Eschatology and Scientific Cosmology: From Conflict to Interaction

The move to a kenotic response to natural theodicy offers a promising road to pursue in future research and could lead to a reconstructing of eschatology which gives intelligibility and credibility to Christian hope in light of scientific cosmology.

Tonight's lecture is part of a much larger research project with which I am currently engaged.[1] The general goal is to advance the field of theology and science by placing them in a mutual and creative interactive process in which each benefits from the insights and discoveries of the other while respecting the differences between them. A secondary goal is to construct ever stronger responses to those voices which claim that theology and science are in total conflict or those which claim that they are in total isolation. The specific goal, however, is to advance the field by moving directly to what I see as its most challenging problem: the relation between Christian eschatology, with its commitment to the future transformation of the universe by God into the 'new creation' based on the bodily resurrection of Jesus at Easter, and physical cosmology, with its prognosis that the future of the universe is endless expansion and cooling, and with it the eventual and irrevocable extinction of all life in the universe. In my view, if Christian theology cannot make genuine headway on this problem, everything else we do is, ultimately, biding time

until the cognitive claims of theology either collapse into their own self-referential isolation, or are overturned by the increasing attacks of atheism, or abandoned by parishioners searching for a credible and intelligible faith.

Atheists, of course, have already claimed a unilateral victory in their use of science to overturn Christianity, but in my opinion the claim is highly premature. The claim is based on a variety of arguments: First, they argue that methodological naturalism, the philosophical position on which natural science is based, necessarily leads to metaphysical naturalism, a philosophical position on which atheism can be based readily. A variety of scholars have shown this claim to be vapid, and I will not focus on it here—except to point out how one approach to theodicy—that 'epistemic distance' is needed if moral growth is to be possible—also entails that the world must be such that methodological naturalism, and thus science, is possible *for theological reasons*. The second and third claims draw directly from science itself. In the

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field of biological evolution, voices from Jacques Monod to Richard Dawkins and Daniel Dennett have announced that 'blind chance' at the heart of evolution contradicts faith in the Biblical God who interacts immanently with the world to create life, leaving at most a pale deism in which God created the universe at the beginning and then abandoned it. Meanwhile Stephen Hawking and Carl Sagan claim to have ruled out even deism since in the newest inflationary and quantum cosmologies that have replaced standard Big Bang cosmology, there is no beginning point, no "t=0", and therefore "nothing left for God to do."

It is now over 50 years since the pioneering work of Ian G. Barbour launched the present epoch in theology and science to its now international and interfaith scope. Numerous—and I believe convincing—responses have been given to the Monod/Dawkins challenge from evolution and equally convincing responses to the Hawking/Sagan challenge from cosmology. The argument is that God not only creates and sustains the universe *ex nihilo*, including its regularities described by science as the "laws of nature," but that God continuously acts in, with, under and through (to use Arthur Peacocke's memorable phrase) the very processes of evolutionary biology. Spelling out the meaning of God's real and ongoing action within the processes of nature in light of the natural sciences has been the subject of a variety of papers in the decade-long CTNS/Vatican Observatory series of conferences and publications. I call this project "non-interventionist objective divine action" (NIODA).

The subject of this lecture, however—the challenge of scientific cosmology to a resurrection-based eschatology—has been scarcely discussed, with John Polkinghorne's writings being the rare exception. Nevertheless, it is my hope to show that a variety of areas in Christian theology lead inevitably to just such a challenge and make it finally unavoidable.

One such area is recent work in New Testament scholarship which leads directly from its central focus on the bodily resurrection of Jesus to an eschatology of transformation in which the present creation will become the 'new heaven and new earth' by God's radical and ongoing action begun at Easter and continuing into the future. Another area is work on the doctrine of the Triune God, where God's being as Trinity is ultimately an eschatological reality. A third area is work in eschatology per se, where little attention has been given to cosmic scenarios. Perhaps the most challenging area, however, is evolutionary biology with its posing of a seemingly insurmountable theodicy—a fact not unnoticed by atheists. I believe it is the reality of suffering, disease, death and extinction and their constitutive role in the evolution of life, and God's action within the processes of evolution as continuous Creation—far more than the role of chance or the undermining of an historical 'Fall' (recall that Schleiermacher wrote decades before Darwin)—that make evolution into a genuine challenge to Christian theology. Indeed, the more we succeed in demonstrating the credibility of claiming that God really does act in time through the evolutionary and physical processes of nature (project NIODA) the more we raise the challenge of theodicy: is God then responsible for the resulting natural evil? What I hope to suggest, in at least preliminary form here, is that the most promising response is to turn directly to 'new creation' eschatology—we are irrevocably committed to facing and responding to the challenge of physical cosmology.

My aim in tackling this challenge is not only to show that a constructive response can be given regarding eschatology, but that this challenge represents a crucial opportunity to show that there can be genuine insight coming 'back from' eschatology to theoretical research in science—and thus that theology and science can be in a relation of what I call "mutual and creative interaction." A demonstration that Christian theology can be a

welcomed partner to the natural sciences could signal a new era in theology and science and a truly robust rebuttal to the attempt by atheists like Dawkins and Hawking to coopt science in support of atheism. Moreover, by showing by a 'worked example' that the insights theology offers to science would be completely consistent with the underlying premise of methodological naturalism on which the natural sciences are based would go a long ways in defusing attempts such as Intelligent Design to claim that scientific methodology — and not just neo-Darwinist evolutionary theory — must be changed to include agency in evolution.

This lecture is part of a much larger, book length, research project. Some of the work on the resurrection of Jesus and an initial set of 'guidelines' for engaging eschatology and cosmology have previously been published.[2] A more detailed study of evolution and theodicy and the bulk of the material on eschatology and cosmology are still being developed. I am grateful, once again, for this splendid opportunity to share some of my most recent work on these themes in the context of CTI and the Witherspoon Lectureship. I eagerly welcome any responses to this material.

Although New Testament scholars and contemporary theologians hold a diversity of views regarding the resurrection of Jesus, they can be divided roughly into what I will call the "subjective" and "objective" interpretations.

According to the subjective interpretation, the resurrection of Jesus is only a way of speaking about the experiences of the first disciples. Although they described the resurrection as having happened to Jesus after his death and burial, it is in fact not about purported events in the new life given to Jesus by God but merely about the experience of renewed faith given the disciples. According to Willie Marxsen, "(a)ll the evangelists want to show is that the activity of Jesus goes on...They express this in pictorial terms. But what they mean to say is simply: 'We have come to believe.'"[3] Rudolf Bultmann was one of the most prominent

defenders of the subjective interpretation in the 20th century. Others include John Dominic Crossan, John Hick, Gordon Kaufman, Hans Küng, Sallie McFague, Norman Perrin and Rosemary Radford Ruether.

According to the objective interpretation, something actually happened to Jesus of Nazareth after his crucifixion, death and burial: God raised Jesus from the dead, he lives forever with God, and he is present to us in our lives and communities. Hence what happened to Jesus in the resurrection cannot be reduced entirely to the experiences of the disciples as reported in the appearances and the empty tomb traditions. According to Raymond Brown, "(o)ur generation must be obedient ... to what God has chosen to do in Jesus; and we cannot impose on that picture what we think God should have done."[4] Karl Barth was a prominent defender of the objectivist interpretation. Others today include Gerald O'Collins, William Lane Craig, Stephen Davis, Wolfhart Pannenberg, Phem Perkins, Ted Peters, Janet Martin Soskice, Sandra Schneiders, Richard Swinburne and N. T. Wright.

The objective interpretation, in turn, emphasizes elements of continuity and discontinuity between Jesus of Nazareth and the risen Jesus, holding these in tension by such terms as "transformation," "transfiguration," or "identity-in-transformation."[5] While rejecting anything that reduces resurrection to mere resuscitation, most scholars assert that there is at least a minimal and irreducible element of continuity in all aspects of the person of Jesus—material as well as mental—between Jesus of Nazareth and the risen Lord even while there is radical discontinuity between them. I will call this view "bodily resurrection" to emphasize its inclusion of physical/material continuity. In contrast to this, a few scholars[6] support what can be called "personal resurrection". Here the resurrection of Jesus includes personal and spiritual continuity, but not (or not necessarily) physical and material continuity. Thus, while the appearances are essential components of both

views, the empty tomb traditions are also essential to the bodily resurrection approach while supporters of personal resurrection can be agnostic towards the empty tomb traditions or even claim that Jesus' body decayed in the grave like any other body.[7]

Finally, most scholars who support the bodily resurrection of Jesus, and with it the empty tomb traditions, connect his resurrection with the general resurrection at the end of time and the coming of a 'new creation'. By analogy with the resurrection, God will bring about the new creation through a radical transformation of the world as a whole and all that is in it. Thus the new creation will be both continuous and discontinuous with the present world, and, as with the resurrection of Jesus, the elements of continuity include something of the physical/material character of this world.

In this lecture I will assume the bodily resurrection approach and thus the eschatological transformation of the universe by God into the new creation. It is this position which runs into the greatest challenge from science. Recall that, according to Big Bang cosmology,[8] there are two scenarios for its far future: freeze or fry. Freeze: It will expand forever and continue to cool from its present temperature (about 2.7^0K), asymptotically approaching absolute zero. Fry: It will expand to a maximum size in a few hundred billion years, then re-collapse to an arbitrarily small size and unendingly higher temperatures, somewhat like a mirror image of its past expansion.[9]

What about the future of life in the universe? It turns out that the overall picture is bleak, regardless of whether it is open or closed (i.e., freeze or fry). According to the standard scenario,[10] in 5 billion years, the sun will become a red giant, engulfing the orbit of the earth and Mars, and eventually becoming a white dwarf. In 40-50 billion years, star formation will have ended in our galaxy. In 10^{12} years, all massive stars will have become neutron stars or black holes.[11] In 10^{19} years, dead stars near the galactic edge will

drift off into intergalactic space, and stars near the center will collapse together forming a massive black hole. In 10^{31} years, protons and neutrons will decay into positrons, electrons, neutrinos and photons. In 10^{34} years, dead planets, black dwarfs and neutron stars will disappear, their mass completely converted into energy, leaving only black holes, electron-positron plasma and radiation, and all carbon-based life-forms will be extinct. Beyond this, solar mass, galactic mass, and finally supercluster mass black holes will evaporate by Hawking radiation. The upshot is clear: According to John Barrow and Frank Tipler, "proton decay spells ultimate doom for … *Homo sapiens* and all forms of life constructed of atoms..."[12]

Clearly, then, the bodily resurrection approach, and entailed by it the eschatological transformation of the universe into the new creation, poses an extraordinarily powerful "test case" for the claim that theology and science can avoid conflict and be in a relationship of creative mutual interaction. Even today, few scholars have taken this question seriously. In my view, John Polkinghorne's response offers the most valuable point of departure.[13] I will return to his work in the final part of this lecture.

Life is filled with beauty, joy, creativity, hope and peace. From an azure sky above a Tahitian atoll, whose choral reefs team with abundant multi-colored fish and plants, to the craggy Rocky Mountains and the soaring Swiss Alps, from the taste of delectable food to the ecstasy of sexual intercourse, from the glorious photos of stars being born in deep space to the astonishment at the birth of one's child, life is, as the Priestly account proclaims, "very good." But life is also torn by the pain of hunger, cold, bodily wounds and mental illness, threatened by hurricanes, drought and earthquakes, vulnerable to bacterial and genetic diseases, a fierce combat zone in the Caribbean tropics and the African savannah. Most living creatures are caught up in the endless cycles of predation that compose the food chain, and most animals are

fated to an agonizing death.

The Bible is striking, compared to the views of its neighboring cultures of Greece and Babylon, in bringing both sides of life under the rubric of radical monotheism: God as the creator of the world, though working even through the tragedies of life, is the source of all that is and, ultimately, all that is is good. Suffering, disease, and death are the universal consequences of an inestimably tragic and singular event, the Fall. Yet they will be removed in the coming Reign of God when all living creatures are restored to their original, right and harmonious relations (Isaiah 11:1-9) and, even more so, when they will be transformed into creatures of everlasting life in the New Creation (Rev. 21-22:5). This historical/theological explanation of the two sides of life as *created* good and *consequentially* evil is severely challenged by neo-Darwinian evolution, where adaptation by natural selection, and with it death and extinction, are integral to evolution and thus *constitutive* of life. This paper focuses on the 'underside' of the picture of life on earth where "natural evil" (suffering, disease, death, and extinction) raise the immense challenge of "natural" or "evolutionary" theodicy: how can we believe in the goodness and power of the God who creates life through the very processes of evolution which constitutively involve natural evil? This challenge is one which believers must address as we struggle to understand our faith in God, as we watch friends turn away from faith because of natural evil, and as we attempt to respond to the atheistic challenge based on natural evil.[14]

Before turning to theodicy, it is important to recall that evolutionary biology has been used repeatedly by atheists to challenge Christian faith and to support a dysteleological metaphysics of nature. The typical charge is that "blind chance" in evolution makes God's purposeful action as the Creator of life impossible, or more simply that evolution leads inevitably to atheism—or at most to a pale deism. In the well-known words of Jacques Monod,

"...chance *alone* is at the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, (lies) at the very root of the stupendous edifice of evolution...." And so Monod concludes that "the ancient covenant is in pieces; man [*sic*] at last knows that he is alone in the unfeeling immensity of the universe out of which he emerged only by chance."[15]

As early as 1979, Arthur Peacocke[16] offered a bracing response to this charge. He argued that the initial potentialities built into the universe by God are actualized in time through chance, so that chance, rather than being inimical to God, is God's way of creating life. More generally, God as the transcendent Creator brings the world into being and sustains it in being out of nothing (*creatio ex nihilo*) and God as the immanent Creator acts "in, with, under and through" the evolutionary processes of the world in a process of continuous creation (*creatio continua*). Indeed what science takes to be the "laws of nature" are our human record of the faithful and regular underlying action of God in creating a world in which creatures with free will and moral capacity can enter into covenant with God. This view, frequently termed "theistic evolution," is widely shared in varying forms by scholars in "theology and science".

An enduring problem for this approach is that it could amount to little more than what I have termed "statistical deism": If "chance" refers merely to our lack of knowledge of the underlying natural causes which deterministicly produce apparently chance events, then the phrase "chance and law" really amounts to "(unknown) law and (known) law", and God's action amounts to little more than the realization in time of potentials and possibilities written into the universe at its creation.

What is needed if theistic evolution is to flourish is an account of God's *real* and *ongoing* action within the processes of nature that meets three stringent criteria: 1) God's acts are objective and specific. 2) God's acts are hidden to science. 3) God's action is

non-interventionist, that is God acts not by suspending or breaking into the processes of nature but by acting in, with and through them—indeed God created them this way, such that non-interventionist divine action and human free will are possible. "Non-interventionist objective divine action"[17] offers to deliver on the 'promissory note' of theistic evolution and in the process to undercut even further the atheistic attempt to co-op evolution.

There are at least four ways to render non-interventionist divine action in light of science. Top-down (or whole-part) causality involving God's relation to the mind/brain problem and God's relation to the universe-as-a-whole (cf., Arthur Peacocke); lateral amplification, involving God's action in relation to chaotic processes in the macroscopic world (cf., John Polkinghorne); bottom-up causality involving God's action in relation to quantum processes in the microscopic world (cf. Nancey Murphy, George Ellis, Tom Tracy); a process philosophy - based discussion of divine action at every level in nature (cf. Ian Barbour). Eventually these approaches should be combined into a single more complex approach.

That being said, however, there is an even more compelling argument for an atheistic interpretation of evolution than the appeal to "blind chance", and that is natural theodicy: God's apparent creation of, complicity in, or at least permission given to suffering in nature. From Charles Darwin to Richard Dawkins, the sheer horror so frequent in the biological world has seemed to make Christianity unintelligible and even offensive. As Darwin wrote in a letter to Asa Gray, "I cannot persuade myself that a beneficent and omnipotent God would have designedly created the Ichneumonidae with the express intention of their feeding within the living bodies of Caterpillars."[18] More recently, Dawkins has pointed to the predator/prey cycle of cheetahs and antelopes to conclude, not that God is evil but that there simply is no God at all: "The universe we observe has precisely the properties we

should expect if there is, at bottom, no design, no purpose, no evil and no good, nothing but blind, pitiless indifference."[19]

What I want to acknowledge and underscore at the outset is that theistic evolution in the form of non-interventionist divine action makes the problem of natural theodicy more egregious than it would have been in earlier, 'statistical deistic', version of theistic evolution. If one chooses to move forward along the trajectory of theistic evolution by the strategy of non-interventionist divine action, there is simply no compelling way to avoid this problem.

Before tackling the problem in detail, we should look briefly at the view that actually does try to avoid the problem: Since what we call natural evil is just a normal part of biological evolution, 'natural theodicy' is a non-issue. Pain, suffering, disease, death, and extinction are not the unnecessary but tragic *consequences* of the Fall and original sin but are instead necessary and unremarkable facts of nature *constitutive* of life. Pain and suffering go hand in hand with sentience, and the death of organisms and the extinction of species are built into, and necessary for, the processes by which life evolves. Thus what we take, erroneously, to be natural evil is no more in need of theological attention than other biological features that reflect the way evolution works. I call this view 'theodicy lite'.

In response, I agree, of course, with the shift from a consequentialist to a constitutive understanding of natural evil, but I do not agree that this means that natural evil is theologically irrelevant. A crucial reason for me comes from the New Testament narratives of the healing ministry of Jesus. These narratives combine both physical healing and the raising of the dead with the forgiveness of sins. Thus they link the realm of natural evil (i.e., disease, death) with the realm of moral evil (i.e., sin) and the salvation offered by the ministry and resurrection of Jesus is meant for both. It would be hard to affirm the theological significance of

moral evil while dismissing the theological significance of natural evil.

Thus while rejecting the biblical framework in which natural evil is the result of moral evil (i.e., the Fall) we must not reject the theological question raised by natural evil, both in the context of humanity and in all of the evolution of life with which we share in it. The way forward, then, will take us along a more complex path.

Christian theology includes a variety of theodicies. For the purposes of this brief paper I will employ John Hick's analysis of this variety as falling within two broad types stemming from the writings of Augustine and Schleiermacher.[20]

According to Augustine[21], both moral and natural evil are ultimately the result of free rational beings who sin: they willfully turn from God as the highest good toward a lesser good. Augustine avoids Manichaeism by affirming the goodness of all that God creates. Instead of being a part of creation as such, sin began with the premundane, cosmic fall of the angels. It continued with Adam and Eve who, though created 'very good' by God, did of their own free will chose creaturely goods over God. The resulting corruption or bondage of the will is transmitted sexually from generation to generation to all humanity from its common human origin in Adam and Eve. On the one hand, then, human beings still have free will, and are thus responsible for, and deserve punishment for, their actions by God. On the other hand, though in Eden it had been possible not to sin ('*posse non peccare*'), in human history free will is corrupted by the Fall and, contrary to Pelagianism, without God's predestination of election through grace it is not possible not to sin ('*non posse non peccare*').

Augustine embedded his 'free-will defense' in a complex philosophical structure. Drawing on a Neo-Platonic understanding of the plenitude of creation Augustine argued for a multitude of grades of creatures of relative value and, invoking an overarching

aesthetic in which the world *as a whole* is good, he taught that things which seem evil to our finite understanding may be means to bring about a justifiable end. The crucial assertion is that since all things are created good by God, nothing that exists is evil in and of itself. These themes underlay Barth's claim that evil only exists in so far as God says "No!" to it, Tillich's conceptualization of sin as "existential distortion" and as the "structure of destruction," and Austin Farrer's suggestion that, although the plenitude of being leads to conflict between species, the world would be worse without such plenitude.

Can the traditional Augustinian theodicy be intelligible and illuminating to contemporary theology as it wrestles with biological evolution? At first the answer might appear to be "no" since it seems too closely tied to the now abandoned Biblical depiction of the Fall as an actual event in the past. However, in recent work I have explored a reformulation of the traditional Augustinian theodicy based on the work of Reinhold Niebuhr which can, in fact, be further reframed to address the problem of natural evil in an evolutionary context—although with mixed conclusions, as we shall see.

The first task is to divest the Augustinian theodicy of its 'creation / fall' framework by uncovering its underlying philosophical argument. In his Gifford Lectures,[22] Niebuhr claimed to do this by viewing sin as unnecessary but inevitable: against the Manichaen move to ontologize evil, sin is seen as a contingent fact of the human condition and not a part of our nature. Yet, against the Pelagian tendency towards self-reliance in the face of sin, Niebuhr's formula stresses that we cannot avoid sinning; without the grace of God it is inevitable.

Next, in order to move our discussion closer to the sciences, in previous writings I have suggested that the underlying logical structure of Niebuhr's claim can be described by the philosophi-

cal idea of a "universal contingent". By this I mean that which is ontologically contingent and yet which occurs universally.[23] The task then is to search for examples of a "universal contingent" in science.

A prime example can be found in the thermodynamical processes which underlie and make possible the evolution of life on earth. Thermodynamics is the study of energy exchanges in physical systems. Here entropy stands for a measure of the available energy or of the (dis)order of a system. According to the famous second law of classical thermodynamics, the entropy of a 'closed' system increases inevitably to a maximum. In 20th century, non-linear, non-equilibrium thermodynamics, however, when a closed system contains 'open' subsystems, these subsystems can spontaneously move to greater degrees of order by exhausting entropy to their environment - a process which Ilya Prigogine referred to as "order out of chaos." An example is the earth-sun system: as a whole, its entropy increases in time, but the energy provided by sunlight makes possible the increase in the physical and biological complexity of systems on earth and thus their decrease in entropy.

In essence, without thermodynamics, *which applies universally* to all physical and thus all biological systems, the evolution of life on earth would have been impossible. Yet although thermodynamics applies to all physical systems, we cannot predict whether a given open system will spontaneously fluctuate towards more complexity or dissipate and decay. Thus the advancement to increased complexity in open systems is entirely *contingent* on factors and processes beyond the limitations of these systems, such as natural selection. Non-linear, non-equilibrium thermodynamics thus carries both of the characteristics underlying my interpretation of Niebuhr's reformulation of Augustine's argument about the nature of sin: universality and contingency.

But there is a second way in which thermodynamics is crucial

to our analysis of natural evil, since it underlies on those processes in physics and biology which we deem to be good. In fact, as I stated above, since thermodynamics is part of what makes the evolution of life possible, it also bears on Augustine's understanding of the goodness of creation. Thus thermodynamics is fundamentally 'bivalent': it underlies both what we call natural evil and what we can call natural goodness!

Another important aspect of thermodynamics for our analysis is 'non-ontological' status of entropy: Entropy is not material, and it is not even a property of matter. Instead it is a 'property of a property' of matter. The standard ontology of classical physics is that the universe is made of matter with properties such as mass and energy. Entropy can be thought of as a measure of the amount of available energy in a system or, more precisely, as a measure of the amount of available energy lost in a given physical process. Thus it is not energy per se, but a derivative of it. So the ontology here starts with matter which has properties such as mass and energy, and changes in energy can be measured in terms of a 'property of a property' called entropy.

Several conclusions follow for us. 1) First, lying below and foreshadowing the problem of sin in human life are physical and biological processes which are suggestive of the underlying logical structure of sin, i.e. universality and contingency. Of course natural evil is much less complex than moral evil, but nature is not wholly devoid of the conditions which make evil eventually possible in humankind. Instead natural evil dates back long before the evolution of humanity. 2) Entropy, like evil, is not 'real', with an ontology of its own. It is not a thing, but a 'property of a property' of matter. Its lack on independent ontological status is similar to the lack of ontological status given evil by the Augustinian tradition and reflected, as we saw above, in Barth's treatment of evil as existing only in so far as God says "No!" to it. It seems to be a precursor in nature to Tillich's description of evil

as the "structure of destruction." 3) Finally, although thermodynamics makes possible the biological processes which we call natural evil (suffering, disease, death, extinction, etc.), here the *dissimilarity* between evil and entropy shows itself most fully: Without thermodynamics the processes we call *good* would not be possible either: health, exercise, growth, the pleasure of eating, communicating, sexual reproduction, and so on. Without thermodynamics the evolution of more complex species with capacities for sentience and, in humans at least, self-consciousness and with it rationality and the capacity for moral goodness *and* evil, would not have been possible. *So thermodynamics displays a fundamental bivalence: it underlies what we mean theologically by speaking of God's creation as good and yet taking with radical seriousness natural evil*.

We have found, then, that the Augustinian theodicy, stripped of the 'Fall' scenario, finds preconditions and pre-figurations in the evolutionary processes of life on earth and on the physical processes which underlie them. But this, in turn, leads to a truly profound challenge to the anti-Manichaen commitment of the Augustinian theodicy: Christians believe that God created the universe as a whole, bequeathing it integrity and natural efficacy which we describe by the laws of physics and thus thermodynamics. Thus if we extend the Augustinian/Niebuhrian free will theodicy beyond biology and physics to cosmology, the challenge of natural theodicy looms much larger: now we are led to ask why God choose to create *this* universe with *these* laws of physics knowing that they would not only make neo-Darwinian evolution possible, and with it the sweep of natural evil in the biological realm, but that they would also contribute to *natural evil at the level of physics*—and thus to natural evil *throughout the universe*.

From this perspective, then, it appears that the Augustinian/Niebuhrian theodicy faces tremendous, and perhaps overwhelming, problems when it is extended to beyond biology

and physics to cosmology. These problems do not arise because it is tied to a mythical "fall"—which it clearly is not—nor because it views death as a consequence of sin instead of as constitutive of life—which it clearly does not. Instead this extension of theodicy to include cosmology leads to the recognition that underlying human, moral evil are forms of natural evil which, in an implicitly Manichaen way, characterize *the universe as a whole*. This fundamental problem which arises through Niebuhr's reformulation of the Augustinian theodicy points, in my opinion, to the need to construct a response to theodicy not just within the theology of creation and its interpretation of the universe as we know it through science, but within the theology of redemption and eschatology when the goodness of God's creation will be fully achieved eschatologically in God's transforming of creation into the new creation.

A second theodicy is available, one in which moral evil is an inevitable factor in a world created for the possibility of genuine moral development. Its roots lie in the work of the early 19th century theologian, Friedrich Schleiermacher, who provided a massive reformulation of original perfection and original sin in a developmental / proto evolutionary framework.[24] Let us explore this theodicy, as we did with that of Augustine, to see what it has to say to our problem of natural evil.

The *original perfection of the world* consists in its being such that God's purposes can be achieved in and through natural processes. In particular, the world is such that our experience of our relative dependence on the world can lead to our experience of our absolute dependence on God as the source of all that is. The *original righteousness of humankind* consists in our capacity for religious experience both as the personal experience of individuals and as communicated through culture.[25] *Sin* consists in the obstruction of our awareness of God due to our dependence on the world. It is virtually inevitable because we are 'sentient ani-

mals' embedded in the world as physical and biological creatures. Yet sin is not necessary, since in Jesus the development of his consciousness of God was unobstructed: i.e., he was 'sinless'. Thus we are still personally responsible for our sins. Finally, *natural evil* does not arise from sin; instead it is part of the prehuman environment. Still because of our sinfulness we experience natural evil as a penalty of sin.

The legacy of Schleiermacher's theodicy can be found in John Hick's profound treatment, *Evil and the God of Love*.[26] Hick's theodicy, in turn, has been widely influential among scholars in theology and science.

Central to Hick's theodicy is the argument that "pain and suffering are a necessary feature of a world that is to be the scene of a process of soul-making." Even their "haphazard and unjust distribution" and excess are ultimately beneficial, since "the right must be done for its own sake rather than a reward." Closely related is Hick's claim that "epistemic distance" is required if humans are to be capable of moral growth. "God must be a hidden deity, veiled by His [*sic*] creation" so that, unlike our physical surroundings, God's presence is not coercively imposed on us. The world must be '*etsi deus non daretur*' ('as if there were no God') because in such a world we have the necessary "cognitive freedom" by which faith and moral growth are possible. A great virtue of this claim is that it also goes a long way to accounting for moral evil, since the hiddenness of God makes evil a "virtually inevitable result" of the actions of a free agent.[27]

Let me pause briefly here to note an implication of "epistemic distance" which bears directly on the relevance of Hick's work for theology and science. First of all I would contend that 'epistemic distance' is also a requirement for science to be possible. Science is based on methodological naturalism: a scientific explanation of the processes of nature should rely on natural causes alone without the introduction of divine causation. Thus the world must be

'as if there were no God' not only because this is necessary for faith and moral freedom, alla Hick, but also for scientific research. Secondly, this means that when we Christians encounter science, we should not see it as antagonistic to theology (although metaphysical naturalism certainly is) or try to replace methodological naturalism with a method that includes a 'divine designer'. Instead we should see science as a legitimate though limited method of knowing the world precisely because it is based on the way God created the world, and God's purpose in creating it this way was to make possible faith and moral freedom.

Returning to the 'moral growth' theodicy, Hick acknowledges that its gravest challenge is both excessive suffering in the world *and* the attempt to justify it by a 'means-end' argument[28]. To underscore this challenge, Hick concludes with the oft-cited and agonizing quotation from Dostoevsky's *The Brothers Karamazov*.[29] Hick's response to this challenge is to introduce eschatology explicitly into the discussion. Only eschatology can provide a context for addressing the challenge of theodicy. Thus the overall goodness of creation lies not in the present, as with Augustine, but in the eschatological future.

Many scholars in theology and science have been influenced by Hick's theodicy. However, in order to include a clearer focus on evolutionary biology they have brought to it a theology of kenosis.

The concept of kenosis is drawn energetically from Paul's letter to the Philippians, where he refers to the self-emptying of Christ in taking on human life and Christ's humbling even to death on a cross (Phil. 2: 5-8). One can trace the impact of kenosis on historical and contemporary theology in various ways. The christological implications of kenosis were explored by the Patristics who argued that Jesus suffered in his human nature while his divine nature remained impassible. In the Protestant reformation, however, and particularly with Luther, the suffering

of Jesus was seen to have an impact on his divine nature, thus leading to "theopassianism." In various strands of 20th century Trinitarian theology, kenosis has extended to include patripassianism, such that God is seen not only to love but to suffer with the world. Some scholars in theology and science, in turn, have extended kenosis to include God's suffering with all of life on earth: God enters into the physical and biological processes of the world kenotically through the Incarnation and through the crucifixion and so experiences the suffering of all life.

I believe the extension of kenosis to God's suffering with all of life is a crucial step in constructing a defensible response to natural theodicy. Still, a kenotic theology of divine suffering without a strong theology of redemption and the eschatological victory over suffering is, ultimately, entirely inadequate. Almost four decades ago, Hick had already argued that the only possible response to theodicy is eschatology, as we have already seen. Now I believe we should widen the scope of eschatology, like kenotic theology, to include not only humanity, with whom God suffers, but all life on earth and wherever it exists in the universe, with whom God suffers too. But here, as before, I mean an eschatology based on the bodily resurrection of Jesus and thus the transformation of the universe into the new creation by God.

With this theological move, however, we face what I believe is the greatest challenge not only to specialists in "theology and science" but to every theologian who takes the bodily resurrection of Jesus seriously: namely the challenge raised by cosmology regarding the future of the universe and of all life within it. To reiterate, according to science, the extinction of all life in the universe is practically inevitable, and far future of the universe is bleak: it will either expand and cool down forever or recollapse and disappear in a fiery inferno. Thus physical cosmology, much more than evolutionary biology, challenges any Christian theology in which eschatology is taken to mean the transformation of the universe

into a 'new creation'.

It is the interaction between eschatology and cosmology, and the recognition of the absolutely crucial challenge which this brings to Christian theology, which I believe constitute the most important topic for current research in theology and science. Very few theologians, and even few scholars in theology and science, have dealt with this challenge carefully—a notable exception being John Polkinghorne. Still, until we give a reasonable response to the challenge of physical cosmology, we cannot place any genuine confidence in an eschatological and kenotic response to natural theodicy.

We have seen that both the 'bodily resurrection' approach to the resurrection of Jesus and the massive problems in theodicy raised by evolution, physics and cosmology all drive us towards eschatology in hopes of responding to them adequately. Here, however, we meet the most massive challenge: scientific cosmology and the far future scenarios for the universe. How are we to proceed?

A detailed response lies beyond the scope of this paper. Here I would like to indicate some of the ways I am approaching it in larger research projects I am currently pursuing. What I have found very helpful is to lay out a series of guidelines that apply to our task of constructing an eschatology. Such guidelines should focus our research to keep in mind the concept of the bodily resurrection of Jesus and the challenge of evolutionary natural theodicy, and they should also suggest ways in which such an eschatology might be useful in leading to new insights into research programs in theoretical science—if they are to make possible the "creative mutual interaction" between theology and science that is our overall goal.

The first guideline focuses directly on the fundamental *challenge of physical cosmology to an eschatology* based on the bodily resurrection of Jesus. In bare form, the challenge is this: if the pre-

dictions of contemporary scientific cosmology come to pass, then the parousia will not be just delayed, it will never happen. And if this is so, then the logic of Paul in 1 Cor. 15 is inexorable: if there will never be a general resurrection, then Christ has not been raised from the dead, and our hope is in vain. The challenge can also be seen as *coming from theology to science*: if it is in fact true that Jesus rose bodily from the dead, then the general resurrection cannot be impossible. This must in turn mean that the future of the universe will not be what scientific cosmology predicts.

We seem to be at loggerheads. How are we to resolve this fundamental challenge? My response is to recognize that the challenge is *not* from science but from two philosophical assumptions which we bring to science: The same laws of nature which govern the past and present will govern the future (what one can call the assumption of "nomological universality").

It is quite possible, however, to accept a very different philosophical assumption about the future predictions of science while accepting all that science describes and explains about the past history of the universe. The first step is deciding whether the laws of nature are descriptive or prescriptive, and, as William Stoeger argues, science alone cannot settle the matter.[30] A strong case can then be made on *philosophical* grounds that the laws of nature are descriptive. One can, in turn, claim on *theological* grounds that the processes of nature which science describes do not "obey the laws of nature" (as if the laws had an independent ontological status governing the world) but instead are the result of God's ongoing action as continuous Creator and God's gift of integrity and efficacy to nature. In short, their regularity is the result of God's faithfulness. The crucial point is that since God is free to act in radically new ways, not only in human history, but also in the ongoing history of the universe—as God did at Easter—then the predictions of the laws based on God's prior action need not apply in the future.

Another way of making this case is to recognize that all scientific laws carry a *ceteris paribus* clause, i.e., their predictions hold "all else being equal." Now God's regular action accounts for what we describe through the laws of nature that science deploys; but if God will act in radically new ways to transform the world, then of course all else is *not* equal.[31] We could say that the 'freeze' or 'fry' predictions for the cosmological future would have come to pass had God not acted in Easter as God did and if God were not to continue to act to bring forth the ongoing eschatological transformation of the universe which God will.

Any eschatology that we might construct must be scientific in its description of the past history of the universe. More precisely, it must be constrained by methodological naturalism in its description of the past: it should not invoke God in its explanation of the (secondary) causes, processes and properties of nature.[32] Standard and inflationary Big Bang cosmologies, or other scientific cosmologies (such as quantum cosmology), place a limiting condition on any possible eschatology as it describes what we know about the past history of the universe.

This guideline separates this proposal as sharply as possible from such approaches as "intelligent design" in so far as they are critical of the physical and/or biological sciences for not including divine agency in its mode of explanation.

Our starting point is that the new creation is not a replacement of the old creation, or a second and separate creation *ex nihilo*. Instead, just as Jesus' body was transformed into a risen and glorified body, God will transform God's creation, the universe, into the new creation. Again, following the lead of our New Testament scholars, the concept of transformation includes elements of continuity as well as discontinuity. To quote John Polkinghorne, "(T)he first creation was *ex nihilo* while the new creation will be *ex vetere*...(This idea) does not imply the abolition of the old but rather its transformation."[33] Creation *ex vetere*

means that "the present created order (has)...a profound significance, for it is the raw material from which the new will come."[34]

Now if God is to transform the universe, it follows that God must have created the universe *such that it is transformable*, i.e., that it can be transformed by God. This, in turn, means that if it is to be transformed and not replaced, *God must have created it with precisely those conditions and characteristics of 'continuity' that will be part of the new creation*. Now we can see the role of science in a theology of eschatology: Since science offers a profound understanding of the history of the universe, then science can be of immense help to the theological task of understanding something about that transformation, if we can find a way theologically to identify, with at least some probability, these needed conditions, characteristics and preconditions of continuity.

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; these can be called "elements of discontinuity" between creation and new creation. Thus physics and cosmology might play a profound role in our theological attempt to sort out what is truly essential to creation and what is to be left behind in the healing transformation to come.

In sum, the terms "continuity" and "discontinuity," found in the New Testament literature on the resurrection of Jesus, provide a more precise meaning and a potential connection with science. With it in place we can move eventually to a material argument and ask just what those elements of continuity and discontinuity might be.

So far in theology and science, discontinuity has played a secondary role within the underlying theme of continuity in nature as suggested by the term "emergence." Accordingly, irreducibly new processes and properties (i.e., discontinuity) arise within the overall, pervasive and sustained background of nature (i.e., continuity). Thus, biological phenomena evolve out of the nexus of the

physical world, the organism is built from its underlying structure of cells and organs, mind arises in the context of neurophysiology, and so on. Now, however, when we come to the resurrection and eschatology, I propose we *invert* the relation: the elements of continuity will be present, but within a more radical and underlying discontinuity as is denoted by the *transformation* of the universe by a new act of God *ex vetera*. With this inversion, discontinuity as fundamental signals the break with naturalistic and reductionistic views such as "physical eschatology," while continuity, even if secondary, eliminates a "two-worlds" eschatology.

This has important implications for our search for candidate theories. It *eliminates* "non-interventionist objective special divine action" as a candidate since it does not involve a transformation of the whole of nature. Indeed, these approaches presuppose that it is the continual operation of the usual laws of nature that makes objective special divine action possible without the need for the violation or suspension of those laws. But the bodily resurrection of Jesus directs us towards a much more fundamental view: the radical 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]

The severe problems arising in the Augustinian / Niebuhrian theodicy in light of the challenge of thermodynamics and cosmology bring with it an exceptional gift: it gives us a crucial insight into what eschatology must include if it is to address these problems. The insight is based on the idea that in the new creation it will be impossible to commit moral evil: we will be liberated fully from the bondage of the will into true freedom (Augustine: *non posso peccare*). Then by analogy the new creation will not include natural evil either, and this in turn has implications for the role of thermodynamics not only in creation but in the new creation.

This insight could be taken in several ways. 1) In its most sim-

ple form it might mean that the new creation will not include such processes as thermodynamics since it contributes to natural evil. I am reminded by the apostle Paul that "the creation itself will be set free from its bondage to decay and obtain the glorious liberty of the children of God." (Rom. 8: 22, 21). As I wrote in an earlier paper, "Are we somehow to be freed from the tyranny of entropy, and is the universe to shine forever as the respondent creation of God—a *new* heaven and earth?" As a Christian I answer, "yes!" 2) In a slightly more complex form it might mean that the new creation will not include thermodynamics to the extent that it contributes to natural evil but that it would include it to the extent that it contributes to natural good.

We saw that the gravest challenge raised by the Schleiermacher-Hick trajectory in theodicy is the combination of excessive suffering in the world *and* the attempt to justify it by a 'means-end' argument[36]. In this context Hick pointed to Dostoevsky's *The Brothers Karamazov*.[37] Hick's response was that only eschatology can provide a context for addressing the challenge of theodicy. The overall goodness of creation—its truly 'greater good'—must lie not in the present, as with Augustine, but in the eschatological future.

As before, then, this implies that the eschatological 'new creation' must include not only humanity but all the species and individual creatures in the history of life on Earth. Specifically, it must include them in terms of the concrete details of their own lives and in light of their own capacities and characteristics, and not as somehow included through the human experience of redemption. In particular, every moment in the history of the evolution of life, and not just the 'end' of historical time, must be taken up and transformed eschatologically by God into eternal life. One might say that, rather than a 'means/end' eschatology it must be such that *every means is also an end in itself*.

It also must be structured on a Trinitarian doctrine of God

since it is the Trinitarian God who will act to bring this about as we know, based on the revelation of the cross and resurrection of Jesus. Thus involuntary suffering of all of nature—each species and each individual creature—must be taken up into the voluntary suffering of Christ on the cross (theopassionism) and through it the voluntary suffering of the Father (patripassionism).

Our project also involves the question of whether such revisions in theology might be of any interest to contemporary science–at least for individual scientists who share eschatological concerns such as developed here, and are interested in whether they might stimulate a creative insight sparking further research in science. I want to stress once again that all such programs in science would have to be tested by the scientific communities (what is often called "the context of justification") without regard for the way theology or philosophy might have played a role in their initiation ("the context of discovery").

Here we ask whether a richer theological conception of nature both as creation *and* as new creation can generate important revisions in the philosophy of nature that currently underlies the natural sciences, the philosophy of space, time, matter and causality in contemporary physics and cosmology.

We can also explore philosophical differences in current options in theoretical physics and cosmology. The theological views of research scientists might play a role in selecting which theoretical programs to pursue among those already on the table (for example, the variety of approaches to quantum gravity).

Finally we can suggest the construction of new scientific research programs whose motivation stems, at least in part, from theological interests.

Here we work 'backwards' from eschatology to the present universe as we now know it via the doctrine of creation and thus to science, making this overall approach genuinely *interactive*.

Recall that the Augustinian/Niebuhrian trajectory led to a pro-

found problem: 'cosmic theodicy'. Accordingly I asked what eschatology must include if it is to address this problem. The response was that the new creation will not include thermodynamics to the extent that it underlies natural evil.

Now to work 'backwards' by asking what the present universe as creation must be like if it is to be transformed by God into the eschatological new creation. (This is the question of "continuity" between old and new.) Since the new creation will not include natural evil—i.e., the new creation will not include thermodynamics in those ways in which it contributes to natural evil—then thermodynamics, as a "universal contingent" characterizing this universe, must itself be "contingent:" If it will not characterize the *new* creation, it must be a contingent and not a necessary feature of *our* universe as the present creation.

This in turn carries *implications for current physics*. One question which has been discussed extensively is whether thermodynamics is a "fundamental" theory comparable to dynamics (e.g., quantum mechanics, quantum field theory, etc.). The implication here is that it is not in reality a fundamental theory since it will not necessarily be part of the eschatological destiny of the universe, or at least not a part of it in the way in which it contributes to natural evil. This in turn could suggest interesting questions for future research in the foundations of physics regarding the relation of thermodynamics to fundamental physical theories.

Recall, too, that the Schleiermacher-Hick trajectory in theodicy was challenged by the combination of excessive suffering and the attempt to justify it by a 'means/end' argument. In response I suggested that a 'means/end' eschatology must be such that *every means is also an end in itself*. In my opinion this means that the life of every creature—or more specifically every event in the life of every creature—must be taken up eschatologically by God into the new creation. Now by working 'backwards' from the 'new cre-

ation' to 'creation', we might be able to anticipate aspects of the universe which must be present if this eschatological response is to hold (the argument of "continuity") and yet which might not have been noticed by science.

A striking possibility is that nature might already have a 'multiple temporality' with the eschatological 'future' woven into and between the ordinary 'future'. Most of the physical sciences operate with a linear conception of time. Perhaps, though, time is more complex than mere linear time, but its complexity might be missed by physics if it represents time in linear terms. Complexity of time, or multiple temporality, might be inferred from the eschatological claim that every moment of each creature's life—and not just at its death—is to be taken up into the 'new creation'. The eschaton that initiates this process might be proleptically present not just in the life of Jesus but through his resurrection, in all moments of the history of life. Suggestions for more complex views of time can be found in the literature of theoretical physics. Looking at them through the lens of eschatology might lead to fruitful directions for new theoretical research in physics.

Conclusions

I hope to have suggested that the move to a kenotic and eschatological response to natural theodicy offers a promising road to pursue in future research. If this leads, as well, to genuine interaction between theology and science, and a reconstructing of eschatology which gives intelligibility and credibility to Christian hope in light of scientific cosmology, the road, though trying, would certainly have been worth traveling.

Endnotes

1. This project is sponsored in part by a grant from the Philadelphia Center for Religion and Science (grant # 933-G).

2. Robert John Russell, "Eschatology and Physical Cosmology: A Preliminary Reflection," in *The Far Future: Eschatology from a Cosmic Perspective*, ed. George F. R. Ellis (Philadelphia: Templeton Foundation Press, 2002), 266-315; Robert John Russell, "Bodily Resurrection, Eschatology and Scientific Cosmology: The Mutual Interaction of Christian Theology and Science," in *Resurrection: Theological and Scientific Assessments*, ed. Ted Peters, Robert John Russell and Michael Welker (Grand Rapids: Eerdmans Publishing Company, 2002), 3-30; Robert John Russell, "Sin, Salvation, and Scientific Cosmology: Is Christian Eschatology Credible Today?" in *Sin & Salvation*, ed. Duncan Reid and Mark Worthing (Australia: ATF Press, 2003).

3. Willi Marxsen, *The Resurrection of Jesus of Nazareth*, trans. Margaret Kohl (Philadelphia: Fortress Press, 1970), 77, 156.

4. Raymond E. Brown, *The Virginal Conception and Bodily Resurrection of Jesus* (New York: Paulist Press, 1973), 72.

5. Gerald O'Collins, S. J., *The Resurrection of Jesus Christ* (Valley Forge: The Judson Press, 1973), 95.

6. See for example Thorwald Lorenzen, *Resurrection and Discipleship: Interpretive Models, Biblical Reflections, Theological Consequences* (Maryknoll: Orbis Books, 1995), esp. Ch. 8.

7. In my opinion, John Polkinghorne holds what I am calling the 'bodily resurrection' view and Arthur Peacocke the 'personal resurrection' view. If so, Peacocke's view sidesteps the conflict with cosmology but leads to a highly anthropocentric eschatology limited to the visio dei. Polkinghorne's view, while much more consistent with the NT in my opinion, necessarily runs up against the challenge of cosmology. For details see Russell, "Eschatology and Physical Cosmology."; Russell, "Bodily Resurrection, Eschatology and Scientific Cosmology."; Russell, "Sin, Salvation, and

Scientific Cosmology: Is Christian Eschatology Credible Today?"

8. For a non-technical introduction, see James Trefil and Robert M. Hazen, *The Sciences: An Integrated Approach*, Second Edition / Updated Edition (New York: John Wiley & Sons, Inc., 2000), Ch. 15; George F. Ellis and William R. Stoeger, S.J., "Introduction to General Relativity and Cosmology," in *Quantum Cosmology and the Laws of Nature: Scientific Perspectives on Divine Action*, ed. Robert J. Russell, Nancey C. Murphy and Chris J. Isham, *Scientific Perspectives on Divine Action Series* (Vatican City State; Berkeley, Calif.: Vatican Observatory Publications; Center for Theology and the Natural Sciences, 1993), 33-48. For a technical introduction, see Charles W. Misner, Kip S. Thorne and John Archibald Wheeler, *Gravitation* (San Francisco: W. H. Freeman and Company, 1973), Part VI.

9. Although the presence of a "cosmological constant" could either accelerate its expansion or possibly, close the universe, the far future scenarios are still freeze or fry.

10. John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon Press, 1986), Ch. 10; see also S. J. Stoeger, William R., "Scientific Accounts of Ultimate Catastrophes in Our Life-Bearing Universe," in *The End of the World and the Ends of God: Science and Theology on Eschatology*, ed. John Polkinghorne and Michael Welker (Harrisburg: Trinity Press International, 2000).

11. If the universe is closed, then in 10^{12} years the universe will have reached its maximum size and re-collapse back to a singularity like the original hot Big Bang.

12. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle*, 648.

13. For earlier work, see: John Polkinghorne, *The Way the World Is* (Grand Rapids: William B. Eerdmans, 1983), Chapter 8; Polkinghorne, *The Faith of a Physicist*, Ch. 6, 9, esp. 163-70; John C. Polkinghorne, *Serious Talk: Science and Religion in Dialogue* (Valley Forge, Pa.: Trinity Press International, 1995), Ch. 7. For more recent work see: John C. Polkinghorne, *The Faith of a Physicist: Reflections of a Bottom-up Thinker* (New Jersey: Princeton University Press, 1994), Ch. 9; John Polkinghorne, "Eschatology: Some Questions and Some Insights from Science," in *The End of the World and the Ends of God: Science and Theology on Eschatology*, ed.

John Polkinghorne and Michael Welker (Harrisburg: Trinity Press International, 2000); John Polkinghorne, "Eschatological Credibility: Emergent and Teleological Processes," in *Resurrection: Theological and Scientific Assessments*, ed. Ted Peters, Robert John Russell and Michael Welker (Grand Rapids: Eerdmans Publishing Company, 2002).

14. Other accounts of what drives evolution, such as punctuated equilibrium, panadaptionism, neo-Lamarkian effects, self-organization, cooperation and symbiogenesis, may provide helpful critiques of the central role accorded to natural selection in neo-Darwinism. For an excellent overview see Ian G. Barbour, "Five Models of God and Evolution," in *Evolutionary and Molecular Biology: Scientific Perspectives on Divine Action*, ed. Robert John Russell, William R. Stoeger and Francisco J. Ayala (Vatican City State; Berkeley, Calif.: Vatican Observatory Publications; Center for Theology and the Natural Sciences, 1998), 419-42. Still, even if our understanding of what drives evolution 'evolves', the facticity of natural evil will remain to be dealt with one way or another theologically, and no glib appeal to the challenges to neo-Darwinism will nullify the problem of evolutionary theodicy.

15. Jacques Monod, *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology*, translated by Austryn Wainhouse (New York: Vintage Books, 1972), 198 pp, 112, 180.

16. A. R. Peacocke, *Creation and the World of Science: The Bampton Lectures*, 1979 (Oxford: Clarendon Press, 1979). See for example the discussion on p. 90 and following where Peacocke specifically refers to the two kinds of chance.

17. For an overview see Robert John Russell, "Does "The God Who Acts" Really Act? New Approaches to Divine Action in the Light of Science," *Theology Today* 51.1 (March 1997). The CTNS/VO series includes: Robert John Russell, Nancey C. Murphy, and Chris J. Isham, eds., *Quantum Cosmology and the Laws of Nature: Scientific Perspectives on Divine Action,* Scientific Perspectives on Divine Action Series (Vatican City State: Vatican Observatory Publications: Berkeley, California: Center for Theology and the Natural Sciences, 1993), 468 pp Robert John Russell, Nancey C. Murphy, and Arthur R. Peacocke, eds., *Chaos and Complexity: Scientific Perspectives on Divine Action*, Scientific Perspectives on Divine Action Series

(Vatican City State: Vatican Observatory Publications: Berkeley, California: Center for Theology and the Natural Sciences, 1995), 416 pp;; Robert John Russell, William R. Stoeger, S. J, and Francisco J. Ayala, eds., *Evolutionary and Molecular Biology: Scientific Perspectives on Divine Action* (Vatican City State: Vatican Observatory Publications: Berkeley, California: Center for Theology and the Natural Sciences, 1998); Robert John Russell, and others, eds., *Neuroscience and the Person: Scientific Perspectives on Divine Action* (Vatican City State: Vatican Observatory Publications: Berkeley, California: Center for Theology and the Natural Sciences, 1999); Robert John Russell, and others, eds., *Quantum Mechanics: Scientific Perspectives on Divine Action* (Vatican City State: Vatican Observatory Publications: Berkeley, California: Center for Theology and the Natural Sciences, 2001). For a brief description of these approaches, see the *Introductions* to Russell, Murphy, and Peacocke, *Chaos and Complexity*, section 3.4. and Russell, and others, *Quantum Mechanics*, section 2.1. Summaries of these papers can be found at http://www.ctns.org/books.html.

18. The quotation is taken from a letter from Darwin to Asa Gray, May 22, 1860. References can be found in Richard Dawkins, *A River Out of Eden: A Darwinian View of Life* (New York: Basic Books, 1995), 95.

19. Dawkins, *A River Out of Eden: A Darwinian View of Life*, 105.

20. John Hick, *Evil and the God of Love, Revised Edition* (San Francisco: Harper & Row, 1966). Hick called the second type "Irenaean" since its earliest occurrence was in the work of Irenaeus. However, since Hick argues that its main source is Schleiermacher, I have simply replace the term here for convenience.

21. See for example Saint Augustine, Bishop of Hippo, *Confessions*, translated by Henry Chadwick (Oxford: Oxford University Press, 1991), 311 pp. and St. Augustine, *The City of God*, translated by Henry Bettenson (London: Penguin Books, 1984), 1097pp.

22. Reinhold Niebuhr, *The Nature and Destiny of Man: I. Human Nature* (New York: Charles Scribner's Sons, 1941 (1964)).

23. Robert John Russell, "The Thermodynamics of 'Natural Evil'," *CTNS Bulletin*

10.2 (Spring 1990); see also Robert John Russell, "Entropy and Evil," *Zygon: Journal of Religion and Science* 19.4 (December 1984): 449-68.

24. Friedrich Schleiermacher, *On Religion: Speeches to Its Cultured Despisers*, translated by John Oman (New York: Harper & Row (Torchbooks), 1958); Friedrich Schleiermacher, *The Christian Faith*, edited by H. R. Mackintosh and J. S. Stewart (Edinburgh: T. & T. Clark, 1968), 760 pp. Most references to the following discussion can be found in paragraphs 58-89.

25. Note: 'Original' designates a timeless character of the world and of humankind, not a state in the past (Eden) from which we have 'fallen': Schleiermacher rejects the Fall unequivocally.

26. Hick, *Evil*.

27. Ibid, 281-2, 353.

28. Ibid, 327-31.

29. Ibid, 385.

30. William R. Stoeger, S.J., "Contemporary Physics and the Ontological Status of the Laws of Nature," in *Quantum Cosmology and the Laws of Nature: Scientific Perspectives on Divine Action*, ed. Robert J. Russell, Nancey C. Murphy and Chris J. Isham, Scientific Perspectives on Divine Action Series (Vatican City State/Berkeley, Calif.: Vatican Observatory Publications; Center for Theology and the Natural Sciences, 1993), 209-34.

31. I am grateful to Nancey Murphy for stressing this point to me (private communication).

32. It is crucial to note that the commitment to methodological naturalism does not carry any ontological implications about the existence/non-existence of God (i.e., it is not inherently atheistic).

33. Polkinghorne, *The Faith of a Physicist*, 167.

34. John Polkinghorne, "Eschatology: Some Questions and Some Insights from Science," in *The End of the World and the Ends of God: Science and Theology on*

Eschatology, ed. John Polkinghorne and Michael Welker (Harrisburg: Trinity Press International, 2000), 29-30.

35. I agree with O'Collins' criticism that previous work on non-interventionist divine action did not deal with the problem of the resurrection. See O'Collins, "The Resurrection," p. 21, footnote 52.

36. Hick, *Evil*, 327-31.

37. Ibid, 385.