, arithmetic, geometry, and music) and in scientific matters and topics that concerned the natural world and human physiology. With respect to the core elements of Orthodox dogma and the patristic legacy, and drawing on a rediscovery and assimilation of ancient philosophical and scientific texts, Byzantine scholars judged discursive reasoning and scientific knowledge of the universe to be a necessary intermediary stage for human accomplishment, a step toward the achievement of likeness to God.

<sup>5</sup> Hans Georg Beck, *Das byzantinische Jahrtausend*, 2nd ed. (Munich: Beck, 1994), p. 192. (Here and throughout the essay, translations into English are my own unless otherwise indicated.)

<sup>6</sup> See Michel Blay, *Dieu, la nature et l'homme: L'originalité de l'Occident* (Paris: Colin, 2013).

<sup>7</sup> See Andrew Louth, “The Greek Tradition,” in *The Orthodox Church World*, ed. Augustine Casiday (London: Routledge, 2012), pp. 3–14, esp. pp. 13–14. See also Matthew Baker, “Neopatristic Synthesis and Ecumenism: Towards the ‘Reintegration’ of Christian Tradition,” in *Eastern Orthodox Encounters of Identity and Otherness: Values, Self-Reflection, Dialogue*, ed. Andrii Krawchuk and Thomas Bremer (New York: Palgrave MacMillan, 2014), pp. 235–260.

<sup>8</sup> For an overview of Byzantine sciences see Anne Tihon, “Science in the Byzantine Empire,” in *The Cambridge History of Science*, Vol. 2: *Medieval Science*, ed. David C. Lindberg and Michael H. Shank (Cambridge: Cambridge Univ. Press, 2013), pp. 190–206. On the occult sciences see Paul Magdalino and Maria Mavroudi, *The Occult Sciences in Byzantium* (Geneva: La Pomme d’Or, 2006).

<sup>9</sup> Linos G. Benakis, “Philosophy and Theology in Byzantium,” in *Byzantine Philosophy II*, ed. Benakis (Athens: Parousia, 2013), pp. 27–29.

Finally, particularly crucial for the better understanding of Byzantine thought was the input of new approaches coming from Byzantine studies. Deeper insight into Byzantine institutions (mainly educational and religious institutions) and Orthodox spirituality, as well as the material culture associated with writing and reading, introduced new perspectives concerning the preservation, reproduction, and dissemination of different types of knowledge within Byzantine society. Moreover, modern research has shed light on the receptiveness of Byzantine scholars to scientific and philosophical knowledge that sprang from other medieval cultures. Early Byzantine society, until at least the ninth century, was influenced by an Eastern Mediterranean culture that incorporated, among others, Jewish, Babylonian, and Gnostic elements that had survived mostly in northern Africa and in the—later extinct—*ex Iudaeis* Christianity of Alexandria. George Syncellus (eighth century) offered a new calculation of the years since the Creation, much different from the Byzantine standard, that was based on calculations by Julius Africanus.<sup>10</sup> Already from the ninth century Byzantine scholars were influenced by Arab science, and after the fourteenth century they translated and adapted texts from the Persian astronomical schools of Tabriz and Maragha, from the medical and astronomical schools of the Karait Jews of Languedoc, and from the Latin medical and astronomical tradition based on Arab sources. Research has also focused on the direct contacts between Byzantine and Western scholars during the fifteenth century, noting the mobility of Byzantine scholars that took place in consequence of the discussions pertaining to the proposed union of the Catholic and Orthodox Churches.<sup>11</sup>

Taking into account the new data on the influence and reshaping of the multiple discourses in Byzantine thought (mainly theological and philosophical) concerning the interaction of faith and secular knowledge during its long history, modern research has enabled corrective reinterpretations, critical reassessments, and more realistic evaluations of the Byzantine worldview and its position in the history of thought in the Middle Ages. Forming the link between late antiquity and the new worldview of Christian revelation, Byzantium is no longer considered only the guardian and transmitter of the textual heritage of Hellenism; it is seen as an active filter, a denominator of dynamic feedback between East and West, as well.

Similar approaches have been seen recently in research on the Orthodox communities of the Ottoman Empire. These approaches have focused on new cultural aspects, such as the teaching and diffusion of science, educational institutions, cultural exchanges, the role of these communities in setting the policy of the empire toward Europe, and their influence on Russian religious and secular education (the Russian Church became independent from the Patriarchate of Constantinople in the sixteenth century). New data on the deeds of Orthodox scholars in Europe, on their interaction with the intellectual, ecclesiastical, and political milieus and their educational and political agendas, puts an end to oversimplified assumptions about a passive reception of Western science by the Orthodox East, offering a far more complex picture of the knowledge transfer between West and East.

These approaches have reaffirmed the importance of the Orthodox Church in the shaping of the scientific and technological culture of Eastern Christianity; at the same time, they have revealed the richness and importance of the exchanges between East and West.

<sup>10</sup> William Adler, *Time Immemorial: Archaic History and Its Sources in Christian Chronography: From Julius Africanus to George Syncellus* (Washington, D.C.: Dumbarton Oaks, 1989).

<sup>11</sup> See Brigitte Mondrain, "L'enseignement à Byzance sous les Paléologues," in *Lumières de la Sagesse: Écoles médiévales d'Orient et d'Occident*, ed. Éric Vallet, Sandra Aube, and Thierry Kouamé (Paris: Publications de la Sorbonne / Institut du Monde Arabe, 2013), pp. 257–263, esp. p. 263; and Maria Mavroudi, "Translations from Greek into Latin and Arabic during the Middle Ages: Searching for the Classical Tradition," *Speculum*, 2015, 90:28–59. See also Nicolaidis, *Science and Eastern Orthodoxy* (cit. n. 2), Ch. 8, pp. 106–118.

### THE BYZANTINE PERIOD

The Byzantine state and Byzantine society were based on Orthodox Christianity as defined by the seven great ecumenical councils of the Orthodox Church.<sup>12</sup> Orthodox Christianity constituted the unifying element among the peoples of the empire and gave legitimacy to the emperor. Furthermore, theology and theological debates in Byzantium were not the privilege of the clergy alone, as in the Latin West, and theology never took the form of a discipline relying on a systematic method for the dialectical elaboration of Christian truths; instead, it remained closely linked to spirituality. Orthodoxy retained a vivid presence in all social activities and, of course, in education. In contrast to the West, Byzantium did not have independent universities. Higher education was highly variable and was usually built around renowned scholars who organized private lecture series.

Unlike in the West, Greek philosophy was taught in Byzantium almost continuously, and at certain periods the Byzantines turned to it in search of an ancestral wisdom that would offer answers to various social problems. Such periods have been characterized by Byzantinists as times of effervescence and receptivity, beginning with the so-called First Byzantine Humanism of the ninth century.<sup>13</sup> The curriculum of studies, rather unstable until the eleventh century, started with Aristotle's logic and ethics, advanced to physics and the *quadrivium*, and culminated in (Neo)platonian metaphysics. The main purpose of institutional higher education was to train state functionaries for imperial and ecclesiastical offices.<sup>14</sup> In this framework, philosophical and scientific studies in Byzantium were linked more to the individual and largely theoretical interests of eminent scholars and the groups formed around them, rather than to official—and varying—educational institutions.

During the Byzantine era, therefore, the history of the relations between Orthodoxy and science is the history of the relations between Byzantine society and science. And Byzantine society was divided between what was seen as the secular mentality of scholars, high ecclesiastics, and emperors and the religious mysticism of the monks, the lower clergy, and the people. "The struggle that so often in Byzantium brought the party of monks into opposition with certain high ecclesiastics sponsored by the emperors was largely based on the aversion among wide sectors of monasticism to the appearance of secular humanism. This was an actual drama within Byzantine civilization," wrote the 1950s Byzantinist John Meyendorff.<sup>15</sup> This permanent struggle between the partisans of secular humanism and a monastic spirituality that claimed the exclusivity of truth characterized the attitude of Byzantine Orthodoxy toward secular knowledge—and especially toward what we now call science.

### Patristic Tradition: Natural Theology and Sciences

A key for understanding the relation of Byzantine scholars and theologians to natural philosophy and cosmology is the explanation of the book of Genesis (called Hexaemeron) by Basil of Caesarea.<sup>16</sup> Written in 378 and based on previous similar texts—those of the Jew Philo of Alexandria (first century) and the Christians Clement of Alexandria (second century) and Origen (third century), it is, historically, the text most read by the Orthodox about the Creation.

<sup>12</sup> See Ernst Benz, *The Eastern Orthodox Church: Its Thought and Life* (New Brunswick, N.J.: Transaction, 2009), Ch. 4.4: "The Constitutional Principle of the Church," pp. 70–73.

<sup>13</sup> See Paul Lemerle, *Le premier humanisme byzantin* (Paris: Presses Univ. France, 1971).

<sup>14</sup> See Katerina Ierodiakonou, "Introduction," in *Byzantine Philosophy and Its Ancient Sources*, ed. Ierodiakonou (Oxford: Oxford Univ. Press, 2002), pp. 1–13, esp. pp. 4–5.

<sup>15</sup> John Meyendorff, "Les débuts de la controverse hésychaste," *Byzantion*, 1953, 23:87–120, on p. 88.

<sup>16</sup> See Frank Egleston Robbins, *Hexaemeral Literature: A Study of the Greek and Latin Commentaries on Genesis* (Chicago: Univ. Chicago Press, 1912); and Nicolaidis, *Science and Eastern Orthodoxy* (cit. n. 2), esp. pp. 5–46, 87–88.

Its long-lasting impact was due to the importance of Basil in Orthodoxy and to its simple and didactic character. Basil, in a fashion similar to other Greek Fathers—such as Gregory of Nyssa, Gregory of Nazianzus, and Maximus the Confessor—achieved by critical syncretism a synthesis of Greek natural philosophy and medieval faith in the process of conceptualizing nature and the created cosmos. In the transition from late antiquity to the Middle Ages (the fourth through the seventh centuries), patristic thought had developed under the shadow of its *double belonging*—to Hellenism and to Christianity. Oscillation between the features of these two influences would be paramount for Byzantine intellectual and spiritual identity across the centuries, giving birth to the most illustrious fruits of Byzantine thought and provoking passionate polemics and dramatic controversies.

Basil and the Fathers after him who shaped the new philosophical and religious paradigm advanced—though not without regressions and ambivalences—to a critical “harmonization” of Hellenism with Christianity, a reconciliation already begun by early Christian thinkers and apologists, mainly from the second half of the second century. Their contribution marked the turning point in the quest for a possible symmetry between Hellenism and Christianity, and this was achieved by a selective use of the Greek philosophical tradition and sciences (mainly Plato, Aristotle, and the Stoics). Their hermeneutical elaborations established new doctrinal concepts linking contemporary scientific knowledge of the universe with the Christian worldview and the Economy of Salvation. In formulating the core of Eastern Christianity’s dogma, the Greek Church Fathers became a medium and a model for the knowledge of ancient philosophical texts and the Byzantines’ scientific views concerning the natural world. The Greek Fathers did not reject natural sciences and the relevant pagan literature, even though they conceived it to be inferior to the Holy Scriptures. On the contrary, they held that the selective use of Greek culture and sciences could serve faith as a preparatory speculative exercise for attaining knowledge of God, with the ultimate goal of achieving likeness to him. On the other hand, however, they emphasized the limited capacity of the human senses and discursive reason to achieve a total apprehension of physical realities without faith, in the sense that there is always a surplus of meaning inherent in creation that remains inaccessible to reasoning alone. Although the Greek Fathers and theologians were well educated, they did not consider Hellenic wisdom from the perspective of research. They approached nature in a contemplative way, through faith in relation to God the Creator and in the light of the Incarnation, seeking the expansion of human cognition in order to recognize the spiritual dimension immanent in the entire Creation. The legacy of the Greek Fathers persisted across the centuries, especially in periods of crisis and destabilization, as a solid point of reference for Byzantine theologians and thinkers, the norm against which the validity of spiritual, theological, and philosophical interpretations could be measured.

The attitude of Byzantine theologians and thinkers toward Hellenism was by no means consistent and linear; it was manifold and variable. Basil of Caesarea, for example, mentioned ancient philosophical ideas without reference to specific philosophers. In his writings, “Hellene” and “Hellenism” had a negative connotation, as synonyms of “paganism.” Later, in the sixth century, John Philoponus, the first Christian director of the Museum of Alexandria, would refer to Plato as having been inspired by Moses in his narration of the creation of the world. “Hellenism” would have a decidedly positive connotation for Byzantine scholars many centuries later, mainly after the thirteenth century, when the second emperor of Nicaea, John Vatatzes, would claim that he and his ancestors were the heirs of the Hellenes.<sup>17</sup>

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<sup>17</sup> Joannis Philoponi de officio mundi libri vii, ed. Walther Reichardt (Leipzig: Teubner, 1897), 4.15–7.3; and Anthony Kaldellis, *Hellenism in Byzantium: The Transformation of Greek Identity and the Reception of Classical Tradition* (Cambridge: Cambridge Univ. Press, 2007), p. 370 (claim by John Vatatzes).

Basil used the philosophical *logos* to explain the holy texts, and at the same time he attacked the main medium of Greek philosophers—dialectical discussion—because it does not establish certain truth. He did not aim to construct truths from observation of the Creation; rather, in approaching the Book of Genesis, he hoped to offer a unique and faithful explanation by faithfully reflecting God's word. His dogmatic approach to the exegesis of the Bible was contradicted by his brother Gregory of Nyssa, who considered his own analysis of Genesis an exercise of the spirit.<sup>18</sup>

Basil and Gregory, despite their different approaches to the uniqueness of the truth concerning nature, both drew on the Greek philosophical worldview to explain Genesis. During the same period, John Chrysostom, who explained Genesis in a literal fashion, believed in a flat earth surrounded by a sky in the form of a dome and claimed that the investigation of nature must not go too far.<sup>19</sup> Basil, Gregory, and John were all declared Fathers of the Church by Byzantine theologians, and their texts not only became the basis for Orthodox dogma but also served as the common foundation for the Eastern and the Western Christian traditions. Never did the official Church, led by the patriarch of Constantinople—the *primus inter pares* of all bishops—stake out a clear position with regard to these contradictory approaches. Even the mythical depiction of the world put forth by Cosmas Indicopleustes (sixth century)—as a tabernacle, where the angels had the role of moving the celestial bodies and creating all natural phenomena—was never openly condemned.<sup>20</sup> Byzantine Christianity managed to live with its contradictions; at various times and in the context of various theological debates, it leaned toward one or another perception of nature.

Thus, in a long process that lasted more than ten centuries, in a manner neither linear nor consistently creative, Byzantine thought gave birth to multiple approaches relating God and nature to science. These approaches highlight the dynamism of Byzantine culture—but also its resistances and hesitations to integrate the “subversive” activity of human knowledge and the love of secular wisdom within religious faith as determining factors in intellectual and spiritual development.

### The Impact of Neoplatonism on Byzantine Scientific Thought

Apart from the influence of the Church Fathers, ancient Greek philosophy also played a direct role in shaping the Byzantine approach to natural philosophy. Byzantine scholars incorporated (indeed, more or less transformed) the philosophical heritage of Neoplatonism in their vision of science and natural philosophy. Neoplatonism did not emerge intact from its encounter with Christianity. Neoplatonists (third–sixth century) and Byzantine thinkers shared the idea that the understanding of nature included metaphysical principles. Both conceived the natural world as inseparable from its metaphysical and formative principles. Consequently, natural sciences were related to areas of knowledge that today are not thought of as scientific. The

<sup>18</sup> Saint Basil, *Homilies on the Hexaemeron*, trans. Sister Agnes Clare Way (Washington, D.C.: Catholic Univ. America Press, 1963), Homily 1:2, p. 5 (for an online edition see Basil of Caesarea, *Homilies on Hexaemeron*, trans. Philip Schaff [Edinburgh: T. and T. Clark, 1889], [www.ccel.org/ccel/schaff/npnf208.viii.ii.html](http://www.ccel.org/ccel/schaff/npnf208.viii.ii.html) [accessed 28 Jan. 2016]); and Gregory of Nyssa, *Explicatio apologetica ad Petrum fratrem in Hexaemeron*, in *Patrologiae Cursus Completus—Series Graeca*, ed. J.-P. Migne (hereafter *Patrologia Graeca*), Vol. 44 (Paris, 1863), col. 68.

<sup>19</sup> John Chrysostom, *Υπόμνημα εἰς τὴν Γένεσιν* [Treatise on Genesis], in *Homilies I–XXIII*, ed. Spyridon Moustakas (Thessalonica: Patristic Editions Gregory Palamas, 1981), p. 85 (Homily 4, para. 3).

<sup>20</sup> Wanda Wolska-Conus, *Cosmas Indicopleustes, Topographie Chrétienne*, Vols. 1–3 (Paris: Cerf, 1968). On the cosmology of Basil, Gregory of Nyssa, John Chrysostom, and Cosmas Indicopleustes see Nicolaidis, *Science and Eastern Orthodoxy* (cit. n. 2), Chs. 1 and 2. On the different cosmological conceptions see A.-L. Caudano, “Un univers sphérique ou voûté? Survivance de la cosmologie antiochienne à Byzance (XI et XII s.),” *Byzantion*, 2008, 78:66–86.



relation between nature and divine causes was associated with the Christian conception of Divine Providence. In this perspective, *physiology* (discourse on nature) or *natural contemplation* could lead, in the view of Byzantine philosophers and theologians, to knowledge of God. According to the Byzantine philosopher Michael Psellos (1018–1078), nature is the hand or the instrument of God, an intermediary between created beings and God the Creator.<sup>21</sup>

Following this conception, the study of nature did not have only cognitive or practical goals for the Byzantines. It could also be linked to existential purposes and eschatological challenges or to spiritual experiences promising an initiation into the hidden dimension of reality. With the mediation of the senses and reason, man could investigate only the *immediate* or *secondary* causes of natural phenomena.<sup>22</sup> The first cause of everything is God. Nothing can exist without divine will, and something always remains beyond the limits of human discursive reasoning.<sup>23</sup> In Byzantine discourses on nature, rational investigations of natural phenomena coexist with doxological/mystical approaches to the Creation as related to its Creator.<sup>24</sup> The natural and the supernatural coexisted and interacted on different levels, from the most sophisticated explanations of natural phenomena to popular superstitions.

There was never an actual dichotomy in Byzantium between Aristotelians and Platonists. Plato and Aristotle reached Byzantine thought mainly through Neoplatonism, which later came to be the most synthetic form of Hellenic philosophy and the closest to Christian thought. During almost the same period as the efflorescence of patristic thought, the Neoplatonic schools of Alexandria and Athens (fifth and sixth centuries) became the guardians of Greek wisdom in a changing world.<sup>25</sup> Harmonizing Platonic metaphysics and mathematics with Aristotelian logic and physics, as well as Orphic, Pythagorean, and Chaldean theology with Platonic theology, the Neoplatonists incorporated a panorama of previous Greek philosophers by using and reformulating their doctrines. In considering the contemplation of the Ineffable as the ultimate purpose of reasoning, they associated philosophy with the spirituality that had inspired the intellectual and spiritual formulation of two monotheisms, Christianity and Islam. Moreover, Neoplatonists presented philosophy as a kind of exegesis of textual authorities, a notion largely accepted within Byzantine philosophy, which, especially after Michael Psellos, took a rather exegetical character. Sciences were attached to bookish activity, focusing—with the exception of practical astronomy and alchemy—on theoretical speculations and problems rather than on observation and experimentation.

Even though Byzantine scholars did not endorse Neoplatonic doctrines as a whole, since they were in certain cases—for example, the fundamental Neoplatonic concept of emanationism with regard to the origins of the world—incompatible with Christian faith, they did adopt, albeit critically, the exegetical tools, the intellectual structures, and the demonstrative methods of the Neoplatonists in their understanding of nature. They also followed their classification of the sciences according to a hierarchy of values and adopted their division of the Aristotelian writings, accepting them as preliminary to platonic philosophy and incorporating the introductory role of the mathematical sciences into theology. Mathematics was understood as the scientific knowledge leading to true wisdom and reverence *par excellence*. Unlike in Western

<sup>21</sup> See Maximus the Confessor, *Mystagogy*, in *Patrologia Graeca*, Vol. 91, cols. 672b–c, 697d; and A. R. Littlewood, ed., *Michaelis Pselli oratoria minora* (Leipzig: Teubner, 1985), oration 24, pp. 58–61.

<sup>22</sup> See, e.g., J. M. Duffy, ed., *Michaelis Pselli philosophica minora* (Leipzig: Teubner, 1992), pp. 30, 183–212.

<sup>23</sup> *The Stromata*, in *Clemens Alexandrinus*, ed. L. Früchtel, O. Stählin, and U. Treu, Vol. 2, 3rd ed. (Berlin: Akademie, 1960), Bk. 2, Ch. 4.

<sup>24</sup> See, e.g., *Syméon le Nouveau Théologien: Traités théologiques et éthiques*, ed. J. Darrouzès (Paris: Cerf, 1966), Oration 2.219–226; and *Symeon Neos Theologos*, in *Hymnen*, ed. Athanasios Kambylis (Berlin: De Gruyter, 1976), Hymn 21, lines 114–117.

<sup>25</sup> Anne Tihon, “Enseigner les sciences à Alexandrie,” in *Lumières de la Sagesse*, ed. Vallet et al. (cit. n. 11), pp. 329–335.

Christianity, Byzantine sciences, from the eleventh and especially from the thirteenth century, had a rather “Platonic” orientation, in the sense that they focused more on geometry and astronomy than on physics. This explains why the high-ranking official and scholar Theodore Metochites (1270–1332) saw the mathematician as the ideal of universal wisdom and the incarnation of true human happiness and why his disciple, the astronomer and scholar Nicephoros Gregoras (ca. 1295–ca. 1360), considered mathematical sciences, linked to the “wonderful” Plato, to be the expression of Byzantine “orthodoxy” and a path to the knowledge of God, in contrast to the Latin image of Aristotle as “natural” and “logical” during the same period.<sup>26</sup>

Among the Neoplatonists, three thinkers had a crucial impact on the way the Byzantines perceived natural philosophy and mathematics as intersecting with religion and theology: Synesius (370–413), the disciple of Hypatia of Alexandria and later bishop of Cyrene; the very controversial Proclus of Athens (412–485); and, finally, John Philoponus of Alexandria (490–570). Synesius embodied the ideal of the “reconciliation” of Greek wisdom with Christianity. A man of books and science, an active public figure, a harsh critic of the anti-intellectual faith of the monks, Synesius became the inspiration for humanist Byzantine scholars such as Psellos, Metochites, Nicephorus Gregoras, and the physician John-Zacharias Actuarius (ca. 1273–after 1328), a role model for their efforts to connect science and rationality with speculative devoutness and faith.<sup>27</sup> On the other side, Proclus was for the Byzantines the most representative figure of pagan knowledge. Discredited among theological circles and rejected by the official Church, Proclus was, however, admired by scholars like Psellos, who selectively drew from his work the necessary intellectual tools and the epistemology for his own scientific inquiries. After the thirteenth century the Byzantines, in a reflective response to Latin conquest, emphasized their Greek ancestry, a social reaction that sparked what came to be known as the Second Byzantine Humanism. Within this context, which gave a new impetus to the study of sciences and philosophy, Proclus’s astronomical work (*Exposition of Astronomical Hypotheses*) was included in the official teaching of the *quadrivium*, as the increased number of surviving manuscripts related to the period suggests.<sup>28</sup> Humanist scholars as George Pachymeres (1242–ca. 1315) and Cardinal Bessarion (1403–1472) were attentive readers of Proclus’s works, and the latter possessed several relevant manuscripts. John Philoponus (also called “the Grammarian”), though scarcely known in the medieval West, was the leading figure of Byzantine natural philosophy.<sup>29</sup> Moving toward more empirical approaches to natural sciences, releasing natural philosophy from the strict frames of the Aristotelian science of his day, he elaborated the synthesis between biblical cosmology and pagan scientific knowledge followed by most Byzantine scholars.

<sup>26</sup> Börje Byden, *Theodore Metochites’ “Stoicheiosis astronomike” and the Study of Natural Philosophy and Mathematics in Early Palaiologan Byzantium* (Göteborg: Acta Univ. Gothoburgensis, 2003), Ch. 5. More generally see Lambros Couloubaritis, “Platonisme et Aristotélisme à Byzance dans l’empire de Nicée et sous les Paléologues,” in *Philosophie et sciences à Byzance de 1204 à 1453: Les textes, les doctrines et leur transmission*, ed. Michel Cacours and M.-H. Congourdeau (Leuven: Peeters, 2006), pp. 147–149, 151–152.

<sup>27</sup> See, e.g., Karin Hult, ed., *Theodore Metochites on Ancient Authors and Philosophy (“Semeioseis gnomikai” 1–26 and 71)* (Göteborg: Acta Univ. Gothoburgensis, 2002), Ch. 18.

<sup>28</sup> Michel Cacours, “Deux épisodes inconnus dans la réception de Proclus à Byzance aux XIII<sup>ème</sup>–XIV<sup>ème</sup> siècles: La philosophie de Proclus réintroduite à Byzance grâce à l’*Hypotyposis*: Néophytos Prodromenos et Kōntostéphanos(?): Lecteurs de Proclus (avant Argyropoulos) dans le Xénōn du Kralj,” in *Proclus et la Théologie Platonicienne: Actes du colloque international de Louvain en l’honneur de H. D. Saffrey et L. G. Westerink*, ed. Alain Philippe Segonds and Carlos Steel (Leuven: Peeters, 2000), pp. 589–627.

<sup>29</sup> Börje Byden, “Natural Philosophy, Byzantine,” in *Encyclopedia of Medieval Philosophy: Philosophy between 500 and 1500*, ed. Henrik Lagerlund, Vol. 2 (Dordrecht: Springer, 2011), pp. 858–859.

### Ecclesiastical Debates and Byzantine Science

Orthodox Christianity had always been strongly opposed to Roman Catholicism after the schism (mainly on the *Filioque*), but it was also tormented by its own vivid ecclesiastical debates, some of which had an enduring impact. Perhaps the most intense division in Byzantine society was the Iconoclast controversy of the eighth and ninth centuries. Influenced by Eastern doctrines rejecting the depiction of the divine, the Iconoclasts forbade the making and worshiping of icons on grounds that this amounted to a “Christian idolatry,” the opposition to which revived the clash over the pagan heritage of Hellenic philosophy. The teaching of science was influenced by this attitude, as is shown by the lack of scientific texts produced during the period of the First Iconoclasm (730–787).

Nevertheless, Byzantine theologians were too deeply influenced by ancient Greek philosophical methodology to cast it out of theological debates. Mathematics soon regained its status as the scientific knowledge leading to true wisdom and reverence, and Iconoclast partisans and leaders such as Leo the Mathematician (ca. 790–after 869) and John the Grammarian (d. before 867) stood for the revival of ancient Greek philosophy and science. John, the Iconoclast patriarch of Constantinople from 837 to 843, held that the understanding of nature includes metaphysical principles and was an adept of alchemy and occult sciences; he was condemned after his death as a magician by the Iconophile party. Leo promoted geometry as a leading science in the renewed imperial university. In fact, the debate on the icons seems not to have influenced the relations between science and faith in the long run. Its impact was mainly institutional, leading to the closing of some schools and neglect of the teaching of science. The focus was on the continuity of the transmission of scientific knowledge rather than the transformation of the attitude toward this knowledge, as conceived by Orthodox Christianity.

The other great Byzantine ecclesiastical debate was about Hesychasm, which, in contrast to Iconoclasm, exercised a deep influence over the Orthodox attitude toward science.<sup>30</sup> During the fourteenth century, the spiritual movement called Hesychasm, from the Greek word “*hesychia*”—that is, “silence”—had found a safe haven far from daily life, on Mount Athos, the monastic peninsula in eastern Macedonia that has served as the home of Orthodox monasticism, in terms of both theology and religious practice, from the tenth century to the present. Hesychasm as a notion was not new to Eastern Christianity; it is deeply rooted in the very essence of monasticism, and, as a term, it can be found as far back as the fourth-century Christian monk and ascetic Evagrius, though it was expressed mainly through the writings of Maximus the Confessor (sixth–seventh century). Hesychasm was a method of spiritual exercise that aimed at achieving union with God through inner quietude and uninterrupted “prayer of the heart” but also required the participation of the body. Through prayer requiring the participation of both spirit and body, the monk—and indeed any devout Christian—could encounter the Uncreated Light witnessed by the disciples of Jesus on Mount Tabor. As a new mystical experience, it reconnected the ascetic ideal with the experiences of the Desert Fathers and hermits of the first Christian centuries, as well as the later Byzantine mystical theologians. The main exponent of the revival of this movement in the fourteenth century was Gregory

<sup>30</sup> The literature on Hesychasm is enormous. For some useful contributions see H. G. Beck, *Kirche und theologische Literatur im byzantinischen Reich* (Munich: Beck, 1970), pp. 702–798; George Florovsky, “Saint Gregory Palamas and the Tradition of the Fathers,” *Greek Orthodox Theological Review*, 1959–1960, 5(2):119–131; Katerina Ierodiakonou, “The Anti-Logical Movement in the Fourteenth Century,” in *Byzantine Philosophy and Its Ancient Sources*, ed. Ierodiakonou (cit. n. 14), pp. 219–236, esp. pp. 226, 228, 231–232, 234–235; J. Meyendorff, *Introduction à l'étude de Gregoire Palamas* (Paris: Seuil, 1959); Gerhard Podskalsky, *Theologie und Philosophie in Byzanz* (Munich: Beck, 1977); J. S. Romanides, “Notes on the Palamite Controversy and Related Topics,” *Greek Orthodox Theol. Rev.*, 1961–1962, 6:186–205, esp. pp. 190–191; and Kallistos Ware, “The Debate about Palamism,” *Eastern Churches Review*, 1977, 9(1–2):45–63.

Palamas, archbishop of Thessalonica (1296–1359), who was a prominent monk and abbot of Esphigmenou Monastery on Mount Athos. Palamas, who as a young man studied ancient philosophy and especially Aristotle, managed to turn a small grassroots monastic movement into a major theological current through his texts, which were produced in the framework of his controversy with an Aristotelian-minded Orthodox scholar from South Italy named Barlaam of Calabria (1290–1348).<sup>31</sup>

The influence of Palamas and the Hesychasts on Byzantine society and the state was enormous. They arose as an expression of opposition to lay moral decline and to the secularization of the high-level Orthodox leaders and gave the Church enormous power over the declining imperial government, leaving behind a significant number of disciples who would take over the Orthodox Church in the years to come. The influence of Hesychasm reached far beyond the Greek-speaking world into Serbia, Bulgaria, and Russia, creating—or, more accurately, completing—an Orthodox ecumenism that alienated the East even more from the West. Although the Hesychasts never implicitly rejected scientific knowledge, their expectation of direct union with God through inner quietude and prayer “liberated” them from the need for the intermediation of science between man and God’s created world. They perceived the body not as a burden to the soul but, rather, as the soul’s home, which was to be respected and cared for. Therefore, despite their negative attitude toward secular knowledge, they had a favorable stance toward medicine, which cared for the body, and their ideas had a great impact on religious art, the corporeal depictions of which emphasized the spirituality of the human body.

During the period when Palamas’s ideas disseminated, however, the ideological counterpart of Hesychasm, humanism, was developing in parallel. Barlaam, Palamas’s main opponent, was also a monk on Mount Athos, but he leaned more on the humanist values of Byzantine society that had emerged from the second Neoplatonist movement. He opposed the mysticism of the Hesychasts and their practices, calling them “belly-button watchers” (*omphaloscopoi*) because of their commitment to prayer, and devoted himself to writing treatises on astronomy and logic. His approach to theology, as he stated numerous times in his letters to Palamas, was evidential: he believed that the understanding of God should follow the method of scientists, whose approach to their topics is based on evidence and facts. It is mainly through Barlaam that Byzantium briefly experienced the influence of Thomas Aquinas.

The last Byzantine ecclesiastical debate that affected science was that concerning the union of the two Churches during the fifteenth century. Byzantine emperors, under the pressure of Ottoman conquest, turned to the West for military support—the price of which, however, was union with the Roman Church. Once more Byzantine society found itself profoundly divided between political authority, which supported the union, and the monks and inhabitants of Constantinople, who opposed it.

During the interminable discussions and debates with the Roman Church, the most important Byzantine scholars of the period visited Italy and came into contact with their Italian colleagues and the rising culture of the West. Pletho Gemistus (ca. 1355–1452), Bessarion (1403–1472), Mark Eugenikos (ca. 1391–1445), and Gennadius Scholarios (ca. 1400–ca. 1473) were part of the Byzantine delegation that participated at the councils deliberating about union in Ferrara and Florence in 1438–1439. These four scholars represent different trends in the debate and different attitudes toward science as well. Mark Eugenikos, a supporter of Palamas, was the leader of the antiunionist party; Pletho, a fervent Platonist, also turned his back on the

<sup>31</sup> For Barlaam’s works see mainly G. Schirò, *Barlaam Calabro, Epistole Greche* (Palermo: Istituto Siciliano di Studi Bizantini e Neogreci, 1954); P. Carelos, *Barlaam von Seminara, Logistiké* (Athens: Academy of Athens, 1996); and A. Frygos, *Barlaam Calabro Opere contro i Latini* (Vatican: Vatican Press, 1998).

union, but for reasons of his own; Scholarios, an Aristotelian antiunionist but not a partisan of Hesychasm, was to become the first patriarch of Constantinople under Ottoman rule; and Bessarion developed into the leader of the unionist party and was later named a cardinal of the Roman Church and a candidate for the papacy.<sup>32</sup>

The influence of the union debate on science seems to have been extremely complex. The unionist Bessarion was a humanist and one of the protagonists of the Italian Renaissance. He devised a plan for the revival of ancient Greek science in Europe by promoting the teaching of Greek and the translation of important texts, such as Ptolemy's *Almagest*, into Latin and establishing a library for Greek philosophy in Venice. Bessarion fully adopted the Neoplatonic ideal of the intermediary role of the mathematical sciences between believers and God, together with the notion that Byzantine Greeks are the heirs of the ancients. As for Pletho, although he blamed Orthodox Christianity for the decay of the Eastern Roman Empire, he rejected the union—mostly because his essentially neopagan ideal of returning to ancient Hellenic philosophical roots, with a touch of Zoroastrianism, would be unthinkable for the Westerners, who had long distanced themselves from the ancient tradition. His larger plan was to reconcile Greeks and Latins through Platonism as a common way of thinking and acting, returning to a form of pre-Christian society where philosophers would rule. His writings on astronomy are evidence of this ideal: he computed a new non-Christian calendar that was almost the only original work in a Greek-speaking world dominated by compilations of Ptolemy and translations of Persian astronomical texts.<sup>33</sup> The antiunionist Mark Eugenikos, while opposed to Roman Catholic dogma, especially on the *Filioque* and the *Purgatorium*, translated Latin astronomical texts into Greek. Although a Palamist, he accepted the Neoplatonic ideal of the revival of mathematical sciences. Finally, Scholarios, who took the name Gennadios when he was named patriarch of Constantinople by the Ottomans in 1453 as a reward for his fierce antiunionist stance, was an Aristotelian influenced by the teachings of Thomas Aquinas who wrote treatises against Pletho and reopened the Patriarchal School, which had closed after the Ottoman conquest. Despite the mixed curriculum, however, his intent was to educate the higher clergy on a more theological basis rather than to promote the universal teaching of science.<sup>34</sup>

Before the fall of Constantinople, antiunionist scholars did not oppose scientific teaching in general, and some were even involved in the Byzantine humanist movement. However, their antisience stances would appear after the Ottoman conquest, when the anti-Latin feelings of those who remained in the city intensified. Most renowned scholars had already fled to Italy, and those who remained had to adapt to a new world dominated by the Islamic ideals of Ottoman rule. European science was developing fast in this period, and the current of scientific exchange had shifted direction; from that point on, ideas moved only from West to East. It was a new era for Orthodoxy, and the debate would henceforth mostly concern the reception of a knowledge seen by many in the Eastern Church as alien—and as a mirror of the Western world in the East.

#### SCIENCE AND ORTHODOXY DURING THE OTTOMAN PERIOD

Byzantine humanism ended with the collapse of Byzantium, and the debate about nature ceased to be a priority for Orthodox scholars. Some who had fled to Italy eventually returned

<sup>32</sup> On Pletho and his philosophical thought see Niketas Siniosoglou, *Radical Platonism in Byzantium: Illumination and Utopia in Gemistos Plethon* (Cambridge: Cambridge Univ. Press, 2011).

<sup>33</sup> Anne Tihon and Raymond Mercier, *Georges Gémiste Pléthon, Manuel d'Astronomie* (Louvain-la-Neuve: Bryuland-Academia, 1998).

<sup>34</sup> For an overview of the life and work of Gennadius Scholarios see M.-H. Blanchet, *Georges-Gennadios Scholarios (vers 1400–vers 1472): Un intellectuel orthodoxe face à la disparition de l'empire byzantin* (Paris: Institut Français d'Études Byzantines, 2008).

to their homeland, where they made a living by teaching; while others, who had already acquired a sound Orthodox theological education and despised the Westerners, would engage in translations, mostly of astronomical works, in parallel to their theological polemics. Yet the sixteenth century in the Ottoman territories failed to produce important works on science—and certainly none that could be perceived as contradictory to faith. Most of the scientific texts that were produced by Greeks were written in Latin, and thus their work was assigned more to the European Renaissance than to the Orthodox world. In the West, Greek scholars contributed a great deal to European humanism by teaching Greek, editing ancient Greek texts, and helping Western scholars discover new gems in Byzantine manuscripts, a number of which, having survived the destruction of Eastern libraries, were carried to libraries in Western European cities.

Only a few Greeks wrote texts addressed specifically to Greeks, and most of these treatises had a practical purpose. A striking example was Emmanuel Glyzoniou, who sought refuge in Venice, where he worked as an editor of Greek texts for local printing houses. He was an editor of the Psalter and anthologies of various Christian texts, but he also wrote a treatise on practical arithmetic, published in 1588 and influenced by the tradition of the Italian abaci, that included the calculation of Orthodox Easter.<sup>35</sup> Despite the scientific “silence,” however, Orthodox monasteries seem to have practiced the teaching of natural philosophy and basic mathematics, probably as a surviving older conception of a well-rounded education. Damaskinos Stouditis (ca. 1500–1577), metropolitan of Nafpaktos and Arta, wrote popular exegetical sermons on the Bible, together with treatises on nature based on Aristotle, and extended popular Byzantine astronomical tables of the fourteenth century to his own time.<sup>36</sup>

Toward the end of the sixteenth century, however, and moving into the seventeenth, things began to change.<sup>37</sup> In the field of theology, scholars were preoccupied with the new ideas coming from the Reformation. Many of Luther’s Ninety-five Theses coincided with Orthodox arguments against the pope, but some were irrelevant to the Orthodox tradition and others were rejected as totally heretical. It is certain that Eastern theologians paid some attention to the new ideas from the West, especially Calvinism; likewise, Luther looked toward the East, if only for a short period, in search of a foothold against the pope.<sup>38</sup>

Despite the series of polemics against the ideas of the Reformation, some scholars in the East were actually influenced by the new wave. Among these we find the very head of the Orthodox Church, Patriarch Cyril Loukaris (1572–1638).<sup>39</sup> Loukaris was perhaps the theologian in the Orthodox world who was most influenced by Calvinism. Many of his treatises were seen by his contemporaries as Calvinist, and his views quickly alarmed other Orthodox theologians, who regarded Calvinism as one more expression of Western “heretic” theology. He had a solid education from the University of Padua, which, as the place where many Greek scholars studied, played a key role in the dissemination of Aristotelian philosophy in the Eastern world.

<sup>35</sup> On the first edition of his book see Émile Legrand, *Bibliographie hellénique; ou Description raisonnée des ouvrages publiés par des Grecs aux XVème et XVIème siècles*, Vol. 4 (Paris: Guilmoto, 1906), p. 167.

<sup>36</sup> The sermons were first published as *Damasceni Biblion quod dicitur Thesaurus: Sermonum* (Venice, 1568). The book was translated into Turkish in 1731 (Karamanli edition), as well as into Russian and Bulgarian. On Damaskenos see Gerhard Podskalsky, “Damaskenos Studites,” in *Lexikon für Theologie und Kirche*, ed. Walter Kasper (Freiburg im Breisgau: Herder, 1994), Vol. 2, p. 1381.

<sup>37</sup> For the discussion regarding nature in the sixteenth–seventeenth century see Konstantinos Petsios, *Η περί φύσεως συζήτηση στη νεοελληνική σκέψη: Όψεις της φιλοσοφικής διερεύνησης από τον 15ο έως τον 19ο αιώνα* [The Conversation about Nature: Views of Philosophical Inquiry from the Fifteenth to the Nineteenth Century] (Ioannina: Hetaireia Epirotikon Meleton, 2002).

<sup>38</sup> For an overview of Martin Luther’s effort to open a channel of communication with the Orthodox Church see Steven Runciman, *The Great Church in Captivity* (Cambridge: Cambridge Univ. Press, 1968), pp. 238–258.

<sup>39</sup> On Cyril Loukaris see esp. G. A. Hadjiantoniou, *Protestant Patriarch: The Life of Cyril Lucaris, 1572–1638, Patriarch of Constantinople* (Richmond, Va.: John Knox, 1961).

Loukaris, although he did not engage in important scientific work, strongly promoted lay education for the Orthodox of the Ottoman territories; he made an effort to bring the Patriarchal School to a higher standard and to reintroduce the teaching of science. The pro-Calvinist ideas of Loukaris probably influenced his attitude toward science, which he saw as mediating between believers and the Creation, but his stance did not come from his love for learning alone; he also sought to raise a wall against the growing influence of the Jesuits, who opened schools that taught the sciences as a way to bring Orthodox youth closer to Catholicism.

Around the same time, the most prominent figure with respect to philosophy, and especially natural philosophy, was undoubtedly Theophilus Korydalleus (1583–1646). Korydalleus was a monk and the most fervent supporter of Aristotelian philosophy of his time.<sup>40</sup> He too had studied in Padua, taught in Zakynthos and Athens, and was appointed director of the Patriarchal School by Loukaris. In Padua he studied Western scholasticism, from which, however, he kept a relative distance, ascribing it to Catholic tradition. Instead he sought to effect a return to the Greek texts of Aristotle and focused mainly on commentaries made by Greeks, all in an effort aimed at supporting and enhancing Greek identity in the Ottoman Empire. This is perhaps the main reason that almost all of his works served as school handbooks into the nineteenth century, although the Orthodox Church, which grouped him with the pro-Calvinist Loukaris, evidenced little trust in his effort to reintroduce the teaching of science in Orthodox schools.<sup>41</sup>

One of Korydalleus's main tenets was that Aristotelian philosophy should remain pure, purged of Platonic influences, and should not be altered within the context of a dialogue with theology. This was a major shift from the Neoplatonic Byzantine views of a Plato-filtered Aristotle. An interesting aspect of Korydalleus's works is his position concerning the conflict between the Christian conception of the Creation and Aristotelian ideas on the eternity of substance. Although in his writings on natural philosophy he seems to be supporting the Aristotelian viewpoint, this caused absolutely no reaction within the Orthodox Church. However, other scholars felt it necessary to close the gap between the Christian faith and Aristotle by propounding a new conception of Aristotelianism. Among these was Nikolaos Koursoulas (1602–1652), educated in Rome and possibly also in Padua, who became a monk and took an active part in the theological debates of his time, in addition to writing philosophical treatises and philological reviews. Yet his main contribution is a long commentary on Aristotle in which he declared that faith and science, in its Aristotelian sense, could very well coexist. He focused on the relation of theology and science and held largely Thomistic views on the relation of theory and practice.<sup>42</sup>

After the fall of Constantinople, science teaching in the Orthodox world fell into sharp decline, as all educational institutions ceased to exist and the vast majority of scholars fled to the West, mostly Italy, together with their books. Thus the reintroduction of science in schools initiated by Korydalleus was an actual revolution for Orthodox education, and it was accompanied by a renewal of interest in Hellenic literature. But Korydalleus's science teaching in the early sixteenth century was not concerned with the new scientific ideas of Copernicus and Galileo; the curriculum he instituted differed little from that of the Byzantine period. This is

<sup>40</sup> Korydalleus wrote a commentary on Aristotle; see V. Tsiotas, "The Manuscripts of Theophilus Korydalleus' Commentaries on Aristotle's Logic," in *Cesare Cremonini: Aspetti del pensiero e scritti*, ed. E. Riionato and A. Poppi, Vol. 1 (Padua: Academia Galileiana di Scienze, Lettere ed Arti, 2000), pp. 219–248.

<sup>41</sup> On Korydalleus's and Loukaris's relations to science teaching see M. Patiniotis, "Οι Pestifarae Quaestiones του Κυρίλλου Λουκάρεως και η ανάδυση του κορυδαλικού προγράμματος" [The Pestifarae Quaestiones of C. Loukaris and the Emergence of Korydalleus' Program], in *Βυζάντιο–Βενετία–Νεότερος Ελληνισμός: Μια περιπλάνηση στον Κόσμο της Ελληνικής Επιστημονικής Σκέψης* [Byzantium–Venice–Modern Hellenism: A Survey in the World of Greek Scientific Thought], ed. G. N. Vlahakis and Efthymios Nicolaidis (Athens: NHRF, 2004), pp. 211–244.

<sup>42</sup> On Nikolaos Koursoulas see A. Palmieri, "Koursoulas, Nicolas," in *Dictionnaire de théologie catholique*, Vol. 3, pp. 1983–1984.

the biggest reason why historians refer to the period introduced by Loukaris and Korydalleus as “Orthodox humanism.” In fact, this was the third time Orthodox scholars turned toward the Hellenic heritage, and each time it came after major political and cultural crises. The first was after Iconoclasm in the ninth century, the second after the Latin conquest of Constantinople in 1204, and the third after the huge political and cultural crisis due to the collapse of the Byzantine Empire and the domination of Muslim Ottomans over the world of Eastern Orthodoxy.

This late humanism of the seventeenth century goes together with the revival of national Hellenic feeling among the Greek Orthodox. After the defeat of the unionists and the collapse of the Byzantine Empire, Orthodox Greeks turned to the heritage of the Fathers, seeking wisdom that would help strengthen social integrity. Many perceived the Ottoman conquest as divine punishment for the sins that tormented the body of Byzantine society, mainly secularism and the pro-Latin feelings of the Byzantine aristocracy. Mystical and Hesychast teachings had prevailed over humanistic thought in late Byzantium, and the cultural and national relation to Hellenism had been neglected. Loukaris and the new generation of high-ranking Orthodox officials were educated in the West, and they were influenced by the admiration of Hellenic culture that European humanism had showed. Thus, they declared that the Greek Orthodox were proud heirs of the ancient Hellenes—an ideology that, although it promoted scientific teaching, delayed the reception of the new European science.

During the Ottoman period, Orthodoxy produced neither great theologians nor great scientists; Orthodox scholars, the vast majority of whom belonged to the clergy, balanced between a sterile patristic tradition and the new European philosophical ideas. These, together with contemporary science, would later be viewed by the heirs of antiunionism as an intrusion of Western Christianity into Orthodox education that would alienate students from the true dogma. Nevertheless, after the Orthodox humanist breakthrough, new generations of Orthodox scholars gradually opened Orthodoxy to the West, influenced by the wave of European modernization, which was bound to leave the Ottoman Empire far behind with respect to science and technology and, thereafter, military and economic power.

During the late seventeenth century and throughout the eighteenth century, the discussion shifted from the meaning of science and its relation to God’s creation to the content of science. Among the questions that arose among Greek scholars were: Should the Orthodox follow Aristotelian or Newtonian physics? Should they accept the heliocentric system? Should they be taught analytical geometry instead of Euclid’s? Such worries often accompanied the question of whether contemporary European philosophy—especially Malebranche and Descartes—should be taught along with selected works of ancient Greek philosophy, in particular Aristotelian logic. The position of certain Orthodox scholars, such as Methodios Anthrakites (1660–1736), seems self-contradictory: they remained Aristotelians in science teaching but they taught the new philosophy. At the end of this period, however, European modernity—new science, new philosophy, new technology, and new political and educational institutions—would make significant headway in the Orthodox world, and secularism would be accepted in a society ruled by religious leaders.<sup>43</sup>

<sup>43</sup> For the content of science during this period see Iannis Karas *et al.*, *Ιστορία και Φιλοσοφία των Επιστημών στον ελληνικό χώρο (17<sup>ος</sup>–19<sup>ος</sup> αιώνες)* [History and Philosophy of Sciences in the Greek-Speaking World (Seventeenth–Nineteenth Century)] (Athens: Metaichmio, 2003). On Enlightenment and religion see Efthymios Nicolaidis, “The Greek Enlightenment, the Orthodox Church, and Modern Science,” in *Enlightenment and Religion in the Orthodox World*, ed. Paschalis M. Kitromilides (Oxford: Voltaire Foundation, 2016), pp. 49–62.



Standing somewhere between the ancient and the modern, many clergymen supported new European ideas within the Orthodox world.<sup>44</sup> Chrysanthos Notaras (1663–1731) is the best example of a well-educated Orthodox high official—patriarch of Jerusalem—who was positioned between modernity and Orthodox dogmatic tradition. Educated in natural philosophy, mathematics, and theology at the University of Padua, he paid an educational visit to Paris and came into contact with liberal theologians of the Catholic Church, such as Louis Ellies Du Pin, Alexandre Noël, and Michel Lequien, as well as leading astronomers, such as Giovanni Domenico Cassini.<sup>45</sup> Apart from theology, he was interested in mathematical sciences, mainly astronomy and geodesy. He supported the creation of new schools, holding that science teaching is important for believers because such knowledge could assist them in praising God's creation. He also promoted both formal (schools) and informal (dilettante science for the aristocracy) education. His printed book *Introduction to Geometry and Spherics*, although it did not support the heliocentric system that was dominant in the new science, introduced to Orthodox Christianity the methods of accuracy in measurement that characterized the new European spirit.<sup>46</sup>

The Enlightenment, like other important European ideological currents, was altered by its contact with local circumstances and aspirations as it spread to the Greek Orthodox world, resulting in a particular Hellenic synthesis; and, like any other novelty, it stirred large debates among Orthodox scholars. Its influence on the Greek Orthodox communities of the Ottoman Empire can be traced more clearly after the second half of the eighteenth century. It was closely related to the economic growth of a Greek mercantile class that formed thriving communities in European cities through trade with the Ottoman Empire. This social class was the motor of new nationalist ideas that sought to create a Greek Orthodox national state that would identify with the Hellenic tradition, rather than with the ecumenical tradition of a multinational Orthodox Christian society. Greek Orthodox Enlightenment figures viewed the new science as a vehicle for promoting modernity and fighting superstition and ignorance, which they held to be among the principal causes of their submission to Ottoman rule.<sup>47</sup>

As noted earlier, most of the scholars involved with science were clergymen. Thus, the debate between Aristotelian natural philosophy and the theories of physics that arose after Newton was, to a great extent, an internal debate within the Church rather than a clash between the Church and secular scholars. It concerned the introduction of a new science curriculum that was to replace the one implemented by Korydalleus a century before. Was the new science, born and developed in a Catholic and Protestant Europe, compatible with Orthodox tradition? This question would dominate the debate between partisans of European Enlightenment, who saw European science as the development of ancient Greek science, and traditionalists who felt more secure with a scientific curriculum almost unchanged from Byzantine times.

<sup>44</sup> For a discussion of modernity and tradition in the Greek Enlightenment see Paschalis M. Kitromilides, *Enlightenment and Revolution* (Cambridge, Mass.: Harvard Univ. Press, 2013), pp. 156–174.

<sup>45</sup> Chrysanthos Notaras, *Εἰσαγωγή εἰς τὰ γεωγραφικὰ καὶ σφαιρικά* [Introduction to Geography and the Sphere] (Paris, 1716), p. 92. For the role of Chrysanthos Notaras in science see Noël Golvers and Efthymios Nicolaidis, eds., *Ferdinand Verbiest and Jesuit Science in Seventeenth-Century China: An Annotated Edition and Translation of the Constantinople Manuscript (1676)* (Athens: NHRF; Leuven: Katholieke Universiteit Leuven, 2009).

<sup>46</sup> Pinelopi Stathi, *Χρυσάνθος Νοταράς, Πατριάρχης Ιεροσολύμων, πρόδρομος του Νεοελληνικού Διαφωτισμού* [Chrysanthos Notaras, Patriarch of Jerusalem, Precursor of the Greek Enlightenment] (Athens: Syndesmos ton en Athinais Megaloscholiton, 1999), p. 107. For more on Chrysanthos Notaras see Nicolaidis, *Science and Eastern Orthodoxy* (cit. n. 2), pp. 151–154.

<sup>47</sup> On the new social and cultural forces see Paschalis M. Kitromilides, *Enlightenment, Nationalism, Orthodoxy: Studies in the Culture and Political Thought of Southeastern Europe* (Aldershot, Surrey: Ashgate, 1994).

In 1700 Meletios Mitros (1661–1714), metropolitan of Athens, presented the first substantially detailed exposition of the heliocentric system in his manuscript *Compendium of Astronomy*. Meletios recognized the success of the Copernican system, for “through this hypothesis a great many issues are excellently settled, issues which studious men should not ignore, remembering what the Ecclesiast said: God gave the Heavens to human reasoning.”<sup>48</sup> However, following the middle road, as the Jesuit astronomers did in the seventeenth century, he adopted Tycho Brahe’s system, which he judged as scientifically adequate and which allowed him to avoid issues of conscience because of its concordance with the Bible. Vikentios Damodos (ca. 1700–1752), one of the very few Orthodox scholars who was not a clergyman, expressed the same idea in his manuscript *General Physiology*. Damodos, a Greek educated in Venice and Padua, was the first to offer an organized presentation of the ideas of Descartes and Newton to the Greek-speaking world.<sup>49</sup> Tycho Brahe’s system was also adopted by the most respected Orthodox scholar of the eighteenth century, Eugenios Voulgaris (1716–1806). Voulgaris had studied at the University of Padua under Giovanni Poleni, who introduced experimental physics and Newton’s science in Northern Italy.<sup>50</sup> He was close to the Russian Empress Catherine the Great and in 1775 became archbishop of the new Russian diocese of Slaviansk and Cherson. According to Voulgaris, the Holy Texts must be the compass for the study of nature, and the Bible must not be used in a fragmentary way, as it constitutes a unique entity that contains nothing useless or extraneous. Hence, he used excerpts from the Bible to support his choice of the most reliable astronomical system, the Tychonic.<sup>51</sup> Like Notaras, Voulgaris, influenced by the new European spirit, also found himself positioned between Orthodox tradition and modernity. Although a supporter of Tycho’s system and the literal reading of the Bible, he taught Newtonian physics in Orthodox schools, as did Nikephoros Theotokis—later also archbishop of Slaviansk and Cherson—who presented Newton’s theory in his book *Elements of Physics*, a work based mainly on the popular textbook *Elementa Physicae*, written by the Dutch popularizer of Newtonianism Peter van Muschenbroek.<sup>52</sup>

Orthodox scholars of the eighteenth century debated all the new ideas concerning nature and the universe introduced from Western Europe. The debate about the existence of life elsewhere in the universe originated from the translation by Panayotis Kodrikas (?–1827), a Greek aristocrat, of the famous *Entretiens sur le pluralité des mondes* by Bernard Le Bovier de Fontenelle.<sup>53</sup> This question was related to the biblical understanding of man as made in the image of God and of the Incarnation of Jesus Christ. Would the relationship between God

<sup>48</sup> *Επιτομή Αστρονομίας* [Epitome of Astronomy], MS 5749, Panteleimon Monastery, Mount Athos, fols. 168a–168b, 172a–172b. See Konstantinos Kyriakopoulos, “Μελέτιος (Μήτρος) Αθηνών, ο γεωγράφος (1661–1714): συμβολή στη μελέτη του βίου και του έργου του και γενικότερα της εποχής του πρώιμου Διαφωτισμού” [“Meletios Mitros of Athens, the Geographer (1661–1714): Contribution to the Study of His Life and Work and Generally to the Study of the Early Enlightenment”] (Ph.D. diss., Univ. Athens, 1990).

<sup>49</sup> On Damodos see V. Bobou-Stamati, *Ο Βικέντιος Δαμοδός: Βιογραφία-Εργογραφία 1700–1754* (Vikentios Damodos: Biography—Works, 1700–1754) (Athens: MIET, 1998).

<sup>50</sup> G. N. Vlahakis, “The Introduction of Classical Physics in Greece: The Role of the Italian Universities and Publications,” *History of Universities*, 1998, 9:157–180.

<sup>51</sup> G. N. Vlahakis, “Philosophy Is the Knowledge of Things Divine and Human: Exploring the Divine Logos in the Milieu of Science during the Greek Eighteenth Century,” *Almagest*, 2010, 1:124–139.

<sup>52</sup> M. Patiniotis, “Periphery Reassessed: Eugenios Voulgaris Converses with Isaac Newton,” *British Journal for the History of Science*, 2007, 40:471–490; and G. N. Vlahakis, “L’oeuvre scientifique de Nikiphoros Theotokis: Tentative d’approche fondée plus particulièrement sur les ‘Stichia Physikis’ (Elements de Physique),” *Revue des Études Sud-Est Européennes*, 1987, 25:251–261.

<sup>53</sup> Fontenelle’s book was originally published in 1686. The Greek translation by Kodrikas, enriched with many notes and additions, was published more than a century later, in 1794.

and rational creatures living in some other part of the universe be the same? At the end of the eighteenth century, Orthodox scholars held two main views on extraterrestrial life.

The first position was represented by Eugenios Voulgaris and the director of the Patriarchal School, Sergios Makreos (?–1819), who, believing that the acceptance of such a hypothesis might cause problems in the context of Orthodox theological anthropology, rejected it unequivocally. Makreos argued that the notion of the existence of many worlds was intentionally directed against Christian faith and that, if that notion were to be accepted, human beings would have no purpose whatsoever.<sup>54</sup> Among the supporters of extraterrestrial life, Rigas Velesinlis (1757–1798) and Benjamin Lesvios (ca. 1759–1824) asserted that the existence of superior forms of life beyond Earth is compatible with the Divine Logos. Rigas, a partisan of the Enlightenment, was a revolutionary who promoted the idea of a Balkan Orthodox state founded on ancient Greek tradition. He had written an elementary introduction to popularize the new physics, based mostly on the French *Encyclopédie*; there, in the part concerning the possibility of extraterrestrial life, he notes: “If we accept this hypothesis, that God created nothing without a reason, the planets have to fulfill a reason and a scope. Otherwise, why were they created? For the time being, we cannot find any other cause for their existence than being inhabited.”<sup>55</sup> Benjamin Lesvios (1759–824), a monk who studied in Italy and Paris and participated in the Greek national revolutionary movement, believed that the rejection of the existence of extraterrestrial life was selfish, that those who rejected it could not bear the possibility that there might be others with whom they would share the Divine Inheritance. He also, taking theological considerations into account, disdained Newtonian action at a distance and accepted a form of ethereal substance, called *pantachekineton*.<sup>56</sup>

Despite opposition toward the new science on the part of Orthodox Aristotelians, the schools of the Orthodox communities in the Ottoman Empire did introduce it to students. Newtonian physics was taught by Eugenios Voulgaris at the school of Mount Athos, the very heart of monastic life and former bastion of the Palamists. Voulgaris also introduced Newtonian physics at the Patriarchal School in 1759; at the beginning of the nineteenth century, the main body of European science was taught there by Dorotheos Proios (1756–1821), deacon and first Greek auditor at the revolutionary French *École Polytechnique*, and the layman Konstantinos Koumas (1777–1836), who had studied in Vienna and was a fervent man of the Enlightenment.<sup>57</sup> The reception of the new science by the patriarchate was not a smooth process, however, as at times it depended on political events. Voulgaris, Proios, and Koumas were all forced to leave the Patriarchal School, under varying circumstances, as a consequence of politics followed by the patriarchs, who sometimes formed ephemeral alliances with various Orthodox groups in order to ensure their tenure on the patriarchal throne. During the eighteenth and nineteenth centuries, these groups often managed to replace a patriarch with the candidate of their choice—and many patriarchs were dismissed and then reinstated several times.

<sup>54</sup> G. N. Vlahakis “Η άλλη άποψη: Η Επιτομή Φυσικής Ακροάσεως του Σέργιου Μακραιού” [“The Other View: The *Epitome of Physics* by Sergios Makraeos”], in *Proceedings of the Panhellenic Scientific Congress “Sciences in the Greek World”* (Athens: National Hellenic Research Foundation / Trochalia, 1997), pp. 249–260. The main works of Makreos against aspects of new science were the *Τρόπαιον εκ της Ελλαδικής πανοπλίας κατά των οπαδών του Κοπερνίκου* [Trophy from the Greek Shield against the Followers of Copernicus] (Vienna, 1797) and *Επιτομή Φυσικής Φιλοσοφίας* [Epitome of Physics] (Venice, 1816).

<sup>55</sup> Rigas Velesinlis, *Φυσικής Απάνθισμα* [Florilegium of Physics] (Vienna, 1797), p. 40. See also D. Karaberopoulos, “Le florilège de Physique ‘Φυσικής απάνθισμα’ de Rhigas Velesinlis et l’*Encyclopédie*: Première identification d’un modèle,” *Bulletin de Liaison*, 1994, 12:129–139.

<sup>56</sup> E. Theodosiou and M. Dimitrijevic, “The Theory of Pantachekineton of Benjamin Lesvios,” *Phlogiston*, 2011, 18–19(3):7–32.

<sup>57</sup> On the scientific teaching of Koumas see I. Karas, *Θεόφιλος Καΐρης, Κωνσταντίνος Μ. Κούμας: Δύο πρωτοπόροι δάσκαλοι του γένους* [Theophilos Kairis, Kosntantinos M. Koumas: Two Avant-garde Teachers of the Nation] (Athens: Gutenberg, 1977).

The emergence of nationalist ideas in the Balkans, followed by revolutions and the formation of nation-states, brought certain Orthodox circles to believe that the new European science, together with the new European philosophy, posed a menace to the Orthodox Church. This anxiety led Patriarch Cyril VI—the one who summoned Koumas to modernize teaching at the Patriarchal School, an institution for the training of the high clergy that offered the best education for young Orthodox men in Constantinople—to support a curriculum promoting philology over science. It also brought his successor, Patriarch Gregory V, to issue an encyclical in 1821 condemning the teaching of science as an alienating element between the Orthodox and their faith.<sup>58</sup> Both the condemner of scientific knowledge Gregory and the student of the French *École Polytechnique* Proios would later be proclaimed saints of the Orthodox Church because they were hanged by the Ottomans in retaliation for the outbreak of the Greek Revolution of 1821.

### THE INDEPENDENT NATIONAL GREEK STATE

The rise of nationalism at the beginning of the nineteenth century menaced the unity of the Orthodox Church and, at the same time, changed the religious landscape for the Christians of the Ottoman Empire. After the formation of the Orthodox national states in the Balkans, relations between science and religion became more complex, varying from nation to nation, each with its own autonomous national church. The first of these national churches was the Greek, established in 1833, only three years after the founding of the independent Greek state.<sup>59</sup> The Bulgarian Church followed in 1870, the Serbian in 1879, the Romanian in 1885, and the Albanian in 1922. These developments left the Patriarchate of Constantinople with an honorary primacy that no longer allowed it to interfere in local religious and educational affairs.

The Greek Revolution of 1821 was the first European national revolution to result in the creation of a sovereign state. Born from the Enlightenment, the French Revolution, and Romanticism, which engendered Philhellenism across Europe, the Greek Revolution succeeded thanks to the support of the Great Powers of the time. The ideology of the new Greek state coalesced around the classical Hellenic heritage, Christian Orthodoxy, and the exaltation of the national revolution.

Following the principle of universal education proclaimed by the French Revolution and spreading across Europe, the new Greek state created centralized education structures, organized and controlled by a special ministry—a concept that had never existed in the Ottoman Empire. From its foundation, this ministry combined education and religion; in fact, it was titled the Ministry of Education and Ecclesiastical Affairs. This conflation shows, on the one hand, the desire of the new nation-state to control the Church and, on the other, the persistent notion that education could not be separated from the Orthodox religion.<sup>60</sup> In this context, Greek scientific practice was carried out in the newly founded institutions of higher learning, such as the University of Athens and the Polytechnic School, the operating principles of which copied those of French and German establishments. Alongside these, an observatory was established with funding from a private donation. Together, these institutions were to serve in the future as the sites of most Greek scientific activity.<sup>61</sup>

<sup>58</sup> Ph. Iliou, *Τυφλώσον κύριε τον λαόν σου: Οι προεπαναστατικές κρίσεις και ο Νικόλαος Πικάλλος* [God, Blind Thy People: Prerevolutionary Crises and Nicolas Piccolo] (Athens: Poreia, 1988), pp. 47–48.

<sup>59</sup> Ch. A. Frazee, *The Orthodox Church and Independent Greece, 1821–1852* (Cambridge: Cambridge Univ. Press, 1969).

<sup>60</sup> K. Pantelis, *Συγκριτική ιστορία της Ελληνικής εκπαίδευσης* [A Comparative History of Greek Education] (Athens: Vivliorama, 2004).

<sup>61</sup> For some of the characteristics of Greek scientific practice see Kostas Tampakis, “The Once and Future Language: Communication, Terminology, and the Practice of Science in Nineteenth- and Early Twentieth-Century Greece,” *History of Science*, 2015, 53:438–455.

### The Agents of the Science and Religion Discourse in Greece

In the vibrant public sphere that emerged within the Greek state, a number of agents discussed and debated the relation between Greek Orthodoxy and the sciences. We can distinguish four main, at times overlapping, categories: para-ecclesiastical scholars, scientists, theologians, and intellectuals.

**Para-ecclesiastical Scholars.** After some turbulent years in the 1830s and 1840s, the Orthodox Church quickly regained its cultural and national importance, and a number of religious societies and groups arose throughout the Greek state. These were not directly controlled by the Church, although they had very strong ties with its hierarchy. Resembling equivalent societies in the Protestant world, they constituted a new phenomenon in the Orthodox Church and acted as a “fifth phalanx” for Orthodox interests. The most powerful of these societies, Zoë and Anaplassis, boasted at times that they ran dozens of schools and had several thousand members all over Greece.<sup>62</sup> They also published homonymous journals that acted as the mouthpieces for the authors here described as “para-ecclesiastical.” Men like K. Dialeismas (1855–1921) and I. Skaltsounis (1821–1905) wrote for several decades on every topic they perceived to be threatening to Orthodox beliefs.<sup>63</sup> These included Darwinism, materialism, and, more rarely, cosmology. Although their ideas never became mainstream within the Church, these men enjoyed the tacit blessings of very high-ranking clergy within Greece.

**Scientists.** Scientists were a small group, no more than a hundred people, in nineteenth-century Greece. Working mostly in state-funded institutions such as the University of Athens and the Polytechnic School, they were very active in the Greek public sphere, writing popularizing articles for newspapers and magazines, publishing journals of their own, and writing textbooks for students. As a rule, Greek scientists paid lip service to Christianity and did not instigate religious confrontations. The cosmological, astronomical, or naturalistic articles of university professors such as Th. Orfanidis (1817–1886) and D. Eginitis (1862–1934) included numerous references to an almighty Christian Creator whose wisdom can be gleaned from within nature itself. A number of them, including K. Mitsopoulos (1844–1911), were in fact devout believers, ready to take up the defense of Christianity and the Greek homeland against anything seen as a threat.<sup>64</sup> In fact, only a minority among Greek scientists active from 1832 to 1939 engaged in direct confrontation with scholars from religious circles, and this took place mainly on issues concerning Darwinism and materialistic natural philosophy. Another kind of confrontation would occur during the 1930s, when several scientists were accused of being Communist sympathizers and materialists.

**Theologians and Clergymen.** Clergymen were also active in the Greek public sphere—in many ways more so than scientists. Their public appearances were often fiery and passionate, but they rarely concerned points of contact between science and religion. Similar to Greek scientists, with whom they were often peers as professors at the University of Athens, high-ranking bishops and archimandrites were careful not to engage other prominent scholars in public debate. Their speeches and articles tended to be focused on general apologetics and mild condemnations of materialism. They were also particularly active in discussions about the calendar and its reform, which took place in Greece in 1922–1923 and created a grand

<sup>62</sup> E. Gazi, *Πατρίς Θρησκεία Οικογένεια: Η ιστορία ενός συνθήματος* [Nation, Religion, Family: The Story of a Slogan] (Athens: Polis, 2011), pp. 44–100.

<sup>63</sup> Biographies and relevant works for all authors mentioned in this section can be found in the NARSES online database, <http://narses.hpdst.gr/resources/content>. The various topics and articles mentioned can also be searched via keywords.

<sup>64</sup> K. Mitsopoulos, *Επί τη εικοσιπεντατηρίδι της καθηγεσίας αυτού εν τω Εθνικό Πανεπιστημίο 1875–1900* [Discourse for Twenty-five Years’ Professorship, 1875–1900] (Athens, 1901), p. 22.

internal controversy within the Church. As for theologians, they were a small minority among Greek scholars but, because Greek was the language of the New Testament and patristic texts, their influence on Orthodoxy outside of Greece was not negligible. Traditionally, the Faculty of Theology of the University of Athens had strong ties with the Greek Church, and many of its professors were clergymen themselves or belonged to para-ecclesiastical organizations.<sup>65</sup> As such, when engaging in discussions of the relation between science and religion, the publications of theologians like Gr. Papamichael (1875–1956) swung back and forth between views like those expressed in the polemical writings of I. Skaltsounis and those of the milder archimandrites and archbishops of Greece.

**Intellectuals.** The prevailing Greek intellectual and cultural atmosphere during the first century of the Greek state did not put special value on disciplinary identity. As a result, in the primary sources of interest on science and Orthodoxy we see many authors publishing articles and booklets on science and religion without being specialists in the domain. Doctors, Army personnel, lawyers, and novelists can all be found writing in support of or against a variety of issues, from calendar reform to the nature of miracles. Views expressed by Greek intellectuals varied depending on their ideology: some were militant proponents of Orthodoxy, whereas others were vocal and acerbic champions of scientific modernity. As such, this category of historical actors is perhaps the most interesting, since it indicates how the dialogue between science and Orthodoxy affected the more general educated public.

### Points of Contact between Orthodoxy and the Sciences

The interactions between science and Greek Orthodoxy were neither planned nor guided. Thus such dialogues took place through a great variety of topics, styles, and means. Nevertheless, there are recurring themes that appear in writings in the period from the 1830s to the onset of World War II.

**Mechanistic Philosophy and the Soul.** The nature of the soul and its relation to the body was a regular concern throughout the nineteenth century and in the first decades of the twentieth century. Initially, during the first half of the nineteenth century, the question concerned the workings of a soul in what was rapidly turning into a naturalized body. While not very frequent, articles in newspapers and journals written mostly by para-ecclesiastical scholars and general intellectuals touched on the issue in an apologetic fashion: the goal was to defend Orthodox doctrine against an emerging mechanistic explanation. However, with the spread of the materialist German philosopher Ludwig Büchner's and the Darwinist German naturalist Ernst Haeckel's ideas after 1880 para-ecclesiastical publications took on a much more polemical tone.<sup>66</sup> The debate continued well into the twentieth century, with treatises against materialistic psychology appearing regularly. While Greek scientists tried to approach the issue from a purely secular viewpoint, perhaps even to disentangle the issue from Orthodoxy altogether, para-ecclesiastical scholars and theologians alike were adamant in identifying such advances as harmful to Orthodox faith and national morals.

**Spontaneous Generation and Evolution.** Accounts of the evolutionary emergence of life were also central in the debates between science and religion from the late nineteenth century in Greece, as elsewhere. This was the issue that consistently polarized the Greek public sphere, producing a number of political disputes. Particularly prominent in this debate was the ex-

<sup>65</sup> For a history of the Faculty of Theology in the University of Athens see D. Balanos, *Εκατονταετηρίς 1837–1937: Ιστορία της Θεολογικής Σχολής* [One Hundred Years, 1837–1937: History of the Faculty of Theology] (Athens: Pirsos, 1937).

<sup>66</sup> Kyriakos Kyriakou and Constantine Skordoulis, "The Reception of Ernest Haeckel's Ideas in Greece," *Almagest*, 2010, 1(2):84–103.

change between the journal *Prometheus* (founded in 1890 by K. Mitsopoulos, a modernist who was at the same time devoutly Orthodox, as a “periodical of physical and applied sciences”) and the Orthodox journal *Anaplassis*. Both sides were unrelenting in the defense of what they saw as a moral and intellectual undertaking. An exchange of pointed articles between the two journals took place in 1890–1891, the period during which the short-lived *Prometheus* was published, but the issue was raised as early as 1876 and discussed as late as 1936. It is not easy to identify what the sides of the debate were, however. Many scientists, such as the University of Athens Chair of Zoology N. Apostolidis (1856–1916), proudly declared that they would not be teaching Darwinism in their university courses. Other Greek intellectuals tried to defend Darwinism, claiming that the idea of evolution actually had a Greek ancestry. Finally, the suicide of a depressive student at the University of Athens in the 1880s was linked to the teaching of Darwinism, sparking moral outrage in ecclesiastical circles.<sup>67</sup> Later, in the 1920s and 1930s, Darwin was deemed a natural ally of the Communist cause by hard-core Communists and religious conservatives alike, and thus attacks on Darwinism amounted to attacks on Communism.

The arguments against Darwin and evolution took a variety of forms. The first line of attack concerned the scientific validity of Darwin’s and Büchner’s theses. For most authors in this period, there was no clear differentiation between Darwin, Haeckel, and Büchner, and they were rejected *tout court* by religious apologists and conservatives alike. Such scientific arguments were at their strongest in the 1880s and 1890s, but by the twentieth century they were already outdated. Objections were expressed on a purely ethical and philosophical basis, but these were usually accompanied by scientific points. In some cases, certain scientists, most notably the University of Athens Chair of Biology Th. Vlissidis (1866–1964), tried to harness Darwinism as an argument against Communism and materialism by showing, first, how Darwinism had been misunderstood and was in fact not antithetical to Orthodoxy at all and, second, how it proved that Marxism could never work because it was unscientific. Eugenics and survival of the fittest, in other words, were used to discredit Communism.

***Magic and Spiritualism.*** An interesting counterpoint to the naturalism of the evolutionary debate was the treatment of spiritualism and magic. Official Orthodox dogma rejected magic and spiritualism. However, during the first decades of the twentieth century, a number of prominent para-ecclesiastical scholars confronted the issue in an attempt to deal with a growing trend among the urban population, supported by renowned proponents among the Greek literati and intellectuals.<sup>68</sup> Seances and ghost-sightings were marshaled as weapons by para-ecclesiastical scholars in their war against mechanism and materialism. They argued that it had been scientifically proven that spiritualism was real and thus, implicitly, that materialism was wrong. They went on, however, to insist that spiritual occurrences were actually a ploy of satanic forces and so should be rejected and avoided by all faithful Christians. Thus spiritualism is a borderline case in the Greek context. Scientists and clergy acknowledged it as an issue but, for their different reasons, rejected it outright. It was scholars working at the limits of the field who found a way to involve an urban craze in their own ideological agenda.

***Cosmology, Astronomy, and the Calendar.*** From its founding, the independent Greek Orthodox Church tacitly accepted the heliocentric system, and astronomy and cosmology became the two scientific disciplines most likely to be put forward to showcase the harmony between religion and science. Not only did astronomical and cosmological articles appear

<sup>67</sup> Nicolaidis, *Science and Eastern Orthodoxy* (cit. n. 2), pp. 180–192.

<sup>68</sup> E. Matthiopoulos, *Η τέχνη περοφύει εν οδύνη: Η πρόσληψη του νεορομαντισμού στην Ελλάδα* [Art Grows Wings in Sorrow: The Reception of Neo-Romanticism in Greece] (Athens: Potamos, 2005), pp. 199–252.

in religious journals with some frequency, but Greek astronomers were particularly cautious regarding the treatment of religion and Divine Creation. Moreover, Greek astronomers, such as D. Eginitis, were often touted as examples of virtuous and religious scientists who defied the materialistic sirens of the day.

The calculation of the calendar was the most prominent such subject to appear in the Greek public sphere. Greece used the older Julian calendar until 1923, as did the Greek Orthodox Church. Discussions that suggested moving to a variety of the Gregorian calendar appeared sporadically throughout the nineteenth century, but they were always discarded for canonical and political reasons. In the first decade of the twentieth century, a movement for a possible reform of the calendar spread through the Orthodox Church, involving the various Orthodox patriarchates and the autocephalous Churches. Greek and Serbian astronomers played a major consulting role in the deliberations, and heated debates arose within the Church concerning the relative strengths of astronomical and canonical arguments. The Greek state reformed the calendar in 1923, and, amid internal and external criticism, the Greek Church followed a year later, prompting a schism in its ranks that is still in effect.<sup>69</sup>

**General Apologetics.** Religious discourse was prevalent in the Greek public sphere from the 1830s onward. Greek intellectuals, members of the clergy, para-ecclesiastical scholars, and scientists wrote on a variety of subjects that fall under the rubric of general apologetics. Examples are articles on the existence of God, on the possibility of miracles in a naturalistic universe, and on the theism of great scientists. Such articles and books did not arise out of a need to confront a specific objection but were, rather, elements in a general rhetoric of religion within Greece. Just as morality was a worthy subject for a religious journal, so too was a possible logical proof of the existence of God or the religious views held by Darwin himself. The vast majority of Greek religious publications were not aimed at specialists, experts, or clergymen but were instead put forward to educate the general public. General apologetic articles very frequently appeared as part of this educational effort.

**Materialism.** The one common thread in the various specific points of contact between science and religion in Greece was the question of materialism and naturalism. From the first decades after 1830 until well after World War II, most debates and discussions among scientists, clergymen, and intellectuals concerned reiterations of the problem of materialism. Earlier discussions pertained to the relation between the soul and a materialist body. Materialism would resurface in the discussion about Darwinism and evolution, while in the decades between the two world wars the debate focused on materialistic science as the backbone of Communism. The most pointed attacks came from para-ecclesiastical journals and authors and, more rarely, members of the clergy. Greek scientists and intellectuals rarely resorted to similarly fierce defenses of materialism, instead praising modern science and its achievements. Indeed, some even condemned materialistic explanations of science, portraying it as an idealistic enterprise. Especially after World War I, and in the context of the appearance of Socialist and Communist ideas, the identification of materialism with science acquired a political and ideological hue that was well recognized by both sides in the debate. In the end, materialism continued to be the main gripe of Greek religious scholarship on science well into the middle of the twentieth century.

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<sup>69</sup> Michael A. Hoskin, "The Reception of the Calendar by Other Churches," in *Gregorian Reform of the Calendar: Proceedings of the Vatican Conference to Commemorate Its Four Hundredth Anniversary*, ed. G. V. Coyne, Hoskin, and Olaf Pedersen (Vatican: Specola Vaticana, 1983), pp. 252–263.



In summary, beyond the specific points of contact between the sciences and Orthodox Christianity in the Greek state, there was a constant background engagement with religion in most public pronouncements by scientists and intellectuals. While specific themes elicited sporadic, or even continuous, debates, these were always engaged within the context of a general reference to religion and Orthodoxy. Greek scientists and Greek intellectuals in general never questioned the importance of Christianity—and specifically Orthodoxy—for the Greek nation. Especially during the nineteenth century, Greek scientific practice was immersed in the cultural and ideological norms of the era. These included a reverence for all the “pillars of Hellenism,” one of which was Orthodoxy, alongside language and the ideal of classical Greece.<sup>70</sup> Thus, for many decades—indeed, until after World War I—Greek scientists and intellectuals made constant implicit and explicit references to Christianity, in a respectful and approving manner. It was only in the years just before World War II, when an atmosphere of polarization arose between a Communist academic minority and the rest of the state apparatus, that we see any kind of systematic dismissal of Orthodoxy. Even these cases, however, were rare, and the focus was a desire for the secularization of science rather than specific hostility to the Church as such.

Interestingly enough, religious and para-ecclesiastical scholars showed the same reverence toward science in their arguments that scientists showed for religion in theirs. Very rare are the cases where scientific arguments were dismissed solely on theological grounds—or even on moralistic grounds. Greek apologists took great pains to invoke contrary scientific assertions, the opinions of respected scientists, and detailed experimental results to show that, in fact, theories like evolution are wrong on scientific grounds. Thus in their articles and speeches they harnessed scientific rhetoric and argumentation, from which they went on to make ethical and moral condemnations.

## CONCLUSION

Throughout the centuries, the relations between Orthodox Christianity and science have had a dynamic and complex character. This complexity is attested not only by the variety and the number of relevant texts but also by the various and multiple identities of the people who produced them. From the first encounters of Eastern Christianity with science to our own time, we have witnessed a sort of pendulum movement concerning secular knowledge about nature and the universe. This movement goes from a rational approach to nature in order to glorify God’s creation to various mystical approaches that deny the intermediation of science between man and the created world.

Indeed, the intermediation of science between believers and creation, so evident in Western Christianity at least since the late Middle Ages, was a controversial matter in the East. Down through the ages, the stress placed on divine grace as the key notion in the Orthodox doctrine of salvation led to an emphasis on *theosis*—deification. The theological concept of deification was identified with an ascetic ideal that emphasized a kind of dismissal of the physical world, associated with an undervaluation of discursive and demonstrative reason. Thanks to this dominant spirituality—and up until the ascendance of modernity in the nineteenth century—science and secular knowledge were not conceived by mainstream Orthodoxy as an indispensable intermediary stage in the process of human union with God.

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<sup>70</sup> Kostas Tampakis, “Onwards Facing Backwards: The Rhetoric of Science in Nineteenth-Century Greece,” *Brit. J. Hist. Sci.*, 2014, 47:217–237.