BOOK REVIEWS AND NOTICES

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P. Copan and Craig, W. (eds.) *The Kalām Cosmological Argument Volume Two: Scientific Evidence for the Beginning of the Universe*. New York: Bloomsbury, 2019, 376 pp.

The book under review is the second volume in a two-volume set. The structure of the two volumes mirrors the structure of Craig's standard discussions of 'the Kalām cosmological argument'. *Volume One* divides into three parts: Part 1: Whatever Begins to Exist has a Cause; Part 2.1: The Impossibility of Existence of an Actual Infinite; and Part 2.2: The Impossibility of the Formation of an Actual Infinite by Successive Addition. *Volume Two* also divides into three parts: Part 2.3.1: Expansion of the Universe; Part 2.3.2: Thermodynamic Properties of the Universe; and Part 3: Conclusion: The Universe has a Cause. Collectively, parts 2.1, 2.2, 2.3.1 and 2.3.2 make up the case for the claim that The Universe Began to Exist. Parts 2.1 and 2.2 are grouped together as Deductive Arguments; 2.3.1 and 2.3.2 are grouped together as Scientific Confirmation (Inductive Arguments).

Part 2.3.1 contains the following four chapters: W. Craig and J. Sinclair (2009) 'The Kalām Cosmological Argument: "Science" Excerpt'; B. Pitts (2008) 'Why the Big Bang Singularity Does Not Help the Kalām Cosmological Argument for Theism'; W. Craig and J. Sinclair (2012) 'On Non-Singular Spacetimes and the Beginning of the Universe'; and A. Vilenkin (2015) 'The Beginning of the Universe'. The first Craig and Sinclair chapter is excerpted from the *Blackwell Companion to Natural Theology*; the second Craig and Sinclair chapter is reprinted from Yujin Nagasawa (ed.) *Scientific Approaches to the Philosophy of Religion*. There is significant overlap in the content of these two chapters; they differ primarily because the latter is constructed as a critical response to Pitts. The Vilenkin chapter is very short.

Part 2.3.2 contains the following four chapters: F. Adams and G. Laughlin (1997) 'The Long Term Fate and Evolution of Astrophysical Objects';

G. Kutrovátz (2001) 'Heat Death in Ancient and Modern Thermodynamics'; M. Ćirković (2002) 'Entropy and Eschatology: A Comment on Kurovátz's Paper "Heat Death in Ancient and Modern Thermodynamics"'; and A. Wall (2013) 'The Generalised Second Law Implies a Quantum Singularity Theorem'. Again, the chapters differ significantly in length: the Kutrovátz and Ćirković chapters are very short. The Wall paper is poorly titled: Wall concludes only that:

> There is a reasonable possibility that the Penrose singularity theorem can be proven even in the context of full quantum gravity. (286) … There are some — necessarily speculative — indications that these results might hold in the full theory of quantum gravity. (287)

Part 3 contains the following three chapters: J. Moreland (1997) 'Libertarian Agency and the Craig/Grünbaum Debate about Theistic Explanation of the Initial Singularity'; Q. Smith (1996) 'Causation and the Logical Impossibility of a Divine Cause'; and W. Craig (2006) 'Beyond the Big Bang'. A significant focus of the Craig chapter is criticism of the Smith chapter.

Discussion in the Craig and Sinclair chapters is framed by the Hawking-Penrose and Borde-Guth-Vilenkin singularity theorems.

The Hawking-Penrose singularity theorems show that singularities are generic in general relativistic universes, given certain conditions. In order to avoid the conclusion that our universe is singular, while retaining the assumption that it is general relativistic, we have four options: (1) we might suppose that there is no closed trapped surface in our past; (2) we might suppose that certain generic energy conditions are violated; (3) we might suppose that there can be closed time-like loops; and/or (4) we might suppose that certain strong energy conditions are violated. Finally, there is a fifth option: (5) we might suppose that our universe is not general relativistic, but rather quantum-gravitational.

Craig and Sinclair dismiss (1) and (2). Concerning (3), they say that 'while it is true that no one has been able definitively to rule out closed time-like loops, the evidentiary burden lies upon those defending the viability of spacetimes and models predicated upon their reality' (23). Discussion of (4) turns our attention to eternal inflationary models, which leads us on to consideration of the Borde-Guth-Vilenkin singularity theorem.

The Borde-Guth-Vilenkin singularity theorem shows that singularities are generic in inflationary models provided only that the average expansion rate is positive along all geodesics. In order to avoid the conclusion that our universe is singular, while retaining the assumption that it is general relativistic, we have

four options: (1) we might suppose that there is an infinite contraction prior to expansion; (2) we might suppose that the average expansion rate over history is zero because it is zero at infinity; (3) we might suppose that the universe is cyclical, with an average expansion of zero in each cycle; or (4) we might suppose that the arrow of time reverses at a $t=-\infty$ hypersurface.

Craig and Sinclair give short shrift to (2) and (4). Concerning (1), they say that there appears to be a dilemma: 'On the one hand, one could have the reality of a past infinite timeline without a beginning. But then one must assert brute contingency. … Further, one must do this with respect to apparent fine-tuning. This seems implausible.' (33) And, at the end of their discussion of (4), they note that, while these cosmologies 'do represent a frontier worth exploring, there seem to be unanswered questions as to the viability of such an approach. The field is too young to pass full judgment.' (43)

Among the quantum-gravitational approaches, Craig and Sinclair discuss (1) string models; (2) loop quantum gravity; and (3) semi-classical creation ex nihilo models. In their view, the semi-classical models 'are supportive of the universe's having had a beginning' (69) and the string models 'do not predict that the past is infinite' (53) and are such that, in them, the universe 'can safely be said to begin to exist' (56). Their view of loop quantum gravitational models is less clear; they cite Bojowald's claim, in personal correspondence, that 'we are not sure if entropy … increases from cycle to cycle' (61), and conclude that 'building a genuinely beginningless cyclic LQG model seems to be a … difficult challenge' (62).

Craig and Sinclair ultimately conclude that their survey 'is quite supportive of the second premise of the Kalām cosmological argument. Further, this conclusion is not reached through ferreting out elaborate and unique failure conditions for scores of individual models. Rather, the repeated application of simple principles seems effective in ruling out a beginningless model.' (69) But, in fact, as the above summary shows, there are various points where their discussion simply leaves it uncertain whether a beginningless model is viable. Moreover, it is hardly a secret that the entire field to which all of this modelling belong remains in a very unsettled state. I think that we can be pretty certain that we do not live in a general relativistic universe; and I think that that renders moot any conclusion that we might draw about generic features of general relativistic universe. Furthermore, I think that it is uncontroversial that we are still a long way from securing agreement on a quantum-gravitational successor to general relativity. So, I think, we should

be very cautious in any claims that we make about *scientific* support *from* expansion of the universe for the further claim that the universe began to exist.

Thermodynamic considerations enter into the alleged consequences of expansion: according to Craig and Sinclair generic difficulties for cyclic models can be sheeted home to the second law. The main import of the first three papers in Part 2.3.2 seems to be that, while we would go wrong if we suppose that the second law entails that our universe is destined for 'heat death' — i.e. reaching a state of maximum entropy from which it subsequently does not depart — we are nonetheless right in thinking that our universe is destined to become a dull and lifeless place in which no physical work can be done— 'cosmological heat death'—even though entropy will go on increasing forever. It seems to me to be artificial to suppose that there are two separate arguments here — one from expansion and one from thermodynamic considerations. Rather, there is a single argument, to which various kinds of considerations contribute. (Readers whose curiosity is piqued by the very interesting paper by Adams and Laughlin might like to also look at their book: *The Five Ages of the Universe* New York: The Free Press, 1999.)

The last part of the book seems to me to be something of a lost opportunity. In his contribution to this part of the book, Craig — very briefly — claims that, if there is a supernatural ('transcendent') cause of the universe, then that cause is atemporal, non-spatial, changeless, immaterial, beginningless, uncaused, and personal (336–7). I think that it would have been good to make the concluding part of the book a focussed discussion of this further claim. Suppose that Craig is right. Then we have two pictures of causal reality to consider:

God → Initial Singularity → …. Initial Singularity → ….

Craig thinks that, on the left hand side, we must and can take the leftmost item ('God') to be beginningless, uncaused, and personal. But what is there to prevent us from taking the leftmost item on the right hand side ('Initial Singularity') to be beginningless, uncaused, and non-personal? That looks to be theoretically less-committing; and it looks to have all of the explanatory virtues to be found on the left hand side. Whence, straightforwardly, it seems to be the better theory. Perhaps there are other attributes that Craig might want to add on the left-hand side; perhaps, for example, he wants to add that the initial item exists of necessity. But that option is equally available on the

right-hand side, too. If we can legitimately suppose that God exists of necessity, why can we not legitimately suppose that the initial singularity exists of necessity? Whatever concerns we might have about allowing for contingency can be met in the same way on either side: we can allow that casual evolution is chancy, and we can allow that some of the properties of the initial items are contingent. (Note that 'Initial Singularity' is just a convenient label for whatever it is that exists in the initial state of natural reality. It would work equally well to use, instead, the label 'Initial Natural Thing'.)

Perhaps it is worth noting that, if we do suppose that there is a necessarily existing initial thing, then we are supposing that every possible world has a certain kind of commonality with the actual world: every possible world begins with that thing. We could go further: we could suppose that every possible world shares some initial history with the actual world: every possible world begins with the same thing, and that thing has the same initial properties in every possible world. I think that it is quite attractive to suppose that every possible world shares initial history with the actual world, departing from the actual world only after chances play out differently. This supposition gives a theoretically lean account of both metaphysical possibilities and metaphysical chances; and that looks theoretically virtuous. Allowing unexplained contingency in the properties of the initial thing, while not ruled out, should seem theoretically undesirable to anyone with any kind of *pro tanto* attraction to principles of sufficient reason. (Of course, I do not expect proponents of Kalām cosmological arguments simply to agree with the claims that I have just made. Rather, the point is that it is these kinds of questions that should have been the subject matter of the final part of the book. The Kalām cosmological syllogism is trivially valid; there is nothing interesting to discuss under that head. So, interesting discussion not focused on the *premises* of the Kalām cosmological syllogism should be focused on the consequences of *acceptance of its conclusion*.)

In the *Foreword*, the work under review is said to be an *anthology*. I'm not convinced that it succeeds under that description. Much of the material in Volume Two is already quite dated; a decade is a long time in scientific cosmology. On the other hand, the work does provide a useful window onto Craig's current understanding of the hypothesis that natural reality has a finite past.