THEOLOGY AND THE NATURAL SCIENCES

Topic: The Big Bang, Quantum Cosmology and *Creatio ex Nihilo*
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Presenter: James R. Pambrun, Saint Paul University, Ottawa

In Stoeger's presentation, he briefly summarized the essentials of contemporary cosmology, emphasizing the universe's expansion and cooling from the Planck era, 13.7 billion years ago. The Planck era is the earliest known phase of its history, right after the Big Bang, when it was so hot that space and time as we know them did not exist. Everything was completely quantized, including gravity and space and time. As the universe expanded and cooled, the universe passed through different stages—the generation of density fluctuations during inflation, the very early exit from inflation, the production of helium and a little bit of lithium about two minutes after the Big Bang, the decoupling of matter from radiation, the gradual formation of stars and galaxies as matter clumped, the synthesis of elements heavier than lithium in stars.

Stoeger stressed that cosmologists have not yet developed a reliable physics of the Planck era, and that the Big Bang itself is not really an accessible part of the present model of the universe. It is simply the past limit of the hotter, denser phases we encounter as go back into its past. It is certainly not the very beginning! In fact, quantum cosmology focuses on developing an adequate theory which would model the Planck era and provide the physical explanation for the expansion of the universe since that time—an explanation of the Big Bang, if you will.

What has become clear, however, is that, though progress in quantum cosmology via string theory, loop quantum gravity, or other approaches to quantizing the gravitational field, and space-time itself will eventually provide a reliable description of the Planck era and what may have preceded it, it will never provide an adequate account—or any account—of the ultimate ground of existence and order. That is what *creatio ex nihilo* deals with. Thus, quantum cosmology and the fundamental theology of creation are in principle complementary understandings of origins, not exclusive alternatives, as is frequently supposed.

Pambrun reflected philosophically and theologically on Stoeger's account of quantum cosmology and scientific origins and on its explanatory complementarity with *creatio ex nihilo*. First, he stressed the narrative character of cosmology, and both the pedagogical and foundational roles that plays. Pedagogically it enables us to locate our world within a more expansive understanding of the cosmos, now seen as a dynamic unity. Foundationally, it testifies to the interdisciplinary character of cosmology—different methods and approaches are necessary for understanding reality, and what we come to understand opens up further questions for understanding and meaning, which take us beyond cosmology and beyond the natural sciences.

Secondly, Pambrun proceeded to show how what cosmology is doing calls for philosophy, which reflects on this quest for understanding and meaning in the cosmos—on "meaning at work". This includes noticing how what is understood

motivates further inquiry, poses the question of initial conditions—and conditions of possibility—for the emergence of the universe, and signals the scientists' personal (ethical) commitments to scientific integrity.

The third and final stage of Pambrun's reflections centered on the importance of the plot—the search for an intelligibility which "organizes and unifies" our growing understanding of the cosmos, providing a movement towards an ending which connects with the beginning. This is exactly where the theologian meets the cosmologist and the philosopher. The creation narratives of *Genesis* and the *Gospel of John* speak of beginnings which unfold towards achieving the fullness of life—thus endowing the cosmos with ultimate meaning.

These rich interlocking contributions stimulated a lively discussion which focused on the role and adequacy of narrative, our understanding of the dimensions of cosmology's account of beginnings, including the possibility of other universes, and the importance of meeting religious education's challenge to present creation in light of our burgeoning scientific knowledge.

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