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# Creation and Science in the Middle Ages[1]

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## Abstract

The reception of Greek learning in mediaeval Islam, Judaism, and Christianity was the occasion for a profound analysis of many theological doctrines. In particular, Neoplatonism and Aristotelian philosophy led to renewed thinking about what it means for God to be the Creator of all that is. In the Latin West, Thomas Aquinas benefited from the works of Avicenna, Averroes, and Maimonides as he fashioned his understanding of creation, understood both philosophically and theologically. The recognition that creation is not a change and as a metaphysical dependence in the order of being does not challenge claims in the natural sciences (e.g., that something cannot come from absolutely nothing) are crucial features of the mediaeval heritage on the relationship between creation and the natural sciences. Indeed, Thomas Aquinas argued that an eternal, created universe was intelligible.



## Keywords

Aquinas, Averroes, Avicenna, creation, Maimonides


> *The first religious obligation of every intelligent boy who comes of age, as marked by years or by the dreams of puberty, is to form the intention of reasoning as soundly as he can to an awareness that the world is originated.*
>
> Abu 'l-Ma'ali al-Juwayni (1028-1085)[2]
> *Book of Right Guidance*

There are few periods in the history of the civilizations of the Mediterranean world more important for an understanding of the

[1] This essay was given as a lecture at the symposium, "Science, Faith, and Culture," jointly sponsored by Blackfriars and the Pontifical Council for Culture, at Oxford in March 2005.

[2] Quoted in L. E. Goodman, *Avicenna* (London: Routledge, 1992), 49. An Ash'arite theologian, he taught al-Ghazali at Nishapur.

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relationship among science, faith, and culture than that of the Middle Ages. In this essay, I want to offer an introduction to one feature of this relationship: the development of the doctrine of creation in the context of what the natural sciences and philosophy tell us about the world. Some of the particulars, if not the vocabulary, of this discourse may seem alien, but I think that it will become evident that our intellectual excursion can disclose important themes for a contemporary understanding of the relationship between science and faith. Furthermore, we might come to appreciate the ways in which mediaeval thinkers in Islam, Judaism, and Christianity profited from the questions raised and analyses offered in different religious and cultural traditions.

I should like to begin with an admonition from a Muslim theologian of the eleventh century: "The first religious obligation of every intelligent boy who comes of age, as marked by years or by the dreams of puberty, is to form the intention of reasoning as soundly as he can to an awareness that the world is originated." Al-Juwayni, thought that an awareness of the originatedness of the world necessarily meant a rejection of any claim to its being eternal and led, consequently, to the affirmation that it was created by God. He argues that it is reasonable to hold that the world is temporally finite – this is what it means to be originated – and that, on the basis of such a recognition, one can come to know that there is a Creator. For, if there is an absolute temporal beginning of the world, there must be a God who causes it to be. Furthermore, knowledge of creation is knowledge of divine sovereignty, which leads one to submit religiously to God's plan.

The idea of God's creating all that is "out of nothing," which becomes standard in Islam, Judaism, and Christianity, has its source in scriptural texts, but it is fundamentally a theological conclusion about what ought to be believed: a conclusion reached as believers came to terms with the content of their faith.

The development of the doctrine of creation offers a particularly good example of the theme of this symposium, since it is part of the wider story of the reception of Greek science, and in particular of the texts of Neoplatonism and of Aristotle, in Muslim, Jewish, and Christian intellectual communities. In the Middle Ages, in each of these communities, there was a wide-ranging discussion of the relationship among theology, philosophy, and the natural sciences: between what reason and faith tell us about nature, human nature, and God. And as I have already indicated, in this essay I want to provide some sense of this sophisticated discussion and to suggest that it has a special relevance for us today.

The reception of Greek thought in the Islamic world is a complex story. Well before the rise of Islam, Nestorian Christians in Syria and Persia established centers of learning producing translations of Greek texts into different Near Eastern languages (especially Syriac

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and later Arabic). By the middle of the eighth century the 'Abassid caliphs had built the new capital city of Baghdad and under their influence the Hellenization of the Islamic world accelerated. The caliph al-Ma'mun (813-833) founded a research institute, the House of Wisdom, in Baghdad, which served as a center for translations. There is a legend that the Caliph had a dream in which Aristotle appeared before him answering his questions, and this dream moved the Caliph to send ambassadors to the Byzantine Empire to procure Greek manuscripts. Many of the original translators were Christians, following in the tradition of those who had translated Greek texts into Syriac.[3]

As we remember that the focus of my comments concerns, if not "the dreams of puberty," at least that "religious obligation . . . to form the intention of reasoning as soundly as . . . [we] can to an awareness that the world is originated," I want to turn to theology and the natural sciences in the Islamic setting. As early as 932 there was a famous public debate in Baghdad over the merits of the "new learning."[4] Greek philosophy seemed particularly challenging to many Muslim theologians (*mutakallimun*) who came to view it with suspicion as an alien way of thinking. First of all, the intellectual heritage of the ancient world brought with it the view that the universe is eternal. An eternal world was generally thought to be the antithesis of a created world. Theologians feared that an eternal world would mean a world not dependent upon God as cause. Also, the world must be seen as created out of nothing, for if God were to fashion the world out of some pre-existent matter, there would be something – that very matter – which was not dependent upon God.

In order to defend a view of God as absolutely free and sovereign, it seemed that one must affirm that the world is temporally finite. If the universe has an absolute beginning, then its coming-into-existence would require a divine agent. Nevertheless, a crucial question which occupied the attention of Muslim, Jewish, and Christian scholars in the Middle Ages was: if the world is created by God, *must* it have a temporal beginning, i.e., must it be temporally finite? Those who answered in the affirmative would argue that only God is eternal; the world must be finite. An eternal universe was, in the view of many, a necessary universe, either in the sense of not needing a cause, or in the sense of not being the result of God's free choice. Divine sovereignty and the radical contingency of the created order must be protected from the encroachments of Greek logic and an Aristotelian science which sought to discover the necessary nexus between cause and effect. For Aristotle, true knowledge meant the

[3] The vast project of translation into Arabic lasted from the middle of the eighth century until the middle of the eleventh century.

[4] The specific debate concerned whether Aristotelian logic transcended the Greek language and was, thus, appropriate to use by those who spoke and wrote in Arabic.

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discovery of necessary truths – of what must be so and cannot be otherwise. But, any necessity posited in the created order seemed to threaten divine omnipotence – that somehow God was required or necessitated to act in a certain way – and, accordingly, many theologians embraced a radical occasionalism which saw events in the world as only the occasions for divine action. God alone is the true cause of all that happens.

The position which many Muslim theologians feared can be found in the work of al-Farabi (870-950), who established in Cairo a curriculum for the study of Plato and Aristotle, and of Avicenna (980-1037), whose writings in medicine, natural philosophy, and metaphysics proved to be extraordinarily influential. Their work offers an excellent example of the way in which Greek thought could be appropriated in the Islamic world. For Avicenna, the view of God, as the absolutely necessary being, and the created order of things as only possible, is the key for an understanding of creation. Anything other than God is, in itself, only possible, and its existence, therefore, requires God's causing it to be.

In explaining the kind of agent (or efficient) causality which creation involves, Avicenna notes that there is an important difference between the ways in which metaphysicians and natural scientists discuss agent cause:

> . . . the metaphysicians do not intend by the agent the principle of movement only, as do the natural philosophers [i.e., the natural scientists], but also the principle of existence and that which bestows existence, such as the creator of the world.[5]

Thus, there is wider sense of cause than that which is the concern of the natural sciences. Metaphysics is crucial for Avicenna. He observes that a reflection on what it means for something to be reveals that what something is – i.e., its essence – is different from whether a thing exists. On the basis of the ontological distinction between essence and existence, Avicenna argues that all beings other than God (in whom this distinction disappears) require a cause in order to exist. Since existence is not part of the essence of things, it needs to be explained by a cause extrinsic to the thing which exists; and, ultimately, there must be an Un-caused Cause.

Too often today we have lost the important insights of thinkers such as Avicenna, who helps us to distinguish between the ontological origin of the universe – its creation – and questions about the universe's temporal beginning. Avicenna helps us to avoid confusion concerning questions in metaphysics, such as creation, and questions

[5] *al-Shifa': al-Ilahiyyat*, VI. 1, quoted in A. Hyman and J. Walsh (eds.), *Philosophy in the Middle Ages: The Christian, Islamic, and Jewish Traditions*, second edition (Indianapolis, IN: Hackett, 1983), 248.

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concerning explanations of change. The natural sciences, including cosmology and evolutionary biology, have as their subject the world of change – indeed, change on a grand scale. As Avicenna shows, the natural sciences do not seek to explain existence in its fundamental metaphysical sense. Thus, it is a mistake to use arguments in the natural sciences either to deny or to affirm creation. An example of this kind of confusion can be seen in the thought of contemporary cosmologists such as Stephen Hawking, who thinks that as a result of contemporary cosmology the question of the beginning of the universe has entered "the realm of science." Hawking's own theory eliminates a beginning and, hence, he thinks, there is nothing for a creator to do. The universe described by Hawking, and others – the fruit so it seems of contemporary science – is a self-contained universe, exhaustively understood in the natural sciences. In such a universe there would seem to be little if any need for the God of Jewish, Christian, or Muslim revelation. For some, the notion of a Creator represents an intellectual artifact from a less enlightened age. An examination of the mediaeval discussion of creation and the natural sciences will challenge any conception of creation as an outmoded notion.

One feature of Avicenna's explanation of all of creation's flowing from a primal source of being and intelligibility was the view that, since the source of all that is is eternal, that which flows from that source must also be eternal, and an eternal world was often seen as a necessary world, a world which had to come forth from God – a world, thus, which was not the result of the free creative act of God. Avicenna sought to be faithful to Greek metaphysics (especially in the Neoplatonic tradition) and also to affirm the contingency of the created order. Although the world proceeds from God by necessity and is eternal, it differs fundamentally from God in that *in itself* it is only possible and requires a cause in order to exist. God, on the other hand, is necessary in Himself and, thus, requires no cause. Contingent existence, although not necessary in itself (*per se*), is necessary through or by another. Avicenna thought that the contingency of the world he described did not deny natural necessity. Finite creatures are contingent in themselves but necessary with reference to their causes, and ultimately with reference to God. A world without necessary relationships is an unintelligible world. Yet, at the same time, the fear was that a necessary world is a self-sufficient world, a world which cannot not be: the opposite, so it seemed, of a world created by God. At best a necessary world would only be a world which *must* surge forth from a primal source of being. The explanation Avicenna offered of the absolute origin of the world in terms of a necessary emanationist schema was attractive since it seemed to do justice to both necessity and dependence. *Necessity* is demanded by Greek science in order to protect the intelligibility of the world;

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*dependence* is demanded by theology to protect the 'originatedness' of the world. Creation for Avicenna is an ontological relationship – a relationship in the order of being – with no reference to temporality. In fact, Avicenna accepted the established Greek view that the universe is eternal. Obviously, his view of the emanation of existing things from a primal source – a view which excluded the free act of God – only made sense in an eternal universe. The question was – and is – whether an emanationist metaphysics can do justice to creation? Is it consistent with the God revealed in the Koran or the Bible?

It was precisely such questions which led al-Ghazali (1058-1111), a jurist and later a mystic [in Persia and Baghdad], to argue against what he considered to be threats to Islam in the thought of philosophers such as Avicenna. In *The Incoherence of the Philosophers* [*Tahafut al-Falasifah*] al-Ghazali sets forth a wide-ranging critique of Greek thought. He defends what he considers to be the orthodox Islamic doctrine of creation versus Avicenna's embrace of an eternal world. An eternal world, al-Ghazali thought, was the very antithesis of a created one. An eternal world cannot be dependent upon an act of God, since an eternal world would be a completely self-sufficient world. In fact, al-Ghazali claims that, even on philosophical grounds alone, all the arguments advanced for an eternal world fail.

The incoherence which al-Ghazali found in Avicenna's position was the affirmation of a world which is simultaneously eternal and created. Al-Ghazali also thought that God's sovereignty meant that God was the only true agent cause. There could be no other real agent causes in the world, if one thought that God were all-powerful. Yet, Avicenna and other philosophers sought to understand the very causes in nature which al-Ghazali denied existed. It would seem to many Muslim thinkers that one had to choose between Athens and Mecca, between Greek science and the revelation of the Koran. To seek to embrace both is, so they thought, to be incoherent.

Later in the twelfth century Averroes [*ca*. 1126-1198], in *The Incoherence of the Incoherence* [*Tahafut al-Tahafut*] defended the Greek philosophical tradition against al-Ghazali. Averroes argued that eternal creation is not only intelligible, but is "the most appropriate way to characterize the universe." Al-Ghazali had thought that for God to be the cause of the world, that is, for God to be the agent who brings about the existence of the world, such causality required a temporal beginning. In other words, the world cannot be both eternal and the result of God's action, since whatever is the result of an action of another must come into existence after the initiation of the action of the other. Thus, what exists eternally cannot have another, not even a divine other, as its originating source. In reply, Averroes draws a distinction between two different senses of an eternal world:

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eternal in the sense of being unlimited in duration, and eternal in the sense of being eternally self-sufficient, without a cause. Thus, an eternal world, understood in terms of duration without beginning or end, does not conflict with God's eternity, understood in the sense of complete and total self-sufficiency.

Averroes notes that a world which is eternal, only in the sense of being unlimited in duration, would still require an external agent which makes it what it is. Thus, what makes the world eternal – in this sense of eternal – could be identified with that which causes it to be. On the other hand, a world which is eternal not only in the sense of unlimited duration but also in the sense of being completely self-sufficient would be entirely independent of any external cause. Its eternal existence would be rooted simply in what it is: it would exist necessarily, without cause. Averroes contends that philosophers, such as Aristotle, are committed to the eternity of the world only in the sense of unlimited duration and not in the sense of the world's being wholly self-sufficient. The distinction he draws, thus, is between a world which is eternally existent in itself and a world which is eternally existent by being made so.

Even though Averroes claimed that an eternal, created universe was indeed probable, he rejected the idea of creation out of nothing in its strict sense. He thought that creation consisted in God's eternally converting potentialities into actually existing things. For Averroes, the doctrine of creation out of nothing contradicted the existence of a true natural causality in the universe. For if it were possible to produce something from absolutely nothing there would be no guarantee that particular effects required particular causes. In a universe without real natural causation, "specific potentialities to act and to be acted upon are reduced to shambles" and causal relations "to mere happenstance." Thus, for Averroes, there could be no science of nature if the universe were created out of nothing.

Analyses of creation and science were also important in the thought of another twelfth century thinker, the Jewish theologian and philosopher, Maimonides [1135-1204]. In his monumental *The Guide of the Perplexed*, Maimonides argues that on the basis of reason alone the question of the eternity of the world remains irresolvable.[6] Along with Averroes, Maimonides was critical of those Muslim theologians who assigned all causal agency to God. Without the necessary nexus between cause and effect, discoverable in the natural order, the world would be unintelligible and a science of nature would be impossible.

[6] Maimonides, commenting on what he thinks Jews, Christians, and Muslims hold in common, does not include the unity of God, because he thinks that it may be doubted that Christians are monotheists, and observes that "temporal creation" (vs. the eternity of the world) is such a common doctrine. *The Guide of the Perplexed,* (S. Pines, trans., Chicago: University of Chicago, 1963), Book I, c. 71, vol. 1, 178.

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He was also critical of their claims to demonstrate that the world is not eternal and *therefore* is created out of nothing. Maimonides thought that whether the universe is eternal or "temporally created" cannot be known by the human intellect with certainty. The most a believer can do is to refute the "proofs of the philosophers bearing on the eternity of the world." Maimonides criticized the methods of the theologians, who claimed first to demonstrate the temporal creation of the world out of nothing and then to argue from such a creation to the existence of God.

Maimonides was particularly alert to what he considered to be the dangers of Neoplatonic emanationism in which the doctrine of creation and the eternity of the world are combined in such a way that would deny the free activity of God. As we have seen, an eternal universe is a natural corollary to the view of creation as emanation. Furthermore, Maimonides recognized that the theory of emanation means that it is necessary that creation occur, that reality pour forth spontaneously and immediately from God: a view which denied God's freedom. In fact, he thought that the Aristotelian commitment to an eternal universe embraced a necessity which was incompatible with divine freedom and eliminated purpose from nature. A universe which is the result of God's free choice discloses the purpose of the Creator. Once again, we see the importance of defending a concept of creation which does justice to God's freedom.

As we turn now to a Christian context, we should note that early Christian thinkers, in the fourth, fifth, and sixth centuries, had already distinguished the Christian doctrine of creation from Hellenistic thought, by affirming that the world is not eternal and that it is created out of nothing. By the thirteenth century, however, Christian theologians were working within a richer intellectual tradition, which included the thought of Muslim and Jewish thinkers as well as that of the Greeks, such as Aristotle, whose works had only recently been translated into Latin. In 1215 the Fourth Lateran Council officially declared the doctrine of creation out-of-nothing and the temporal beginning of the world to be dogmas of the Catholic Church. It would be Thomas Aquinas (1224-1274), however, later in the thirteenth century, who develops more fully this doctrine; and Thomas uses extensively the insights of Avicenna, Averroes, and Maimonides as he forges an account of creation which does justice to the demands of reason and Christian faith.

From his earliest to his last writings on the subject, Thomas Aquinas maintains that it is possible for there to be an eternal, created universe. On the basis of faith Thomas holds that the universe is not eternal. But he thinks that God could have created a universe which is eternal. Although reason affirms the intelligibility of an eternal, created universe, Aquinas thought that reason alone leaves unresolved the question of whether the universe is eternal. On this point, he

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follows Maimonides, and differs from Avicenna, who thought that the universe must be eternal.

Contrary to the claims of Averroes, for example, Aquinas thought that a world created *ex nihilo* (whether that world be eternal or temporally finite) was susceptible to scientific understanding. Creation so understood does not destroy the autonomy of that which is created: created beings can and do function as real secondary causes, causes which can be discovered in the natural sciences. God as cause so transcends the created order that He can cause beings in this order to be causes. Nor does an eternal universe have to mean, as Maimonides, al-Ghazali, and others argued, a necessary universe, a universe which is not the result of the free creative act of God. An eternal, created universe would have no first moment of its existence, but – as Avicenna had noted – it still would have a cause of its existence. Indeed, Thomas thinks that, leaving aside the question of whether the universe is eternal, reason alone can demonstrate that the universe is created.

The key to Thomas Aquinas' analysis is the distinction he draws between creation and change, or as he often said: *creatio non est mutatio* (creation is not a change). The natural sciences, whether Aristotelian or contemporary, have as their subject the world of changing things: from subatomic particles to acorns to galaxies. Whenever there is a change there must be something which changes. The ancients are right: from nothing, nothing comes; that is, if the verb "to come" means a change. All change requires something which changes.

To create, on the other hand, is to be the radical cause of the whole reality of whatever exists. To cause completely something to exist is not to produce a change in something; to create, thus, is not to work on or with some already existing material. If there were a prior something which was used in the act of producing a new thing then the agent doing the producing would not be the *complete* cause of the new thing. But such a complete causing is precisely what the act of creation is. As Thomas writes in *On Separated Substances* [c. 9, n. 49]: "Over and above the mode of becoming by which something comes to be through change or motion, there must be a mode of becoming or origin of things without any mutation or motion through the influx of being [*per influentiam essendi*]." To create is to give existence, and all things depend upon God for the fact that they are. God does not take nothing and make something out of "it." Rather, any thing left entirely to itself, separated from the cause of its existence, would be absolutely nothing. Creation is not exclusively some distant event; it is the continual, complete causing of the existence of whatever is. In a fundamental sense, creation is not really an event at all.

This understanding of creation as metaphysical dependence is not challenged by cosmological speculations in our own day which refer

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to an endless cycle of "big bangs" in which new universes spring into existence out of black holes in other universes. However we might conceive of universes bursting forth from other universes, all such universes would depend upon God for the cause of their existence. Although the Big Bang has been traditionally seen as a singularity in which time and space appear to be born, Thomas would warn believers to avoid the mistake of thinking that the Big Bang, so understood, offers scientific confirmation of creation.

In what I have already described we have some sense of the rich and sophisticated inter-religious dialogue on creation and science which occurred in the Middle Ages. The Greek philosophical tradition provided an important intellectual and cultural space in which specific religious differences became, in a sense, irrelevant, and common questions, such as how to understand creation, could be examined.[7]

Thomas Aquinas is an heir of and he contributes significantly to this inter-religious dialogue. Thomas distinguishes between creation understood philosophically – as the complete dependence of all that is on God as cause – and creation understood theologically, which includes all that philosophy says and adds, among other things, that there is an absolute beginning to time. Thomas thinks, as does Avicenna, that metaphysics can prove that all things depend on God as cause of their existence. And with Avicenna, Thomas shows that there is no conflict between creation and any of the claims of the natural sciences, since the natural sciences have as their subject the world of changing things, and creation is not a change. Whether the changes described are biological or cosmological, unending or temporally finite, they remain processes. Creation accounts for the existence of things, not for changes in things. Furthermore, Thomas thinks that God's absolute sovereignty, expressed, for example in the doctrine of creation out-of-nothing, and so important to thinkers such as al-Ghazali, does not require that one deny that there are real causes in nature. With Averroes, Thomas insists that the world is susceptible to scientific analysis in terms of causes in the world. But, as I have already noted, Thomas does not think, as Averroes did, that one must reject creation out-of-nothing in order to defend the possibility of a science of nature. Nor, according to Thomas, would an eternal universe have to mean a necessary universe, a universe which is not the result of God's free choice. With Maimonides, Thomas thinks that reason alone cannot know whether or not the universe is eternal.

[7] "This world of shared intellectual discourse could exist because, in origin and content, much of it was neither Islamic nor Jewish nor Christian: it was Greek. Moreover, Arabic was not just the language of the dominant, and hostile majority religion, but also the linguistic medium of mathematics, logic, and medicine, subjects which we call (and they felt were) secular." Mark R. Cohen, "Medieval Jewry in the World of Islam," in *The Oxford Handbook of Jewish Studies*, edited by Martin Goodman (Oxford: Oxford University Press, 2002), 204.

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It is, he thinks, an error to try to reason to creation *ex nihilo* by attempting to show scientifically that the world has a temporal *beginning*. Nevertheless, reason can show, in the discipline of metaphysics, that the world has an *origin:* that it is created *ex nihilo*. The affirmation in faith, that the universe has a temporal beginning, perfects what reason knows about creation. Thomas' theological analysis of creation is much richer than just the recognition that the world has a beginning. He sees all things coming from and returning to God. Furthermore, the entire universe of creatures, spiritual and material, possesses a dynamic character, analogous to the internal dynamism of the Divine Persons of the Trinity. With the eyes of faith one sees the whole created order as a *vestigium Trinitatis*. Throughout, Thomas' theological understanding of creation is informed by his philosophical analysis; after all, Thomas is a philosopher because he is a theologian.

Mediaeval discussions about creation and the natural sciences can help us to overcome several temptations: 1) to emphasize divine omnipotence in such a way as to deny any real autonomy to nature and to human nature; 2) to defend a real autonomy of nature and of human nature by limiting God's omnipotence in some way (as, for example, is the case with process theology today), and, more generally, to overcome the temptations 1) to view religious faith with suspicion as being a kind of blind fanaticism, or to insist that faith must be subordinate to reason; 2) to view reason with suspicion or, more frequently, in the name of faith, to deny philosophy and the natural sciences any real independence from religious belief.[8]

Pope John Paul II often observed that science and religion need one another. Scientists, for example, should recognize that the natural sciences alone can never be a "genuine substitute for knowledge of the truly ultimate." As the Pope said: "Science can purify religion from error and superstition; religion can purify science from idolatry and false absolutes. Each can draw the other to a wider world, a world in which both can flourish."[9] For the Pope, and I think he is right, the truths discovered by the natural sciences contain no threat to

[8] Alain de Libera, in *Raison et Foi: Archéologie d'une crise d'Albert le Grand à Jean Paul II* (2003), argues for the importance of Albert and Thomas in working out the relations between theology and philosophy – as part of the reactions (both positive and negative) to the heritage of Arabic Aristotelianism. He thinks that the separation they work out is condemned in the ecclesiastical censure of 1277 and that it is not the position which triumphs in the Middle Ages. Thomas and Albert are opposed by an Augustinian party which will always insist that philosophy must teach what faith contains: that is, there can be no existence of philosophy separate from revealed theology and the Church must maintain control over philosophical life.

[9] John Paul II, "A Dynamic Relationship of Theology and Science," 1 June 1988, published in *L'Osservatore Romano*, 26 October 1988. Letter to George Coyne, Director of the Vatican Observatory.

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authentic religious belief. What reason says and what faith affirms are complementary, not contradictory. There is no real conflict between faith and reason. After all, God is the author of both reason and revelation.

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