

FAR–FUTURE UNIVERSE: a mutual challenge between Physical Cosmology and Christian Eschatology

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The following short paper would like to deal with the topic of 2012 *Forum Junge Theologie* from the perspective of the dialogue between theology and science, where a major question continues to be whether both disciplines can be placed in a genuine position of *dialogue and interaction*. Focusing on the core question of methodology that lies at the heart of interdisciplinary studies American physicist and theologian Robert John Russell¹ developed an interactive methodological “bridge” to tackle what he considers the most serious challenge to constructive relations between theology and science: the challenge to Christian eschatology by the scientific predictions for the cosmic far future².

End-of-the-world scenarios: the “bleak scientific picture”

Physical cosmology deals with the fundamental questions about the origin and evolution of the universe *as a whole* (trying to describe the “history” of our universe from the origin to its far future). The Big Bang theory — based on Einstein’s theory of general relativity — is currently the leading model of physical cosmology. It states that some 14 billion years ago, the portion of the universe we can see today was concentrated in a few millimeters across. The universe was at the beginning extremely hot and dense, but it expanded quickly from this state into the vast and much cooler universe we currently inhabit. The rapid expansion caused the universe to become cooler, emptier

- 1 Robert John Russell is the Ian G. Barbour Professor of Theology and Science at the Graduate Theological Union (GTU), Berkeley, where he has taught since 1981. He is also the founder and director of the Center for Theology and the Natural Sciences of Berkeley (<http://www.ctns.org>).
- 2 Russell’s ongoing theological program is to undertake a reconstruction of Christian eschatology as “transformation of the universe” with theological concepts reformulated in light of contemporary science, and then to explore ways in which this revised eschatology leads to a revised philosophy of nature as it underlies science, to criteria of theory choice among current theories in science, and to the construction of new scientific research programs.

and gradually far more complex than the initial “plasma”, resulting in its *present continuously expanding state*.

Until the end of last century, there were two scenarios for the far future universe according to Big Bang cosmology:³ “freeze” or “fry”. Either the universe would collapse under its own weight one day, in a fiery “big crunch” (if the cosmic gravity is strong enough to slow the expansion to a stop, and then reverse it);⁴ or the galaxies, now flying outward from each other, would go on coasting outward forever, forever slowing but never stopping, while the cosmos would grow darker and darker, colder and colder (until the average temperature asymptotically approach the absolute zero, that means the *thermal-death*), as the stars gradually burned out.

Since 1998 there is a new apocalyptic scenario: the so-called “big rip”⁵. It is one scenario among them of far-future’s ones resulting from the discovery, by two teams of astronomers, that a mysterious force — called *dark energy* — seems to be wrenching the universe apart. Instead of slowing down from cosmic gravity, as cosmologists had presumed for one century, the galaxies started speeding up about five billion years ago. Recent astronomical measurements cannot rule out the possibility that in few billion years a mysterious force permeating *space-time* will be strong enough to blow everything apart, shred rocks, animals, molecules, and finally even atoms in a sort of cosmic self-annihilation.⁶

To date, nobody really knows what *dark energy* is,⁷ but it has become one of the central features of the universe, the question mark at the top of researchers’ list, undermining what physicists presumed they understood

3 For a short introduction to core issues Cf. Art. Future of the universe, in: Liddle, Andrew / Loveday, Jon (Ed.): *The Oxford Companion to Cosmology*, Oxford: Oxford University Press 2009, 126–127.

4 Cf. Art. Big crunch, in *The Oxford Companion to Cosmology*, 28–29.

5 Cf. Art. Big rip, in *The Oxford Companion to Cosmology*, 29.

6 Robert Caldwell, a Dartmouth physicist, described for the first time this apocalyptic possibility on 2003 in a paper written with Marc Kamionkowski and Nevin Weinberg, from the California Institute of Technology: The paper explores “the consequences that follow if the dark energy is phantom energy, in which the sum of the pressure and energy density is negative. The positive phantom-energy density becomes infinite in finite time, overcoming all other forms of matter, such that the gravitational repulsion rapidly brings our brief epoch of cosmic structure to a close. The phantom energy rips apart the Milky Way, solar system, Earth, and ultimately the molecules, atoms, nuclei, and nucleons of which we are composed, before the death of the Universe in a “big rip””. Cf. Caldwell, Robert R. / Kamionkowski, Marc / Weinberg, Nevin N.: Phantom Energy. Dark Energy with $w < -1$ Causes a Cosmic Doomsday, in: *Physical Review Letters* 91(2003), 071301.

7 The label “dark energy” for the substance or phenomenon responsible for the acceleration of the universe may be convenient, but does not by any means indicate that the mechanism is understood. For a useful overview Cf. Art. Dark energy, in *The Oxford Companion to Cosmology*, 86–89.

about space, time, gravity, and the future of the universe. Among the hypothesis proposed to explain the nature of *dark energy* one — the so-called *phantom energy* — could lead the universe to the “big rip”. In fact, while the density of the energy in Einstein’s cosmological model remains the same while the universe expands, according to this new approach the density of *phantom energy* would go up and up, eventually becoming infinite. Then, billions of years from now, when *phantom energy* would have increased its push and the cosmic expansion would have been accelerated, more and more galaxies would start to disappear from the sky at the point where their speeds would have reached the speed of light. But things would not stop there. Some billions of years from now, the *phantom force* will be strong enough to overcome gravity and to break up clusters of galaxies. After that the apocalypse will speed up. About 900 million years later, that means about 60 million years before the end, our own Milky Way galaxy will be torn apart. Three months before the rip, the solar system will fly apart. The Earth will explode when half an hour would be left on the cosmic clock. The last item of this doomsday agenda is the dissolution of atoms immediately before the Big Rip ends everything.

Here is the key question: can Christian Eschatology be seen as consistent with these scientific scenarios foreseeing the destruction of all—that-is, which is certainly not anything like the biblical and theological New Creation?

The “bodily” resurrection as prolepsis: the beginning of the end in historical time

The starting point of Russell’s proposal is the “bodily” interpretation of Jesus’ resurrection and its implication for eschatology. Just like Jesus’ body was transformed into the risen and glorified body, so the “matter” of this new environment “must come from the transformed matter of this world”⁸. Thus the

8 Russell, Robert J.: *Cosmology — Form Alpha to Omega. The Creative Mutual Interaction of Theology and Science* (Collected writings in Theology and Science 1982–2007), Minneapolis: Fortress Press 2008, 304. For previous Russell’s works concerning the same issue: Russell, Robert J.: *Eschatology and Physical Cosmology. A Preliminary Reflection*, in: Ellis, George F.R. (Ed.): *The Far Future. Eschatology from a Cosmic Perspective*. Philadelphia: Templeton Foundation Press 2002, 266–315; Russell, Robert J.: *Bodily Resurrection, Eschatology and Scientific Cosmology. The Mutual Interaction of Christian Theology and Science*, in: Peters, Ted / Russell, Robert J. / Welker, Michael (Ed.): *Resurrection. Theological and Scientific Assessment*, Grand Rapids: Eerdmans 2002, 3–30; Russell, Robert J.: *Sin, Salvation and Scientific Cosmology. Is Christian Eschatology credible today?*, in: Reid, Duncan / Worthing, Mark (Ed.): *Sin and Salvation*, Adelaide: ATF Press Australia 2003 (= The ATF Task of Theology Today Series 3); Russell, Robert J.: *Art. Cosmology and Eschatology*, in: Walls, Jerry L.: *The Oxford Handbook of Eschatology*, Oxford: Oxford University Press 2007.

New Creation would not be a replacement of the old creation, or a second and separate creation *ex-nihilo*. As John Polkinghorne states: “The first creation was *ex-nihilo* while the new creation will be *ex-vetere* (...); the new creation is the divine redemption of the old (...). This idea does not imply the abolition of the old but rather its transformation”⁹.

The idea is rooted in Karl Rahner’s assumption that the resurrection is the beginning of the end-times occurring in history. This gives to eschatology its *proleptic character*, a view shared by Russell and several other contemporary theologians working on Trinity and eschatology¹⁰:

“Jesus’ corporal humanity is a permanent part of the one world with its single dynamism (...). Consequently, Jesus’ resurrection is not only in the ideal order an ‘exemplary cause’ of the resurrection of all, but objectively is the beginning of the transfiguration of the world as an ontologically interconnected occurrence. In this beginning the destiny of the world is already begun. At all events it would in reality be different if Jesus were not risen”¹¹.

The bodily resurrection, for the scholars who pursue it, is the transformation of the total person of Jesus into a new form of existence. It is more than a mere “resuscitation” (such it was the raising of Lazarus), and it is also “more than a ‘miracle’ confined to person of Jesus and played out against the backdrop of a totally ordinary surrounding world”¹². This objective interpretation of the resurrection emphasizes elements both of continuity and discontinuity between Jesus of Nazareth and the risen Christ, and it includes at least a minimal element of the physical world in the overall meaning of the resurrection. It leads to an eschatology in which our universe “is to be transformed into the New Creation, the environment called the ‘new heaven and new earth’, and this New Creation was instantiated by God’s proleptic act at Easter”¹³.

It follows that God must have created our universe precisely with those conditions and characteristics that it needs as *preconditions* in order to be transformable by God’s ongoing creative action. Moreover, if the universe is to

9 Polkinghorne, John: *The faith of a physicist. Reflections of a Bottom-Up Thinker*, Minneapolis: Fortress Press, 1996, 167.

10 Theologians such as Wolfhart Pannenberg, Jürgen Moltmann and Ted Peters. Cf. Russell, Robert J.: *Time in Eternity. Pannenberg, Physics, and Eschatology in Creative Mutual Interaction*, Notre Dame (Indiana): University of Notre Dame Press 2012. According to Russell “the topic of ‘time and eternity’ is central to the relation between God and the world in two ways. First, it involves the notion of the divine eternity as the supratemporal source of creaturely time. Second, it involves the eternity of the eschatological New Creation beginning with the bodily resurrection of Jesus in relation to creaturely time”.

11 Rahner, Karl: *Art. Resurrection*, in: Rahner, Karl (Ed.): *Encyclopedia of Theology. A concise Sacramentum mundi*, London: Burns and Oats 1975 (Mumbai: St. Paulus 2004, 1441–1442). Cf. Russell, *Cosmology*, 285–291.

12 Russell, *Cosmology*, 298.

13 *Ibid.*

be transformed and not replaced, God must have created it precisely with those conditions and characteristics that will be part of the New Creation. In this perspective, science can be of immense help to the theological task in understanding something about that transformation of the universe if we can find a way to identify the so-called elements of “continuity”. But science might also shed light on the aspects of the present creation that we do not expect to find in the New Creation (the elements of “discontinuity” into an overall *healing* process).¹⁴

According to Russell’s thought, the bodily resurrection of Jesus and the eschatology of cosmological transformation is the “test case” (or *worst case*) for the relationship theology–science; the one which poses the most profound questions to theology if scientific cosmology is taken seriously.¹⁵ If one takes it into account, and if the scientific predictions are correct, than “the *parousia* will not just be ‘delayed’, but it will never happen”¹⁶. So, following Paul’s argument in 1 Corinthians 15, “since there will not be general resurrection, Christ has not been raised from the dead and our hope is in vain”¹⁷. But the challenge can also be seen in the opposite way: from theology to science. In fact, if it is true that Jesus has been raised “bodily” from the dead at Easter, then the general resurrection cannot be impossible and the future of our universe will be different from what scientific cosmology predicts.

Is there any way out as to this mutual challenge?

Science and Theology in Creative Mutual Interaction

Against competing claims for outright conflict or radical independence, Russell proposes a methodology to set science and theology in a positive — though asymmetrical — interaction.

His *Creative Mutual Interaction* is built upon two pillars: the *critical realism* of Ian Barbour, that claims for methodological analogy between science and theology;¹⁸ and Arthur Peacocke’s *epistemic holism* (or *epistemic emer-*

14 Cf. Russell, *Cosmology*, 308–309.

15 Russell notes: “Scholars who support the bodily resurrection of Jesus connect his resurrection with the ‘general resurrection’ at the end-of-time and the New Creation (...) but they tend to overlook the challenge from Cosmology. They view the New Creation as a transformation of the world as a whole and all that is in it; it is the return of the risen Christ to *this* world in order that *this* world be *transformed* into an eternal world. Curiously, the challenge raised by scientific cosmology to this claim is seldom inspected” (Russell, *Cosmology*, 302).

16 Russell, *Cosmology*, 306.

17 *Ibid.*, 22–23.

18 Cf. Barbour, Ian G.: *Religion and Science. Historical and Contemporary Issues*, New York: HarperCollins 1997, 77–161. Barbour’s *critical realism* is an alternative to three competing

gence), that places sciences and humanities, including theology, in a series of hierarchical levels which reflect the increasing complexity of the phenomena they are researching. It involves two claims about these levels: (1) lower levels place *constraints* on upper levels; but (2) upper levels cannot be reduced entirely to lower levels: some of the processes, properties, or laws, of one upper level are *emergent* in nature (against epistemic reductionism).¹⁹ This holistic view of epistemology requires to take the claims posed by science as a constraint, even while theology — placed at the top of the hierarchy — deploys new and emergent concepts and categories in its description of reality in light of science but transcending it. Cosmology — as a part of physics — lies at the bottom of the hierarchy, giving it the power of maximum constraint on theology. Therefore, according to Russell's perspective, the questions raised by cosmology must be taken thoroughly into account revising eschatology.

The epistemic holism safeguards science from any normative claims by theology. While any eschatology we might construct must be "scientific"²⁰ in its description of the *past history* of the universe, theological theories do not act as data for science, placing constraints on which theories can be constructed. The contingency and intelligibility of the universe — stated by the *ex-nihilo* doctrine of creation through the divine Word — means that divine

interpretations of scientific theories: (a) classical realism (scientific theories provide a "photographic" representation of the world); (b) instrumentalism (scientific theories are mere calculative devices), and (c) idealism (scientific theories depict reality as mental). Instead, "from a critical realist perspective, scientific theories yield partial, revisable, abstract, but referential knowledge of the world". *Critical realism* has continued to be defended, deployed and diversified widely in theology and science. A detailed overview in: Russell, Robert J.: Dialogue, Science and Theology, in: G. Tanzella-Nitti, Giuseppe / Larrey, Philip / Strumia, Alberto (Ed.): Interdisciplinary Encyclopedia of Religion and Science (<http://www.inters.org>).

- 19 Cf. Peacocke, Arthur R.: *Theology for a Scientific Age. Being and Becoming — Natural, Divine, and Human*, Minneapolis: Fortress Press 1993, 213–254. To counter *epistemic reductionism* and *reductive materialism* most scholars in theology and science argue that the academic disciplines form a non-reducible hierarchy, starting from physics at the bottom and moving upwards through chemistry, biology, physiology, the neurosciences, the behavioral, psychological and social sciences. The ordering of the hierarchy reflects the increasing complexity of the phenomena being studied; more importantly, it allows both for rules of constraint and genuine emergence. Peacocke divides the hierarchy into two dimensions: vertically it consists in four levels of increasing complexity (physical world, living organisms, the behavior of living organisms, and human culture) while horizontally it depicts systems ordered by part-to-whole hierarchies of structural and/or functional organization. Peacocke's analysis reflects the broad consensus of the scientific community (Cf. Russell, Dialogue, Science and Theology). The discussion of *epistemic holism* was taken up and developed further by Nancy Murphy, George Ellis and Philip Clayton.
- 20 It should not invoke God in its explanation of the (secondary) causes, processes and properties of nature.

and natural causalities are ontologically distinct; that genuine knowledge of it must be empirical, and that such knowledge can be represented by mathematics.²¹ However, theology can influence science as to the philosophical assumptions which underlie the scientific work or acting as sources of inspiration for individual scientists, or teams of scientists, stimulating creative insights in the “context of discovery” (the starting phase of a research program) or leading to “selection rules” between competing theories in physics.²²

The *direct contradiction* in which cosmology and eschatology of cosmological transformation seems to be *forced* is a challenge — as Russell notes — raised not technically from science but from

“a philosophical assumption which we routinely bring to science, namely that scientific predictions necessarily hold. This assumption is required in the practice of science since scientific theories must be falsifiable,²³ but it is not required in taking science into the theological conversation. Instead it is quite possible for a theologian to accept a very different philosophical assumption about the future predictions of science while accepting what science tells us about the past history of our universe”²⁴.

Recognized that we need not to make that strictly philosophical assumption, the following step is to decide whether the laws of nature are prescriptive or descriptive; and science alone cannot settle this matter.²⁵ On philosophical ground a strong case can be made that these laws are descriptive. The further step is to claim, on theological ground, that the processes of nature, which science describes in term of the laws of nature, are due ultimately to God’s ongoing action as Creator and not to nature acting entirely on its own. “The regularity of natural processes is ultimately the result of God’s faithfulness, even if the Creator bequeaths a significant degree of causal autonomy to nature”²⁶. Finally, if this holds, and if God is free to act in radically new ways not only in human history but also in the ongoing history of the universe, then

21 Russell separates as sharply as possible his proposal from movements such as “intelligent design” which criticize current theories in the physical and biological for not including divine agency in science.

22 Cf. Russell, *Cosmology*, 321–322.

23 Karl Popper takes *falsifiability* as his criterion for demarcating science from non-science: if a theory is incompatible with possible empirical observations it is scientific; a theory which is compatible with all such observations, is unscientific (Cf. Popper, Karl R.: *Logic of Scientific Discovery*, London: Hutchinson ²1968).

24 Russell, *Cosmology*, 24.

25 Cf. Stoeger, William R.: *Contemporary physics and the ontological status of the laws of nature*, in: Russell, Robert J. / Murphy, Nancy / Isham, Chris J. (Ed.): *Quantum Cosmology and the Laws of Nature*, Vatican City: Vatican observatory publications 1993, 209–234. Interesting observations on the ontological status of the laws of nature also in Klein, Étienne: *Discours sur l’origine de l’Univers*, Paris: Flammarion 2010.

26 Russell, *Cosmology*, 307.

“the future of the cosmos will not be what science predicts. Instead the cosmic far future will be based on a radical new kind of divine action which began with the resurrection of Jesus, and this new act of God cannot be reduced to, or explained by, the current laws of nature, that is, by God’s action in the past history of the universe”²⁷.

We could say that scientific end-of-the-world scenarios based on present creation might be applied if God did not act at Easter, and if God would not continue to act bringing forth the ongoing eschatological transformation of the universe. But if God acted at Easter and he is going on acting through a *proleptical* transformation of the universe, then the far future “will be based on a radically new kind of divine action that began with the resurrection of Jesus, and this new act of God cannot be reduced to, or explained by, the current laws of nature, that is, by God’s action in the past history of the universe”²⁸. The radically new divine act at Easter has begun the transformation of the universe into the New Creation without a second one *ex-nihilo*.

The resurrection as “first instantiation” of the New Creation

Drawing on his earlier studies on contingency in Pannenberg, Russell refers to this idea as the “first instantiation of a new law of nature”²⁹. Contingency is the key concept developed by Russell (and other scholars) as philosophical expression and mediation of a possible relation of consonance between Big Bang cosmology and the theology of creation *ex-nihilo*. On the one hand, we can move from contingency in philosophy to its role in theology.³⁰ On the other hand, philosophical contingency can be related in different ways to physical cosmology (in Big Bang theory for example to the scientific idea of an absolute beginning of time). The “first instant” contingency is a form of contingency reflected in the laws of nature, pointing to the fact that some — perhaps all — of these laws have a first instantiation.

27 Ibid.

28 Ibid.

29 Cf. Russell, *Cosmology*, 34–38. On the same topic cf. also Russell, Robert J.: *The Bodily Resurrection of Jesus as a First Instantiation of a New Law of the New Creation*. Wright’s Visionary New Paradigm in Dialogue with Physics and Cosmology, in: Haire, James / Ledger, Christine / Pickard, Stephen (Ed.): *From Resurrection to Return. Perspectives from theology and science on Christian eschatology*, Adelaide: ATF Press 2007.

30 According to Russell, “in both Roman Catholic and Protestant thought, the philosophical sense of the dependence of the finite world on God is taken up into the concept of *contingency*”. He quotes K. Rahner (“contingency is (...) the philosophical counterpart of the theological notion of createdness”) and P. Tillich (“Man is a creature. His being is contingent (...) and therefore man realizes that he is the prey of nonbeing”) in Russell, *Cosmology*, 38.

“First instance” contingency admits a mild or an aggressive interpretation.³¹ In the *mild way*, even if there were a moment of absolute origination of the universe, not all the laws of nature were manifest at that point. For example, in a cooling universe atoms first occur when electrons are finally able to combine stably with protons; hence chemical proprieties, and the rules they obey to, have a first instantiation. This concept is closely related, on philosophical ground, with the idea of *emergence* in nature, “the occurrence of new processes and properties of complex system which cannot be reduced to the processes or properties of simpler component systems”³². As Pannenberg observes, if new processes and properties begin in time (if they have a “first instance”), their meaning can be fully disclosed only at the end-of-time (*historicity*).

In the *aggressive way*, first instantiation offers a “nomological framework” to accept the appearance of something radically new like the resurrection of Jesus, “which represents a transformation of the present nature *beyond* what *emergence* refers to”³³. If emergence is an element of novelty or discontinuity, within a framework of predominant continuity, the aggressive first instantiation contingency consists primarily in discontinuity with a small element of continuity. This aggressive first instantiation contingency

“plays a crucial role in Pannenberg’s argument for the historicity of the resurrection; for his claim that the meaning of contingent processes which begin with a first instance in nature will only be fully clear at the end of history and in his conclusion that the presence of such processes in the universe give it a historical character”³⁴.

Russell’s “bodily” interpretation of the resurrection points to a radical transformation of the whole of nature: “It is the transformation of the background conditions of space, time, matter and causality and with this a permanent change in at least most of the present laws of nature”³⁵. So he considers the bodily resurrection as the “first instance” of a new form of nature, the first instance of a general, regular phenomenon that “cannot be reduced to, or explained by, the current laws of nature”: the general resurrection from the dead and everlasting life with God in the New Creation.

31 Cf. Russell, *Cosmology*, 37.

32 Russell, *Cosmology*, 37.

33 *Ibid.*

34 *Ibid.*, 37–38.

35 *Ibid.*, 309.