

Eschatology, Science, and Hermeneutics

with Klaus Nürnberger, "Eschatology and Entropy: An Alternative to Robert John Russell's Proposal"; and Robert John Russell, "Eschatology and Scientific Cosmology: From Deadlock to Interaction"

ESCHATOLOGY AND SCIENTIFIC COSMOLOGY: FROM DEADLOCK TO INTERACTION

by Robert John Russell

Abstract. Among the many scholarly surveys of historical and contemporary approaches to Christian eschatology, few treat the relation between eschatology and scientific cosmology. It is the purpose of this essay to do so. I begin with a brief summary of the importance of eschatology to contemporary Christian theology. Next, an overview is given of scientific cosmology, its earlier scenarios for the cosmic far future of "freeze or fry," and, more recently the discovery that the expansion of the universe is accelerating. These predictions severely challenge those versions of Christian eschatology that are based on the bodily resurrection of Jesus and, by analogy, the transformation of the universe into the new creation. Several recent approaches to this challenge are outlined, including those of Denis Edwards, Jürgen Moltmann, Wolfhart Pannenberg, Ted Peters, John Polkinghorne, and my own. I conclude with some suggestions for future research in both theology and science.

Keywords: bodily resurrection of Jesus; creation *ex vetere*; eschatology as transformation of the universe; method of creative mutual interaction; Klaus Nürnberger; Wolfhart Pannenberg; Ted Peters; John Polkinghorne; scientific cosmology and the predicted end of all life in the universe; time in eternity

THE IMPORTANCE OF ESCHATOLOGY TO CHRISTIAN THEOLOGY

While traditional Christianity typically treated eschatology literally, limited it to the topic of "last things," and consigned it to the end of dogmatics, theologians in the eighteenth and nineteenth centuries reconstructed it in nontheological categories using philosophical, ethical, social, political,

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and economic contexts. In 1906, however, Albert Schweitzer returned eschatology to theology properly, arguing convincingly that eschatology was at the heart of Jesus's self-understanding, as well as that of the early Church, in his stunning work *The Quest of the Historical Jesus*. There ensued a variety of responses to Schweitzer's work. One was to treat the eschaton as "realized" in the present experience of individuals and of the church. Because of its conflict with modern science, Rudolf Bultmann viewed eschatology as mythology and reinterpreted it in lived, existentialist categories. Feminist, black, Latin American, and other contemporary liberation theologies use eschatology to challenge such contemporary scourges as patriarchy, racism, sexism, political, and economic oppression and the abuse of the natural, ecological world. Another way, taken by the Jesus Seminar, is to construct a thoroughly "noneschatological Jesus" based on abandoning most if not all eschatological-related texts as historically reliable, including the resurrection narratives in the Synoptic Gospels and much of the Gospel of John.

In this paper I take a third approach that seeks to combine future hope for a universal transformation of the world with the present realization of that hope in the world. Roots of this approach lie, of course, in the theology of Karl Barth with his clarion-like claim that "Christianity that is not entirely and altogether eschatology has entirely and altogether nothing to do with Christ" (Barth 1933, 314). Paul Tillich too saw the eschaton in terms of both our present experience of the eternal, as well as the aim and end of history in its "elevation" into the eternal (Tillich 1967, Vol. III, 394–96). The Vatican II document *Lumen Gentium* points to the immediacy and the futurity of the Kingdom of God in proclaiming that "the final age of the world has already come upon us" (Abott 1966, 9). Perhaps most impressive of all is the massively determining role eschatology plays for the entire content of Wolfhart Pannenberg's systematic theology. Here God as Trinity acts from the future through the proleptic event of the resurrection of Jesus to transform history into its eschatological goal (Pannenberg 1969; 1998, Chapter 5, esp. Part 3). For Jürgen Moltmann, too, Christian eschatology involves the future coming of the universal new creation already found in the historical person of Jesus Christ (Moltmann 1996; 1967, esp. Introduction and Part I).

The key to understanding eschatologies such as these is to view the new creation not as a "replacement" of the present creation—that is, not as a second *ex nihilo*—or as the mere working out of the natural processes of the world. Instead eschatology involves the radical *transformation* of the world by God's new act, beginning at the original Easter and continuing through our present world and into the fully transformed future. For New Testament and theological scholars such as Raymond Brown, Gerald O'Collins, William Lane Craig, Phem Perkins, Ted Peters, Janet Martin

Soskice, Sandra Schneiders, Richard Swinburne, and N. T. Wright, the concept of eschatology as transformation is derived in large measure from a view of the resurrection of Jesus that emphasizes elements of continuity and discontinuity between Jesus of Nazareth and the risen Jesus. In this view, the empty tomb plays a key role in pointing to an irreducible element of *physical/material continuity* within the overarching presence of *discontinuity*. By analogy, the transformation of the world happens not only synchronically at the end of time but also diachronically throughout the entire course of world history.

It should be self-evident now that it is *these* eschatologies which face the severest challenge from contemporary science, particularly cosmology. When we expand the domain of eschatology from an anthropological and even an ecoterrestrial context to a *cosmological* horizon, we encounter the grim reality of a universe in which all life must inevitably and remorselessly be extinguished. Following this, the prognosis for *far* cosmic future is either “freeze or fry” (i.e., either endless cold as the universe expands forever or unimaginable heat as it recollapses), and as we shall see following, current cosmology strongly points to “freeze” through an eternal and accelerating expansion. For obvious reasons I call this the “hardest case” for eschatology, since it sets aside as of limited help certainly in a pastoral context, but not in a theological context, those existentialist and social/political readings of eschatology that never engage science. Instead, I pledge to take on board the “hardest case”—namely, the direct challenge from science that I believe deeply deserves our attention if we are to speak to a generation overwhelmingly impacted by science, one abandoning traditional Christianity *en masse*. What response can we give that does not just avoid science or minimize the challenge, as existentialist and social-political renditions of eschatology routinely do? I will return to this question shortly, but first I want to summarize the concrete details of the challenge from science.

SCIENTIFIC COSMOLOGY AND THE PREDICTION OF AN END TO ALL LIFE IN THE UNIVERSE

Scientific cosmology (Trefil 2000, Chapter 15) has undergone stunning developments this century. In 1905, Albert Einstein proposed the special theory of relativity (SR) that was quickly given a geometrical interpretation by Hermann Minkowski: space and time, independent and absolute in Newtonian physics, are united as a four-dimensional “spacetime” geometry. A decade later, Einstein proposed the general theory of relativity (GR) that represents the force of gravity by the curvature of spacetime. From the 1920s, decades of observational evidence and theoretical arguments led astronomers to conclude that the universe is expanding in time. Its origin, labeled $t = 0$ and called the “Big Bang,” was 13.7 billion years ago.

By the 1950s, three Big Bang models were being studied: In the first two (flat and open) the universe is infinite in size and is destined to expand endlessly as its temperature falls exponentially toward absolute zero. The third model is a closed universe: It is finite in size and will eventually stop expanding; then it will recontract toward a future singularity much like $t = 0$, in which the temperature and density soar to infinity. The far future in the first two models is aptly termed “freeze,” and in the third model, “fry.” There is now growing evidence that the universe is marginally *open* and destined to expand forever. Moreover, recent evidence indicates that its expansion rate is not slowing, as it would in the standard flat or open Big Bang models; instead, it is actually *speeding up*. Given the increasingly strong evidence for an open universe, the prognosis for biological life in our far future is grim (Stoeger 2000). As the universe expands forever, all of its early structure, from galaxies to living organisms, will vanish forever without a trace.

What responses have been given to Big Bang cosmology in relation to Christian eschatology? We first turn to a variety of minimalist responses.

ESCHATOLOGY AS IRRECONCILABLE WITH COSMOLOGY

A number of distinguished scientists have given pessimistic, “dysteleological” readings of scientific cosmology. In 1903, long before Big Bang cosmology was on the horizon, Bertrand Russell wrote darkly:

All the labors of the ages, all the devotion, all the inspiration, all the noon-day brightness of human genius are destined to extinction in the vast death of the solar system, and the whole temple of man’s [*sic.*] achievement must inevitably be buried beneath the debris of the universe in ruins. (Russell 1903, 41)

Over 70 years later, his detailed knowledge of modern cosmology brought Steven Weinberg to a strikingly similar conclusion:

It is very hard to realize that this all is just a tiny part of an overwhelmingly hostile universe. It is even harder to realize that this present universe has evolved from an unspeakably unfamiliar condition, and faces a future extinction of endless cold or intolerable heat. The more the universe seems comprehensible, the more it also seems pointless. (Weinberg 1977, 154–5)

Similar positions can be found among those few theologians who have seriously considered the meaning of eschatology in light of cosmology. In 1966 John Macquarrie wrote: “If it were shown that the universe is indeed headed for an all-enveloping death, then this might . . . falsify Christian faith and abolish Christian hope” (Macquarrie 1977; 1966, Chapter 15, esp. 351–62). Three decades later, Kathryn Tanner echoed this view: “If the scientists are right . . . hope for an everlasting and consummate fulfillment of this world is futile” (Tanner 2000, 222). Ted Peters also wrote unequivocally about the threat posed by science:

Should the final future as forecasted by the combination of big bang cosmology and the second law of thermodynamics come to pass . . . we would have proof that our faith has been in vain. It would turn out to be that there is no God, at least not the God in whom followers of Jesus have put their faith. (Peters 1993, 175–6)

Pannenberg has listed the conflict between eschatology and cosmology as one of five key questions in the theology/science dialogue and offered wise advice: living with the conflict may well be better than seeking an “easy solution” (Pannenberg 1981, 12, 14–5). Arthur Peacocke has also acknowledged that “science raises questions about the ultimate significance of human life in a universe that will eventually surely obliterate it.” But Peacocke drew out of this to a deeper insight that, I believe, points us in the right direction: “Our grounds for hope (cannot be) generated from within the purely scientific prospect itself” (Peacocke 1979, 329). The task, of course, will be to develop these grounds of hope into a robust eschatology while keeping squarely in view the challenge of scientific cosmology.

“PHYSICAL ESCHATOLOGY”: THE REDUCTION OF ESCHATOLOGY TO COSMOLOGY

First, however, we must attend to an entirely different approach: basing eschatology on, by reducing eschatology to, scientific cosmology. Perhaps by doing so, a dysteleological reading of cosmology will not be forced on us by science and at least some points of contact can be made with Christian eschatology.

In 1979 physicist Freeman Dyson published a groundbreaking paper that moved precisely in this direction in developing what he called “physical eschatology” (Dyson 1979). (For a nontechnical introduction, see Dyson 1988.) Working with an open universe that expands and cools forever (“freeze”), Dyson advanced an unprecedented argument: If life can be reduced to information processing and thus freed from its biological basis, then life can continue into the *infinite* future, conscious of its history, processing new experiences, storing them through new forms of *nonbiologically* based memory, and ultimately remolding the universe to its own purposes. A decade later, physicists Frank Tipler and John Barrow took up Dyson’s arguments but focused instead on the closed universe with its “fry” scenario for the far future (Barrow and Tipler 1986). Like Dyson, they too defined life reductively as information processing. Their crucial insight was that if the rate of processing could continually increase, an infinite amount of information could be processed (thus, they claimed, constituting “eternal life”) even in the finite time remaining before the closed universes “fries.”

The scientific details of these scenarios are fascinating, and to his immense credit, Dyson did undermine Weinberg’s dysteleology even while working with the same scientific cosmology. Moreover, Dyson, Tipler, and

Barrow all suggested various connections between physical cosmology and Christian eschatology somewhat in the spirit of Teilhard. Tipler has even claimed to provide a scientific basis for God, resurrection, and immortality via his “Omega point theory” (Tipler 1994). These moves should not go unacknowledged.

But what are the theological consequences of attempting to reduce Christian eschatology to physical cosmology? Drees (1990) and Hallberg (1988) pointed to theological strengths and weaknesses, while Polkinghorne (1989, 96), Barbour (1990, 151–2), Peacocke (1993, 345), Clayton (1997, 132–6), and Worthing (1996, Chapter 5) have criticized them on both theological and philosophical grounds. Tipler and Pannenberg have engaged in an extensive interaction (Pannenberg 1989; Tipler 1989) to which Drees (1997) and Russell (1989; 1994; 1997) have replied. Meanwhile Tipler’s scientific claims have been attacked aggressively by Choi (1995) and Stoeger and Ellis (1995).

On balance, I believe that “physical eschatology” does *not* hold out genuine promise for an eschatology of “new creation.” Nevertheless if we set aside the reductionist assumptions, theological oversimplifications, and scientific controversies that habitually accompany both Weinberg’s conclusions and the Dyson-Barrow-Tipler response to it, we may yet discover some vital clues from the immense complexity of scientific cosmology for our constructive attempt to relate it to Christian eschatology.

IS COSMOLOGY IRRELEVANT TO ESCHATOLOGY?

Before turning in this constructive direction, we must address a beguiling “pseudosolution” to the challenge: Perhaps cosmology is simply irrelevant to eschatology; if so, the conflict would be over. This view takes several forms.

1. *The irrelevance of “two separate worlds.”* The most obvious reason for irrelevancy is to switch entirely from dialog to a “two worlds” model of science and theology. If this model holds for every aspect of the relation between them, it obviously holds for cosmology and eschatology. The cost, however, is that we are stuck in the “dead end to progress” that the new approaches to theology and science are trying to avoid

2. *Science is merely provisional.* Even without switching from dialog to “two worlds” one can drift into it by exaggerating the fact that all scientific theories are provisional. There is wisdom to this view. Scientific theories embody philosophical assumptions that can be challenged, and all are open to more than one philosophical interpretation. They are eventually replaced by, or incorporated into, new and broader theories. In light of this, perhaps we need not be too concerned about the present conflict between eschatology and cosmology; instead, we should “wait and see.”

But there is reason to be cautious about relying too heavily on the provisionality of science. It is one thing to acknowledge the current

situation of conflict, as Pannenberg, Tanner, and Peters do, and while doing so, it may be of some relief to remember the provisionality of scientific theories. It is quite another thing to overcome the conflict categorically by drifting from provisionality into a “two worlds” cul-de-sac.

3. *A cosmology-free eschatology as the beatific vision.* There may be theological reasons for presupposing that cosmology is irrelevant to Christian eschatology even while maintaining that other scientific theories may be highly relevant to theology. This form of irrelevancy is doctrine-specific and avoids a “two worlds” model.

As we have already seen, Peacocke asserts that scientific cosmology cannot provide a basis for eschatology, but he actually goes further than this. Although he disagrees with scholars who reduce the resurrection of Jesus to the subjective experience of his disciples, he does not seem to connect the resurrection with the eschatological transformation of the universe. Instead, eschatology refers to “our movement towards and into God beginning *in the present*. . . . It transcends any literal sense of ‘the future.’ It is ‘beyond space and time within the very being of God.’ Our ultimate destiny is Dante’s ‘beatific vision’” (Peacocke 1993, 344–5), while resurrection in the “bodily” sense and, in turn, the redemption of nature through its transformation into the new creation, are set aside (Peacocke 1993, 126–8, esp. endnote 72). In taking this position, Peacocke avoids a conflict with cosmology, but the cost seems to be that the universe has no eschatological destiny; only humanity does.

4. *Spiritual immortality, not bodily resurrection: eschatology in process theology.* In process theology the consequent nature of God is continually enriched as God prehends every actual occasion in the world. In this way the “perpetual perishing” of the world in the concrescence of every occasion—an evil more profound than personal death—is overcome by God’s everlasting enjoyment of the world. Moreover, through God’s prehension of us, we obtain what Whitehead called “objective immortality,” God’s memory of us. The prehension of the world by God is the basis for process eschatology (Cobb and Griffin 1976, 118–24). In attempting to bring Whitehead’s views closer to Christian eschatology and its insistence on the importance of personal eternal life, some process theologians, such as Ian Barbour and Marjorie Suchocki, add to this “subjective immortality.” In this view, a person continues after death to be “a center of experience” within God (Barbour 1990, 241; Suchocki 1982, Chapters 11 and 17, esp. 114–5, 184–5; Suchocki 1988).

In my opinion these views can neither deal adequately with the bodily resurrection of Jesus *vis.* the empty tomb traditions nor respond to the challenge science poses about the far future. Here again, as with Peacocke, the scientific predictions seems *irrelevant*, only now for a philosophical, rather than a theological, reason: The underlying Whiteheadian metaphysics provides process theology a way to speak

of eschatology without regard to cosmology even though, ironically, Whiteheadian metaphysics is routinely cited by its followers as having been based in large measure on science (specifically on relativity and quantum mechanics).

TENTATIVE STEPS TOWARD AN ESCHATOLOGY THAT FACES THE CHALLENGE OF COSMOLOGY

In this section and the next, we briefly survey some of the most promising directions for dealing with an eschatology of God's transformation of the universe into the new creation in light of science.

Jürgen Moltmann offers a threefold concept of creation: "*creatio originalis—creatio continua—creatio nova*"; the latter leads to eschatology (Moltmann 1985, 208). He then delineates several crucial reasons for requiring that eschatology be cosmic in scope. One is to avoid a Gnostic reading of redemption that would be a redemption from, and not of, both body and world. An even stronger reason is given in his doctrine of the Trinity in which the Redeemer is the Creator. Thus, without redeeming all that God creates, God would contradict Godself. Finally, cosmic eschatology is essential because of Moltmann's theological anthropology:

Because there is no such thing as a soul separate from the body, and no humanity detached from nature . . . there is no redemption for human beings either without the redemption of nature. . . . Consequently it is impossible to conceive of any salvation for men and women without "a new heaven and a new earth." There can be no eternal life for human beings without the change in the cosmic conditions of life. (Moltmann 1996, 259–61)

Drawing on the writings of Teilhard de Chardin, Karl Rahner, and Moltmann, Denis Edwards views salvation as more than the forgiveness of sin. It involves God's transforming the universe as a whole and all that is within it, from clusters of galaxies to subatomic particles. Edwards then raises a crucial question: Will "every sparrow that falls" be redeemed (Lk. 12:6, Matt. 10:29) or merely representatives of every species? While Moltmann claims that every creature (i.e., "victim" of evolution) will find *individual* fulfillment in God, Edwards leaves this question open (Edwards 1995, esp. 145–52).

Ted Peters develops Pannenberg's theme of prolepsis in terms of what he calls "temporal holism" (Peters 1993, 168–73). For Peters the cosmos is both created and redeemed proleptically from the future by the Trinitarian God (Peters 1992, 134–9, 308–9). Prolepsis ties together *futurum*, the ordinary sense of future resulting from present causes, and *adventus*, the appearance of something absolutely new—namely, the kingdom of God and the renewal of creation. In this way the present creation will be consummated and transformed into the eschatological future that lies beyond, but that will include, this creation as a whole. Peters develops these

thoughts further in recent work where he lays out the power of the future to impact and change the present through what he calls “retroactive causality.” Here the immediate future frees the present from its determination from the past even while the proleptic future reaches back to manifest the new creation in the present moment (Peters 2006). Having said this, Peters, as we saw above, is ruthlessly honest about the challenge from science. Like Moltmann and Edwards, however, Peters does not offer a detailed response to it.

In his extended discussion of the doctrine of creation in *Systematic Theology*, Volume 2, Pannenberg suggests that some of the underlying ideas in the proposal of Barrow and Tipler might be used theologically without in any way “adopting” their model (Pannenberg 1994, 2:7/III/2, esp. 158–61). These ideas include the permanent role of intelligent life in the universe; the divine reality as both emerging at the final “omega point” and as present throughout the history of the universe; and the “constitutive function” eschatology has for the whole universe. In Volume 3, however, where the doctrine of eschatology is discussed in detail, little more is added (Pannenberg 1998, Chapter 15, esp. 3b, 586–90). Here Pannenberg states that Christian faith in the end of the world can neither be supported by nor in contradiction to scientific knowledge. He notes that the closed model, which is finite in space and time, is “undoubtedly more compatible with the biblical view of the world than that of a world that is infinite and imperishable.” In Volume 2, Pannenberg reports that scientists favor the open (i.e., flat) model but that new evidence might support the closed model (p. 158). In Volume 3, Pannenberg claims that scientific opinion “no longer upholds” the open model but “teaches” the closed model. In fact, however, the open model has been generally supported over the closed model since the late 1970s, particularly with the recent evidence that the expansion of the universe is accelerating. Since the theological ideas that Barrow and Tipler propose depend on the universe being closed, can they still be useful to Pannenberg if the universe is open?

Finally Pannenberg sharply distinguishes between the biblical expectation of an imminent end of the world and the scientific view of a “remote” end, and he concludes that they may not even refer to the same event. With this move Pannenberg seems to be drawing back from his otherwise more engaged dialogue with science. In essence, then, neither Edwards, Moltmann, Pannenberg, nor Peters offers a detailed response to the challenge from cosmology.

MORE DETAILED ESCHATOLOGICAL RESPONSES TO THE CHALLENGE OF COSMOLOGY

Among all those writing on eschatology today, John Polkinghorne offers the most promising insights for responding to the challenge of cosmology

(Polkinghorne 1994, Chapter 9; 2000; 2002). He too bases his eschatology of the transformation of the universe into the new creation by analogy with the bodily resurrection of Jesus Christ. To characterize an eschatology of new creation by transformation from the present, creation, Polkinghorne uses the term “creation *ex vetere*”: “The new is not a second creation *ex nihilo*, but it is a resurrected world created *ex vetere*. Involved in its coming to be must be both continuity and discontinuity, just as the Lord’s risen body bears the scars of the passion but is also transmuted and glorified” (Polkinghorne 1991, 102–3; 2000, 29–30). (Moltmann also uses this term, see Moltmann 1996, 265.) Polkinghorne then focuses on the element of continuity that will characterize the transformation of the universe into the new creation, since it is here that science can offer a partial perspective on these elements of continuity. He starts with such theories as special relativity, quantum mechanics, chaos theory, and thermodynamics and “distills” out of them some very general features of the universe that might be a clue to the new creation: relationality and holism, energy, pattern (form), and mathematics. There must also be a degree of continuity to preserve the individual identities of persons through the transformation. For Polkinghorne this is accomplished by God as one is remembered by God and reembodyed in the new creation.

Is it possible to move the dialog with science still further? In previous writings I have proposed that we should expand the usual methodology in theology and science to allow for their genuine interaction. Not only should theology critically incorporate the discoveries of science and their philosophical interpretation in theological reconstruction, but in addition such a reconstructed theology might offer either insights for future research programs in science or criteria by which to select among competing research programs. Of course, all such scientific research programs would have to be tested strictly by the scientific community and would presuppose methodological naturalism. I call this the Method of Creative Mutual Interaction (Russell 2008, Introduction, Chapter 10). In a recent work, I explored this interaction in detail, with particular attention to the problem of eschatology and cosmology that is the focus of this essay. I will return to it following (Russell 2012). Before proceeding, however, we must first deal explicitly with the challenge raised by a cosmic future of “freeze or fry” for an eschatological future of new creation. How are we to resolve this challenge?

My response is to recognize that the challenge is not strictly speaking from *science* but from the *philosophical assumptions* we routinely bring to science—namely, that the events that a well-winnowed scientific theory predicts must come to pass. Although *science* must be based on this assumption if it is to be falsifiable, it is quite possible *theologically* to accept both a very different assumption about the predictions of science and at the same time to accept what science explains about the past history

of the universe. The first step is deciding whether the laws of nature are descriptive or prescriptive, and a strong case can then be made that they are descriptive (or, equivalently, regulative). The next step is to claim on theological grounds that the processes of nature that science describes are the result of God's ongoing action as Creator and that their regularity is the result of God's faithfulness. Finally, God is free to act in radically new ways, not only in human history but also in the ongoing history of the universe. Because of this, we can claim that the scientific predictions are *right but inapplicable*, since God did act in a radically new way at Easter and will continue to act to bring about the new creation. In short, the future of the universe *would have been* what science predicts (i.e., "freeze" or "fry") had God *not* acted at Easter and *did God not continue* to act in the future (Russell 2008, Chapter 10). With this in place, we can move ahead to reconstruct eschatology in light of science and, hopefully, to suggest promising insights from such an eschatology for research programs in science. Clearly eschatology must work critically with science's description of the *past and present* of the universe as described by inflationary Big Bang cosmologies, evolutionary biology, and so on. This description might shed light on *elements of continuity* in the transformation of the universe. In particular, since our starting point is God's act to transform the universe into the new creation, it follows that God must have created the universe *such that it is transformable* by God's action. To put this even more crisply, God must have created the universe with precisely those conditions and characteristics that it needs as preconditions in order to be transformable by God's new act. Here, then, we can return to Polkinghorne's insight that science can be of immense help to the theological task of understanding something about that transformation if we can find a way to identify, with at least some probability, these needed *elements of continuity* in that transformation, including their preconditions in nature.

In a very recent work, I explored these elements of continuity in some detail. In *Time in Eternity: Pannenberg, Physics and Eschatology in Creative Mutual Interaction*, I start with Pannenberg's understanding of time, both now in the present creation and in the eschatological new creation, and its complex relation to the eternity of God. I then reconstruct his theology about eternity (and omnipresence) in light of fundamental theories in physics, particularly special relativity. In doing so, we face yet another serious challenge: relativity is routinely interpreted as supporting a timeless view of nature—the so-called "block universe." This view of time, if imported inadvertently into the theology of eternity, would be radically opposed to Pannenberg's understanding of eternity as neither timelessness nor simple flowing time. Instead, eternity for Pannenberg (as well as for other twentieth-century theological luminaries, including Barth, Moltmann, and Peters) is the source of creaturely time and its

ultimate grounding. Hence, in order to use relativity in reconstructing Pannenberg's theology, I must first propose a flowing time interpretation of relativity to combat its block universe interpretation. I also draw on the mathematics of Georg Cantor in analyzing the meaning of infinity in Pannenberg's discussion of eternity. Here I start with Pannenberg's use of Hegel's philosophical concept of infinity and then replace it with that of Cantor's mathematical concept, including his concept of the "transfinites" (which share both finite and infinite properties) and the "Absolute Infinite" (which Cantor relates to the theological concept of God). Finally, I use Pannenberg's reconstructed theology to suggest a variety of possibilities for the nature of physical time in our universe, including duration (or temporal thickness), the structure of duration as "copresence" (distinct events held together without a loss of their unique pasts and futures), and prolepsis (as suggestive of temporal branching in nature). I then identify a number of recent and current research programs in physics that might reflect these possibilities, including branching time and the causality of the immediate future in quantum mechanics. These, in turn, would reflect the preconditions in physics for the possibility of some minimal element of continuity between the present creation and its transformation into the eschatological new creation—while in no way forgetting the overwhelming elements of discontinuity in that transformation.

Continuing in this line, I would add that science might also shed light on which conditions and characteristics of the present creation we do *not* expect to be continued into the new creation, the "*elements of discontinuity*" between creation and new creation. These would include those physical processes that underlie such biological realities as disease, suffering, death, and extinction. At the level of physics, they could include the role of the second law of thermodynamics in the dissipation of closed physical systems (and yet noting its role in driving open physical systems towards greater complexity); the sheer fact that our experienced form of temporality is radically marred by the loss of the present into the past and the unavailability of the future in the present (i.e., some aspects—but not all—of flowing time); and the kind of ontological determinism of the past on the present (from efficient physical causes to genetic and neurocognitive factors) that seems to undercut genuine free will. My method is to start with the discontinuous aspects of creation that we expect will not be a part of the new creation (e.g., "natural evil"). I treat these as seemingly real but actually as epiphenomenal and ultimately transitory characteristics of creation compared to those characteristics of creation already in place that will play a crucial role in the new creation. In this way the challenge to a theology of creation raised by "natural evil" can be turned into a criterion of theory choice when reconstructing eschatology in light of science: only those proposed eschatologies will be considered as potentially acceptable

that directly address the presence of natural evil in this world and its eschatological elimination (Russell 2004; 2008, Chapters 8 and 10; 2012, Appendix to the Introduction).

A BRIEF RESPONSE TO KLAUS NÜRNBERGER'S COMMENTS ON MY WORK IN THIS ISSUE OF *ZYGON*

Before moving to my conclusions, on the invitation of Willem B. Drees, the editor of *Zygon*, I would like to make a brief response to Klaus Nürnberger's (2012) comments on my work in his paper. I find much that is attractive and deserving of further discussion in Nürnberger's paper. Here, however, I can only respond to a few of his comments regarding my work in hopes of clarifying certain points in my writings and some miscommunications between us.

First, Nürnberger points out that I often characterize the challenge from science to theology as actually going in both directions: Not only does scientific cosmology challenge an eschatology based on the bodily resurrection of Jesus, but such an eschatology also challenges scientific cosmology: If the eschatological future of the universe is to be God's New Creation understood as a transformation of this present universe, then scientific predictions such as the "freeze" scenario cannot come to pass. Nürnberger writes: "Russell assumes that theology and science are based on contradictory, yet equally valid metaphysical assumptions, one capable of questioning and impacting the other" (970). "[That is why] Russell can speak of a mutual challenge: science can question faith, but with the same validity faith can also question science" (971).

Nürnberger is correct in pointing out that I see the challenge between theology and science to be mutual, but this is *not* because I believe that science and theology are based on "contradictory . . . metaphysical assumptions." Indeed, they are *not* based on contradictory metaphysical assumptions, and this fact is pivotal to the success of the entire theology and science project over the past six decades—despite the fact that many atheist scientists, fundamentalist Christians, and ID supporters claim that they are. What I do assume, based on the writings of such scholars as Francisco Ayala, Ian Barbour, Philip Clayton, Nancey Murphy, Arthur Peacocke, John Polkinghorne, and numerous others, is that science is based on methodological naturalism and that it is metaphysically neutral. The mutual challenge does not, therefore, come from a *metaphysical* conflict between theology and science but from an *epistemic* conflict between the predictions of science and the NT hopes for, and vision of, the eschatological future of the universe. If the latter are not true, it is hard to see what meaning is left to Pauline Christian hope based on the general resurrection as making intelligible the claims about the resurrection of Jesus (1 Cor. 15:12–20).

Next, Nürnberger is concerned that my writings reflect what he calls a “prescientific worldview.” He suggests that “the Christian tradition got stuck in a prescientific worldview, whether biblical, Hellenistic, or medieval, and that this worldview has become progressively more obsolete as scientific insight advanced” (971). I, of course, agree with him in general. After all, the purpose and mission of CTNS, IRAS, and other leading organizations in theology and science is to move the theological conversation beyond a prescientific worldview and into the worldviews of contemporary scientific. Still, I would like to put a sharper point on what I take to be Nürnberger’s issue. To do so I turn to one of the founders of modern biblical criticism, Rudolf Bultmann.

Bultmann argued emphatically that we must demythologize the biblical tradition of its prescientific worldview. As I read Bultmann, this worldview included three parts: the cosmology of a three-storied universe, mental disorders as due to demon possession, and objective and miraculous divine action in nature in which God acts by suspending or violating the laws and causal closure of nature. While I agree with Bultmann that we should reject the first and second parts of the biblical worldview, I do not believe we need to reject objective divine action in nature because it need not be construed as miraculous in light of contemporary science. As an alternative, I believe we can construct a new account of objective divine action, based on contemporary science, which is nonmiraculous (or in my terms “noninterventionist”). We can only do so, however, if nature can be interpreted philosophically as ontologically open to divine action—that is, if we can identify scientific theories from physics and biology to the neurosciences whose philosophical interpretation points to ontological indeterminism in nature. I have developed this approach, which I represent by the acronym *NIODA* (noninterventionist objective divine action), in several writings (Russell 2008, Chapters 4–6). Note, however, *NIODA* is not directly relevant to the issues at stake in the relation of eschatology and cosmology, since these involve God’s changing the laws of nature, not their violation. In short, then, while I agree with Nürnberger that much of the prescientific worldview found in the Bible and Christian tradition must be set aside as obsolete, noninterventionist objective divine action need not be rejected.

Nürnberger rightly points out that scientists would insist that “the basic parameters and regularities underlying the current universe cannot be changed, suspended, or replaced” (975). I simply want to suggest that this is a philosophical assumption being made by scientists about science, whether they know it or not. It is not an intrinsic part of any particular scientific theory, such as quantum mechanics or general relativity.

Nürnberger is also concerned that if these parameters and regularities were changed, it would entail “not just a ‘transformable,’ but a completely new and different universe that is discontinuous with the one we know”

(975). Instead, I want to distinguish sharply between the transformation of this universe due to changes in at least some of its basic parameters and regularities (a creation *ex vetere* of the new out of the old), and a radical recreation of an entirely new universe (a second creation *ex nihilo*). Simply put, a transformed universe is not completely new and different from the present one. As Polkinghorne and I have stressed repeatedly, there are continuities as well as discontinuities involved in the concept of transformation whose original context is in the approach to the bodily resurrection of Jesus by a variety of New Testament scholars. A radical recreation would entirely lack such continuities, and that's why I do not espouse it.

Nürnbergger writes that "an eschatological vision is something totally different from a scientific prediction. At best, eschatology is a protest against the ambiguities of the real world, a tenacious insistence, against all appearances to the contrary, that the transcendent Source and Destiny of reality is benevolent and that this benevolence will ultimately triumph. . . . But these are the product of a reassured faith, rather than a quasi-futurological prediction" (977). I certainly agree with his eloquent point that eschatology is "a protest against the ambiguities of the real world" and an "insistence . . . that the transcendent Source and Destiny of reality is benevolent" and ultimately triumphant. But for this protest to be eschatology *at its best*, it must be one that includes our full humanity, our psychosomatic unity as persons in the world, and indeed that it must include entire realm of nature. If matter, created by God, really matters to God its creator, then the ultimate triumph we hope for cannot be merely an existentialist take on what is the core of being human (although it certainly includes that) but a full and transformed psychosomatic destiny for humanity—indeed, for all life in the universe—one that might include even the universe itself as God's creation. And in saying this I certainly do not believe I am proposing a "quasifuturological prediction." Instead, the vision for the eschatological future is about the "the future of the future," or, to use phrases such as those of Moltmann, Pannenberg, and Peters, it is about "*adventus*," the eschatological future, versus "*futurum*," the ordinary future predicted by science.

Finally, Nürnbergger asks, "Why did believers in biblical times come up with experientially counterintuitive and scientifically counterfactual propositions in the first place?" (978). Well, perhaps it was because they discovered that the tomb really was empty and they really did encounter the embodied Risen Lord.

CONCLUSIONS AND FUTURE RESEARCH

From Barth and Rahner to Moltmann, Pannenberg, and Peters, systematic theologians agree that Christian theology as a whole requires critical

attention to eschatology. Of its many forms today, the one I find most in line with the overarching Christian tradition starts with New Testament scholarship regarding the bodily resurrection of Jesus and its implications for the new creation as the transformation of our universe and it includes a direct response to the horror of biological and physical natural evil. Clearly the challenges raised by scientific cosmology to an eschatology of this form demand a careful and detailed response.

In my opinion we have now begun to engage this challenge in depth. In its most robust form the engagement should involve both the theological reconstruction of eschatology in light of science and the indication of directions for potential research in science from this new eschatological perspective on the universe. This engagement represents an instance of the method of creative mutual interaction between theology and science. The value of this interaction can only be assessed when, over time, its results have been carefully articulated by a variety of scholars with a diversity of theological and scientific interests and views and these results have then be compared with eschatologies which, for a variety of reasons, turn aside from the challenge of the natural sciences. It is my hope that the former eschatologies will produce a richness of vision for Christian faith and a compelling fruitfulness in their engagement with contemporary scientific culture. Despite the enormous task of scholarship in both theology and science demanded by them, such richness of vision and compelling fruitfulness in turn might well lead to a clear preference for the former over the latter.

NOTE

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