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Toward a Natural Kalām for Science-Religion Engagement: Al-Ghazālī and the Natural Sciences

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Abstract:

This article proposes a pluralistic framework for the science–religion relationship—termed Natural Kalām—by drawing on Abū Ḥāmid al-Ghazālī's engagement with the natural sciences. It situates this proposal in relation to two influential nineteenth-century narratives that continue to shape contemporary discussions—the conflict thesis between science and religion and the "decline" narrative of Islamic civilization. Contemporary science–religion scholarship has largely moved beyond the conflict thesis toward models such as dialogue, independence, and integration; yet these approaches face two persistent difficulties: treating "science" as a single ahistorical category and assuming a fixed framework governing its relation to religion. Through a close reading of al-Ghazālī's writings, this study reconstructs his methodological stance into a pluralistic framework in which scientific questions are engaged according to the nature of their subject matter rather than through a single predetermined model of the science–religion relationship.

Keywords:

Natural Kalām; al-Ghazālī; science–religion relationship; Ashʿarite theology; natural sciences..

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نحو علم كلامٍ طبيعِيٍّ للعلاقة بين العلم والدين: الغزالي والطبيعيات

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الملخص:

تُقدِّمُ هذه الورقةُ مقترحًا منهجِيًّا تعدُّديًّا للعلاقة بين العلم والدين، يَحمِلُ مسمَّى «علم الكلام الطبيعي،» يَجِدُ أصولَه في تراث أبي حامدٍ الغزالِيّ وتفاعله مع العلوم والطبيعيات. ويرتبط الموضوعُ على نحوٍ وثيقٍ بسرديتين بارزتين متداخلتَين، مازالتا تؤثران في النقاشاتِ المعاصرة حول العلم والدين، أولاهما: أطروحةُ الصراع ومعاداة العلوم، وثانيتُهما سردية «انحطاط» الحضارة الإسلامية. وعلى الرغم من أن الدراساتِ الحديثةَ في مجالِ العِلم والدِّينِ قد تجاوزت إلى حدٍّ كبيرٍ روايةَ الصراع نحو نماذجَ بعديةٍ مثل الحوار والاستقلال والتكامل، فإن هذه النماذجَ -نفسَها- تواجه إشكالَين أساسيَّين: 1: التعامل مع «العلم» بوصفه مفهومًا واحدًا ثابتًا عابرًا للتاريخ. 2: وافتراضُ وجود نموذجٍ واحدٍ أوحدَ يَحكمُ علاقته بالدين في مختلفِ القضايا والسياقات. بينما هذه المقالةُ، ومن خلال استعادةٍ تحليليةٍ لنصوص الغزالي، تقترحُ إطارًا منهجيًّا تعدديًّا؛ يختلفُ فيه الموقف الذي يتخذه الدِّين إزاء العِلم تبعًا لاختلاف الموضوعاتِ والقضايا نفسِها، بدلًا عن الصدور عن نموذجٍ أحاديٍّ مُسبقٍ ثابتٍ للعلاقة بين العلم والدين.

الكلمات المفتاحية:

علم الكلام الطبيعي؛ أبو حامد الغزالي؛ العلاقة بين العلم والدين؛ علم الكلام الأشعري؛ العلوم الطبيعية.

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Introduction:

In March 1883, Ernest Renan (d. 1892) delivered his lecture *L'Islamisme et la science* at the Sorbonne, provoking considerable controversy in Western and Islamic intellectual circles.(3) His argument reflected a broader nineteenth-century European narrative that viewed the West as the "master of the world" and the center of civilization and rationality, while portraying the East as the intellectual "Other," the civilizational opposite open to domination and colonization. Within this framework, the history of the Islamic world was increasingly presented as a story of "decline" allegedly resulting from the suppression of rational inquiry, often identified with Greek philosophy and the natural sciences. As Renan himself states:

> From about the year 1200, religious reaction triumphed completely; philosophy was abolished in Muslim lands, and historians mentioned it only as a memory—indeed, a regrettable one. Philosophical manuscripts were destroyed and became rare. Astronomy was tolerated only insofar as it served to determine the direction of prayer. Soon the Turkish race came to dominate Islam, and the complete absence of philosophical and scientific spirit prevailed everywhere. From that time on—save for very rare exceptions such as Ibn Khaldūn—Islam no longer sheltered a free mind; it killed science and philosophy on its own soil.(4)

Earlier, in *Averroès et l'averroïsme: Essai historique*, first published in 1852 and later revised, Renan had already assigned Abū Ḥāmid al-Ghazālī (d. 1111) responsibility for extinguishing rationality in Islam. He argued, first, that al-Ghazālī denied causality—thereby, in his view, denying science itself and trivializing reason—and second, that al-Ghazālī had embraced Sufism, and that those who turn to Sufism typically become sworn enemies of phi-

(3) One of the most notable responses to Renan was that of Jamāl al-Dīn al-Afghānī (d. 1897). Although perceptive in some respects, his reply was largely apologetic and conceded several of Renan's accusations concerning Islam's relationship to science and philosophy. See Amélie Marie Goichon, "Jamāl al-Dīn al-Afghānī: Refutation des matérialistes," in *Les Joyaux de l'Orient*, vol. 11 (Paris: Librairie orientaliste, 1942), 174–85.

(4) Ernest Renan, *L'Islamisme et la science* (Paris: Calmann Lévy, 1883), 14.

losophy.[5] In a similar vein, Salomon Munk (d. 1867) asserted in 1859 that al-Ghazālī had dealt philosophy in the East a decisive blow from which it never recovered.[6] Here, it should be noted that the term "philosophy" refers primarily to Greek philosophy (*falsafa*), within which rational inquiry is often reduced when al-Ghazālī is accused of opposing reason.

Al-Ghazālī thus came to bear the charge of decline and hostility toward the sciences for two intertwined reasons: his critique of philosophy and his alleged denial of causality. Yet this narrative has been extensively reassessed. Since the mid-twentieth century, numerous studies have revisited the history of philosophy and the sciences in Islam, challenging the thesis of stagnation after al-Ghazālī and demonstrating the continued vitality and originality of Islamic intellectual life, as well as its contribution to the course of the European Scientific Revolution.[7]

Renan was neither directly nor accurately acquainted with al-Ghazālī's works, nor was he a specialist in his writings. His knowledge of al-Ghazālī largely derived indirectly from accounts transmitted through Ibn Rushd (Averroes, d. 1198) and early Orientalist studies such as those of Joseph von Hammer-Purgstall (d. 1856), August Schmölders (d. 1880), and Munk. Yet he nonetheless cast al-Ghazālī as the figure responsible for civilizational decline, not on the basis of a careful analysis but in accordance with the narrative he sought to construct.

A similar motif persists in the twenty-first century. In widely circulated lectures, the non-religious astrophysicist Neil deGrasse Tyson praises the scientific achievements of the so-

(5) Ernest Renan, *Averroès et l'averroïsme* (Paris: Calmann Lévy, 1882), 97.

(6) Salomon Munk, *Mélanges de philosophie juive et arabe* (Paris: A. Franck, 1859), 382.

(7) A. I. Sabra, "The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam," *History of Science* 25, no. 3 (1987): 223–243; Roshdi Rashed, *Histoire des sciences arabes* (Paris: Éditions du Seuil, 1997); Dimitri Gutas, *Greek Thought, Arabic Culture: The Graeco-Arabic Translation Movement in Baghdad and Early ʿAbbāsid Society* (London: Routledge, 1998); Michael Marmura, "Ghazālī and Demonstrative Science," in *Probing in Islamic Philosophy*, ed. Michael E. Marmura (Binghamton: Global Publications, 2005), 189–207; George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007); Syed Nomanul Haq, "That Medieval Islamic Culture Was Inhospitable to Science," in *Galileo Goes to Jail and Other Myths about Science and Religion*, ed. Ronald L. Numbers (Cambridge, MA: Harvard University Press, 2009), 35–42; Peter Adamson, *Philosophy in the Islamic World: A History of Philosophy without Any Gaps* (Oxford: Oxford University Press, 2016); Sonja Brentjes, *Teaching and Learning the Sciences in Islamicate Societies (800–1700)* (Turnhout: Brepols, 2018); Frank Griffel, *The Formation of Post-Classical Philosophy in Islam* (New York: Oxford University Press, 2021).

called "Islamic Golden Age"—algebra, algorithms, numerals, inventions, and even a third of the names of the stars in the sky—yet maintains that this flourishing lasted only three centuries before what he describes as an intellectual collapse:

> 12th century kicks in and then you get the influence of this scholar al-Ghazālī. All right. And so, so out of his work, you get the philosophy that mathematics is the work of the devil, and nothing good can come of that philosophy. That, combined with other sort of codification, philosophical codifications of what Islam would, was and would become the entire intellectual foundation of that enterprise collapsed. And it has not recovered since.(8)

In another lecture, Tyson argues that the belief that natural events are simply the will of Allah, combined with suspicion toward mathematics, led to the collapse of the scientific enterprise of the Islamic Golden Age.(9) His praise of that period therefore serves not to elevate religion but to warn that when revelation replaces investigation, scientific creativity declines and fails to recover.(10) In short, he presents this episode as evidence that religion and science are ultimately incompatible. Along similar lines, the theoretical physicist Steven Weinberg (d. 2021) had advanced the same claim earlier, in 2007:

> Islam began to turn against science in the twelfth century. The most influential figure was the philosopher Abu Hamid al-Ghazālī, who argued in *The Incoherence of the Philosophers* against the very idea of laws of nature, on the ground that any such laws would put God's hands in chains. According to al-Ghazālī, a piece of cotton placed in a flame does not darken and smolder because of the heat, but because God wants it to darken and smolder. In the centuries after al-Ghazālī, science went into a decline in Islamic countries that has not yet been reversed.(11)

Weinberg reiterated this view in 2008, suggesting that although al-Ghazālī did not deny causal relations altogether, he regarded the investigation of such relations as undesirable, comparing disciplines such as astronomy and mathematics to wine: beneficial in themselves

(8) Neil deGrasse Tyson, "The Intellectual Collapse of Islam," YouTube video, 2012.
(9) Neil deGrasse Tyson, "The Golden Age of Islam Explained," YouTube video, 2020.
(10) Tyson, "The Intellectual".
(11) Steven Weinberg, "A Deadly Certitude," in *Lake Views: This World and the Universe* (Cambridge, MA: Belknap Press, 2011).

yet religiously forbidden.[12] Comparable claims also appear in the writings of contemporary atheists and former Muslims, including Ibn Warraq, Taner Edis, and Ayaan Hirsi Ali.[13]

Despite the widening temporal and intellectual gulf between Renan and the twenty-first century, his narrative appears to remain alive in popular and polemical literature. The same claim continues to circulate with remarkable persistence: that Islam entered a period of decline, allegedly because the sciences were suppressed after al-Ghazālī and causality was replaced by divine will. Perhaps the only notable change is that al-Ghazālī is now sometimes described as a philosopher—a designation Renan himself would scarcely have granted, since for him the philosopher carried a rational prestige rarely accorded to dogmatic religious scholars.

Within contemporary New Atheist discourse, "philosophy is dead. Philosophy has not kept up with modern science, particularly physics. Scientists have become the bearers of the torch of discovery in our quest for knowledge".[14] As rationality increasingly becomes identified exclusively with the natural sciences, philosophy is often reduced to a marginal—or even superfluous—enterprise. In such a context, it becomes possible simultaneously to describe al-Ghazālī as a philosopher while proclaiming the "death" of philosophy in the modern West, much as its demise had earlier been announced in Islam.

The issue, therefore, concerns less the fate of philosophy itself than the shifting civilizational standards through which narratives of progress and decline are constructed. Although many serious Western scholars have moved beyond the doctrinal assumptions of the nineteenth century, their residues continue to circulate widely, particularly in popular discourse and in the missionary churches of the New Atheism.

The problem of al-Ghazālī's alleged denial of natural causality and suppression of the

(12) Steven Weinberg, "Without God," in *Lake Views: This World and the Universe* (Cambridge, MA: Belknap Press, 2011).
(13) Shoaib Ahmed Malik, "Al-Ghazālī," in *The Cambridge History of Atheism*, ed. Stephen Bullivant and Michael Ruse (Cambridge: Cambridge University Press, 2021), 291–307.
(14) Stephen Hawking and Leonard Mlodinow, *The Grand Design* (New York: Bantam Books, 2010), pt. 1.

sciences can be approached from two angles: a historical inquiry into the fate of philosophy and the sciences after him, and an epistemological analysis of his views. This study adopts the latter approach. The science–religion relationship has undergone significant transformations since the decline of the nineteenth-century conflict thesis and the emergence of models such as independence, dialogue, and integration. Yet these models face epistemological challenges, while the conflict narrative persists in popular discourse.

In recent years, a number of important studies have revisited al-Ghazālī's position toward the sciences, while some have sought to develop contemporary kalāmic approaches to scientific questions within an Ashʿarite framework.(15) This study may appear to follow this trajectory; however, it seeks to pursue a different aim. It neither restates the historical position nor reproduces contemporary Ashʿarite kalāmic approaches as they stand; rather, it reanalyzes al-Ghazālī's historical position and derives from it a framework that is itself operative in the science–religion relationship, namely what is termed Natural Kalām.

From this perspective, Natural Kalām is presented as an epistemological appropriation of al-Ghazālī's method in dealing with the sciences, rearticulated in a contemporary context. It thereby opens the way toward a pluralistic understanding of the science–religion relationship, one that varies according to the nature of the questions and disciplines involved. In this sense, the present study offers a conceptual foundation upon which further work may build by developing concrete applications of this approach. This plurality does not imply contradiction, absolute agreement, or complete separation, but reflects the differing nature of the issues at stake (as in debates surrounding evolution, convergence in certain cosmological models such as the Big Bang, and relative independence in fields such as plate tectonics). This constitutes the central aim of the present study.

(15) Karen Harding, "Causality Then and Now: Al-Ghazali and Quantum Theory," *American Journal of Islamic Social Sciences* 10, no. 2 (1993); Malik, "Al-Ghazālī."; Shoaib Ahmed Malik and Nazif Muhtaroglu, "How Much Should or Can Science Impact Theological Formulations? An Ashʿarī Perspective on Theology of Nature," *European Journal for Philosophy of Religion* 18, no. 2 (2022): 8–35; Basil Altaie, *Islam and Natural Philosophy: Principles of Daqīq al-Kalām* (London: Routledge, 2019); Basil Altaie, *Natural Philosophy of Imam Al-Ghazali* (Oldham, UK: Beacon Books and Media Ltd., 2023).

Toward a Pluralistic Model of the Science-Religion Relationship: Natural Kalām

It is necessary to recall the cultural context of the nineteenth-century West in which the narrative of decline and the claim that al-Ghazālī brought about the downfall of the sciences gained wide circulation. This narrative did not emerge out of a vacuum; rather, it arose within a dense historical context in which the Western Church played a central role. The intellectual transformations that reshaped the Western cultural landscape, beginning with the Renaissance and followed by profound political, religious, social, and philosophical upheavals, produced a narrative that gradually separated "Caesar" from "God"—that is, the secular from the religious. Science came to be regarded as a Caesarian domain: not merely independent of the Church but often portrayed as its dark and hostile adversary. This context also contributed to the emergence of a series of binary oppositions—often antagonistic—such as matter and spirit, the unseen and the visible, subject and object, and idealism and realism. Among these was the science–religion dichotomy, whose retrospective projection onto the past produces misleading narratives.[16] It suffices to recall that the writings of John William Draper (d. 1882)[17] and Andrew Dickson White (d. 1918)[18]—which popularized the conflict narrative between science and religion and whose echoes still resonate today—belong precisely to this intellectual context and its ideological concerns.

As for the ideological protagonists of that period, the issue concerned not only Islam and Christianity, but religion more broadly. Although Draper, for instance, explicitly stated that his problem was primarily with Catholicism in particular,[19] the generalization of the conflict narrative soon extended to Christianity as a whole,[20] and eventually to the very

(16) Peter Harrison, *The Territories of Science and Religion* (Chicago: University of Chicago Press, 2015).
(17) John William Draper, *History of the Conflict between Religion and Science* (New York: Cambridge University Press, 2009).
(18) Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom* (New York: Cambridge University Press, 2009).
(19) Draper, *History*, x–xi.
(20) White, *A History*, 22–23, 25.

concept of religion itself. From Renan's perspective, for example, "the Catholic Church did not treat Galileo any better than Islam treated Averroes".(21)

After these competing binaries began to subside and positivist and scientistic currents weakened, contemporary scholars and historians of science reexamined the science–religion question. A decisive moment came in 1966, marked by two significant events: the publication of the American physicist and theologian Ian Barbour's book *Issues in Science and Religion*, and the founding of the journal *Zygon: Journal of Religion and Science*. This development opened a new academic field, and discussion shifted toward three alternative models of the relationship between religion and science: independence, dialogue, and integration.(22) These developments allowed specialists in the field to move beyond the nineteenth-century conflict narrative, and they increasingly turned away from it, despite its continued influence in popular culture and in the rhetoric of the New Atheism.

Yet today we are increasingly aware of the limitations of these models. If the conflict model ignores the historical evidence of harmony between religion and science and focuses exclusively on episodes of dispute, often reframing them to fit a narrative of perpetual conflict, the integration model likewise cannot ignore genuine historical tensions and intellectual confrontations between science and religion, nor reduce them simply to scientistic or atheistic ideologies.

In this sense, the models of independence and dialogue appeared to many as a more satisfactory approach. One of the strongest formulations of the independence model was Stephen Jay Gould's (d. 2002) proposal of Non-Overlapping Magisteria (NOMA), developed toward the end of the twentieth century.(23)

However, the independence model—while offering a convenient truce for many—re-

(21) Ernest Renan, *L'Islam et la science* (Paris: L'Archange Minotaure, n.d.), xx.

(22) Ian G. Barbour, *Nature, Human Nature, and God* (Minneapolis: Fortress Press, 2002), 1–2.

(23) Stephen Jay Gould summarizes his proposal in *Rocks of Ages*: "the central principle of respectful noninterference—accompanied by intense dialogue between the two distinct subjects ... the Principle of NOMA, or Non-Overlapping Magisteria." *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine Books, 1999), 9.

mains a provisional solution that overlooks the overlapping boundaries between science and religion. Moreover, it has produced troubling side effects. The historical division between domains of knowledge has contributed to a rupture between scientific truth and moral responsibility. This is evident in contemporary discussions of environmental ethics and climate issues,(24) where separating moral motivation from material action has weakened the sense of moral responsibility toward the planet.

The dialogue model—especially in its integrative forms—has emerged as a leading framework among specialists in the field.(25) A major institutional expression of this approach was the Divine Action Project (DAP), sponsored by the Vatican Observatory and the Center for Theology and the Natural Sciences (CTNS) between 1988 and 2003.

Yet this project received some criticism. One of the most significant objections was that it sought to "naturalize" divine action—or even to "physicize" it—so that it would appear compatible with natural laws understood in purely material terms(26).

More broadly, this criticism is often directed at the dialogue model itself. In practice, what is presented as dialogue frequently becomes a one-directional monologue, in which science occupies the position of the authoritative lecturer while religion assumes the role of obedient student, rather than a genuinely reciprocal exchange.(27) This imbalance reflects the immense epistemic authority science has acquired over the past centuries, together with the rise of scientistic attitudes, in contrast to the relative decline of religious authority under secular modernity(28) .

(24) Michael S. Northcott, *A Political Theology of Climate Change* (London: SPCK, 2014); Michael S. Northcott, "Religion and the Science of Climate Destabilisation," in New Directions in Theology and Science: Beyond Dialogue, ed. Peter Harrison and Paul Tyson (London: Routledge, 2022), 56–72.

(25) Peter Harrison and Paul Tyson, "Introduction," in *After Science and Religion*, ed. Peter Harrison and John Milbank (Cambridge: Cambridge University Press, 2022), 1–2.

(26) Wesley J. Wildman, "The Divine Action Project, 1988–2003," *Theology and Science* 2, no. 1 (2004): 31–75; Wesley J. Wildman, "Further Reflections on the Divine Action Project," *Theology and Science* 3, no. 1 (2005): 71–83.

(27) Harrison and Tyson, "Introduction," 2–3.

(28) Bernard Lightman, "The Nineteenth-Century Origins of the Problem," in *After Science and Religion*, ed. Peter Harrison and John Milbank (Cambridge: Cambridge University Press, 2022), 35–60.

Consequently, contemporary scholars have become increasingly aware of the limitations of these classical models. The historical relationship between science and religion is now widely understood through what is known as the "complexity thesis," shaped by multiple contexts, perspectives, and intellectual traditions and moving beyond simplistic binary frameworks, particularly the one-sided narrative of conflict.(29)

Yet once again, while highlighting the multifaceted character of the historical landscape, the complexity thesis offers no constructive proposal for the science–religion relationship. Its role remains largely descriptive rather than normative.

For this reason, scholars increasingly approach these questions through what has come to be known as the "critical approach," addressing contemporary issues such as bioethics, knowledge colonialism, gender, race, biotechnology, identity, and reproduction.(30) This approach, while important, often moves toward sociological, political, or broadly ethical considerations. These dimensions are significant, but they cannot by themselves resolve the deeper epistemological problems involved.

The work of Peter Harrison, *The Territories of Science and Religion*, has been particularly important in drawing attention to the problem of conceptual anachronism, namely, the projection of contemporary conceptual categories onto the past.(31) When we attempt to define the relationship between science and religion—whether in terms of separation, conflict, or integration—we implicitly assume two stable and clearly defined concepts acrosshistory.(32)

Accordingly, some scholars have proposed what is called "theology-engaged science," in which theology and science interact while drawing attention to the historical fluidity and

(29) Bernard Lightman, ed., *Rethinking History, Science and Religion* (Pittsburgh: University of Pittsburgh Press, 2019).

(30) Myrna Perez Sheldon, Ahmed Ragab, and Terence Keel, eds., *Critical Approaches to Science and Religion* (New York: Columbia University Press, 2023); M. Perez, Terence Keel, and Ahmed Ragab, "Roundtable on Critical Approaches to Science and Religion," *Zygon* 60, no. 4 (2026): 1316–24.

(31) Harrison, *The Territories*.

(32) Paul Tyson, "Introduction: After Science and Religion?" in After *Science and Religion: Fresh Perspectives from Philosophy and Theology*, ed. Peter Harrison and John Milbank (Cambridge: Cambridge University Press, 2022), 1.

conceptual dynamism of scientific ideas. Conversely, other scholars speak of "science-engaged theology," an approach that shifts the focus away from abstract models of the science–religion relationship toward the examination of specific cases and concrete interactions between scientific and theological reasoning.(33) This approach also seeks to neutralize the implicit hierarchy that often grants science the position of intellectual authority at the expense of theology.(34) Instead, theology participates as an equal partner capable of critically engaging scientific assumptions without surrendering to scientistic reverence for the scientific method.

Although some scholars criticize the analytic philosophical examination of science–religion questions in isolation from historical contexts,(35) we maintain that, while historical and social contexts are essential—since ignoring them easily leads to anachronism and overgeneralization—this does not eliminate the need for rigorous epistemological analysis of the issues.

Accordingly, this study proceeds from two fundamental propositions. First, science itself is a historically fluid concept whose meaning and scope have changed over time; what counted as science in the past is not identical to what we call science today. Second, there is no single universal model of the science–religion relationship. Rather, it varies according to particular issues, as well as the sciences themselves and their underlying assumptions.

We illustrate this methodological approach through the case of al-Ghazālī, here termed Natural Kalām.

The roots of Natural Kalām can be identified in the later Ashʿarite intellectual tradition, particularly in what became known as the method of the later theologians (*ṭarīqat al-mutaʾakhkhirīn*), characterized by direct engagement with the sciences of the *falāsifa*

(33) John Perry and Joanna Leidenhag, "What Is Science-Engaged Theology?" *Modern Theology* 37, no. 2 (2021): 247.
(34) Perry and Leidenhag, "What Is Science-Engaged Theology?" 248.
(35) Peter Harrison, "Science and Religion as Historical Traditions," in *After Science and Religion*, ed. Peter Harrison and John Milbank (Cambridge: Cambridge University Press, 2022), 15–34.

(Greek-inspired philosophers) and their integration into the earlier kalām tradition (*ṭarīqat al-mutaqaddimīn*). This development begins with the work of al-Ghazālī.[36]

Prior to al-Ghazālī, Muslim scholars broadly fell into two camps: one accepting Aristotelian philosophy and another rejecting it. Al-Ghazālī introduced a methodological program that critically engaged the philosophical sciences, distinguishing between what accords with Islamic doctrines, what contradicts them, and what remains neutral with respect to them. This method later became widespread, particularly with Fakhr al-Dīn al-Rāzī (d. 1210), and reached a mature form in the work of ʿAḍud al-Dīn al-Ījī (d. 1355). It involves a precise critical engagement between kalām and the philosophical sciences—including natural philosophy—whenever they intersect with theological principles.

However, in al-Ghazālī's time there was nothing strictly equivalent to what we today call "science." Most of the natural sciences remained embedded within philosophy before gradually gaining independence in the modern West: physics began to separate methodologically in the seventeenth century, chemistry in the eighteenth, and biology in the nineteenth. Hence the familiar saying that philosophy is the mother of the sciences.

Even in the eighteenth century, Isaac Newton (d. 1727)—the greatest physicist—was known not as a scientist but as a natural philosopher. His most influential work bears the title *Philosophiæ Naturalis Principia Mathematica* ("Mathematical Principles of Natural Philosophy").

Scientific data, considered simply as empirical data about the natural world, do not themselves speak of conflict or harmony between science and religion. Such conclusions arise only through interpretive frameworks and inferential arguments that use those data as premises.

Distinguishing between scientific propositions and the philosophical or metaphysical claims derived from them is essential. This distinction becomes particularly important

(36) ʿAbd al-Raḥmān Ibn Khaldūn, *Al-Muqaddima* (Giza: Dār Nahḍat Miṣr, 2014), 3:976.

when assessing al-Ghazālī's position: was his dispute with the *falāsifa* directed against their sciences themselves, or against the metaphysical interpretations derived from them?

Al-Ghazālī did not approach the philosophers from ignorance of their sciences or from preconceived hostility. His critique followed a careful study of their disciplines and began with a methodological classification of philosophical sciences into six branches: mathematics, logic, natural philosophy (*al-ṭabīʿiyyāt*), metaphysics (*al-ilāhiyyāt*), politics, and ethics.(37)

This classification reveals an early awareness that the relationship between science and religion can take different forms—independence, integration, or conflict—depending on thediscipline.(38)

Thus, the philosophy that al-Ghazālī is often said to have opposed was not a single unified system but a collection of diverse intellectual fields whose relationship to religious belief varies according to their subject matter, methodology, and degree of connection to Islamic doctrines.

The same principle applies to modern science: different scientific disciplines do not stand in identical relationships to theology. Geology, for example, does not raise the same theological sensitivities as biology, just as the Big Bang theory carries very different metaphysical implications from theories in fluid mechanics or plate tectonics.

Natural Kalām: Neutrality and Independence

The model of separation between religion and science often appears more diplomatic than epistemological, given the considerable influence both domains exert on human life. At least two interpretations of this model may be distinguished. One advocates near-complete isolation, treating science and religion as distinct spheres that can coexist only if a safe

(37) Abū Ḥāmid al-Ghazālī, *Iḥyāʾ ʿUlūm al-Dīn* (Jeddah: Dār al-Minhāj, 2011), 1:84–85; *Al-Munqidh min al-Ḍalāl* (Beirut: Dār al-Andalus, n.d.), 100.

(38) The dialogue model is not entirely independent; rather, it provides the basic ground from which the other models develop.

distance is maintained between them.(39) Another proposes a complementary separation without rupture, suggesting that each offers a different yet non-contradictory perspective on the world, and that conflict arises only when the boundaries between their domains are ignored—whether by religious actors making scientific claims or by scientists extending their authority into broader philosophical or metaphysical assertions.(40)

Although this separation resonates with modern secular sensibilities that sought to exclude religion from public life or confine it to the private sphere, religion has proven resistant to such marginalization, and the model itself fails to resolve deeper intellectual tensions. Scientists hold scientific views that may conflict with or complement religious teachings. Strict separation suppresses legitimate epistemic questions where such tensions arise, producing an internal dissonance in which one belief governs the laboratory while its opposite governs the prayer niche. Separation may therefore function as a politically convenient arrangement but remains epistemologically incomplete, as it typically presupposes a fideistic understanding of religion—an assumption at odds with religion's rational structure.

The separation model also rests on problematic generalizations. The relationship between religion and science concerns not a single entity with a fixed essence but a plurality of questions and disciplines. When a natural scientist studies annual rainfall patterns, the causes of polar bear extinction, or the physiological effects of prolonged exposure to mobile phone screens, the religious scholar may see little reason to intervene unless ethical concerns arise. Yet when the discussion turns to the origin of life, the nature of causality, or the fate of existence after death, religious inquiry becomes not merely relevant but central.

In this context, al-Ghazālī offers a helpful perspective: differentiation and independence between domains exist but are neither universal nor absolute. Rather, they are question-dependent—or, in kalām terminology, *iʿtibārī*—and governed by the degree to which

(39) Ian G. Barbour, *When Science Meets Religion* (San Francisco: HarperOne, 2000), Introduction; *Religion in an Age of Science* (San Francisco: HarperCollins, 1990), Independence.

(40) Barbour, *When Science*, Introduction; Barbour, *Religion in an Age*, Independence.

the premises of particular sciences intersect with the religious principles conveyed by the prophets. Where contradiction occurs, conflict arises; where no contradiction exists, the relationship may take the form of complementarity or independence. As an example, al-Ghazālī refers to astronomical explanations of eclipses:

> A lunar eclipse consists in the disappearance of the moon's light when the earth intervenes between it and the sun, since the moon receives its light from the sun. The earth is spherical and the heavens surround it on all sides... Likewise, a solar eclipse occurs when the body of the moon comes between the observer and the sun when the two coincide at the nodes.(41)

He concludes that such matters fall outside theological dispute: "We do not engage in refuting this discipline, for no religious purpose depends upon it."(42)

Natural facts such as the sphericity of the earth, and scientific explanations such as eclipses—illustrated by examples drawn from the knowledge of his time—do not invite religious objection when they contradict no established principle transmitted by the prophets. Indeed, al-Ghazālī warns that denying such demonstrative conclusions harms religion itself, since "these matters are established by geometrical and mathematical proofs that leave no room for doubt".(43)

He further clarifies the boundary separating the work of the theologian from that of the natural philosopher:

> The investigation of the world with respect to whether it is originated or eternal—once its origination has been established—does not depend upon whether it is spherical, simple, hexagonal, or octagonal, nor upon whether the heavens consist of thirteen layers or more or fewer. Such matters stand in relation to theological inquiry as the investigation of the layers of an onion or the number of seeds in a pomegranate. The essential point is simply that the world is the act of God.(44)

The theologian thus investigates the origin of the world, whereas the natural scientist

(41) Al-Ghazālī, *Tahāfut*, 80.
(42) Al-Ghazālī states: "The religious law neither affirms nor denies these sciences, and these sciences likewise do not address religious matters." *Al-Munqidh*, 102.
(43) Al-Ghazālī, *Tahāfut*, 80.
(44) Al-Ghazālī, *Tahāfut*, 81.

studies its structure and processes. Once it is established that the world is the act of the Creator, whether the universe is expanding, contracting, flat, or curved falls outside theological concern. Al-Ghazālī illustrates this with the metaphor of an onion: once it is known to have a cultivator, counting its layers is no longer the theologian's task.

This method is applied both to specific questions and to entire disciplines. After dividing the sciences of the philosophers into six categories, al-Ghazālī classifies mathematics and geometry as neutral disciplines:

> As for mathematics, it concerns arithmetic, geometry, and the science of the structure of the world. None of these matters relate to religious questions, either in affirmation or denial. They are demonstrative sciences that cannot be rejected once they are properly understood.(45)

Thus, al-Ghazālī does not regard mathematics as "the work of Satan," as Tyson suggests, nor as "forbidden like wine," as Weinberg claims. On the contrary, he considers it a demonstrative science unrelated to religion either positively or negatively—an autonomous field of knowledge free from theological dispute. The same judgment applies to logic.(46) Likewise, the natural sciences and medicine are independent disciplines whose investigation religion does not oppose, except in particular cases to be examined later.(47)

The portrayal of al-Ghazālī as hostile to the sciences is not confined to certain Orientalists or currents of New Atheism; it has also appeared in some writings on science and religion. Nidhal Guessoum, for instance, claims that al-Ghazālī adopted a cautious attitude toward mathematics because it served as a gateway to false sciences and corrupt doctrines.(48) Yet this claim raises several methodological difficulties. Guessoum does not cite the statement directly from al-Ghazālī but rather through Mehdi Golshani; Golshani himself relied on an intermediary source; the statement is paraphrased rather than quoted; and the work

(45) Al-Ghazālī, *Al-Munqidh*, 100; *Tahāfut*, 84; *Maqāṣid al-Falāsifa* (Damascus: Maṭbaʿat al-Ṣabāḥ, 2000), 10.
(46) Al-Ghazālī, *Al-Munqidh*, 103.
(47) Al-Ghazālī, *Al-Munqidh*, 105–6.
(48) Nidhal Guessoum, *Islam's Quantum Question: Reconciling Muslim Tradition and Modern Science* (London: I.B. Tauris, 2011), 103–4.

to which it is attributed, *Fātiḥat al-ʿUlūm* ("The Opening of the Sciences"), remains disputed in its attribution to al-Ghazālī.(49)

Even if the work is accepted as al-Ghazālī's—as I am inclined to do, especially since it largely summarizes ideas already found in the *Iḥyāʾ ʿUlūm al-Dīn* ("The Revival of the Religious Sciences")—the real issue lies in the context of the passage. Golshani states that al-Ghazālī believed mathematics should be excluded because it leads to false sciences.(50) Guessoum repeats the claim.(51) In reality, al-Ghazālī explains that the concern arises because mathematics and geometry were embedded in the philosophical system of the ancients, which contained erroneous doctrines. The restriction is therefore not intrinsic but circumstantial: it reflects the risk that those lacking philosophical training might be drawn through mathematics into problematic metaphysical conclusions.(52)

Two contextual considerations clarify this point. First, mathematics and geometry in al-Ghazālī's time had not yet become independent disciplines; they were embedded in a broader philosophical framework. The restriction he mentions is therefore accidental rather than essential, similar to legal restrictions in Islamic jurisprudence where permissible acts may be temporarily limited under particular circumstances without altering their intrinsic permissibility—just as buying and selling during the Friday prayer is prohibited without implying that trade itself is unlawful.

Second, the passage occurs in a discussion of the harms of disputation, where al-Ghazālī lists practices that may possess benefits but nevertheless involve risks. These harms may

(49) Maurice Bouyges (d. 1951) questioned the attribution of Fātiḥat al-ʿUlūm to al-Ghazālī, a view later followed by Badawī (d. 2002). ʿAbd al-Raḥmān Badawī, *Muʾallafāt al-Ghazālī* (Kuwait: Wikālat al-Maṭbūʿāt, 1977), 263.

(50) Mehdi Golshani, *Min al-ʿIlm al-ʿIlmānī ilā al-ʿIlm al-Dīnī* (Beirut: Dār al-Hādī, 2003), 22.

(51) Golshani cites another passage from al-Munqidh—also cited by Guessoum—in which al-Ghazālī distinguishes two errors: accepting all the philosophers' sciences because mathematics is certain, and rejecting them entirely because of their theological doctrines. Golshani thus acknowledges that al-Ghazālī did not reject mathematics or natural science as such but only their possible implications; nevertheless, he adopts the familiar decline narrative, which leads him to read al-Ghazālī selectively. As he states: "Philosophy managed to break this isolation in limited circles of the Islamic world, yet the natural sciences never truly flourished." Golshani, *Min al-ʿIlm al-ʿIlmānī ilā al-ʿIlm al-Dīnī*, 24.

(52) Abū Ḥāmid al-Ghazālī, *Fātiḥat al-ʿUlūm* (Cairo: al-Maṭbaʿa al-Ḥusaynīya al-Miṣriyya, 1904), 56.

arise even in religious sciences such as jurisprudence, kalām, or Sufism. The *Iḥyāʾ* contains numerous examples of such critiques, and the work itself was criticised by jurists and even burned in the Maghrib. However, this hardly implies that al-Ghazālī considered jurisprudence forbidden; rather, it illustrates the importance of context in interpreting his remarks.

Indeed, in the same work—*Fātiḥat al-ʿUlūm*—while discussing collective obligations (*farḍ kifāya*), he states:

> This obligation is not limited to religious sciences; it includes every discipline people cannot do without, such as medicine, which is needed to treat the sick, arithmetic, which is required for dividing inheritances and bequests, and surveying.(53)

We thus encounter three distinct judgments regarding mathematics in al-Ghazālī's thought: it is a neutral science independent of religion; it may be discouraged under particular circumstances; and it may even become religiously obligatory as a collective duty. This triadic view, incorporating independence, tension, and integration, does not reflect inconsistency but rather the different considerations that may attach to a discipline depending on its context. Considered in itself, mathematics remains largely a neutral field of knowledge to which religion neither affirms nor denies anything.

In conclusion, the separation model cannot serve as a universal or primary framework for the relationship between religion and science. That relationship varies according to the nature of the discipline involved, the character of its questions, and the degree to which those questions intersect with metaphysical or theological commitments. Where no contradiction exists and no shared domain invites competing interpretations, separation may function as a realistic epistemological arrangement rather than merely a diplomatic compromise. Where domains intersect and questions become contested or convergent, however, separation becomes little more than a temporary retreat, an attempt to postpone an unavoidable intellectual engagement.

(53) Al-Ghazālī, *Fātiḥat al-ʿUlūm*, 38.

Natural Kalām: Dispute and Debate

I use the terms dispute or debate rather than conflict for conceptual reasons. Conflict implies an inherent and irreconcilable opposition, whereas dispute denotes differences in interpretation, method, or conceptual framework without necessarily entailing hostility. Disagreement is a structural feature of knowledge production, and the natural sciences themselves advance through criticism and debate. Thus, disagreements between religion and science should not be treated as pathological but as epistemic situations requiring clarification of the precise point at issue. Some disputes are genuine, others merely apparent, arising from conceptual confusion or conflated levels of analysis.

In al-Ghazālī's engagement with the philosophers, his objections were not directed at their sciences as such but at two domains: metaphysics and certain questions within natural philosophy carrying metaphysical implications. Metaphysics is not a natural science but the philosophical system the philosophers constructed concerning existence and the world, and it is here that the substantive disagreement arose. Many misunderstandings of the religious intellectual tradition stem from overlooking the distinction between natural science and its philosophical framework. Al-Ghazālī's criticisms target the Hellenizing philosophers' metaphysical claims about existence; yet responses to a philosopher or physician on theological grounds are often misrepresented as attacks on philosophy or medicine themselves. As he notes, admiration for the rigor of the philosophers' demonstrations may lead some to assume that all their doctrines share the same certainty.(54) Yet medicine is one thing and the physician's metaphysical beliefs another: "the statements of the ancients in mathematics are demonstrative, whereas in metaphysics they are conjectural".(55) Hence, judging a philosopher's beliefs erroneous does not invalidate the sciences he practices—just as imprisoning a physicist for a crime does not imply opposition to physics.

(54) Al-Ghazālī, *Al-Munqidh*, 100.
(55) Al-Ghazālī, *Al-Munqidh*, 101.

With regard to natural philosophy, Guessoum cites a passage from *al-Munqidh min al-Ḍalāl* ("Deliverance from Error") to claim that al-Ghazālī regarded it as a mixture of truth and error.(56) Yet this reading once again relies on Golshani,(57) whose interpretation of al-Ghazālī's position on natural philosophy rests largely on a single work, the *Maqāṣid al-Falāsifa* ("The Intentions of the Philosophers"), where al-Ghazālī merely reports philosophical doctrines rather than presenting his own position. Moreover, Golshani refers to no more than four Ghazālian works in total—one of them of disputed authenticity—and often cites them indirectly.

More precisely, the claim that al-Ghazālī regarded natural philosophy as a mixture of truth and error is correct; that is, he holds that "some of its doctrines contradict the Law (*sharīʿa*) and the true religion and are therefore ignorance rather than knowledge to be counted among the sciences".(58) In such cases he does not even recognize these claims as genuine science. This observation brings us back to the methodological question raised by Harrison: what exactly counts as "science"? When al-Ghazālī rejects certain doctrines within natural philosophy, are these doctrines considered science by him, by his contemporaries, or by the modern meaning of the term?

In the medieval context, a substantial portion of natural philosophy was intertwined with metaphysical speculation rather than confined to empirical investigation of nature. Muslim scholars therefore distinguished between the empirical aspects of natural philosophy and its metaphysical doctrines.

Moreover, the account presented by Guessoum and Golshani reflects only half of al-Ghazālī's position; the other half concerns the proper domain of natural inquiry. Al-Ghazālī describes natural philosophy as the study of the heavens and celestial bodies, the basic elements—water, air, earth, and fire—composite bodies such as animals, plants, and min-

(56) Guessoum, *Islam's Quantum*, 103.
(57) Golshani, *Min al-ʿIlm al-ʿIlmānī*, 24.
(58) Al-Ghazālī, *Iḥyāʾ*, 1:85.

erals, and the processes of change affecting them.(59) He likens it to medicine—one of its branches in his view—which studies the human body and its changes, though he regards it as more beneficial in practice in his time due to people's need for it.(60) This reflects the largely abstract character of many discussions in natural philosophy and their limited practical utility.(61) Yet from a religious perspective he explicitly states: "Just as religion does not require denying the science of medicine, it does not require denying that science either, except in certain specific matters"(62)—the very matters he criticizes in *Tahāfut al-Falāsifa* ("The Incoherence of the Philosophers").

Among all the sciences of the philosophers, al-Ghazālī maintains that they contradict religion in only twenty propositions, three of which are fundamental. Sixteen belong to metaphysics and bear no relation to mathematics, geometry, medicine, anatomy, or astronomy. Only four concern natural philosophy. Yet he also stresses that natural philosophy itself comprises many sciences: "We mention their divisions so that it may be known that the religious law does not require disputing them or denying them, except in certain matters we have mentioned".(63) After outlining their main branches—including medicine, astrology, and alchemy—he adds: "It is not required by the religious law to oppose them in any of these sciences; rather, we oppose them within this group of sciences only in four issues".(64) These are:

1. Their claim that the connection between causes and effects is necessary.
2. Their assertion that human souls are self-subsisting substances whose relation to the body ends at death, and their claim to demonstrate this rationally.

(59) Al-Ghazālī, *Al-Munqidh*, 105–106; *Iḥyāʾ*, 1:85.
(60) Al-Ghazālī, *Iḥyāʾ*, 1:85; *Tahāfut*, 235.
(61) In certain contexts, al-Ghazālī remarks that sciences such as arithmetic and geometry are true yet of little benefit, referring to their lack of eschatological rather than worldly value. This reflects the Sufi hierarchy of knowledge operative in some of his works, where the "sciences of the Hereafter"—associated with Sufism—occupy the highest rank, even at the expense of some religious sciences. Al-Ghazālī, *Al-Mustaṣfā*, 3; *Jawāhir*, 44.
(62) Al-Ghazālī, *Al-Munqidh*, 105–6.
(63) Al-Ghazālī, *Tahāfut*, 234.
(64) Al-Ghazālī, *Tahāfut*, 235.

3. Their belief in the impossibility of the annihilation of these souls.
4. Their denial of the resurrection of bodies.(65)

These issues are not natural sciences in the modern sense but metaphysical judgments concerning theological doctrines. The first concerns causality—the well-known issue often cited as evidence that al-Ghazālī denied causation. Accordingly, no genuine conflict arises between religion and the natural sciences in al-Ghazālī's thought. The disagreement appears only within a limited part of medieval natural philosophy where it overlaps with metaphysical claims; even there it concerns just four issues, only the last of which—bodily resurrection—touches a central article of faith.

The underlying principle governing this issue is clearly expressed by al-Ghazālī:

> You must know that nature is subject to God; it does not act by itself but is employed by its Creator. The sun, the moon, the stars, and the natural properties are all subjected to His command; none of them acts independently of Him.(66)

The conclusion is clear: despite his distinction between useful and non-useful sciences, al-Ghazālī did not oppose the sciences as such, nor did he perceive an inherent clash between scientific inquiry and religion. His objections were directed instead at philosophical doctrines and metaphysical claims, with the exception of four specific questions associated with natural philosophy. The dispute arises only when such doctrines attribute independent causal power to nature or deny theological principles—such as bodily resurrection—on the basis of speculative philosophical claims.

Accordingly, the claim that science never conflicts with religion is as reductive as the opposite claim that such conflict is inevitable, or that al-Ghazālī opposed science and philosophy altogether. These portrayals arise largely from simplified readings and from projecting modern conceptual categories onto a far more complex historical reality.

(65) Al-Ghazālī, *Tahāfut*, 235–36.
(66) Al-Ghazālī, *Al-Munqidh*, 106.

Natural Kalām: Integration and Confirmation

Viewed within the broader history of science, and once the positivist and scientistic paradigms—which conflated their conflict with religion with a conflict with science itself—are set aside, the model of integration tends to prevail. This is evident both in the biographies of many major scientists and founders of scientific disciplines, who combined scientific inquiry with religious belief, and in the broader relationship between scientific and religious knowledge. In the Islamic case, this relationship was particularly close: science was not merely compatible with religion but could itself be considered a form of devotion. The pursuit of knowledge was regarded as an act rewarded by religion, while religion simultaneously encouraged inquiry, reflection, and the study of nature. In this context, the integration between religion and science may be understood from several complementary perspectives.

First, at the level of society and the public good.

This concerns primarily the applied sciences whose benefits are directly reflected in human life. From an Islamic perspective, many natural sciences are even religiously required because they serve the common good. Mathematics, engineering, and medicine are typical examples. Al-Ghazālī, for instance, classifies them among the *farḍ kifāya* (collective obligations), meaning that their pursuit is not merely permissible but religiously necessary for the community.(67) It is therefore unsurprising that many scholars in the Islamic tradition—such as Ibn Rushd (d. 1198), al-Māzarī (d. 1141), and al-Qarāfī (d. 1285)—combined religious learning with disciplines such as medicine, mathematics, and astronomy. As al-Ghazālī writes when classifying non-religious sciences:

> The praiseworthy sciences are those connected with the welfare of worldly life, such as medicine and arithmetic. These are of two kinds: those that constitute a collective obligation and

(67) Abū Ḥāmid al-Ghazālī, *Al-Iqtiṣād fī al-I'tiqād*, ed. Anas Muḥammad ʿAdnān al-Sharfāwī (Jeddah: Dār al-Minhāj, n.d.), 78.

those that are meritorious though not obligatory. A collective obligation is every science indispensable for the proper ordering of worldly affairs—such as medicine, which is necessary for the preservation of bodies, and arithmetic, which is required in transactions, in the division of bequests and inheritances, and in similar matters.(68)

Second, at the level of general knowledge.

Integration may also occur at the epistemic level, where science and religion address different dimensions of human understanding. Science investigates natural processes and the material order of life, while religion engages questions of meaning, value, and moral orientation. Their relation is therefore complementary rather than conflicting. They address different dimensions of reality; they may also illuminate the same reality from distinct perspectives—like pieces of a puzzle forming a single image: science explains how the universe operates and develops, whereas religion addresses its origin, ultimate cause, and the ethical responsibilities it entails for human beings.

Al-Ghazālī illustrates this complementarity through a well-known analogy between reason (*ʿaql*) and revelation (*sharʿ*/*naql*)—considering the natural sciences among the rational sciences—and comparing their relation to that between sight and sunlight(69):

> The sound intellect is like a healthy eye free from defect and disease, while the Qurʾān is like the sun whose light spreads everywhere. One who seeks guidance through one of them while dispensing with the other belongs among the foolish. Turning away from reason while claiming sufficiency in the light of revelation resembles exposing oneself to the sunlight while closing one's eyelids—there is no difference between such a person and the blind. Reason together with revelation is light upon light.(70)

(68) Al-Ghazālī, *Iḥyāʾ*, 1:62.

(69) Al-Ghazālī likewise stresses the complementarity of reason and revelation: "Reason cannot dispense with revelation, nor revelation with reason; to rely solely on imitation while setting reason aside is ignorance, and to rely on reason alone without the light of the Qurʾān and Sunna is delusion." Al-Ghazālī, *Iḥyāʾ*, 5:63. A similar analogy appears in Miʿrāj al-Quds—whose attribution remains disputed—where reason is likened to sight and revelation to light, each incomplete without the other. Abū Ḥāmid al-Ghazālī, *Miʿrāj al-Quds fī Madārij Maʿrifat al-Nafs*, 1st ed. (Beirut: Dār al-Kutub al-ʿIlmiyya, 1988), 65.

(70) Al-Ghazālī, *Al-Iqtiṣād*, 66.

In the *Ashʿarī kalām* tradition, this form of integration resembles what Barbour calls *systematic synthesis,* where science and religion together contribute to a comprehensive metaphysical framework capable of offering a coherent worldview.(71)

Third, at the level of theological claims about existence (ontology).

Integration may take a stronger form in which scientific knowledge verifies religious belief while remaining methodologically distinct. This resembles what John Haught calls confirmation.(72) It is also comparable to Barbour's notion of *natural theology*, where theological claims are supported through reflection on nature, whose structure science helps illuminate. As John Polkinghorne (d. 2021) defines it, natural theology is "the attempt to learn something about God through rational reflection on and general examination of the world".(73)

In this broad sense, natural theology largely overlaps with *kalām*. More specifically, when the argument proceeds from the evident order and design in nature, it closely resembles what Muslim theologians call the argument from order and precision (*dalīl al-iḥkām wa-l-itqān*).

These forms of integration are all present in al-Ghazālī's thought, particularly the last. Theologians frequently argued from the wisdom and craftsmanship evident in the world as signs pointing to the Creator and His attributes:

> For they indicate His majesty and greatness, His transcendence and exaltedness. They also point to the perfection of His knowledge and wisdom, and to the efficacy of His will and power; thus His attributes are known through the traces of His acts.(74)

This line of reasoning—known among theologians as the argument from order or design—proceeds from reflection on living beings or from observation of the wider cosmos.

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(71) Barbour, *When Science*; Barbour, *Religion in an Age*.
(72) John F. Haught and Eugene E. Selk, "Science and Religion: From Conflict to Conversation," *American Journal of Physics* 64, no. 12 (1996): 1532.
(73) John Polkinghorne, *Science and Religion in Quest of Truth* (New Haven: Yale University Press, 2011), 70.
(74) Al-Ghazālī, *Iḥyāʾ*, 9:266.

Ashʿarī theologians sometimes describe it as the argument from the signs within the self and in the horizons (*dalīl al-anfus wa-l-āfāq*).(75) Such reflection may arise from direct observation or be further informed by scientific knowledge. Al-Ghazālī himself remarks:

> Among them is the knowledge of the structure of the body and the functions of its organs, which is discussed in the science of anatomy. It is a great science, yet people are largely heedless of it—just as they are of the science of medicine.(76)

Elsewhere, he writes:

> If you were to examine the anatomy of the organs and observe the remarkable way in which they necessarily serve one another, and then—after completing the study of bodily structure—turn to investigate the powers of those bodies through the truths uncovered by the natural sciences, you would encounter the utmost wonder. Wretched indeed is the one who denies God and neglects His saying: 'In the earth are signs for those who possess certainty, and in yourselves—do you not see?' (Qurʾān 51:20–21).(77)

A similar point appears in another passage:

> God Most High has said: 'The sun and the moon move by precise calculation,' and 'He has determined for it phases—that you may know the number of years and account [of time].' No one truly understands the ordered motion of the sun and the moon, their eclipses, the succession of night and day, and the manner in which each sphere encompasses the other except one who has studied the structure of the heavens and the earth—an entire science in its own right (al-Ghazālī 1986, 46; Qurʾān 55:5; 10:5).

The study of the structure of the heavens and the earth—what al-Ghazālī elsewhere classifies in *al-Munqidh* as belonging to natural philosophy—thus forms part of the rational inquiry into the signs of creation. He further adds:

> No one fully grasps the meaning of God's saying, 'O mankind, what has deceived you concern-

(75) Al-Ghazālī repeatedly reflects on the wonders of creation in the human being, the cosmos, and the animal world across several of his works; see, for example, Al-Ghazālī, *Iḥyāʾ*, 9:268–305; *Mīzān al-ʿAmal*, ed. Sulaymān Dunyā, 1st ed. (Cairo: Dār al-Maʿārif, 1964), 200–215.

(76) Abū Ḥāmid al-Ghazālī, *Kīmiyāʾ al-Saʿāda wa-Yalīhā al-Risāla al-Laduniyya*, 2nd ed. (Cairo: Maṭbaʿat al-Saʿāda, 1925), 19.

(77) Al-Ghazālī, *Mīzān al-ʿAmal*, 214–15.

ing your generous Lord, who created you, proportioned you, and balanced you? In whatever form He willed He assembled you,' except one who has studied the anatomy of the human body, both outwardly and inwardly (Qurʾān 82:6–8).(78)

These passages reveal not only a form of integration between religious reflection and the study of nature but—as some scholars have noted—also al-Ghazālī's significant role in encouraging the study of medicine and anatomy, contrary to the commonly repeated narrative.(79)

In the Islamic intellectual tradition, religious and scientific knowledge were not separated by an impermeable boundary. Differences existed in subject matter and method but not in their ultimate orientation toward truth. Muslims did not view the book of nature as distinct from the revealed book; rather, the latter repeatedly calls upon humans to reflect upon the former—to investigate the world, observe its causes, and discern the traces of divine craftsmanship in nature.(80)

Indeed, kalām begins the proof of the *Necessary Existent* with reflection on the external world—its properties, transformations, and patterns of order. The original relationship between religion and science was therefore one of complementarity and mutual reinforcement: between the sources of knowledge—the visible universe and the revealed text—and between the means of acquiring it—reason, the senses, and trustworthy reports—within which natural science itself operates. Integration, however, did not exclude debate; yet the mere presence of dispute does not establish a real conflict. For this reason, Muslim theologians developed refined methods to resolve apparent tensions between scriptural evidence and scientific disciplines, a subject that warrants separate study through specific contemporary debates.

(78) Al-Ghazālī, *Jawāhir*, 46.

(79) Emilie Savage-Smith, "Attitudes Toward Dissection in Medieval Islam," *Journal of the History of Medicine and Allied Sciences* 50, no. 1 (1995): 94–96.

(80) The Qurʾān repeatedly invites reflection on the natural world as a sign of divine wisdom. For example: "Travel through the land and observe how He began creation" (Qurʾān 29:20), and "Indeed, in the creation of the heavens and the earth and the alternation of the night and the day are signs for those of understanding" (3:190). See also Qurʾān 3:191; 88:17–20; 51:20–21; 45:4.

Al-Ghazālī, Occasionalism, and Quantum Physics

Epitemus of Pharsalus was standing in a public gathering in Athens during an athletic contest when a javelin, thrown by one of the competitors, struck him and killed him. Plutarch relates that Pericles spent an entire day in heated debate with Protagoras, attempting to determine the cause of the Pharsalian's death: was it the athlete who threw the javelin, the javelin itself, or the organizers of the competition?(81)

Guessoum argues that al-Ghazālī was not the sole figure responsible for the decline that affected philosophy and the sciences in Islam, though he does not deny that such a decline occurred.(82) He nevertheless adds:

> Never mind that Abu Hamid introduced and insisted on the 'occasionalist' view of God's action, namely that events occur because God wills them at every instant, and not because any natural cause happened to occur at that moment. His famous example: cotton burns not because it came in contact with fire, but because God decided so at that instant.(83)

This is essentially the same claim popularized by Tyson, albeit formulated more carefully: that al-Ghazālī denied natural causality. More broadly, this interpretation reflects the widespread understanding of Ashʿarite causality. Such readings, however, are superficial and misleading.

The Ashʿarite position was already articulated by al-Sanūsī (d. 1490):

> Fire has no effect in producing burning, cooking, or any other outcome—neither by its nature nor by a power inherent in it. Rather, God freely established the customary sequence whereby these effects occur in conjunction with it. The same applies to cutting with a knife, pain from a wound, satiety from food, and quenching of thirst by drink.(84)

What has often been attributed to the Ashʿarites is that fire does not burn and that a knife

(81) Plutarch, *Lives*, vol. 3 (London: William Heinemann, 1916), 104–5.
(82) Guessoum, *Islam's Quantum*, 229.
(83) Guessoum, *Islam's Quantum*, 229.
(84) Muḥammad ibn Yūsuf al-Sanūsī, *Sharḥ al-ʿAqīda al-Ṣughrā*, ed. Anas Muḥammad al-Sharfāwī (Damascus: Dār al-Taqwā, 2019), 222.

does not cut. What they actually maintain is that fire does not burn by itself or by an intrinsic power inherent in it; rather, burning occurs in customary conjunction with it, not through it by necessity. As al-Ghazālī himself famously stated: "The connection between what is taken to be a cause and what is taken to be its effect is not necessary, according to us."(85)

This does not mean that events have no causes; rather, such causes are secondary causes, while the true efficacious agent is Allah. It is Allah who creates the fire, the cotton, and the act of burning when the two come together. The fact that this connection is customary rather than necessary is demonstrated by the possibility of conceiving its suspension in thought: the relation is not rationally necessary (*wājib*) but only possible (*mumkin*). Accordingly, the customary course of events may be interrupted, as in miracles, which are not violations of reason but only of habit.

In reality, denying the necessary link between ordinary causes and their effects does not abolish causality as a rational principle. On the contrary, the Ashʿarite theological system rests on the kalām cosmological argument (*dalīl al-ḥudūth*), which presupposes rational causality in its very structure, since inferring from the origination of the world requires affirming a cause that brings it into existence, namely Allah.

In recent decades, some scholars have argued that al-Ghazālī departed from the Ashʿarite position and adopted an Avicennian account of causality, a thesis advanced by Richard M. Frank (d. 2009).(86) This interpretation was strongly challenged by several scholars, most notably Michael Marmura (d. 2009), who showed in several studies that al-Ghazālī neither denied causality nor departed from his Ashʿarite framework.(87) Frank Griffel later sought to

(85) "Two things do not necessarily entail one another: the existence of one does not necessitate the existence of the other, nor does the absence of one necessitate the absence of the other—such as quenching and drinking, satiety and eating, or burning and contact with fire. All such conjunctions observed in medicine, astronomy, crafts, and the various arts occur because God has previously ordained their concurrence in creation, not because the relation is necessary in itself." Al-Ghazālī, *Tahāfut*, 239.
(86) Richard M. Frank, *Creation and the Cosmic System: Al-Ghazālī and Avicenna* (Heidelberg: Carl Winter Universitätsverlag, 1992); *Al-Ghazālī and the Ashʿarite School* (Durham, NC: Duke University Press, 1994).
(87) Michael Marmura, "Ghazalian Causes and Intermediaries," *Journal of the American Oriental Society* 115 (1995): 89–100; "Ghazali and Ashʿarism Revisited," *Arabic Sciences and Philosophy* 12 (2002): 91–110.

mediate between these readings in a creative Hegelian fashion,[88] though Marmura's interpretation remains more precise.

Two strands can be identified in al-Ghazālī's discussions of causality—one allowing mediation through secondary causes and another emphasizing divine immediacy. Yet his overall view may be summarized as follows: events occur on two levels of causation. The first is the true efficacious cause, God the Creator; the second is the subservient cause (*sabab musakhkhar*), which appears to produce the effect but in reality does not.[89]

The claim that "if you drop a stone and it falls, Allah willed that. If that's your explanation, your curiosity stops"[90] presupposes the incompatibility of religious and scientific explanations. Yet the Ashʿarite tradition would affirm that the stone falls through gravity while maintaining that the ultimate cause of this process lies in divine agency.

In short, the Ashʿarites do not deny causality as an observable order; rather, they deny the intrinsic efficacy of natural causes and causal determinism. Such a position may appear to conflict with the mechanistic worldview associated with classical Newtonian physics. Yet modern quantum physics has cast doubt on this deterministic picture.

As one of the founders of quantum theory, Max Born (d. 1970) explained: "Not causality, properly understood, is eliminated, but only a traditional interpretation of it consisting in its identification with determinism..."[91]

In classical physics, the dominant view held that the universe follows a precise mechanical order, such that knowledge of the present state permits reliable prediction of the future. Quantum physics, however, following Werner Heisenberg's (d. 1976) uncertainty

(88) Frank Griffel, "The Western Reception of al-Ghazālī's Cosmology from the Middle Ages to the 21st Century," *Dîvân: Disiplinlerarası Çalışmalar Dergisi* 16, no. 30 (2011): 33–62.

(89) Al-Ghazālī illustrates this with the analogy of a royal decree of pardon: if the condemned man thanks the ink, paper, and pen rather than the king who issued the decree, his gratitude is misplaced. Likewise, the sun, moon, rain, and all natural phenomena are merely instruments of divine power, like the pen in the hand of a writer; the true agent is God, as indicated in the Qurʾān: "You did not throw when you threw, but God threw" (Qurʾān 8:17). Al-Ghazālī, *Iḥyāʾ*, 8:210.

(90) Tyson, "The Golden Age".

(91) Max Born, *Natural Philosophy of Cause and Chance* (Oxford: Clarendon Press, 1949), 101–2.

principle,[92] showed that the present state itself cannot be specified with complete precision, since the position and momentum of a particle cannot be simultaneously determined. What emerges, therefore, is not a deterministic trajectory but a probability distribution.

What, then, has happened? Has causality collapsed? Such claims usually arise from confusing causality with determinism. To say that identical causes always produce identical effects is not the same as saying that events have causes. Likewise, to say that releasing a stone does not necessarily entail its fall is not to claim that it would fall without cause.

Three main interpretations have emerged in response to quantum indeterminacy.

1. A deterministic interpretation treats quantum indeterminacy as merely a temporary limitation of our knowledge. Max Planck (d. 1947) and Albert Einstein (d. 1955) were among its most prominent defenders, as expressed in the famous remark that "God does not play dice."
2. An agnostic interpretation attributes indeterminacy to the limits of measurement and experimental conditions. In quantum mechanics, the act of observation itself affects the phenomenon observed, a principle known as the observer effect and illustrated by experiments such as the double-slit experiment.[93]
3. An indeterministic interpretation holds that indeterminacy is intrinsic to nature itself. This interpretation, most prominently associated with Heisenberg, comes close to the Ashʿarite position regarding the absence of a necessary linkage between causes and effects. It is also adopted by Barbour, who observes: "It is at least clear that physics can no longer be the chief witness called on behalf of reductionism or determinism".[94]

The claim that al-Ghazālī "denied causality" stems from a conflation of two distinct levels: the rational principle that events require causes and the metaphysical assertion that natu-

(92) Werner Heisenberg, *Physics and Philosophy* (New York: Harper & Brothers, 1958), 54.
(93) Richard P. Feynman, Robert B. Leighton, and Matthew Sands, *The Feynman Lectures on Physics*, New Millennium ed., vol. 3 (New York: Basic Books, 2011), 8.
(94) Ian G. Barbour, *Issues in Science and Religion* (Englewood Cliffs, NJ: Prentice-Hall, 1966), 316.

ral phenomena are governed by necessary and deterministic causal relations. The Ashʿarites rejected the latter, not the former. Their position therefore marks an ontological distinction rather than a denial of the regularity of nature or the legitimacy of scientific inquiry.

More broadly, this discussion highlights two related points. First, al-Ghazālī's position on causality has often been misunderstood because it has been read outside its proper epistemological and ontological framework. Second, scientific concepts are not historically stable but evolve with shifts in theoretical frameworks and paradigms. What medieval natural philosophy regarded as absolute necessity—precisely what al-Ghazālī was accused of denying—has been reconsidered in modern physics, especially quantum theory, which has called strict determinism into question. This in turn suggests that the relationship between science and religion is itself historically contingent rather than governed by a single universal model.

Conclusion

The nineteenth century stands at the forefront in producing sweeping grand narratives. Among the most influential are the narrative of the decline of the Islamic world, often attributed to hostility toward philosophy and science beginning with al-Ghazālī, and the narrative of conflict between science and religion in Western civilization. These two narratives converge around al-Ghazālī, portraying him as the turning point at which the sciences were excluded in the name of religion. Yet this account rests on two fundamental errors: a historical misreading of the period in which al-Ghazālī lived and what followed it, and an epistemological misunderstanding of his own position toward philosophy and the sciences.

This paper has shown that al-Ghazālī neither accepted philosophy and the sciences wholesale nor rejected them outright. Rather, he adopted a discriminating approach, criticizing a limited number of issues that do not exceed twenty in total: sixteen belonging to

metaphysics and only four to natural philosophy. Even these latter questions were intertwined with philosophical doctrines and do not correspond to natural science in the modern sense. By contrast, other disciplines—such as mathematics, logic, medicine, and anatomy—were not rejected by him. On the contrary, al-Ghazālī defended them, adopted some of their methods, and even regarded hostility toward demonstrative sciences as harmful to religion itself.

From this analysis emerges a methodological framework for approaching the relationship between science and religion in the contemporary context—what may be termed Natural Kalām, that is, a theological approach engaged with scientific questions and shared domains of human inquiry. This perspective rests on two premises. First, the concept of "science" is not a timeless essence but a historically conditioned category shaped by changing intellectual contexts. Second, the relationship between science and religion cannot be reduced to a single fixed model. Rather, it varies according to the nature of the issues involved: it may take the form of independence, debate, or integration, and may even shift within a single discipline depending on the specific question under consideration.

In this light, the development of a contemporary methodology of Natural Kalām becomes essential for identifying the points of convergence and divergence between religion and the sciences and for addressing their shared questions with historical and epistemological awareness, while offering a conceptual framework for interpreting scientific knowledge within a theological horizon. This study has sought not merely to reassess al-Ghazālī's position, but to articulate it as a pluralistic methodological framework for engaging the science–religion relationship—one that varies according to the nature of the issues and contexts involved. As such, this article provides a conceptual foundation for further work, offering a basis for future studies to develop concrete applications of this approach.

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References:

Adamson, P. (2016). *Philosophy in the Islamic world: A history of philosophy without any gaps*. Oxford University Press.

Al-Ghazālī, A. Ḥ. (1904). *Fātiḥat al-ʿulūm*. al-Maṭbaʿa al-Ḥusaynīya al-Miṣriyya.

Al-Ghazālī, A. Ḥ. (1925). *Kīmiyāʾ al-saʿāda wa-yalīhā al-risāla al-laduniyya* (2nd ed.). Maṭbaʿat al-Saʿāda.

Al-Ghazālī, A. Ḥ. (1964). *Mīzān al-ʿamal* (S. Dunyā, Ed.). Dār al-Maʿārif.

Al-Ghazālī, A. Ḥ. (1986). *Jawāhir al-Qurʾān*. Dār Iḥyāʾ al-ʿUlūm.

Al-Ghazālī, A. Ḥ. (1988). *Miʿrāj al-quds fī madārij maʿrifat al-nafs*. Dār al-Kutub al-ʿIlmiyya.

Al-Ghazālī, A. Ḥ. (1992). *Al-Mustaṣfā min ʿilm al-uṣūl*. Sharikat al-Madīna li-l-Ṭibāʿa.

Al-Ghazālī, A. Ḥ. (2000). *Maqāṣid al-falāsifa*. Maṭbaʿat al-Ṣabāḥ.

Al-Ghazālī, A. Ḥ. (2011). *Iḥyāʾ ʿulūm al-dīn*. Dār al-Minhāj.

Al-Ghazālī, A. Ḥ. (n.d.). *Al-Iqtiṣād fī al-iʿtiqād* (A. M. ʿA. al-Sharfāwī, Ed.). Dār al-Minhāj.

Al-Ghazālī, A. Ḥ. (n.d.). *Al-Munqidh min al-ḍalāl*. Dār al-Andalus.

Al-Ghazālī, A. Ḥ. (n.d.). *Tahāfut al-falāsifa* (S. Dunyā, Ed.). Dār al-Maʿārif.

Al-Sanūsī, M. ibn Y. (2019). *Sharḥ al-ʿaqīda al-ṣughrā* (A. M. al-Sharfāwī, Ed.). Dār al-Taqwā.

Altaie, B. (2019). *Islam and natural philosophy: Principles of Daqīq al-Kalām*. Routledge.

Altaie, B. (2023). *Natural philosophy of Imam Al-Ghazali*. Beacon Books and Media.

Badawī, ʿA. al-R. (1977). *Muʾallafāt al-Ghazālī*. Wikālat al-Maṭbūʿāt.

Barbour, I. G. (1966). *Issues in science and religion*. Prentice-Hall.

Barbour, I. G. (1990). *Religion in an age of science*. HarperCollins.

Barbour, I. G. (2000). *When science meets religion*. HarperOne.

Barbour, I. G. (2002). *Nature, human nature, and God*. Fortress Press.

Born, M. (1949). *Natural philosophy of cause and chance*. Clarendon Press.

Brentjes, S. (2018). *Teaching and learning the sciences in Islamicate societies (800–1700)*. Brepols.

Brooke, J. H. (1991). *Science and religion: Some historical perspectives*. Cambridge University Press.

Draper, J. W. (2009). *History of the conflict between religion and science*. Cambridge University Press.

Feynman, R. P., Leighton, R. B., & Sands, M. (2011). *The Feynman lectures on physics* (New Millennium ed., Vol. 3). Basic Books.

Frank, R. M. (1992). *Creation and the cosmic system: Al-Ghazālī and Avicenna*. Carl Winter Universitätsverlag.

Frank, R. M. (1994). *Al-Ghazālī and the Ashʿarite school*. Duke University Press.

Goichon, A. M. (1942). Jamāl al-Dīn al-Afghānī: Refutation des matérialistes. In *Les Joyaux de l'Orient* (Vol. 11, pp. 174–185). Librairie Orientaliste.

Golshani, M. (2003). *Min al-ʿilm al-ʿilmānī ilā al-ʿilm al-dīnī*. Dār al-Hādī.

Gould, S. J. (1999). *Rocks of ages: Science and religion in the fullness of life*. Ballantine Books.

Griffel, F. (2011). The Western reception of al-Ghazālī's cosmology from the Middle Ages to the 21st century. *Dîvân: Disiplinlerarası Çalışmalar Dergisi, 16*(30), 33–62.

Guessoum, N. (2011). *Islam's quantum question: Reconciling Muslim tradition and modern science*. I.B. Tauris.

Gutas, D. (1998). *Greek thought, Arabic culture: The Graeco-Arabic translation movement in Baghdad and early ʿAbbāsid society*. Routledge.

Gutas, D. (2002). The study of Arabic philosophy in the twentieth century. *British Journal of Middle Eastern Studies, 29*(1), 5–25.

Haq, S. N. (2009). That medieval Islamic culture was inhospitable to science. In R. L. Numbers (Ed.), *Galileo goes to jail and other myths about science and religion* (pp. 35–42). Harvard University Press.

Harding, K. (1993). Causality then and now: Al-Ghazali and quantum theory. American Journal of Islamic Social Sciences, 10(2).

John Perry and Joanna Leidenhag, "What Is Science-Engaged Theology?," Modern Theology 37, no. 2 (2021).

Harrison, P. (2015). *The territories of science and religion*. University of Chicago Press.

Harrison, P. (2022). Science and religion as historical traditions. In P. Harrison & J. Milbank (Eds.), *After science and religion* (pp. 15–34). Cambridge University Press.

Harrison, P. (Ed.). (2010). *The Cambridge companion to science and religion*. Cambridge University Press.

Harrison, P., & Tyson, P. (2022). Introduction. In P. Harrison & J. Milbank (Eds.), *After science and religion* (pp. 1–2). Cambridge University Press.

Haught, J. F., & Selk, E. E. (1996). Science and religion: From conflict to conversation. *American Journal of Physics, 64*(12), 1532–1537.

Hawking, S., & Mlodinow, L. (2010). *The grand design*. Bantam Books.

Heisenberg, W. (1958). *Physics and philosophy*. Harper & Brothers.

Ibn Khaldūn, ʿA. al-R. (2014). *Al-Muqaddima*. Dār Nahḍat Miṣr.

Lightman, B. (2022). The nineteenth-century origins of the problem. In P. Harrison & J. Milbank (Eds.), *After science and religion* (pp. 35–60). Cambridge University Press.

Lightman, B. (Ed.). (2019). *Rethinking history, science, and religion*. University of Pittsburgh Press.

Malik, S. A. (2021). Al-Ghazālī. In S. Bullivant & M. Ruse (Eds.), *The Cambridge history of atheism* (pp. 291–307). Cambridge University Press.

Malik, S. A., & Muhtaroglu, N. (2022). How much should or can science impact theological formulations? An Ashʿarī perspective on theology of nature. *European Journal for Philosophy of Religion, 18*(2), 8–35.

Marmura, M. E. (1995). Ghazalian causes and intermediaries. *Journal of the American Oriental Society, 115*, 89–100.

Marmura, M. E. (2002). Ghazali and Ashʿarism revisited. *Arabic Sciences and Philosophy, 12*, 91–110.

Marmura, M. E. (2005). Ghazālī and demonstrative science. In M. E. Marmura, *Probing in Islamic philosophy: Studies in the philosophies of Ibn Sina, al-Ghazali and other major Muslim thinkers* (pp. 189–207). Global Academic Publishing.

Munk, S. (1859). *Mélanges de philosophie juive et arabe*. A. Franck.

Northcott, M. S. (2014). *A political theology of climate change*. SPCK.

Northcott, M. S. (2022). Religion and the science of climate destabilisation. In P. Harrison & P. Tyson (Eds.), *New directions in theology and science: Beyond dialogue* (pp. 56–72). Routledge.

Perez Sheldon, M., Ragab, A., & Keel, T. (Eds.). (2023). *Critical approaches to science and religion*. Columbia University Press.

Perez, M., Keel, T., & Ragab, A. (2026). Roundtable on critical approaches to science and religion. *Zygon, 60*(4), 1316–1324.

Perry, J., & Leidenhag, J. (2023). *Science-engaged theology*. Cambridge University Press.

Plutarch. (1916). *Lives* (Vol. 3). William Heinemann.

Polkinghorne, J. (2011). *Science and religion in quest of truth*. Yale University Press.

Rashed, R. (1997). *Histoire des sciences arabes*. Éditions du Seuil.

Renan, E. (1882). *Averroès et l'averroïsme*. Calmann Lévy.

Renan, E. (1883). *L'islamisme et la science*. Calmann Lévy.

Renan, E. (n.d.). *L'Islam et la science*. L'Archange Minotaure.

Sabra, A. I. (1987). The appropriation and subsequent naturalization of Greek science in medieval Islam: A preliminary statement. *History of Science, 25*(3), 223–243.

Saliba, G. (2007). *Islamic science and the making of the European Renaissance*. MIT Press.

Savage-Smith, E. (1995). Attitudes toward dissection in medieval Islam. *Journal of the History of Medicine and Allied Sciences, 50*(1), 67–110.

Tyson, N. deGrasse. (2012). *The intellectual collapse of Islam* [Video]. YouTube.

Tyson, N. deGrasse. (2020). *The golden age of Islam explained* [Video]. YouTube.

Tyson, P. (2022). Introduction: After science and religion? In P. Harrison & J. Milbank (Eds.), *After science and religion: Fresh perspectives from philosophy and theology* (pp. 1–12). Cambridge University Press.

Weinberg, S. (2011). *Lake views: This world and the universe*. Belknap Press.

White, A. D. (2009). *A history of the warfare of science with theology in Christendom*. Cambridge University Press.

Wildman, W. J. (2004). The divine action project, 1988–2003. *Theology and Science, 2*(1), 31–75.

Wildman, W. J. (2005). Further reflections on the divine action project. *Theology and Science, 3*(1), 71–83.