

WILLIAM E. CARROLL**Aquinas and Contemporary
Cosmology: Creation and Beginnings**

Discussions in the Middle Ages about creation and the temporal beginning of the world involved sophisticated analyses in theology, metaphysics and natural philosophy. Medieval insights on this subject, especially Thomas Aquinas's defence of the intelligibility of an eternal, created universe, can help to clarify reflections about the philosophical and theological implications of contemporary cosmological theories: from the 'singularity' of the Big Bang, to 'quantum tunnelling from nothing', to multiverse scenarios. This paper looks at different senses of 'beginning' and argues that creation, in its fundamental, philosophical meaning, tells us nothing about whether there is a temporal beginning to the universe. Multiverse models, like that recently proposed by Stephen Hawking and Leonard Mlodinow, may challenge certain views of a Grand Designer, but not of a Creator.

Key words: cosmology, creation, multiverses, Aquinas, Big Bang, quantum tunnelling, *ex nihilo*

Introduction

Discussions concerning the origin of the universe now routinely include topics from particle physics as well as cosmology. Often, however, there is considerable confusion as to what is meant when one speaks of the 'origin' of the universe, and this confusion is only increased when philosophical and theological discourse about creation is added to the discussion. Such confusion was apparent near the end of March 2010 in commentary that accompanied the initial functioning of the European Organization for Nuclear Research (CERN)'s Large Hadron Collider. Two beams of protons, each with an energy equivalent of 3.5 trillion electric volts, smashed into one another in a tunnel seventeen miles in circumference. Physicists have great hopes that this huge particle accelerator, built three hundred feet underground on the Swiss-French border, will provide new and fascinating insights into what the universe was like shortly after the Big Bang. One goal is to discover the elusive Higgs boson, a particle reputedly responsible for the conversion of the energy of the Big Bang into the mass of the nascent universe. Some in the media were quick to cite the observation of physicist Michio Kaku of City College of New York who remarked that the new experiments at CERN would be 'a huge step toward unraveling Genesis Chapter 1, Verse 1 – what happened in the beginning. This is a Genesis machine. It'll help to recreate the most glorious event in the

history of the universe.¹ It has been easy for some to reach the conclusion that experiments conducted using this machine will, as one author in *Le Monde* put it, permit us ‘d’éclaircir le mystère de la création de l’Univers’.² Almost a decade earlier, a science journalist for *The New York Times* predicted that high-speed particle accelerators would help scientists to work out ‘a mechanistic, gears-and-levers theory of the Genesis moment itself – the hows, if not the whys of creation *ex nihilo*’.³

In this essay, I propose to use insights from Thomas Aquinas (1224-1274) to help disentangle some of the confusion in reflections about the implications of developments in contemporary cosmology for the doctrine of creation. It may seem strange to juxtapose Thomas Aquinas and the cosmological theories of the twenty-first century; even stranger, perhaps, to argue that what Thomas has to say about beginnings and creation can speak directly to debates in our own day about the philosophical and theological implications of current cosmological speculations. Despite dangers of falling into anachronistic commentary or of failing to recognise profound differences in the ways in which terms such as science, creation and time have come to be used in the centuries that separate us from Thomas Aquinas, I want to enter into discourse where even angels may fear to tread to examine the enduring relevance of the thought of the Angelic Doctor, especially in natural philosophy, metaphysics and theology. Astronomers often note that to look out at the heavens is to look back in time. Perhaps looking back in time to mediaeval discussions of creation and science will help us to look out more clearly and to avoid confusions about both what we are seeing and what the philosophical and theological implications of contemporary science are.

Cosmology and creation

Developments in cosmology and particle physics have long encouraged flights of fancy about what the natural sciences can discover about the world. It seems easy to draw connections between developments in cosmology concerning the beginning of the universe and theological reflections about creation. Nevertheless, we ought to be alert to what it is that cosmology explains, or seeks to explain, and what creation means. What can cosmologists tell us about the ‘mystery of the creation of the universe’? An answer to this question requires us to be clear about the explanatory domains of the natural sciences, philosophy and theology. As early as 1988, in the preface to Stephen Hawking’s *A Brief History of Time*, Carl Sagan reached the conclusion that Hawking’s cosmological model, which denied

1 See Higgins, A. & Borenstein, S. ‘Atom smasher will help reveal “the beginning”’, Associated Press (30 March 2010).

2 Le Hir, P. ‘Big Bang en sous-sol’, *Le Monde*, 30 mars 2010.

3 Glanz, J. ‘On the verge of re-creating creation’, *The New York Times*, 28 January 2001.

a beginning to the universe, 'left nothing for a creator to do'.⁴ Theories concerning what happened 'before the Big Bang' as well as those which speak of an endless series of big bangs are often attractive because they too deny a fundamental beginning to the universe and thus appear to make a Creator irrelevant. In *The Grand Design*,⁵ published in September 2010, Hawking and his co-author, Leonard Mlodinow, make the same point. Just as the universe has no edge, so there is no boundary, no beginning to time. Therefore to ask what happened before the beginning – or even at the beginning – would be meaningless.

In the early universe – when the universe was small enough to be governed by both general relativity and quantum theory – there were effectively four dimensions of space and none of time. That means that when we speak of the 'beginning' of the universe, we are skirting the subtle issue that as we look backward toward the very early universe, time as we know it does not exist! We must accept that our usual ideas of space and time do not apply to the very early universe. That is beyond our experience, but not beyond our imagination.⁶

Ultimately, they claim: 'Spontaneous creation is the reason there is something rather than nothing, why the Universe exists, why we exist. It is not necessary to invoke God... to set the Universe going.'⁷

Citing a version of contemporary string theory, known as 'M-theory', they tell us that the 'creation' of a great many universes out of nothing 'does not require the intervention of some supernatural being or god'. Rather, these multiple universes 'arise naturally from physical law'⁸ Foundational questions about the nature of existence that have intrigued philosophers for millennia are, so they claim, now the province of science, and 'philosophy is dead'.⁹ Theology, if mentioned at all, is simply dismissed as irrelevant.¹⁰ The new book has fewer than two hundred pages, divided into eight chapters, each with a suggestive title such as: 'The Mystery of Being'; 'What is Reality?'; 'Choosing Our Universe'; 'The Apparent Miracle'; and culminating in 'The Grand Design'. The principal argument they offer is that once we recognise that our universe is but one of an almost infinite number of universes then we do not need a special explanation – a Grand Designer – for the very precise initial conditions which account for life and our existence. As they say, 'just as Darwin... explained how the apparently miraculous design of living forms could appear without intervention

4 Hawking, S. *A Brief History of Time*, New York: Bantam Books (1988), x.

5 Hawking, S. & Mlodinow, L. *The Grand Design*, New York: Bantam Books (2010).

6 *ibid.*, p. 134.

7 *ibid.*, p. 180.

8 *ibid.*, pp. 8-9.

9 *ibid.*, p. 5.

10 This was Hawking's answer to a query about theology in a television interview in the United States [The Larry King Show on CNN], 10 September 2010.

by a supreme being, the multiverse concept can explain the fine-tuning of physical law without the need for a benevolent creator who made the universe for our benefit'.¹¹ But, the Grand Designer rejected by Hawking is not the Creator, at least not the Creator that traditional philosophy and theology affirm.

Hawking's work is part of a larger context of speculations that have intrigued cosmologists. Christopher Isham wrote in 1993 that, with respect to the quantum origination of the universe, the central theoretical question is 'whether this coming into being of the universe can be explained, or at least described, using the methods of theoretical physics'.¹² Since current theories of the quantum origination of the universe take seriously that there is some real sense in which the universe 'began' around 14 billion years ago, the challenge is to ascribe scientific meaning to such an event and, in particular, to the associated concept of the beginning of time. According to traditional Big Bang cosmology the answer to Isham's query is 'no'; but some recent research programmes have sought to discover such explanations. As we shall see, we ought to keep distinct different senses both of 'beginning' and of what it means 'to come to be'.

Alexander Vilenkin developed a variation of an inflationary model of the expanding universe that accounts for the birth of the universe 'by quantum tunneling from nothing'. 'Nothing', for Vilenkin, is a 'state with no classical space-time... the realm of unrestrained quantum gravity; it is a rather bizarre state in which all our basic notions of space, time, energy, entropy, etc. lose their meaning'.¹³ Describing these speculations in his book, *The Inflationary Universe*, Alan Guth appropriates traditional theological terminology in a chapter called: 'A Universe *ex nihilo*'. His analysis involves complex speculations about 'gravitational potential energy' stored in 'gravitational fields'. But what I wish to point out is the striking conclu-

11 Hawking & Mlodinow, *op. cit.*, (5), p. 165:

Bodies such as stars and black holes cannot just appear out of nothing. But a whole universe can. Because gravity shapes space and time, it allows space-time to be locally stable but globally unstable. On the scale of the entire universe, the positive energy of matter *can* be balanced by the negative gravitational energy, and so there is no restriction in the creation of whole universes. Because there is a law such as gravity, the universe can and will create itself from nothing.

ibid., pp. 180-181:

The ultimate theory must be consistent and must predict finite results for quantities that we can measure. We've seen that there must be a law such as gravity, and for a theory of gravity to predict finite quantities, the theory must have what is called supersymmetry between the forces of nature and the matter on which they act. M-theory is the most general supersymmetric theory of gravity. For these reasons M-theory is the only complete theory of the Universe. If it is finite – and this is yet to be proved – it will be a model of a Universe that creates itself.

12 'Quantum theories of the creation of the universe,' in Russell, R.J., Murphy, N. & Isham, C.J. (eds.) *Quantum Cosmology and the Laws of Nature*, Vatican City: Vatican Observatory Publications (1993), p. 51.

13 Vilenkin, A. 'Birth of inflationary universes', *Physical Review D* (1983) 27, 12, 2851.

sion he draws: "The universe could have evolved from absolutely nothing in a manner consistent with all known conservation [of mass/energy] laws. While no detailed scientific theory of creation is known, the possibility of developing such a theory now appears open."¹⁴

Andrei Linde, speculating on what he admits is a bizarre question – what happened before the Big Bang – has developed a theory of 'eternal inflation', according to which what we know as the Big Bang is only one of many in a chain of big bangs by which 'the universe endlessly reproduces and reinvents itself'. According to Linde, 'our universe' began as a bubble that ballooned out of the space-time of a pre-existing universe. He thinks that it makes little sense to search for some 'original bubble'.¹⁵ Lee Smolin, has spoken of a whole chain of universes that develop according to a theory of 'cosmological natural selection', so that 'our universe forms part of an endless chain of self-reproducing universes whose physical laws evolve as they are passed along'. For Smolin, 'the laws of physics in this universe (or universes) are less like commandments from God and more like the zoning regulations promulgated by some fractious city council, ever susceptible to amendment and compromise'. Smolin thinks that the universe is like a city, 'an endless negotiation, an endless construction of the new out of the old... No one made the city. There is no city-maker, as there is no clock-maker. If a city can make itself without a maker, why cannot the same be true of the universe?' Each black hole, just like the black hole in which the Big Bang occurred, begets a new universe which expands, evolves and eventually creates new black holes which spawn new universes: 'over many cycles a kind of Darwinian pressure would encourage the formation of universes whose physics favored black holes, since universes that did not make black holes would have no progeny'.¹⁶

The desire in some cosmological circles to get rid of 'the troubling singularity' of the Big Bang itself can be seen in the work of Neil Turok. Using a development of 'super string theory', Turok offers a model in which the birth of the present universe is the result of a collision of enormous four-dimensional membranes. Turok's universe, like the one described by Linde, is an endless cycle of universes in collision with other universes. Turok notes that his model is, as he says, 'philosophically very appealing.... Time is infinite, space is infinite, and they have always been here.... It is exactly

14 Guth, A. *The Inflationary Universe: the Quest for a New Theory of Cosmic Origins*, Reading, MA: Addison Wesley (1997), p. 12.

15 Quoted in Overbye, D. 'Before the Big Bang, there was... what?' *The New York Times*, 22 May 2001. Overbye offers an excellent *tour d'horizon* of the then current cosmological speculations: from quantum tunnelling from nothing, to eternal inflation, to string theory and multiple universes, to Neil Turok's 'ekpyrotic' universe [from 'ekpyrosis', which denotes the fiery death and rebirth of the world in Stoic philosophy], to Linde's modification, called the 'pyrotechnic universe'.

16 Quoted in an interview in Overbye, D. 'The Cosmos according to Darwin', *The New York Times Magazine*, 13 July 1997, 26-27.

what the steady-state-universe people wanted. Our model realizes their goal.¹⁷ As Turok points out, many cosmologists in the 1950s and early 1960s were reluctant to accept the Big Bang theory because if the universe were thought to have such a beginning then the initial conditions would have to be in some sense accidental, that is, not included within the explanatory framework of the natural sciences. The initial conditions, thus, would have to have a source beyond the explanatory domain of the natural sciences: such conditions might seem to offer evidence for the existence of God. Turok is critical of the linear, inflationary model of the development of the universe and argues that the cyclical model he sets forth fits as well with all the evidence. Turok presented his cosmological speculations in a book written with Paul Steinhardt of Princeton University, the title of which is suggestive: *The Endless Universe: Beyond the Big Bang* (2007). As we have seen, for them, ‘the big bang [now in lower-case letters] is not the beginning of space and time, but, rather, an event that is, in principle, fully describable using physical laws. Nor does the big bang happen only once. Instead the universe undergoes cycles of evolution.’¹⁸

But others have embraced traditional Big Bang cosmology, which seems to affirm an absolute beginning to the universe, as providing scientific support for, if not actual confirmation of, the Genesis account of creation. Even Pope Pius XII once remarked that this cosmology offered support for what the opening of Genesis revealed.¹⁹ The argument is that an initial ‘singularity

17 Turok, N. *Science* (26 April 2002).

18 Steinhardt, P. & Turok, N. *The Endless Universe*, New York: Doubleday, (2007), p. 8; *ibid.*, pp. 165-166:

Although the cyclical model does not require a beginning of time, it is compatible with having one. One could imagine the sudden creation from nothing of two infinitesimal spherical branes arranged like two concentric soap bubbles, both of which undergo continuous expansion as well as regular collisions with each other under the influence of an interbrane force. Both brane bubbles would grow enormously with every new cosmic cycle. After several cycles of expansion, the pair of branes would appear very flat and very parallel to any observer like us, with access to only a limited region of space. For such an observer, there would be little difference between this universe with a beginning, and a universe in which two flat, parallel branes had been colliding forever into the past.

Note that Turok and Steinhardt identify ‘creation from nothing’ with a beginning of time – and they admit this as theoretically possible, even though they prefer their model. Thus, they would have to admit that cosmology itself could not determine whether or not there was a beginning of time. As with so many others, on all sides of the debate, they treat creation and having a temporal beginning as necessarily linked.

19 [I]t would seem that present-day science, with one sweeping step back across millions of centuries, has succeeded in bearing witness to that primordial ‘Fiat lux’ uttered at the moment when, along with matter, there burst forth from nothing a sea of light and radiation Thus, with that concreteness which is characteristic of physical proofs, it has confirmed the contingency of the universe and the well-founded deductions as to the epoch when the cosmos came forth from the hands of the Creator. Hence creation took place in time. Therefore, there is a Creator. Therefore, God exists!

Pope Pius XII, Address to the Pontifical Academy of Sciences, 22 November 1951.

larity', outside the categories of space and time, points to a supernatural cause of the beginning of the universe. The relationship between the temporal finitude of the universe and the conclusion that it is created can be found in the work of Robert J. Spitzer. In his recent book, *New Proofs for the Existence of God: Contributions of Contemporary Physics and Philosophy*, Spitzer claims that modern physics reinforces the mediaeval Kalam cosmological argument and shows us that the past time of the universe is finite.²⁰ Some of these arguments had already been advanced by William Lane Craig.

Creation, or a beginning?

In a way, the debate is about whether or not cosmology discloses a beginning of the universe: Hawking denies the intelligibility of such a notion and others argue for variations of an eternal universe. William Lane Craig and Robert Spitzer claim that cosmology does indeed point to a beginning. The debate, framed in such terms about a beginning, lead the exponents either to reject or to embrace the idea of creation. Despite fundamental differences as to what contemporary cosmology tells us, all these views tend to identify what it means for the universe to be created with its having a temporal beginning. As we shall see, this emphasis on beginnings leads to confusion about creation.

News of the experiments to be conducted at CERN and the publication of books such as that of Hawking and Mlodinow (and more recently Brian Greene's *The Hidden Reality: Parallel Universes and the Deep Laws of the Cosmos*,²¹ which describes several (9) models of different multiverse scenarios and Roger Penrose's *Cycles of Time*)²² all provide renewed interest in questions concerning the relationship between cosmology and creation, but, unfortunately, much of the discussion contains old errors concerning what cosmology, philosophy and theology tell us about the world and its origin. This is true even when more careful commentators remind us that the Large Hadron Collider can offer at best only insights about the very

20 Spitzer, R.J. *New Proofs for the Existence of God: Contributions of Contemporary Physics and Philosophy*, Grand Rapids, Michigan: Eerdmans (2010), esp. chap. 5, pp. 177-215. Spitzer argues that developments in relativity theory and quantum mechanics have led to an ontological understanding of time quite different from that found in Aristotle and Thomas Aquinas (for whom time is viewed as the measure of motion). Combining what he terms these new conceptions of time with arguments about infinity informed by the German mathematician, David Hilbert (1862-1943), Spitzer thinks that he can show the impossibility of the 'past infinity of time', thus proving that time must have a beginning, and hence must have a Creator. With respect to this topic, Spitzer notes the importance of William Lane Craig's *The Kalam Cosmological Argument*, New York: Barnes and Noble (1979).

21 Greene, B. *The Hidden Reality: Parallel Universes and the Deep Laws of the Cosmos*, New York: Knopf (2011).

22 Penrose, R. *Cycles of Time*, New York: Knopf (2011).

early history of the universe, shortly after the Big Bang.

The distance between minute fractions of a second after the Big Bang and creation is, in a sense, infinite. We do not get closer to creation by getting closer to the Big Bang. Since, as we shall see, creation is not really an event at all, it is not within the explanatory domain of cosmology; it is a subject for metaphysics and theology. Similarly, the ‘nothing’ in some cosmological models which speak of the Big Bang in terms of ‘quantum tunnelling from nothing’, is not the nothing referred to in the traditional sense of creation out of nothing. The ‘nothing’ in cosmological reflections may very well be nothing like our present universe, but it is not the absolute nothing central to what it means to create; it is only that about which the theories say nothing.

One part of the confusion between creation and the natural sciences has its source in a broad commitment to a kind of ‘totalising naturalism’. This is the view that the universe and the processes within it need no explanation beyond the categories of the natural sciences. The claim is that contemporary science is fully sufficient, at least in principle, to account for all that needs to be accounted for in the universe. Whether we speak of explanations of the Big Bang itself (such as quantum tunnelling from nothing) or of some version of a multiverse hypothesis, or of self-organising principles in biological change, the conclusion which seems inescapable to many is that there is no need to appeal to a creator, that is, to any cause that is outside the natural order. Here is how one cosmologist, Lee Smolin, has put it:

We humans are the species that makes things. So when we find something that appears to be beautifully and intricately structured, our almost instinctive response is to ask, ‘Who made that?’ The most important lesson to be learned if we are to prepare ourselves to approach the universe scientifically is that this is not the right question to ask. It is true that the universe is as beautiful as it is intrinsically structured. But it cannot have been made by anything that exists outside of it, for by definition the universe is all there is, and there can be nothing outside it. And, by definition, neither can there have been anything before the universe that caused it, for if anything existed it must have been part of the universe. So the first principle of cosmology must be ‘There is nothing outside the universe.’... The first principle means that we take the universe to be, by definition, a closed system. It means that the explanation for anything in the universe can involve only other things that also exist in the universe.²³

Thus, whatever kind of ‘creation’ science can disclose, or be used to deny, through particle accelerators, elaborate mathematical models, or

23 Smolin, L. *Three Roads to Quantum Gravity*, New York: Basic Books (2001), p. 17.

whatever, would be a scientific account of origins employing, as Smolin would say, principles drawn from within the universe. But such a conception of 'creation' is not what philosophers and theologians mean when they speak of creation.

Confusions concerning creation and cosmology, as I have suggested, run the gamut from denials of creation because the universe is conceived as having no beginning, to explanations of a beginning in exclusively scientific terms that avoid any appeal to a Creator, to opposing claims that the Big Bang itself offers a kind of scientific warrant for belief in God's creation of the universe. Contrary to all these claims, we need to recognise that creation is a metaphysical and theological affirmation that all that is, in whatever way or ways it is, depends upon God as cause. The natural sciences 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 that changes. Whether these changes are biological or cosmological, without beginning or end, or temporally finite, they remain processes. Creation, on the other hand, is the radical causing of the whole existence of whatever exists. Creation is not a change. To cause completely something to exist is not to produce a change in something, is not to work on or with some existing material. When God's creative act is said to be 'out of nothing', what is meant is that God does not use anything in creating all that is: it does not mean that there is a change from 'nothing' to 'something'. Cosmology and all the other natural sciences offer accounts of change; they do not address the metaphysical and theological questions of creation; they do not speak to why there is something rather than nothing. It is a mistake to use arguments in the natural sciences to deny creation. It is also a mistake to appeal to cosmology as a confirmation of creation. Reason (as well as faith) can lead to knowledge of the Creator, but the path is in metaphysics not in the natural sciences. Discussions of creation are different from arguments from order and design to a source of order and design. Similarly, discussions about the fine-tuning of the initial conditions of the universe do not directly concern the topic of creation; thus whether or not multiverse theories do away with the need to explain such fine-tuning (as, e.g., Hawking claims) they do not offer a commentary on creation. Creation, as we have seen, provides an explanation of why things exist at all.

To avoid further confusion, we need also to recognise different senses of how we use the term 'to create'. We often speak of human creations, especially with respect to the production of works of art, music and literature. What it means for God to create is radically different from any kind of human making. When human beings make things they work with already existing material to produce something new. The human act of creating is not the complete cause of what is produced; but God's creative act is the complete cause of what is produced; and this sense of being the complete cause is captured in the expression 'out of nothing'. To be such a complete

cause of all that is requires an infinite power, and no creature, no human being, possesses such infinite power. God wills things to be and thus they are. We should remember that to say that God is the complete cause of all that is does not negate the role of other causes which are part of the created natural order. Creatures, both animate and inanimate, are real causes of the wide array of changes that occur in the world, but God alone is the universal cause of being as such. God's causality is so different from the causality of creatures that there is no competition between the two, that is, we do not need to limit, as it were, God's causality to make room for the causality of creatures. God causes creatures to be causes.

Aquinas on creation

Already in the thirteenth century the groundwork was set for the fundamental understanding of creation and its relationship to the natural sciences. Working within the context of Aristotelian science and aided by the insights of Muslim and Jewish thinkers, as well as his Christian predecessors, Thomas Aquinas provided an analysis of creation and science which remains true. As Thomas wrote: '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.'²⁴ Thomas drew heavily upon the analysis of Avicenna, who carefully distinguished between the ways in which metaphysicians and natural philosophers discuss agent (or efficient) cause. As Avicenna said: 'the metaphysicians do not intend by the agent the principle of movement only, as do the natural philosophers, but also the principle of existence and that which bestows existence, such as the creator of the world'.²⁵ Avicenna distinguished between two kinds of agent causes: an agent which acts through motion, and a divine agent which is 'a giver of being'.²⁶ Such an agent needs only the power to create and nothing else. On the basis of the ontological distinction between essence and existence, Avicenna argued that all beings other than God (in whom this distinction

24 Aquinas, T. *On Separated Substances*, c.9.

25 *al-Shifa':al-Ilahiyyat*, in Anawati, G. (trans.) *La Métaphysique du Shifa'*, Paris: J. Vrin (1978), VI.1.

26 Avicenna argues in his *Liber de philosophia prima* that the world is an ensemble of possible beings, which of themselves have no existence, but do in fact exist. They exist only because they are the emanated effect of the efficient causality of one necessary being, which is perfect and lacks nothing. Possible beings in this emanated universe are arranged hierarchically, ordered in a causal chain under the one necessary being, first cause of all. From necessary beings in its eternal productive act only one effect can come forth, the first immaterial being or intelligence. The rest of the chain of being continues with each intelligence eternally causing the being and nature of each succeeding intelligence, up to the tenth intelligence, the Giver-of-Forms, from which issues immediately the material universe, matter and form. For Avicenna, emanation proceeds through intermediaries.

disappears) require a cause in order to exist.²⁷ Since existence is not part of the essence of things, it needs to be explained by a cause extrinsic to the thing that exists; and, ultimately, there must be an Uncaused Cause.²⁸ David Burrell has emphasised the importance of Thomas's reading of the *Liber de causis* in the development of his understanding of the Creator as cause-of-being.²⁹ Although Thomas will come to differentiate his own position on essence and existence from that of Avicenna,³⁰ he too thought that

27 Avicenna recognised the need to affirm both the contingency of the created order and, yet, a necessity in it so that there can be a science of things. As L. Goodman puts it:

[Avicenna] fused the Aristotelian metaphysics of self-sufficiency with the monotheistic metaphysics of contingency.... The key to [his] synthesis of contingency with the metaphysics of necessity lies in the single phrase: *considered in itself*. Considered in itself, each effect is radically contingent. It does not contain the conditions of its own existence: and considered in itself, it need not exist.... But considered in relation to its causes, not as something that in the abstract might never have existed, but as something concretely given before us... considered in relation to its causes, this object must exist in the very Aristotelian sense that it does exist, and must have the nature that it has in that its causes gave it that nature.

Goodman, L. *Avicenna*, London: Routledge (1994), pp. 63, 66-67.

28 Charles Kahn emphasises the importance of Islamic philosophy, and especially of Avicenna, in the development of a really new notion of radical contingency:

My general view of the historical development is that existence in the modern sense becomes a central concept in philosophy only in the period when Greek ontology is radically revised in light of the metaphysics of creation: that is to say, under the influence of biblical religion. As far as I can see, this development did not take place with Augustine or with the Greek Church Fathers, who remained under the sway of classical ontology. The new metaphysics seems to have taken place in Islamic philosophy, in the form of a *radical* distinction between necessary and contingent existence: between the existence of God, on the one hand, and that of the created world, on the other. The old Platonic contrast between Being and Becoming, between the eternal and the perishable (or, in Aristotelian terms, between the necessary and the contingent), now gets reformulated in such a way that for the contingent being of the created world (which was originally present only as a 'possibility' in the divine mind) the property of 'real existence' emerges as a new attribute or 'accident', a kind of added benefit bestowed by God upon possible beings in the act of creation. What is new here is the notion of radical contingency, not simply the old Aristotelian idea that many things might be other than they in fact are – that many events might turn out otherwise – but that the whole world of nature might not have been created at all: that it might not have *existed*.

Kahn, C. 'Why existence does not emerge as a distinct concept in Greek philosophy', in Morewedge, P. (ed.) *Philosophies of Existence, Ancient and Medieval*, New York: Fordham University Press (1982), pp. 7-17, p. 7-8.

29 Burrell, D. 'Aquinas's appropriation of *Liber de causis* to articulate the Creator as cause-of-being', in Kerr, F., *OP Contemplating Aquinas: On the Varieties of Interpretation*, London: SCM Press (2003), pp. 75-83.

30 Aquinas develops the notion of radical dependency in such a way that creaturely existence is understood not as something which happens to essence (as it does for Avicenna) but as a fundamental *relation* to the Creator as origin.

In one fell swoop, Aquinas has succeeded in restoring the primacy Aristotle intended for individual existing things, by linking them directly to their creator and by granting Avicenna's 'distinction' an unequivocal ontological status. Yet as should be clear, this is more than a development of Avicenna; it is a fresh start requiring a conception of *existing* that could no longer be confused with an *accident*, and which has the capacity to link each creature to the gratuitous activity of a free creator. Only in such a

the science of metaphysics is able to demonstrate that all things depend upon God as the cause of their existence. Unlike many of his contemporaries, Thomas does not restrict his analysis of creation to theology, although he recognises that a full understanding of creation does include what faith discloses. His philosophical account of creation enables him to distinguish the act of creating from any kind of change, but in such a way as to make creation – understood as the complete dependence of all that is on God – accessible to reason alone.

Creation is not essentially some distant event; rather, it is the on-going complete causing of the existence of all that is. At this very moment, were God not causing all that is to exist, there would be nothing at all. Creation concerns first of all the origin of the universe, not its temporal beginning. Indeed, it is important to recognise this distinction between origin and beginning. The former affirms the complete, continuing dependence of all that is on God as cause. Whatever is created has its origin in God. But we ought not to think that to be created must mean that whatever is created has a temporal beginning. It may very well be that the universe had a temporal beginning, as the traditional interpretation of the opening of Genesis acknowledges, but there is no contradiction in the notion of an eternal, created universe: for were the universe to be without a beginning it still would have an origin, it still would be created. This was precisely the position of Thomas Aquinas, who accepted as a matter of faith that the universe had a temporal beginning but also defended the intelligibility of a universe, created and eternal. It is the failure to recognise that to be created does not necessarily entail a temporal beginning that causes considerable confusion in contemporary debates about the implications of cosmology for arguments about whether or not the universe is created.

Thomas also thought that neither science nor philosophy could know whether the universe had a beginning.³¹ He did think that metaphysics

way can the radical *newness* of the created universe find coherent expression, for the *existing* 'received from God' will be the source of all perfections and need not presume anything at all matter or 'possibles'.

Burrell, D. 'Aquinas and Islamic and Jewish thinkers', in Kretzmann, N. & Stump, E. (eds.) *The Cambridge Companion to Aquinas*, Cambridge: Cambridge University Press (1993), pp. 60-84, pp. 69-70.

31 That the world had a beginning... is an object of faith, but not a demonstration or science. And we do well to keep this in mind; otherwise, if we presumptuously undertake to demonstrate what is of faith, we may introduce arguments that are not strictly conclusive; and this would furnish infidels with an occasion for scoffing, as they would think that we assent to truths of faith on such grounds. *Summa theologiae* I, q. 46, a. 2. [Unde mundum incoepisse est credibile, non autem demonstrabile vel scibile. Et hoc utile est ut consiederetur, ne forte aliquis, quod fidei est demonstrare praesumens, rationes non necessarias inducat, quae praebeant materiam irridendi infidelibus, existimantibus nos propter huiusmodi rationes credere quae fidei sunt.] Resp: Dicendum quod mundum non semper fuisse, sola fide tenetur, et desmonstrative probari non potest...

could show us that the universe is created,³² but he would have warned against those today who use Big Bang cosmology, for example, to conclude that the universe has a beginning and therefore must be created.³³ He was always alert to reject the use of bad arguments in support of what is believed. The ‘singularity’ in traditional Big Bang cosmology may represent the beginning of the universe we observe, but we cannot conclude that it is the absolute beginning, the kind of beginning that would indicate creation. As some contemporary cosmologists recognise, there could very well be something before the Big Bang. Indeed, Gabriele Veneziano, a theoretical physicist at CERN and one of the fathers of string theory in the late 1960s, observes that ‘the pre-bang universe has become the latest frontier of cosmology’.³⁴

When it came to how to read the opening of Genesis, Thomas Aquinas observed that what is essential is the ‘fact of creation’, not the ‘manner or mode’ of the formation of the world.³⁵ Questions concerning order, design and chance in nature refer to the ‘manner or mode’ of formation of the world. Attempts in the natural sciences to explain these facets of nature do not challenge the ‘fact of creation’. A world with a temporal beginning concerns the kind of world God has created. It may very well be easier to accept that a world that has an absolute temporal beginning is a created world, and such a world may be especially appropriate for understanding sacred history, important as it is for believers. But an eternal world, one without a beginning to time, would be no less a created world.

Conclusion

Cosmological theories are easily used, or rather misused, to support or to deny creation. Each time, however, as I have suggested, ‘to create’ has been joined inextricably to temporal finitude in such a way that to be created necessarily means to begin to be: in consequence, to deny a beginning is to deny creation. It was the genius of Thomas Aquinas to distinguish between creation understood philosophically, with no reference to temporality, and creation understood theologically, which included the recognition that the

32 The argument involves a recognition that the difference between what things are (their essences) and that they are (their existence) must ultimately be resolved in a reality (God) in whom essence and existence are identical. Thus, what it means to be God is to be, and God is the uncaused cause of all beings. One need not accept the validity of Thomas’s claim to demonstrate that the universe is created in order to understand his distinction between creation and science and that ‘to create’ is not to produce a change.

33 ‘quod creationem esse non tantum fides tenet, sed etiam ratio demonstrat.’ *In II Sent.*, dist. 1, q. 1., a. 2. An English translation and commentary of this discussion of creation can be found in Baldner, S.E. & Carroll, W.E. *Aquinas on Creation*, Toronto: Pontifical Institute of Mediaeval Studies Press (1997).

34 See his essay: Veneziano, G. ‘The myth of the beginning of time’, *Scientific American* (April 2004).

35 *In II Sent.*, dist. 12, q. 1, a. 2.

universe does have an absolute temporal beginning.³⁶ Thomas's analysis of creation and its relationship to what the natural sciences and philosophy tell us, is a good example of the importance of science and philosophy for theological reflection – indeed, of the appropriate autonomy of these disciplines in any theological view of the world. Creation understood theologically includes far more than the universe's having a temporal beginning. Trinitarian theology involves a recognition that creation is 'through the Son' and is intimately connected to the drama of Fall and Redemption. For the purposes of this essay, I have limited my analysis to Thomas's philosophical account of creation since it is this account which is crucial for distinguishing creation from the explanatory categories of cosmology and the other natural sciences.

There is a wider confusion at work here as well – wider than the confusion of creation with beginnings: that is, the failure to distinguish between creation and change, and hence the failure to recognise that the natural sciences, including cosmology, have nothing to tell us about the ultimate cause of existence of things. God's creative power is exercised throughout the entire course of cosmic history, in whatever ways that history has unfolded. No explanation of cosmological or biological change, no matter how radically random or contingent such an explanation claims to be, challenges the metaphysical account of creation, that is, of the dependence of the existence of all things upon God as cause.³⁷ When some thinkers deny creation on the basis of theories in the natural sciences, or use cosmology to confirm creation, or reject the conclusions of science in defence of creation, they misunderstand creation or the natural sciences, or both. The experiments that have begun at CERN may very well offer new and spectacular insights into the nature of the very early universe, but they will tell us nothing about the creation of the universe. Speculations about our universe's being but one among a vast multiverse system may appeal to the imaginations of mathematical cosmologists like Stephen Hawking, but such speculations do not call into question the fact that whatever is, in whatever way or ways it is, is caused to be by God.

William E. Carroll is Thomas Aquinas Fellow in Theology and Science, Blackfriars, University of Oxford.

³⁶ See Baldner & Carroll, *op. cit.*, (33).

³⁷ See my essay, Carroll, W.E. 'At the mercy of chance? Evolution and the Catholic tradition', *Revue des Questions Scientifiques* (2006) 177:2, 179- 204.