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11. The Christian Imagination and the Anthropocene

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Abstract

Evidence from Earth system science suggests that we have forced the earth system out of the relatively stable conditions of the Holocene into a new geological epic. Among the implications of this evidence is that human beings have become a geological force whose influence will be detected thousands to millions of years from now. Our social and cultural imagination, however, has become reduced more and more to the present. This paper develops theological foundations through systematic and philosophical theology, in dialogue with the natural sciences, for opening our imaginations to the deep future so that we can grasp our responsibility for the effects of our actions that will extend for thousands to millions of years. As such it will offer theological foundations for an ethic of the deep future.

Keywords: Anthropocene, climate change, environmental ethics, Christian theology, future

Introduction

In a meeting of the International Geosphere-Biosphere Programme held in Mexico in February 2000, Paul Crutzen, who won a Nobel Prize for his work on the ozone layer,

proposed the idea that human beings had forced the planet out of the stable climactic conditions of the Holocene, which have persisted for 11,500 years, into a new geological epoch that Crutzen named “the Anthropocene.” Two years later he further developed his argument in a paper in *Nature*. The formal process conducted by the International Commission on Stratigraphy to determine whether human beings have pushed the earth system out of the Holocene could take decades, as it did with the naming of the Holocene. The concept of the Anthropocene is, however, gaining wide acceptance by geologists, earth system scientists, and climate scientists, and its significance is being reflected upon by social scientists, philosophers, political philosophers, and theologians. This paper is interested in human responsibility, for the deep future in light of the Anthropocene. When we speak of the Anthropocene as a new geological epoch we are indicating that human beings have become a geological force whose influence will be detected millions of years from now in the sedimentary rocks deposited in layers or strata that mark the passage of geological time (or what I will call “deep time”).

While the evidence revealed in scientific literature indicates that human actions are casting a shadow across thousands to millions of years (the latter in the case of ocean acidification, species extinction, and biodiversity loss), our social and cultural imagination has become reduced more and more to the present. The truncation of our imaginations to the short term inhibits our ability to grasp the gravity and true extent of our actions. Without the opening of our imaginations (Ricoeur: 117) to the deep future, we will lack the capacity to come to grips with the full extent of our responsibility. This paper addresses through systematic and philosophical theology, in dialogue with the natural sciences, the question: how can theology help open our imaginations to the deep future so that we can grasp our responsibility for effects that will extend for thousands to millions of years? The overall argument will offer theological foundations for an ethic of the deep future.¹

The Problematic Situation

Social, Cultural, and Political Time versus Geological Time

Contemporary Western culture has lost a sense of the future. As media theorist Douglas Rushkoff argues, “our society has reoriented itself to the present moment. Everything is live, real time, and always-on.” This is “why the world’s leading search engine is evolving into a live, customized, and predictive flow of data branded ‘Google Now’; email is giving way to texting, and blogs are being superseded by twitter feeds” (2). In this context, “narrativity and goals are surrendered to a skewed notion of the real and the immediate; the Tweet; the status update. What we are doing at any given moment becomes all-important” (6). The “trivial pursuit of the immediately relevant” (5) makes it very difficult to “engage in meaningful dialogue about . . . long term global issues” (2). Our policy makers are not immune to this. They too must adjust to being always on in real-time mode such that they do not have time to reflect. In this context, “policy . . . is no longer measured against a larger plan or narrative; it is simply a response to changing circumstances on the ground, or on the tube” (47) or Facebook, twitter, and blogs.

¹ Elements of this paper’s argument are advanced in my 2016 paper that deals with the deep future from a different angle.

When we do actually address long term social problems, policies that have impacts regarding the future have been driven not by ethical considerations, but by economic cost benefit-analyses that privilege the present. The use of conventional cost-benefit analyses “reduce all issues of value to matters of preference as measured by market prices” (Gardiner: 252). Cost benefit analyses that privilege the present have been particularly influential in climate change policy analysis in the developed world, especially the U.S., over the past forty years (Brown). William Nordhaus typifies this approach in his argument for a high discount rate, which “means that the welfare of future generations is reduced or ‘discounted’ compared with nearer generations” (202).

To gain perspective on the gap between how we culturally imagine the problem of climate change and some of the possible long-term effects of our actions we need to return to the notion of the Anthropocene. While geologists do not yet have sufficient evidence in sedimentary rocks that would indicate that human beings have initiated a new geological epoch, the evidence of human beings acting as geological agents will likely show in the strata. The central pieces of evidence will come from the following sources. First, the abrupt increase in atmospheric CO₂ levels, 100 times faster than the Paleocene/Eocene extinction event 56 million years ago (Diffenbaugh and Field: 490), that have not been this high for 3 million years (Raymo et al.), will show up in ice cores (if the ice sheets remain) and ocean sediments. Second, the collapse of biodiversity. The earth has experienced several mass extinctions “often in conjunction with rapid climate change” (Hansen 2013: 7). Indeed, four of the five great mass extinctions, except for the K-T extinction that wiped out the dinosaurs, were greenhouse extinctions. The extinction rate for several million years prior to the Holocene was 1 species per million species per year. The current rate of loss is 100 to 1,000 species per million with some research suggesting that “the rate of extinction of species and races is conservatively estimated to be 877 times above that prevailing before the origin of humanity” (Wilson: 39). If global warming, according to the International Panel on Climate Change (IPCC), reaches 1.6° C, an estimated 9-31% of species will be committed to extinction and with 2.9° C an estimated 21-52% of species will be committed to extinction (Hansen 2013: 7). The extinction rate has been accelerated by climate change, but was under way through simplification and fragmentation of ecosystems through agriculture and urbanization (Bonneuil and Fressoz: 178). These extinctions will leave their mark in sedimentary rocks. Other human effects will likely show up in the strata into the deep future.

To avoid the perpetuation of a common confusion, it is important to note that the concept “Anthropocene” is not primarily about the expansion of human impacts on the environment or upon ecosystems. The concept was employed to indicate that effects of the actions of humans have “become so large and active that it now rivals some of the great forces of Nature in its impact on the functioning of the earth system” (Steffen et al.: 843). The designation “Anthropocene” was introduced by an atmospheric chemist and has been developed by the burgeoning field of Earth systems science to indicate that human beings have initiated “*a new epoch in the Geological Time Scale, a phase shift in the functioning of the Earth system as a whole*” (Hamilton: 237). For instance, perhaps the clearest indication a million years from now of human influence on the planet will be marks of radionuclides in the rock strata because of the detonation of nuclear bombs in 1945. While this will show up in the strata, the use of nuclear weapons did not initiate a shift in the earth system. The components

of the earth system – atmosphere (layer of gases surrounding the planet), hydrosphere (watery parts of the planet), the biosphere (living creatures), and the lithosphere (the earth’s crust) – are linked in a dynamic earth system. This is a new discovery over the past thirty-five years. Changes in the terrestrial biosphere alone are unlikely to initiate a state shift in the earth system – “the terrestrial biosphere in isolation, is not the right place to be looking for a planetary-scale tipping point; one must consider the coupled dynamics of the Earth system as a whole” (Lenton and Williams: 382). Nevertheless, “domino effects in terrestrial ecosystems may be prompted by connectivity with the climate system” (380). Here we see the importance of the climate system for a shift of the earth system into a new state. According to geophysicist Bill McGuire, “So complex and entangled is the Earth System that, looking to the future, nothing can be regarded as immune to the influence of anthropogenic warming” (241). McGuire argues from evidence in the earth’s recent history that global warming, over the long term, will even effect what he calls “the giant beneath our feet.” As Greenland melts and there is a decrease in the weight of the two-mile-thick ice sheet earth’s crust will rebound creating earthquakes and tsunamis (266), and volcanoes previously contained under ice sheets are more likely to erupt (106). With the melting of the great mountain glaciers, earthquakes around the globe could also be triggered.

While science understands itself as concerned with facts (or converging lines of evidence) and not values, the scientific enterprise does not take place in a neutral space unaffected by the values of the culture and government organizations that provide research grants. Indeed, the horizon of concern in scientific studies dedicated to forecasting future climate change is dominated by the relatively short horizon of 2050 to 2100 – “most studies of the future impact of anthropogenic CO₂ on the climate system focus their attention on the next few decades, or at most up to the end of the 21st century” (Montenegro et al.: 1). This restriction is due to “computational costs” (Tyrell, Shepherd, and Castle: 665) in running computer models and “these periods are comparable to policy planning and implementation times and comprehensible in terms of [a] human life span” (Montenegro et al.: 1). The latter reason suggests our concern is limited by what we can imagine or what is comprehensible for the public; namely, one human life span.

In the interface between science and policy, the focus is on the short term, that is, temperature increases and other impacts until 2100. Concern for the long-term (post 2100) fades into the background. Yet, the basic physical dynamics within the earth system lend themselves to long term consequences. First, most of the energy trapped by greenhouse gases goes into heating the oceans (to date around 90%) (NOAA: 4). Oceans take time to heat up (i.e., thermal inertia). Thus, there is a lag time between the cause (increased greenhouse gas emissions) and the effect (increased temperatures). Just as the oceans take time to heat up, it will take time for them, and the planet, to cool down again. This means that once emissions are stopped (presuming deep ocean warming) temperatures will remain elevated for around a thousand years (Solomon et al.: 1704). Second, carbon dioxide lasts for a very long time in the atmosphere. Around 50% of the CO₂ released is absorbed in around twenty-five years (Hansen 2013: 174) by soils, land vegetation, and the oceans, while around 25% of it will be affecting the climate after a thousand years, 12% after ten thousand years, and around 7% of it could be affecting the climate several hundred thousand years from now. According to David Archer, “the mean lifetime of fossil fuel CO₂ is about 30-35 kyr [30,000-35,000 years]”

(5). Third, as you heat up the planet you will set in motion other chain reactions (i.e., positive feedbacks) that can substantially increase warming.

When science is brought into inform policy, the short term positive feedbacks are incorporated into the discussion while long term feedbacks are generally not considered. If the 2015 Paris Agreement carbon reduction commitments are realized through 2030 and go no further in emissions reductions post 2030, then CO₂ levels will likely rise to 665 ppm causing 3.3° C warming by 2100 (MIT). The agreement is based on IPCC climate models that only incorporate immediate feedbacks, which include water vapor, clouds, aerosols, and sea ice disintegration. Scientists, however, recognize, in looking at the earth's history, that there are longer-term feedbacks, which "may begin to come into play on time scales as short as centuries or less," such as "ice sheet disintegration, vegetation migration, and GHG [greenhouse gas] release from soils, tundra or ocean sediments" (Hansen 2008: 217). When we consider these longer-term feedbacks, carbon dioxide could have more than twice the effect on global temperatures. While the current proposals following the Paris Climate Agreement would likely lead to 3.3° C of warming by 2100, they would likely lead to over 6° C of warming over the longer term (Hansen 2008: 217). Over the long-term, past the 2100 horizon, it is not only temperature that is higher but all the impacts increase markedly. The current agreed upon target by the international community is 2° C or around 450 ppm CO₂. Yet current CO₂ levels (400 ppm) have not been this high for 3 million years (Raymo et al.: 323), when sea levels were between 50 and 80 feet higher than today (Hansen 2013: 6) and then 15 million years ago, when sea levels were between 80 and 130 feet higher than today (Tripathi, Roberts, and Egel: 1394).

The geological time scale categorizes the earth's history in descending order of significance from eons, eras, periods, epochs, and ages. Wallace Broecker maintains "one could argue that the potential for planetary change is almost as great as that caused by the origin of life or the rise of oxygen" (Langmuir and Broecker: 645). As such "it appears . . . that we have changed epochs from Holocene to Anthropocene; one could argue that we have changed eras and eons, from Cenozoic and Phanerozoic to Anthropozoic," (Langmuir and Broecker: 645) and "eon and era boundaries of the past have separated spans of time of hundreds of millions of years" (Langmuir and Broecker: 645).

Christian Ecological Thinking and the Earth System

Though the problem of opening one's imagination to the deep future is an issue for all of Christianity, I focus on Catholicism and the most influential recent document on climate change and ecological degradation, Pope Francis's Encyclical *Laudato Si'*. In the opening chapter of *Laudato Si'*, Pope Francis "urgently appeal[s] . . . for a new dialogue about how we are shaping the future of our planet" (14). This paper enters into dialogue with *Laudato Si'* on how restricting our imaginations to the short term diminishes our sense of responsibility for "shaping the future of the planet." In addition, while it must be recognized that *Laudato Si'* has played a crucial role in injecting ethics on a global scale into the climate change debate, I will show how *Laudato Si'* is ambiguous at best regarding its treatment of the future. Furthermore, its ahistorical romanticized view of nature (where creation is reduced to the Holocene), which is intended to elicit care for God's creation and a proper ethical response,

undermines opening of the imagination to the deep future. Thus, it undermines the possibility of grasping the full extent of human actions.

The Pontifical Academy of Sciences published a work entitled “Fate of Mountain Glaciers in the Anthropocene,” by leading climate scientists, including Paul Crutzen, but *Laudato Si'* does not unambiguously indicate the longterm impacts of climate change to effectively counteract the cultural, social, and political focus on the relatively short term. The term “future” appears twenty-nine times in *Laudato Si'*, including references extending the common good (159), solidarity (159), and rights (109) to future generations. Francis even seems to have a somewhat expansive sense of the future when he maintains that “the effects of climate change will be felt for a long time to come” (170). Other times, his language regarding the future is unspecified and open to interpretation as to whether he is thinking short-term (up to 2100) or long-term (post 2100). This can be seen when he argues that the major tropical forests are important “for the entire earth and for the future of humanity” (38). When *Laudato Si'* speaks more specifically about the future, it defaults to this century: “If present trends continue, this century may well witness extraordinary climate change and an unprecedented destruction of ecosystems, with serious consequences for all of us” (24). Even more commonly, *Laudato Si'* speaks of the future in terms of the effects on the next generation and children. In extending the common good to future generations, *Laudato Si'* quotes the Portuguese bishops: “the environment is part of the logic of receptivity. It is on loan to each generation, which must then hand it on to the next. An integral ecology is marked by this broader vision” (159). The image here is of a resource that one generation passes onto the subsequent generation and that generation passes it on to the next. The central issue at stake in the Anthropocene is not about running out of a resource, it is the problem of destabilizing the Earth far beyond one generation; indeed, we are talking on the order of tens of thousands of generations. The opening question of the subsequent paragraph, which was also the opening question of the Vatican guide to the encyclical, asks “what kind of world do we want to leave to those who come after us, to children who are now growing up?” (160; see Vatican Press Office). While these excerpts speak of the next generation (our children), that same paragraph speaks of leaving an inhabitable planet to future generations.

Laudato Si' not only has an ambiguous sense of the future, but the arguments it advances for the interconnectedness of all things and the “harmony of creation” do not engage the evidence from earth’s history and as such harbor romantic notions of the earth system that are not in line with scientific knowledge. While *Laudato Si'* provides grounds for caring of “our common home,” which is its subtitle, it is inadequate to our knowledge of the past and future earth and as such inhibits the opening of our imaginations to the deep future. In the section entitled “The Message of Each Creature is the Harmony of Creation,” Francis maintains that, “the entire material universe speaks of God’s love, his boundless affection for us. Soil, water, mountains; everything is, as it were, a caress of God” (84). “All of us are linked by unseen bounds and together form a kind of universal family, a sublime communion” such that “we can feel the desertification of the soil almost as a physical ailment, and the extinction of a species as a painful disagreement” (89). Quoting the Catholic catechism, he maintains, “God wills the interdependence of creatures. The sun and the moon, the cedar and the little flower, the eagle and the sparrow: the spectacle of their countless diversities and inequalities tells us that no creature is self-sufficient. Creatures exist only in dependence on each other, to

complete each other, in the service of each other” (86). The theological grounds for these statements are sound: all things come from (89) and return to a loving God and “God wills the interdependence of creatures.” These fundamental aspects of the doctrine of creation are the grounds for the intrinsic value of all creatures. They also provide conditions for an ecological conversion that entails the recognition that the world is a gift from God and we are called to imitate God’s generosity through caring for all creatures that we are connected with “in a splendid universal communion” (220). That God is the source and end of all things and that God brings things into existence out of generosity and love and not necessity are revealed truths and statements of faith that are fundamental to any doctrine of creation.

There is, however, a certain ahistorical (in terms of the earth’s history) romanticism when *Laudato Si’* speaks of “The Message of Each Creature is the Harmony of Creation” and “the entire material universe speaks of God’s love, his boundless affection for us. Soil, water, mountains; everything is, as it were, a caress of God” (84). These statements are difficult to hold onto on their own within the Holocene when nature must also be understood as “red in tooth and claw” (Tennyson). They become even more difficult to hold when we look at the earth’s history with its five great mass extinctions and paleoclimate data from the past 110,000 years where a Younger Dryas type abrupt climate change of a hemispheric to global climate shift of 3° C to 5° C in a few years happened twenty-four times (National Academy of Sciences: 14, 36). Wallace Broecker, in giving a vivid description of the instability and the volatility of the climate system, referred to the climate system as an “angry beast” that we should stop poking with a stick (Stevens). The theme of the interconnectedness of all things that runs through *Laudato Si’* has a constricted understanding of the term “all.” It seems to forget that the harmony of creation that Francis eloquently describes is dependent upon a stable climate system that is dependent upon solar output, slight perturbations in the earth’s orbit, volcanic activity, and a host of feedback mechanisms that are sensitive to slight forcings.

This is not to suggest that Pope Francis’s understanding of caring for our common home grounded in theology is incorrect; rather, the romanticism operating here constricts the imagination to the relatively stable climatic conditions of the Holocene. What science is telling us is that we have destabilized the Holocene and have set in motion the Anthropocene and possibly the Anthropozoic. The care for creation that Pope Francis argues for is to be applauded and is an important piece in the process of ecological conversion that is necessary to avoid the worst of the coming climate catastrophes. Yet constricting the imagination to the Holocene does not provide grounds for fully coming to grips with our responsibility for forcing us out of the Holocene and the devastating impacts that will extend into the deep future. We can only grasp our full responsibility and the great significance of this period if we understand ourselves in terms of the whole history of the earth system. Thus, theological thinking must be coherent with the earth system sciences.

Theological Foundations for Imagining the Deep Future and Caring for Our Common Home

Considering this problematic situation our original guiding question – how can theology help open our imaginations to the deep future so that we can grasp our responsibility for effects that will extend for thousands to millions of years? – is further specified. The central question that I will address is: how can we bring together systematically (albeit somewhat

schematically) the doctrines of creation, incarnation, eschatology, and providence in order that theological thinking is coherent with contemporary scientific understandings of earth's history so that we can open our imaginations to the deep future and create conditions for taking responsibility for the true extent of our actions and thus grasp the significance of this moment? Regarding the methodological relationship of theology and the natural sciences, Ian Barbour developed a fourfold typology for the relationship between the sciences and theology: conflict, independence, dialogue, and integration. The approach here for engaging the natural sciences will be dialogical and integrationist. The dialogical relationship includes comparison of methods, the discovery and exploration of boundaries of the two disciplines, and the comparison of doctrines and theories. The integrational relationship includes the possibility of theology and science informing each other directly such that "some sort of integration is possible between the content of theology and the content of science" (98). The interchange between the findings of the sciences and the content of theology should be such that each of the dialogue partners, in the words of John Paul II, "become not less itself but more itself." This will allow "for a common interactive relationship in which each discipline retains its integrity and yet is radically open to the discoveries and insights of the other." In this paper, the discoveries of the earth sciences reveal the possible long-term effects of our present actions. These scientific discoveries push the boundaries of common theological ways of imagining and ethically relating to the future (dialogical relationship). These scientific insights can also be integrated (integrational) to inform our theological imagination such that the horizon in which theologians reflect upon human beings' ethical relationship to the future can be expanded. My treatment of the deep future allows the sciences to inform theology such that theology can become more itself without reducing the content of theology to the findings of the sciences.

The Purpose of the Incarnation and the Unity of Creation, the Incarnation, and the Eschaton

Now let us constructively respond to our central question: how can we bring together systematically the doctrines of creation, incarnation, eschatology, and providence in order that theological thinking is coherent with contemporary scientific understandings of earth's history so that we can open our imaginations to the deep future and create conditions for taking responsibility for the true extent of our actions and thus grasp the significance of this moment? The dominant tradition in the West held that the purpose of the Incarnation was to blot out the sin incurred from the fall of Adam and Eve (e.g., Aquinas, *Summa Theologica* III q.1 a.3). Nevertheless, early Greek patristic authors such as Irenaeus (d. 202) and Maximus the Confessor (d. 662) drew upon texts from scripture like the Christological hymn in Colossians 1:15-20, which speaks of Christ "as the image of the invisible God, the firstborn of all creation . . . all things have been created through him and for him," Ephesians (1:20-23), and the prologue to John's Gospel (1:18) to argue for the connection between Christ and creation. Irenaeus and Maximus further argued that the Incarnation would have taken place even without the fall of humanity. This view was also held in the West in the Middle Ages by Rupert of Deutz (d. 1129/1130), Honorius of Autun (early 12th century), and Albert the Great (d. 1280). This view was further developed through the work of Matthew of Aquasparta (d. 1302), who held that the purpose of the Incarnation was for the perfection of the natural order; Raymond Lull (d. 1289), who thought that the Word became Incarnate to reveal the love of God; and Bonaventure (d. 1274), who held that the purpose of the Incarnation was both for

the perfection of creation and the redemption from sin. It was, however, in Duns Scotus (d. 1308) that the doctrine of the primacy of Christ as the motive of the Incarnation came to full fruition. For Scotus, “the Incarnation represents not a divine response to a human need for salvation but instead the divine intention from all eternity to raise human nature to the highest point of glory by uniting it with divine nature” (Delio: 9).

I would like to further this tradition of thinking through reflecting, inspired by the thought of Karl Rahner, on the conditions of the possibility for the truth of the Chalcedonian settlement. Jesus’ full humanity, “like us in all things but sin” (Hebrews 4:15), is reaffirmed in the Council of Chalcedon. The full humanity of Jesus indicates that Jesus is a part of the history of the human community and the history of the natural world (the earth’s history) and by extension the history of the cosmos. The council also affirmed that Jesus possessed two natures – divine and human – in one person, the person of the Logos. To hold onto the unity (one person, the person of the Logos) and plurality (two natures – divine and human) of Christ the plurality must be grounded in a prior unity. For a plurality cannot ground a unity. Diversity does not provide the sufficient reason for unity. It is not because there is a distinction that there is a unity; rather, for there to be a unity in plurality, “the plurality must be plural moments arising from a single being, for a subsequent conjunction of elements existing separately on their own cannot form an essential unity” (Wong: 77). The two natures of Christ do not provide the sufficient reason for the unity of Christ in one person; rather, the plurality of natures in Christ are grounded in the prior unity of the Logos. More specifically the unity of the distinct natures in Christ are grounded in the active potency (i.e., pure act) of the Logos to empty itself in another (i.e., humanity) while remaining divine. In light of the doctrine of the Trinity we cannot say that the reality of three persons diminishes the oneness of God; rather, we must say the plurality of persons is constitutive of the perfected unity or oneness of God. Similarly, in light of the doctrine of the incarnation we cannot say that the becoming human of the infinite and immutable divine Logos suggests that the divine Logos is less perfect; rather, we must say that the possibility of the Logos becoming human is indicative of the height of God’s perfection.

Since this possibility of the unity of the created and uncreated natures of Christ is grounded in the perfection of the Logos and was willed by God and realized in the Incarnation, we must say there is an intrinsic unity between the distinct orders of creation (God giving a finite gift other than God, though this gift participates in a limited way in God’s infinite act of existence) and redemption (God giving God’s self). Since this possibility of the unity of divine and human natures is grounded in the perfection of the Logos, creation finds its ground in the higher possibility of God giving God’s self. In addition, if God is self-communicative in God’s self (as revealed in the doctrine of the Trinity), then it is more theologically coherent to hold that the sufficient (not necessary) reason for God creating is to realize the higher possibility of God giving God’s self. In adopting this position, we maintain an intrinsic teleological connection between creation and the Incarnation because the purpose or end (telos) of God creating is God communicating God’s self.

The effect of God communicating God’s self in the life, death, and resurrection of Christ is the inauguration of the kingdom of God. The coming of God’s kingdom was the centerpiece of Jesus’ ministry, with the expression “kingdom of God” occurring one hundred and fifty times in the New Testament (Senior: 856). In the New Testament, Jesus is the proleptic

inbreaking of the kingdom of God. Through Jesus's ministry the kingdom is at hand (Mark 1:14-15), has come upon us (Matthew 12:28; Luke 11:20), and is in our midst (Luke 17:20; cf. Luke 10:7, 11). The healings, exorcisms, and the preaching of the good news to the poor and marginalized are signs that the kingdom of God is present in Jesus (e.g., Matthew 11:4-5). These texts that announce the imminent presence of the kingdom of God in Jesus must, however, be held in a dialectical tension with other sayings and parables of Jesus which suggest that the kingdom of God is a future event. The parables of Jesus reveal that the kingdom is present, but the kingdom has not been definitively realized. The parables of the mustard seed, the leaven, the sower, and the patient husbandman all "looked forward to the future culmination of something begun in the present" (Saucy: 20). In addition, the not-yet character of the kingdom of God is revealed in the Lord's prayer, when Jesus prays for the coming of God's kingdom (Luke 11:2-4; Matthew 6:10). Furthermore, "judgment parables such as Matthew 13:24-30 (see also 13:36-43 and 24-25) project the consummation of the reign of God as future event" (Senior: 859).

The apocalyptic discourses in the synoptic gospels (Mark 13; Matthew 24; Luke 17) refer to the last days "when God breaks into history and brings about a new heaven and a new earth" (Harrington: 512). There is an "already now," but "not yet" character to the kingdom of God. As transcendent and future, the kingdom of God is incomprehensible. As those texts that emphasized the immanent character of the reign of God in Jesus have a heightened sense of the present (the *kairos*), the apocalyptic texts which reveal the end time events also counsel an eschatological expectation where one must be vigilant and follow the way of the Lord lest "he finds you asleep when he comes suddenly" (Mark 13:36; cf. Matthew 24:43-44; Luke 12:39-40). This is because "there are not two different kinds of reign proclaimed by Jesus but only the one same rule manifesting itself in his presence and then appearing on a cosmic scale" (Schnackenburg: 160). It is "impossible to dissociate the realization of the *basileia* in the present from the person of Jesus and, in so far as there exists an indissoluble connection between the dawn of God's reign and its coming full manifestation in glory, the significance of Jesus for the perfect kingdom is evident" (Schnackenburg: 163). Thus, while there is in Jesus's bringing of the kingdom a distinction between past, present, and future, there is continuity. Jesus is the messiah that was anticipated in the past, the one through whom the kingdom of God has entered and reigns in history (present), and the one through whom the final consummation of the universe will be realized in the future.

If Christ inaugurates the kingdom, then there must be a unity between the Christ event in history and the eschatological Christ event. If the unity between creation, incarnation, and ultimate fulfillment is real, it cannot simply be concerned with thematic connections between theological doctrines; rather, it must be an ontological unity. If a plurality cannot ground a unity, then the ontological unity between the humanity and divinity of the Incarnate Christ and the eschatological Christ, must be grounded in the Logos. The new creation in the eschaton cannot be added on from outside, but creation must have the potentiality to be transformed from within; otherwise, there would neither be a real unity between the divinity of the Logos and a human nature in the Incarnation nor would there be a unity between the resurrected Jesus and his body. There is an ontological unity between creation, Incarnation, and the eschaton, which is grounded in the active potency of the Logos (i.e., the pure act of God). The Logos is the one through whom all things come into existence, the one who in

becoming fully human while remaining fully God is the absolute self-revelation of God in history in his life, death, and resurrection, and the one through whom all things reach their ultimate fulfillment. The Incarnation then is the proleptic final cause of God creating. The final cause is the realization of the kingdom of God, where God will be all in all (1 Corinthians. 15:28). Here we see that we not only have an ontological unity but a teleological connection between creation, incarnation, and the eschaton because the purpose of creating is the self-communication of God through the Incarnation that inaugurates the kingdom that will be realized when all things are united with God in the consummation of the universe.

The teleological connection between creation, incarnation, and the eschaton does not mean the fulfillment of creation comes because of a steady evolution of the earth's history and cosmic history. To clarify this point, let us reflect on the resurrection as the "most dramatic sign of the inauguration or presence of God's kingdom" (Harrington: 510). The resurrection accounts reveal that while there is an aspect of discontinuity between the new heaven and new earth there is also continuity with our embodied selves and our histories. The discontinuity is expressed by Jesus appearing behind closed doors (John 20:26) and even locked doors (John 20:19), suddenly vanishing (Luke 24:31), transcending the limits of time in being present to the end of the age (Matthew 28:28), and being carried up into heaven (Luke 24:51). These texts reveal that the resurrected Jesus "now shares God's own capacity to be present in a way more instant and immediate than is possible to any merely mortal body, whose spirit is confined by the limits of physical capability and location" (Johnson: 17). In light of this new capacity, Jesus has to demonstrate to his disciples that it really is him (continuity). He must show them that he is not a ghost "for a ghost does not have flesh and bones as you see that I have" (Luke 24:39) and he does this by showing them his hands and feet that carry the wounds of his crucifixion (cf. John 20:27).

The implication that the resurrected Jesus bears the wounds of his crucifixion indicates that there is continuity in Jesus before and after the resurrection, between the inauguration of the kingdom in the Incarnation and the proleptic fulfillment in the resurrection of Jesus. Furthermore, because the resurrected Jesus bears the wounds of his crucifixion, this suggests that Jesus's history and the objective patterns and social relationships of his context have eternal significance. For Jesus bears the deformities of the social and political context of his time. The event of Jesus's abandonment, betrayal, passion, and death find their culmination in his crucified body (his disciples fell asleep in his hour of need, they abandoned him, Peter denies him, the chief priests and elders hand him over to the Roman governor of Judea, who oppressively occupied Jerusalem, who then crucified him according to Roman law). These events, whose traces remain on the body of the resurrected Jesus, is part of the identity of the resurrected Jesus. While the deformities of those systems and the choices of those who capitulated to these systems are eternally marked on the resurrected Jesus because of the redemptive power of the Father, those choices are not ultimate, they are redeemed. This redemptive power is demonstrated in how Jesus greets his disciples, who abandoned him in the garden of Gethsemane, not with condemnation, but with peace (Luke 24:36; John 20:26). There is continuity between the present unfolding kingdom and its fullness not only in its privations and negations, but also in its positive aspects. This redemptive power mediated through Christ in his resurrected body gathers the disciples together after they scattered and abandoned Jesus in the garden, not as a group huddled behind closed or locked doors, but as

a group joined in faith, hope, and love missioned to spread the good news of Christ to the world (Matthew 28:19-20). This group (the church) is the embodied effect, which sacramentalizes Christ's redemptive power. The resurrected body not only bears the marks of his crucifixion, but becomes an aspect of the means for mediating Christ's redemptive power in the present and into the future.

Following Paul's argument (that if Christ is raised, then the followers of Christ will be raised, 1 Corinthians 15:12-58), and the subsequent development of the doctrine of the resurrection of the body, we can argue that our histories and the objective patterns and social relationships in the past, present, and into the deep future have eternal significance. The eternal significance of our choices and histories does not negate the notion of the final definitive bringing of the new kingdom; rather, it simply indicates that there is a continuity between our embodied self (and by extension the created world), our history, and the final eschatological fulfillment. The resurrection accounts are not only an analogue for the eternal significance of our choices, but because it is a resurrection of the body they provide further evidence for the continuity between creation and eschatology.

If we view the resurrection as the primary revelatory analogue for the eschaton, then we see that the resurrection came out of a catastrophe. Jesus's life did not unfold according to nature's course such that Jesus died from old age; rather, he was arrested, scourged, crowned with thorns, and crucified. This was an abrupt and violent death; yet, God brought new life through the resurrection in the context of its abrupt and violent end (Edwards). This means that God can realize God's kingdom in the context of catastrophe. That catastrophe can be at human hands, as happened to Jesus. In our age, the catastrophe from human hands can come from a full scale nuclear war or rapid, high-CO₂, human-induced climate change (as is happening now). An abrupt catastrophe could also come about, as we have seen, through natural causes like super volcanoes or asteroid impacts. These are all instances of relatively abrupt changes initiated by human beings or natural causes that God would respond to as God responded to the contingent event of Jesus's death by crucifixion with resurrection. These are not events initiated by God, though God, in fidelity to the intelligibility of God's creatures, could permit them. The apocalyptic texts of the gospels counsel an eschatological expectation of vigilance in following the way of the Lord, lest "he finds you asleep when he comes suddenly" (Mark 13:36; cf. Matthew 24:43-44, Luke 12:39-40). These texts are envisioning God coming suddenly not in response to catastrophic events initiated by creatures, but solely on God's terms. And while we must be open to God bringing the full realization of the kingdom of God at any time, the vigilance to the reign of God in our time requires a greater attention to the effects on "the least" (Matthew 25:31-46) in the deep future. In our age of unfolding ecological catastrophe, to be true to the *kairos*, the decisive moment of the decision for or against God and God's kingdom, we must see it not only in terms of our choices in relation to others in the here and now, but more importantly those in the deep future who will experience the most profound effects of our actions. It is only if we allow creation (now illuminated by earth system sciences) to inform eschatology, that we can truly take possession of this decisive moment.

Let us examine how creation can inform eschatology. The argument for the ontological unity and teleological connection between creation, incarnation, and the eschaton must be brought to bear on the not-yet character of the kingdom of God. If there is a unity between

creation, incarnation, and the eschaton, and if God creates to communicate God's self, then the unfolding of creation is necessary for God's self-communication. In creation creatures share in the perfection of existence (and as such creatures have an intrinsic value), and even more importantly creation is the condition of the possibility of God communicating God's self to those creatures who are in their graced natures open to the Infinite. We cannot know the day or hour and we must avoid a vision of pure continuity where the eschaton simply arrives at the end of a long evolutionary progression of earth and the universe such that eschatology is reduced to a developmental reading of cosmology. We must, however, be open to the possibility that God's purpose for human beings as earthlings involves the long unfolding of life over the next 500 million years at which time the increasing output from the sun and the drop in CO2 levels will start to undermine the conditions of life for human beings. (Ward and Brownlee, 109) First, we should be open to this possibility on theological grounds. The Triune God is self-communicative in God's self. If God creates to give God's self, then it is fitting that creation will be ordered for God to communicate God's self abundantly with creatures. This might come about through the emergence of created persons (i.e., created beings open to the infinite) to whom God communicates God's self through the Incarnation of the Word and the sending of the Spirit on millions or billions of planets over the long history of the cosmos. This might also come about through the long history of the earth. That is, to say that despite the possible catastrophes in the deep future of the earth leading up to the ultimate catastrophe of the wiping out of all life when the sun becomes a red giant, we should be open to the possibility that part of the order of creation is that life is resilient because the ultimate purpose of life is the self-communication of God. Second, we should be open to this possibility on scientific grounds. We see in earth's history that while life on earth can go through global catastrophes (five great mass extinctions), life is amazingly resilient and is very difficult to wipe out in its entirety. Though human beings are relatively new in the earth's history, we should be open to the resiliency of human beings (especially because of human intelligence) and thus to the possibility that threats to the future of the earth are not likely to destroy all life on earth or wipe out all human beings. This is not to diminish our responsibility. Ultimately, it should heighten our responsibility by allowing theological principles from the doctrine of God, coupled with the book of nature as disclosed by the natural sciences, to inform our eschatology so that it does not truncate our imaginations, but opens them it up so that we come to terms with the reign of God, which is at the heart of eschatology.

The Purpose of the Incarnation and Radical Contingency in the Earth's History

The argument for the teleological unity of creation, incarnation, and the eschaton emerged from a transcendental analysis of the Chalcedonian definition (i.e., the condition of the possibility of the unity and plurality in the reality of Christ) informed by the doctrine of the Trinity (God is self-communicative in God's self). This argument maintained that the more satisfying tradition regarding the purpose of the Incarnation is the tradition that holds that God created to give God's self. This theological judgement, which was the basis for the theological argument opening our imaginations to the deep future, does not, however, appear to be compatible with the earth's history. While the theology underpinning *Laudato Si'* appears to be blind to vast extent of the earth's history that does not encompass the Holocene, which represents a blink in geological time, my account, in arguing for opening our imaginations to the earth's deep future seems to be blind to the earth's deep past. In our dialogical and

integrational engagement with the earth system sciences such antinomies need to be reconciled, at least schematically at this point, in order to have a picture of the whole. In short, we need to take the whole of the Earth's history seriously and this history poses serious challenges to the theological argument that the purpose of creation is God giving God's self. By implication the foundational theological judgement regarding the teleological unity of creation, incarnation, and the eschaton that created the conditions for opening our imaginations to the future is also called into question. More precisely, how can this view that God creates to give Godself be reconciled with radical contingency in the earth's history? Though Simon Conway Morris argues for convergence and directionality in the evolutionary process, the dominant view among evolutionary biologists was expressed by Stephen Jay Gould in his work on the Burgess Shale: "wind back the tape of life to the early days of the Burgess Shale; let it play again from an identical starting point, and the chance becomes vanishingly small that anything like human intelligence would grace the replay" (125). Gould's thesis was not restricted to the Burgess Shale, but he argued that this was true if one "went back to any time and place in the past" (537). The evolutionary history of the planet is full of contingencies, that is, moments where the course of life could have taken a very different turn such that we would not have ended up with human beings. If human beings would not have emerged then God's purpose in creating would have been ultimately frustrated. One striking example of this on the macro scale is the K-T extinction that wiped out the dinosaurs. Human beings likely exist only because of the impact of an asteroid or comet on what is today the Yucatan Peninsula of Mexico, with the possibility that the volcanic eruptions of the Deccan basalts in India at about the same time also played a contributing role in the extinction of the dinosaurs. The dinosaurs were reptiles and they were the dominant land animals on earth for nearly 140 million years (from 200 to 66 million years ago). While mammals were present for most of this time they "never got very large or very diverse until the dinosaurian competition was removed" (Alvarez: 183-84). Following "that cataclysmic event, mammals began a rapid diversification and some lineages increased enormously in size, filling the large-animal niches occupied by dinosaurs" (Alvarez: 183-84). The question of the final part of this paper is: Can the principle of an intrinsic connection between creation and incarnation be reconciled with radical contingency in the Earth's history? To respond to this question, I will bring into the argument the doctrine of providence; particularly, I will draw upon the late Jesuit John H. Wright's work on providence to answer this question.

In his two-volume work *Divine Providence in the Bible: Meeting the Living and the True God*, John H. Wright, S.J., reviews the whole of scripture to discover the "biblical teaching about God as Lord of nature and Lord of history, and about the interaction of divine and human freedom in accomplishing God's purpose in the world" (2009: 7). Wright finds four themes that run through the whole of scripture, and which are crucial to a proper understanding of the eternal plan of providence: the omnipotence and infallibility of the divine government, the frustration of God's plan in the face of free human resistance, the adaptability that characterizes God's dealings with human beings, and the collective and communal quality of God's purpose and the means for attaining God's purpose.

Wright's analysis reveals how these themes appear over and over in the texts of scripture from the earliest tradition of the Pentateuch through the New Testament. The fourth biblical theme, which will be particularly significant for a proper understanding of divine providence,

is the collective or communal quality “both in the end aimed at by God’s dominion of the world and in the means ordered to this end” (1966: 36). It is not that God saves individuals and they make up the kingdom; rather, the kingdom is something that the faithful enter into (Matthew 5:20, 7:21, 18:3, 19:23-24; Mark 9:47, 10:23-25; Luke 18:25; John 3:5) and has been prepared for them from the beginning (Matthew 25:31-46). The kingdom is not “an inevitable but incidental consequence of having many individuals attain salvation” (1966: 37). Rather, “the constitution of the kingdom is primary; the individual by his fidelity to God’s call can guarantee his entrance into this kingdom” (1966: 37). It is by being incorporated into the community of believers that “one gains fellowship with God and with God’s Son Jesus Christ” (1966: 38; e.g., 1 John 1:3.).

In the history of theology, the doctrine of providence was often formulated solely in terms of the first theme of the omnipotence and infallibility of the divine government. Considering the exclusive focus on this theme theologians assumed that God’s sovereign providence requires that God’s election or decrees cannot be frustrated in individual instances. For those who grounded God’s sovereignty in God’s foreknowledge (patristic authors prior to Augustine [354-430], Luis de Molina, S.J. [1535-1600], etc.), this assumption led to a philosophical contradiction – namely, God knowing what free creatures would do in every possible set of circumstances (i.e., free conditioned futures) before any actual divine decree (i.e., antecedent to God’s knowing what God will communicate). In this case, the central problem is what grounds this knowledge of God. A free choice involves the determination of a creature’s power of acting to one way of acting so that what was merely possible becomes actual and as such becomes knowable. Antecedent to this determination to one way of acting there is nothing there to be known. These accounts are incoherent because they require that God know what is undetermined and thus unknowable. For those who grounded God’s sovereignty in God’s will (Augustine after 396, Domingo Bañez [1528-1604]) this assumption created philosophical and theological problems; it eviscerated human freedom and responsibility and negatively altered the understanding of God’s wisdom, goodness, and justice.

Once we recognize that one of the central biblical themes is the communal character of God’s end then we can allow this to inform the notion of the infallibility of God’s governance. God knows infallibly that God’s purpose of a society of the blessed united to God will be realized because God knows that God’s response and the light of God’s grace will be infallibly effective in the group (there will be a community of the blessed), even though some individuals can choose to finally and refuse God’s universal invitation to eternal life.

Wright provides an analogy from the natural order, “which the supernatural order resembles and perfects” (1966: 45) to illuminate the idea that there is an intelligibility in the group that is “not found in individuals isolated from one another and merely added together” (1966: 46). Excluding some cataclysm that would lead to human extinction, we know with virtual certitude that human beings will be in existence one hundred and fifty years from now. We know this “because we know that the means for guaranteeing the continued existence of the race are infallibly effective in the group, even though they may not be in each individual case” (1966: 45). Even though many people will choose not to have children, there is not the slightest possibility that all people will choose not to have children because the instincts of “sex, self-preservation, and parental care are so strong in human nature” (1966: 45). The intelligibility found in the whole group “is founded on the nature of human liberty as

something not absolutely unconditioned and upon the forces acting everywhere to condition the exercise of this liberty” (1966: 46). Analogously, God infallibly knows that while God’s offer of salvation may be refused in individual instances, the light and attraction of God’s grace offered to created persons in their freedom will be infallibly effective in the group. Hence, God knows antecedent to any created act of free choice that God’s purpose of the realization of the kingdom of God will be infallibly effective.

This argument, grounded in the scriptural theme of the communal character of God’s end, allowed Wright to argue that God’s ultimate purpose of the realization of a community of the blessed can be infallible even though some can turn away from God. This argument can be analogously applied when we widen our field of vision to the whole universe. As an analogy, there are similarities and differences between God’s purpose relative to the contingency of free choices and the contingencies in the earth’s history. The similarity is that they are both dealing with radical contingencies. What is important here is the recognition that the infallibility of God’s government can be upheld in terms of the group while allowing for contingency among individual choices and natural events. The differences, which cannot be explored here, center around the distinction between the contingency operative in free choices and the contingency operative in natural causes in dynamic systems and even more importantly a theological account of God’s knowledge of these two distinct types of contingencies.

When we widen our vision we can say that the purpose of God creating is to give God’s self in the sending of the Son and the Spirit such that the Incarnation and sending of the Spirit are the proleptic final cause of God’s activity, while the consummation of the universe, in which the Triune God (Father, Son, and Holy Spirit) redeems the cosmos, is the final cause of God’s creating. God has created an emergent universe shot through with contingency and chance such that if an asteroid had not hit the earth, then human beings might not have ever existed on earth and thus the second person of the Trinity would not have become incarnate on this planet. While God’s purpose of communicating Godself through the sending of the Son and Spirit might not have been realized on planet earth, God knows antecedently that God’s purpose will be realized somewhere in the cosmos at some time. With the immensity of the observable universe the odds of life and more importantly the emergence of intelligent life and thus the Incarnation of the second person of the Trinity become greater. While the immensity of the universe might be unimaginable to us, on theological grounds it is fitting because God in Godself is self-communicative such that when God chooses to create it is fitting that God creates an immense universe. In addition, on theological grounds if God is self-communicative in Godself and the purpose of God creating is communicating Godself through the Incarnation and the sending of the Spirit, then, though one will never know this in this life, it would be fitting that the second person of the Trinity has incarnated or will incarnate on millions of planets across the universe during the universe’s history. It would be odd to think that God created to give Godself, but the only place in this staggeringly large universe where God gave Godself was on planet earth. This theology of providence, albeit presented in outline, can allow us to accept radical contingency in the earth’s history while upholding the theological judgment that the purpose of creation is the self-communication of God in the sending of the Son and Spirit which is inaugurated in the Incarnation and finds its ultimate fulfillment in the eschaton.

Conclusion

The Anthropocene indicates that human actions are casting a shadow across thousands to millions of years; yet our social and cultural imagination has become reduced more and more to the present. Even scientific studies forecasting future climate change impacts are dominated by a relative brief time horizon of 2050 to 2100 because, along with computational costs, “these periods . . . are comprehensible in terms of [a] human life span” (Montenegro et al.: 1). This suggests that the range of our concern is limited by what we can imagine or what is comprehensible for the public – namely, one human life span. The truncation of our imaginations to the short term inhibits our grasping the true extent of our actions in deep time and as such conceals our moral obligations as we force the earth system into the Anthropocene or possibly the Anthropozoic. Opening our imaginations and thinking to the long-term effects of our actions is thus foundational for ethical considerations of the Anthropocene. Currents in Christian environmental thinking, as exemplified by *Laudato Si'*, tend to have an ambiguous sense of the future and harbor romantic notions of the earth system that implicitly confine themselves to the Holocene and as such are not in line with scientific knowledge. Out of this problematic situation came the guiding question of this paper: how can we bring together systematically (albeit somewhat schematically) the doctrines of creation, incarnation, eschatology, and providence in order that theological thinking is coherent with contemporary scientific understandings of earth's history so that we can open our imaginations to the deep future and create conditions for taking responsibility for the true extent of our actions and thus grasp the significance of this moment?

The response to this question had three moments. First, a transcendental analysis of the Chalcedonian definition (i.e., the condition of the possibility of the unity and plurality in the reality of Christ) informed by the doctrine of the Trinity (God is self-communicative in God's self) argued that there is an intrinsic teleological connection between creation and the Incarnation because the purpose or end (telos) of God creating is God communicating God's self.

Second, we examined the future through the notion of the kingdom of God in conversation with the conclusion of the first moment of the argument and the natural sciences. There is an ontological unity and teleological connection between creation, incarnation, and the eschaton because the effect of God communicating God's self through the life, death, and resurrection of Jesus is the inauguration of the kingdom of God that will be realized in the future on a cosmic scale. This emphasis on the unity of creation, incarnation, and the eschaton and the sense of continuity between the inauguration of the kingdom and its final consummation through Christ in the eschaton provide theological foundations for countering the view, held for almost two millennia, that earth and the natural world are “the setting for human existence, the stage on which human protagonists worked toward their salvation in a better world to come” (Hart: 65). The resurrection accounts, which are the “most dramatic sign of the inauguration or presence of God's kingdom” (Harrington: 510), reveal that while there is discontinuity between the new heaven and the new earth there is also continuity because the resurrected Jesus bears the wounds of his crucifixion. The implication is that the deformities in the social relationships of his time and the choices of those who capitulated to those systems are eternally marked on the body of the resurrected Jesus and thus have eternal

significance despite their being redeemed by the resurrected Jesus. The continuity of the resurrection accounts (it really is Jesus) must be held together with the discontinuity (Jesus exists in a new transcendent way); yet, the continuity indicates the eternal significance of our actions and counters any diminishment of our responsibility for the natural world and the course of human history. The “better world to come” is not separate from this world and our choices, there is continuity and discontinuity. The argument for the unity of creation, incarnation, and the eschaton provided theological grounds for maintaining that the doctrine of creation in dialogue with earth system sciences can inform eschatology. This allowed for the preservation of the basic sense of the vigilance called for in the apocalyptic discourses in the synoptic gospels without diminishing the time horizon of our concern to the immediate moment in the context of the final in-breaking of the kingdom. Here it was argued that we must be open to the possibility that God’s purpose for human beings as earthlings involves the long unfolding of life because if God creates to give God’s self, then it is fitting that creation would be ordered for God to communicate God’s self abundantly with creatures including through the deep future of the earth. We also see through the natural sciences that life, including possibly human life, could last another 500 million years. While we must be open to the possibility of God bringing the full realization of the kingdom of God at any time, if we bring the idea that the purpose of creation is the self-communication of God into dialogue with the apocalyptic discourses in the gospels, then we can, in our age of unfolding environmental tragedy, understand the vigilance to the reign of God as requiring greater attention to the effects on “the least” (Matthew 25:31-46) in the deep future. As “the insistence on constant vigilance helped them [the early Christian community] to find significance and ethical direction in their actions in the present” (Donahue and Harrington, 382) so too it can help us find ethical direction in grasping our responsibility for effects that will extend into the deep future and are contrary to the purpose of God.

Finally, the theological idea that God creates in order to communicate God’s self through the sending of the Son and Spirit which is inaugurated in the Incarnation and finds its ultimate fulfillment in the eschaton was reconciled with radical contingency in the earth’s history through a doctrine of providence that can allow for such contingency and thus is coherent with the history and forecasted future of the earth system.

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