The End of it All: Cosmology and Christian Eschatology in Dialogue

David Wilkinson

Summary

Science looks forward with a degree of pessimism concerning the future. This is reflected in four aspects of current scientific thinking:

1. The destruction of the environment
2. Terrestrial mass extinction
3. The end of the Sun
4. The end of the Universe whose rate of expansion is increasing

This paper suggests that of these, recent theological thought has concentrated almost exclusively on the first, with little work at all on the last. Indeed even those theologians who have recognised the importance of the question of the end of the Universe have not interacted with it with any degree of depth or seriousness.

Concerning the end of the Universe, six questions are posed to theologians. What does the end of the Universe as predicted by science mean for the understanding of creation, new creation, the relationship of the Earth to the whole of the created order, providence, hope and ethics? If a fruitful interaction of science and theology is to proceed, such an integration cannot solely concentrate on the beginning of the Universe, it must take account of the end. This is in part to respond to Pannenberg's questions to scientists, and in addition to suggest a framework for continued dialogue between science and theology in this area.

Within this integration, the resurrection is particularly important in any understanding of creation and eschatology which takes seriously the scientific predictions for the end of the Universe.

The End of it All: Cosmology and Christian Eschatology in Dialogue

David Wilkinson

Introduction

In contrast to the beginning of the Universe, very little dialogue has taken place between science and religion with regard to the end of the Universe. Yet current scientific speculation on the future of the Earth and the Universe is a hot topic in contemporary science, and raises some important questions for Christian eschatology, that is thinking about the end.

Another fascinating contrast is that contemporary science rather than encouraging an optimistic view of the future, which was prevalent at the end of the 19th century, paints a rather pessimistic view of the future. In this paper we review these sources of 'cosmic pessimism' and then pose some questions for Christian theology.

A pessimistic view of the future?

1. Destruction of the environment

The use of global resources, such as food in the face of growing population, deforestation and the overuse of fossil fuels, has received a great deal of interest in recent years with the growth of environmental concern. Coupled with issues of global pollution such as the dumping of waste and global warming and the destruction of the ozone layer, the situation if continued becomes serious[1].

The recent report of the Scientific Assessment Group of the Intergovernmental Panel on Climate Change, uniting most of the world's atmospheric scientists, concluded that if the current situation of the emission of greenhouse gases continues then models predict an average increase in temperature for the Earth of between 1.5 and 6 degrees in the next century. The implications of this for sea-level changes, eco-systems and population movement are severe. For example it will create some 150 million environmental refugees over the next 100 years.

Some react to this with warnings that the earth will become uninhabitable within the next century; others look to technology in order to control these consequences.

2. Terrestrial mass extinction

Recent Hollywood movies such as *Deep Impact* and *Armageddon* concern comets heading for the Earth threatening 'an extinction level event'. Tidal waves destroy New York, humanity takes to deep caves to survive and astronauts are dispatched on a last ditch attempt to avert disaster.

Such scenarios are not solely the area of science fiction. The impact of the 21 fragments of comet Shoemaker-Levy on Jupiter in 1994 demonstrated the possibility and indeed seriousness of such impacts. Scars existed in the Jovian atmosphere for more than a year[2].

In 1991 and 1994 asteroids passed within 100,000 km of earth which is about half the distance between earth and moon. The impact of an asteroid only a mile wide would lead to tidal waves or a crater 20 miles wide depending on whether it impacted on sea or land. The accompanying explosion would be the equivalent of two million Hiroshima-sized bombs. Indeed, it is widely held that an impact by a comet or asteroid led to the extinction of the dinosaurs some 65 million years ago. In fact the dinosaurs are not the only species that seem to have been wiped out within a short time in the fossil record. Such mass extinctions happen roughly every 30 million years. We have shown elsewhere that all such extinctions cannot be caused by cometary impacts, so other mechanisms such as enhanced volcanic activity may be responsible[3]. Yet the danger from comets or asteroids remains real.

A collision with a comet is entirely possible every 250 million years on average. We also now know of some 2000 asteroids whose orbits cross the orbit of the earth, and therefore potentially could cause catastrophic environmental conditions for human beings. Smaller asteroids not leading to extinction events may be expected every 0.3 million years, while larger ones capable of mass extinction every 100 million years.

Such a serious possibility has recently led to serious political discussion on how the earth may be protected.

3. The end of the Sun

Whether or not a comet hits, we know for certain that in 5 billion years, the earth will be uninhabitable. The Sun will come to the end of its available hydrogen fuel and will begin to swell up, its outer layers swallowing up Mercury, Venus and the Earth. It will then lose its outer layers and the centre will become a white dwarf, an object of high density about the size of the Earth. Without the heat and light of the Sun none of the remaining planets will be habitable.

At this point, it is envisaged that human beings will have moved away from the Earth to colonize the Galaxy, finding new stars and inhabitable planets. It may be worth noting in passing that this may not be as easy as it sounds. There are good arguments for believing that the Earth may be unique in its environment[4]. However, human beings seem capable in the future of living on vast space stations or even engineering planetary atmospheres for their own benefit.

---

[2] P. Barnes-Svarney, *Asteroid: Earth Destroyer or New Frontier?* (New York, Pelnum Press, 1996) pp. 125-127.
[3] M.E. Bailey, D.A. Wilkinson and A.W. Wolfendale,. 'Can Episodic Comet Showers Explain the 30 Myr Cyclicity in the Terrestrial Record', *Mon. Not. R. astr. Soc*., **227**, 863-885(1987); A.W. Wolfendale and D.A. Wilkinson, 'Periodic Mass Extinctions' in *Catastrophes & Evolution*, ed. S.V.M. Clube, (Cambridge, CUP, 1989) pp. 231-239.

4. The end of the Universe

A decade ago, cosmologists saw two possible futures for the Universe[5]. The Universe was believed to be slowing down in its expansion. Therefore, it could reach a point where the force of gravity acts on the matter of the Universe to reverse the expansion force of the Big Bang, collapsing the Universe back to a point of infinite density - a Big Crunch. However, a second scenario called heat death was also on offer. Scientists argued that there might not be enough matter in the Universe to make this happen. If this was the case, the Universe expands forever becoming more and more a cold life-less place full of dead stars.

For a number of years, both observers and theorists struggled to decide between these two possibilities. The key was thought to be how much matter there was in the Universe, and this was difficult because gravitational studies of the local movements of galaxies indicated a large amount of unseen matter, that is dark matter. This form of matter that did not emit light was present but its nature was unknown.

However, since 1998 the picture has totally changed. Cosmology has undergone a massive revolution stemming from the work of two groups, The Supernova Cosmology Project and the High-Z Supernovae Search, who wanted to see how the rate of expansion was changing in order to decide between Big Crunch and Heat Death. In this work they discovered something that nobody expected.

To see how the Universe is expanding one must look at distant objects that emitted light much earlier in the Universe's history. If one knows the intrinsic brightness of these objects then a comparison of their intrinsic brightness and the brightness of them as you measure from Earth will give you the distance. This 'standard candle' method then allows you to compare their redshifts (which gives you their recession velocity) and distances in order to see how the Universe was expanding in the past compared to now.

The key is therefore to find such standard candles that you can see at large cosmological distances. The two groups used supernovae explosions as these standard candles. For a few days, supernovae explosions of a certain type shine nearly as brightly as a whole galaxy. In particular, Type Ia Supernovae, which are the explosions of white dwarfs onto which matter has fallen from a companion star, can be used as standard candles over cosmological distances.

The main problem however with these standard candles is that there are not a lot of them, and they fade very quickly. They are quite rare; the last one seen in our galaxy was in 1006! However, by surveying lots of galaxies you multiply the chances of seeing them. The technique was developed to survey a million galaxies in a typical night's observing and from that find more than 10 supernovae.

The results announced in 1998 were completely unexpected. Far from the Universe slowing down, the results indicated that the expansion of the Universe was actually speeding up. This sent a shock wave through the

[5] J. N. Islam, *The Ultimate Fate of the Universe* (Cambridge: Cambridge University Press, 1983); F. Close, *End: Cosmic Catastrophe and the Fate of the Universe* (London: Simon & Schuster, 1988); P. Davies, *The Last Three*

scientific community. Observers tried to check the result and theoreticians began to ask what was causing such acceleration. As time has gone on the evidence has accumulated to show that the acceleration is real.

What does this mean? One possibility is that the data is misleading. For example, for some reason supernovae may be fainter in the past, and therefore look further away. That seems unlikely but remains a possibility. Or perhaps the predictions of General Relativity, on which the expanding Universe is based, are wrong. This would be unexpected because of the success of General Relativity in so many other areas. If both of these options are rejected, then one is forced to the conclusion that some unknown type of material or force throughout the Universe is accelerating its rate of expansion. It is this final conclusion to which most scientists have been drawn.

This new force therefore controls the expansion of the Universe even though it has no discernible effect on scales less than a billion light years, that is we do not see its effects in our local stars and galaxies. To put it another way it seems that the combined amount of visible matter and dark matter is less than half the content of the Universe. The rest is 'dark energy' with a totally unexpected feature, that is, it does not attract like gravity but repels. Due to this repulsion force the Universe is accelerating in its rate of expansion.

What is this dark energy? Einstein in applying general relativity to the Universe had suggested a cosmic repulsion, represented by his introduction of a 'cosmological constant' into the equations, in order to achieve a static rather than contracting Universe. He rejected such a suggestion as his 'biggest blunder' yet physicists have returned to it.

Some have suggested that the vacuum itself can exert a force for it is a seething mass of particles and anti-particles. The difficulty of this vacuum energy is that it is completely inert, maintaining the same density for all time. This means that the cosmological constant would have to be fine-tuned at the beginning of the Universe. This is an example of an anthropic balance, that is something in the law and circumstance of the Universe that is 'just right' for the existence of life. Some distinguished cosmologists such as Sir Martin Rees and Steven Weinberg pursue an anthropic explanation for this fine-tuning, involving the concept of many universes and the fact that our existence selects for us this particular universe.

Others have suggested a new idea known as quintessence, which refers to a dynamical quantum field that gravitationally repels. The advantage of quintessence over the vacuum energy is that quintessence may interact with matter and evolve with time, so might naturally adjust itself to reach the present day value without the need for fine-tuning. The further advantage to cosmologists is that quintessence compared to the vacuum energy, may undergo all kinds of complex evolution. Theorists however are only speculating at this point. Some suggest that quintessence springs form the other dimensions required by string theory.

Those who suggest quintessence do so not only for scientific reasons. Ostriker and Steinhardt write:

'As acceleration takes hold over the next tens of billions of years, the matter and energy in the universe will become more and more diluted and space will stretch too rapidly to enable new structures to form. Living things will find

the cosmos increasingly hostile. If the acceleration is caused by vacuum energy, then the cosmic story is complete: the planets, stars and galaxies we see today are the pinnacle of cosmic evolution.
But if the acceleration is caused by quintessence, the ending has yet to be written. The universe might accelerate forever, or the quintessence could decay into new form of matter and radiation, repopulating the universe…….the universe had once been alive and then died, only to be a given a second chance'[6]

It is interesting that they are looking for some hope in this cosmic picture. As we shall see they are not alone in such speculation.

It is probably at this point that we need to recall a word of caution from one of the world's most distinguished cosmologists, James Peebles. He wrote recently that 'The theory of the accelerating Universe is a work in progress. I admire the architecture, but I would not want to move in just yet'[7]

Yet at the same time we should not underestimate the importance of these findings. 'If you thought the universe was hard to comprehend before,' says University of Chicago astrophysicist Michael Turner, 'then you'd better take some smart pills, because it's only going to get worse.'

So what will be the future of a Universe made up of 5% ordinary matter, 35% exotic dark matter and 60% dark energy? T.S. Eliot was right in, 'This is the way the world ends. Not with a bang but a whimper.' When the Universe is 10^{12}years old, stars cease to form, as there is no hydrogen left. At this stage all massive stars have now turned into neutron stars and black holes. At 10^{14} years, small stars become white dwarfs. The Universe becomes a cold and uninteresting place composed of dead stars and black holes. According to some theories of particle physics, protons themselves should decay at 10^{31} years. All that would be left would be some weakly interacting particles and a low-level energy background[8].

A Theological View of the Future?

Theologians have responded in different degrees to these pictures of the future. Much work has been done in recent years on the destruction of the environment, both theologically and practically[9]. Perhaps because of this, interest has been deflected away from other questions about the future. For example, Moltmann's *God in Creation* demonstrates an environmental perspective but does not go further[10].

Other questions have been rarely addressed. The existence of mass extinctions raises the question of why there is so much waste in the creative process? The end of the Sun raises the question of whether human beings are destined to be cosmic travelers, seeking out new planets capable of supporting life?

---

[6] J.P. Ostriker and P.J. Steinhardt, 'The Quintessential Universe', *Sci. Am*., January 2001.
[7] P.J.E. Peebles, 'Making Sense of Modern Cosmology', *Sci. Am*., January 2001, p. 54.
[8] F.C. Adams and G. Laughlin, 'A Dying Universe: The Long Term Fate and Evolution of Astrophysical Objects' *Reviews of Modern Physics* 69 (1997) pp. 337-72.
[9] See for example S. McFague, *Models of God: Theology for an Ecological, Nuclear Age* (London, SCM, 1987); G. Prance, *The Earth Under Threat: A Christian Perspective,* (Iona, Wild Goose Publications, 1996); C.A. Russell, *The Earth, Humanity and God* (London: UCL Press, 1994).

More seriously, very few theologians have taken seriously the scenarios for the end of the Universe. It cannot be argued that this is because the scientific picture is very recent. The scenarios of heat death and Big Crunch have been with us in outline since the work of Einstein and Hubble in the 1920s. In fact, as early as 1854 Hermann Helmholtz gave a lecture on the implications of the 'running down' of the Universe predicted by the Second Law of Thermodynamics[11].

It is an area where scientists and theologians need to work together but an area where there is a degree of mutual cynicism. The theologian Daniel Hardy writes, 'It is partly due to the widespread avoidance of direct engagement with creation and eschatology by theologians...that scientists and those of a speculative turn of mind have turned to such wider issues'.[12] Meanwhile the cosmologist Frank Tipler in his writing about the end of the Universe wants to 'rescue eschatology from the hands of theologians who with a few exceptions...are quite ignorant of it'[13]. Likewise, in a series of lectures given at New York University in 1978, the physicist Freeman Dyson stated his purpose as, 'I hope with these lectures to hasten the arrival of the day when eschatology, the study of the end of the Universe, will be a respectable scientific discipline and not merely a branch of theology'.[14] Here are challenges from the scientific community that theologians need to take seriously.

Why is there such a lack of theological enthusiasm to deal seriously with the end of the Universe? First, gazing into the future is perceived to be very difficult and subject to a great deal of risk. The origin of the Universe is often presented as a solid scientific fact, and therefore theologians feel that they are on more solid ground. This may be illusory, as any models of the origin of the Universe share with predictions about its future, the assumption that the laws of physics apply at any time in the Universe's history and one's model is only as good as the evidence on which it is built. Of course, the evidence of the redshift, the microwave background and the helium abundance in the Universe forms a strong basis for the Big Bang model, allowing us to be more confident about the origin rather than the future. However, the future is not totally unknown. The long lifetime of the Universe and a future of futility either in heat death or Big Crunch are as firm scientific conclusions as the Big Bang.

The second reason is a reason shared with theological work concerned with the origin of the Universe. That is there is an inherent difficulty in discussing the beginning and end of the Universe from inside it. Arthur Peacocke has pointed out that the beginning and end of the Universe are not events in history, but are the framework for history itself, and that the scientific method was never designed to deal fully with these issues. This recognition should lead to a degree of humility, but does not mean that it is useless to engage with the beginning of the Universe. Indeed, for the Christian theologian, belief in the Universe as creation means that the beginning and end of the Universe are appropriate topics for theological work.

---

[11] M. & I.F. Goldstein, *The Refrigerator and the Universe*, (Cambridge, Harvard University Press, 1993).
[12] D.W. Hardy, 'Creation and Eschatology' in *The Doctrine of Creation*, ed. C. Gunton, (Edinburgh, T&T Clark, 1997) p. 112
[13] F.J. Tipler, *The Physics of Immortality* (London: Weidenfeld & Nicolson, 1994), p. xiii.
[14] F.J. Dyson, 'Time without end: Physics and Biology in an Open Universe', *Reviews of Modern Physics*, **51:3**

Third, theological work on the end of the Universe has suffered from the theological excess of former years. Predictions of the end of the world, hell and damnation preaching, and the absurdity of some theological speculation have given eschatology a bad name. Work on the origin of the Universe may seem safer, although the spectre of seven-day creationism is always in the background. Yet the existence of theological excess indicates the need for good theology in this area rather than silence. Theology needs to reclaim and explore the relationship between eschatology and the physical Universe.

Fourth, it is difficult to see initially how work on the end of the Universe has any practical value. Does it really matter whether the Universe will end in 100 billion years? Does it have anything to say to questions of justice or Christian lifestyle? The strength of the revival of interest in Christian eschatology has been the way that theologians such as Moltmann have earthed the future in the past and present, with a moral implication for human response. It is difficult to see how this may be the case concerning events which are predicted billions of years in the future. However, we shall see that the end of the story always is important.

Hardy is one of the few theologians who have attempted to address the question of the end of the Universe, in relation to both science and the doctrine of creation. Criticizing Tipler's speculations about immortality (although perhaps not understanding them fully), he suggests that theology must provide a combined account of creation and eschatology that would consist of 'the successful integration of current understanding of cosmology (the structure and dynamics of the universe) with theology (normative conditions of the structure and dynamics of the universe grounded in normative authority)'.[15]

He then outlines the lines on which the account might proceed. They may be summarized as:

1. Creation keeps the Universe from ending, but also brings it to an end
2. Covenant is a way to view the dynamics of the created Universe with two aspects – obligatory and promissory.
3. These dynamics result from a radical gift/self promise on the part of God, in which God gives to the other (universe, world, humanity) varying capacities for finitude, full possibilities of development, and redemption in the face of evil.
4. This action of God requires worship, and in this creation and eschatology return glory to God.

This is a helpful starting point but Hardy is somewhat disappointing in applying this to the scientific picture of the end of the Universe. Indeed, after pleading for integration of the current understanding of cosmology he does not interact with it at all. Hardy needs a number of bridges between theology and cosmology in order for the integration to proceed.

The other theologian to take these issues seriously is Pannenberg. In 1981 in his questions to scientists, he asked,

'Is the Christian affirmation of an immanent end of this world that in some way invades the present reconcilable with scientific extrapolations of the continuing existence of the universe for billions of years ahead?….Scientific

predictions that in some comfortably distant future the conditions for life will no longer continue on our planet are hardly comparable to biblical eschatology'[16].

It is interesting that this is a question he poses to the scientific community. However, Pannenberg could have equally addressed this question to the theological community.

In what follows I attempt to outline some of the specific theological questions raised by the scientific picture of the end of the Universe. They may become bridges between scientists such as Tipler and theologians such as Hardy. It is the conviction of the paper that the scientific picture of the end of the Universe is significant and needs to be taken with theological seriousness. I therefore pose six questions to both scientists and theologians.

1. What does the end of the Universe mean for the doctrine of creation?

The futility of the end of the Universe has been taken seriously by a number of philosophers and scientists. In a famous quote, Bertrand Russell laments:

'.....the world which science presents for our belief is even more purposeless, more void of meaning..... that all the labours of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast depth of the solar system, and the whole temple of man's achievement must inevitably be buried beneath the debris of a universe in ruins - all these things, if not quite beyond dispute, are yet so nearly certain that no philosophy that rejects them can hope to stand.'[17]

Steven Weinberg is a cosmologist who has made outstanding and fundamental contributions to the development of the subject during this century. Primarily because of the picture given by science about the end of the Universe, he states, 'the more the universe seems comprehensible, the more it also seems pointless'[18].

Christian theology needs to take this seriously. Can the Universe be understood as creation with this picture of the end? How significant is the end of the story to the understanding of the whole?

This can be illustrated in the area of natural theology. A great deal of work concerned with creation, especially in the area of science and religion has concentrated on aspects of design[19]. These accounts see the anthropic balances in the law and circumstances of the Universe as pointers to or at least consistent with the belief in a Creator God. The danger of this is that it stresses the beautiful aspects of creation rather than the reality of creation. David Hume criticised the design argument for highlighting the good things in creation while not taking into account evil. The same criticism could be made of modern restatements of the design argument in the area of modern cosmology.

---

[16] W. Pannenberg, 'Theological Questions to Scientists', *Zygon*, **16**, 65-77, 1981
[17] B. Russell, *Why I am not a Christian,* (New York; George Allen and Unwin, 1957) p. 107.
[18] S. Weinberg, *The First Three Minutes*, (London, Andre Deutsch, 1977) p. 154.
[19] See for example D.A. Wilkinson, 'The Revival of Natural Theology in Contemporary Cosmology,' *Science and Christian Belief,* **2**, No. 2, 95-116 (1990); P. Davies, *God and the New Physics*, (Harmondsworth, Pelican, 1983); J.C. Polkinghorne, *Science and Creation*, (London, SPCK, 1988); A. Peacocke, *Paths from science towards God: The end of all our exploring*, (Oxford; Oneworld, 2001); D.A. Wilkinson, *God, Time and Stephen Hawking*

One of the leading proponents of such an argument is the physicist Paul Davies. In a recent interview he was pressed him on the apparent futility of the end of the Universe[20]. He responded by restating the importance of anthropic balances and indeed the possible existence of life throughout the Universe. In a recent book he concluded, 'For those who hope for a deeper purpose beneath physical existence, the presence of extraterrestrial life forms would provide a spectacular boost, implying that we live in a universe that is in some sense getting better and better rather than worse and worse.'[21] He seems desperate to avoid Weinberg's despair.

In contrast, a Christian understanding of creation can incorporate an end in futility. This is because such an end may not be totally unexpected within the tension that the creation is both good and fallen. Such a tension is seen within the biblical literature. Creation is good and beautiful, independent of our presence within it and ability to observe it (Gen. 1, Job 38-39). Yet at the same time, the fall has had some corrupting effects on the creation. So that the earth is under a curse but it is also under covenant (Gen. 8:21, 9:8-17).

Such a tension might lead to you to expect a creation that exhibits at the same time both purpose and futility. This of course raises questions of how the fall in terms of human rebellion affects the physical Universe. The questions have some parallel with questions concerning human death. In one sense human beings are destined to futility, they will all die. Resurrection does not immediately solve questions such as what is the purpose of death. Is death itself part of God's intention within creation?

In the same way, was the future of the Universe ending in heat death or Big Crunch part of God's plan from the beginning and if so, why? The answer to such questions must however struggle with the tension of a good and fallen creation. Not holding in some way to that tension leads to extremes. Hardy is right to see creation as keeping the Universe from ending, but also bringing it to an end.

Some have stressed too much the fallen aspects of creation, seeing it as totally futile. Thus Frank Tipler picks up on this and writes, 'As I understand biblical eschatology, once humankind have no further use for the physical Universe, it is terminated'. Yet that is not biblical eschatology. The Old Testament through the earth being under covenant makes clear God's continuing purposes for the earth. In the New Testament the pictures are not of human beings escaping from the earth to heaven, but that God should do something with the earth, so we can dwell on it in rest with God. God comes here rather than we go somewhere else. The incarnation itself is an affirmation of the value and goodness of creation.

At the other extreme, a view of the Universe that sees everything as good may find it difficult to cope with the futility of the end. Some see the physical evolution of the Universe as bringing about something better and better, identifying God's purposes totally and exclusively with this Universe. Indeed, the physical evolution leads to spiritual evolution in an ever-upward spiral.

---

[20] D. Wilkinson and P. Davies, 'Surer path to God?', *Third Way*, June 1999

Christian eschatology wants to avoid either extreme and does so not only by reflecting on the doctrine of creation but also on incarnation and resurrection. If the incarnation affirms creation, then the resurrection not only vindicates the whole created order but it also points the way beyond it, as the first fruits of a new created order. The biblical picture sees that God's purposes are still with this creation but go beyond it. On this basis the Universe which science presents incorporating both purpose and futility has some resonances with the biblical picture.

2. What has the end of the Universe to say to the doctrine of new creation?

Moltmann comments, 'it is God's new beginning which brings this perverted world to its deserved and longed-for end'[22]. This is an important Christian insight that is often overlooked.

Initially, the biblical theme of God creating a new heaven and a new earth seems to link well with a present Universe destined to futility. Just as God's purposes for the human person go beyond the futility of physical death, so God's purposes go beyond the present creation to new creation.

However, we need to be clear what we really mean by this, and the initial picture has a great deal more to it than we might at first realize. For example, a 1983 commentary on a passage from 2 Peter quotes a commentator who identifies the biblical verse literally with the scientific picture of the end of the Universe:

'The solar system and the great galaxies, even space-time relationships will be abolished….All elements which make up the physical world will be dissolved by heat and utterly melt away. It is a picture which in an astonishing degree corresponds to what might actually happen according to modern theories of the physical universe'[23].

The commentator does not seem worried at all that the writer of 2 Peter would be astonished to be told that 100 billion years would have to pass before these events! In addition to parallels of swelling suns and the like, another difficulty is in the relationship of old creation and new creation. Some strands of biblical interpretation have seen the new creation coming after the total destruction of the old, with no continuity between the two apart from God himself and a number of 'saved souls'.

Yet the main biblical passages are a little subtler than this. Isaiah 65:17-19, 2 Peter 3:10, and Revelation 21:1 do not refer to abolition of the old creation but of transformation[24]. As Bauckham comments, "the contrast between 'the first heaven and the first earth' on the one hand, and 'the new heaven and the new earth' on the other refers to the eschatological renewal of this creation, not its replacement by another"[25].

---

[22] J. Moltmann, 'Is the World Coming to an End or Has Its Future already Begun?' in D. Fergusson and M. Sarot (eds.), *The Future as God's Gift,* (Edinburgh, T&T Clark, 2000) p. 131.
[23] B. Reicke quoted in M. Green, *2 Peter and Jude,* (Leicester, IVP, 1983) p. 138.
[24] D. Wilkinson, *Creation,* (Leicester, IVP, 2002); See also C. Westermann, *Isaiah 40-66*, (London, SCM, 1969) p. 408; J.D.W. Watts, *Isaiah 34-66*, (Waco Texas, Word, 1987) p. 354; R. Bauckham, *Jude, 2 Peter*, (Waco Texas, Word, 1983) pp316-322; G.R. Beasley-Murray, *The Book of Revelation*, (London, Oliphants, 1974) p. 312.

A fourth passage, 1 Cor. 15:35-49 also follows this line. In his imagery of seed and plant, Paul combines continuity and transformation. The old creation is not abolished but is transformed. The resurrection of Jesus provides the model for this. The New Testament sees the resurrected Jesus as the same Jesus but somehow different.

What is important in all of this is that New Testament does not see new creation as God's 'second attempt'. John Polkinghorne summarizes, 'the new creation is not a second attempt by God at what he had first tried to do in the old Creation. It is a different kind of divine action altogether, and the difference may be summarized by saying that the first creation was ex nihilo while the new creation will be ex vetere. In other words, the old creation is God's bringing into being a universe which is free to exist 'on its own', in the ontological space made available by the divine kenotic act of allowing the existence of something wholly other; the new creation is the divine redemption of the old'[26].

This redemption of the old seems to be pictured in terms of a long process such as seed into plant as well as a specific event of judgment such as in the 2 Peter passage. What is common is that both are acts of God. There is no sense of creation progressing by itself; only God's actions can bring about a new creation.

The end of the Universe envisioned by science can interact well with this. The ultimate fate of the Universe is not an ever-upward spiral, indeed it needs to be saved from futility by an act of God. The only 'good ending' of the story is a transformation or renewal of the present Universe. Ian Barbour argues that the biblical stories of the end are symbolic expressions of trust in God[27]. The importance of trust in God for the future can be seen in the contemporary perspective of the end of the Universe.

If the resurrection of Jesus gives us the best model of the new creation, we can tentatively ask how this new heaven and earth will exhibit both continuity and discontinuity with the present creation? How might we characterize this theological continuity and discontinuity in terms of the scientific view of the Universe? It seems to me that within many aspects to be explored, two areas are the nature of space-time and the nature of matter.

In terms of space-time, many theologians have seen new creation as some timeless existence. Yet many contemporary theologians suggest that divine eternity should not be conceived of as sheer timelessness. Time is important for relationship and growth. The continuity may be that time is real in the new creation but the discontinuity is that time no longer limits us in the way that it does in this creation. In this creation time is associated with decay and growth, but in new creation might time be simply about growth?

In terms of matter what will be the nature of the new creation? The resurrection body of Jesus implies some form of physical embodiment that has the continuity with this creation of eating fish and seeing the marks of the nails. However, the risen and ascended Jesus does not need to eat fish to survive, and the marks of crucifixion are now marks of glory rather than suffering. Physical matter has been transformed. In this creation matter comprises energy and information pattern. How is that transformed in new creation? Is the information pattern embodied in a

[26] J. Polkinghorne, *Science and Christian Belief* (London, SPCK, 1994) p. 167

different way? Certainly, the Christian understanding of Eucharist points towards this continuity and discontinuity of matter, the bread and wine being a foretaste of the heavenly banquet.

3. What does the future of the Universe say to the relationship of the earth to the Universe?

I suggested earlier that many contemporary pictures of the future, certainly in the popular arena, are concerned with the end of the world rather than the end of the Universe. The question of the end of the world is much more immediate of course than the end of the Universe. However, in the last three decades, work on the anthropic principle has demonstrated the close connection between the earth and the Universe in the context of the origin of the Universe. That is, the earth only exists because of very sensitive balances in the laws and circumstances of the early Universe. This at the very least raises the question of the relationship of the earth and the Universe in the context of their end.

Much of the biblical material quite understandably pictures the end of the world rather than the end of the whole Universe. How far can the biblical view of the earth or the world be extrapolated to all creation? Furthermore, how does God's act of redemption of human beings relates, if at all, to the whole Universe?

Romans 8:19-22 raises the question of what is the relationship of the rebellion and redemption of human beings to creation? Some have interpreted this in a very anthropocentric way, that we are at the centre of the Universe and therefore our state determines the state of the rest of the Universe.

The geneticist R.J. Berry, writing with the environmental issue in mind, argues that Paul's point is that as long as we refuse to play the part assigned to us by God, that is to act as his stewards, then the entire world of nature is frustrated and dislocated. That is, 'an untended garden is one which is overrun by thorns and thistles'[28].

In this he follows Cranfield who comments:

'What sense is there in saying that "the subhuman creation - the Jungfrau, for example, or the Matterhorn, or the planet Venus - suffers frustration by being prevented from properly fulfilling the purpose of its existence?", the answer must surely be that the whole magnificent theatre of the universe, together with all its splendid properties and all the varied chorus of sub-human life, created for God's glory, is cheated of its true fulfillment so long as man, the chief actor in the great drama of God's praise, fails to contribute his rational part..... just as all the other players in a concerto would be frustrated of their purpose if the soloist were to fail to play his part'.[29]

Thus human disobedience means that the natural order cannot achieve its goal. The redemption of humans is a part of wider redemptive work.

---

[28] R.J. Berry, 'Creation and Environment', *Science and Christian Belief*, **7**, No. 1, 39 (1995)

[29] C.E.B. Cranfield, 'Some observations on Romans 8:19-21', *in Reconciliation and Hope: Essays on Atonement*

Does this mean that humans have some part to play in the renewal of the cosmos as well as the renewal of the earth? It is easier to see how renewed human beings may join in with God's purposes of cleaning and caring for the environment. It is harder to see this in a cosmic perspective.

4. What does the end of the Universe mean for providence?

Models of providence have to take seriously the Universe over its entire history, rather than just the present state of the Universe[30]. Polkinghorne has emphasized this in relationship to the beginning of the Universe. Although those models of providence that picture the Universe as God's body work reasonably well with a Universe of its present structure, variety and life, Polkinghorne has pointed out that such models are weak in coping with the Universe as a 'quark soup' in the first few moments of the Big Bang[31].

We can raise the same weakness in relation to the end of the Universe. At this point does God's body decay forever or die? Models that stress immanence too much at the expense of transcendence must take the end of the Universe with seriousness.

Likewise, models that stress God's non-intervention in the Universe are presented with an interesting question in terms of the end of the Universe. For example, Wiles model sees God simply sustaining the creative process of the Universe, limiting himself not to act in the world in any particular way[32]. The question then arises of is God sustaining a process that will end in futility? The Universe may seem creative and diverse at the moment, giving the human actors freedom to work out the drama as they wish. But what of the time when the Universe is tending to destruction and the uniformity of heat death? Has God given the actors freedom to work out their own drama in a theatre that is destined for demolition?

An allied question concerning God's action in the Universe concerns what is the purpose of God in creation? Arguing against new creation as God's second attempt to get things right, Gunton has suggested that that creation is to an end, which is that all that is within space time be perfected in praise of the creator. Redemption is then the 'achievement of the original purpose of creation'[33]. Moltmann views Christian eschatology not as ending but as beginning of new creation, when creation is finally taken up into life of Trinity[34]. But how do these theological concepts relate to the scientific picture for the future of the physical Universe? Is the physical Universe, sustained by God, simply a backdrop to the purposes of God in redemption and perfection?

5. What does the end of the Universe mean for hope?

In one of the few books which deal directly with the end of the Universe, Polkinghorne and Welker rightly point out, 'Scientific prognosis puts to theology the question of whether it is not, in fact, ultimate..despair that is the

---

[30] D. Wilkinson, 'The God of the Physical Universe' in *Science, Life and Belief,* ed. R.J. Berry & M. Jeeves (Leicester, Apollos, 1998)
[31] J.C. Polkinghorne, *Science and Providence* (London, SPCK, 1988).
[32] M. Wiles, *God's Action in the World,* (London, SCM, 1986).
[33] C. Gunton, *Christ and Creation* (Grand Rapids, MI, Eerdmans, 1992) p. 57

appropriate human attitude to the world in which we live. Theology's response is to replace despair with hope and joy'[35]

Bauckham and Hart have recently examined what they suggest is one of the meta-narratives of the western world, that is the belief in human progress.[36] In this, human history is pictured as a long march towards the Utopian goal which is achieved through science, technology and education. On the basis of these things, the power and responsibility for creating the future are seen to be human. Humanity can deliver Utopia, and this myth of human progress was able to replace trust in God.

Bauckham and Hart go on to show how such a myth has had its credibility shattered in the events of the twentieth century. War, torture, famine, poverty and the ecological crisis all undermine the belief of humanity able to achieve Utopia.

It is interesting to note against such a background that the myth of human progress appears quite strongly in some of the responses to the 'cosmic pessimism' of science. There are those who see science and technology not simply as the cause of environmental damage but in fact the way out of such problems. Nuclear technology (and then speculation about cold fusion) was sold as energy that would not use up fossil fuels. In the movies Armageddon and Deep Impact the world is saved by a combination of technology, human ingenuity and courage. Even within the scientific literature, the end of the Sun is combated by terraforming in other solar systems.

The 'myth of human progress' is also a strong theme in the some of the responses to the despair of Stephen Weinberg. Two leading cosmologists, Freeman Dyson and Frank Tipler see technological progress as the way out of this despair at the futility of the Universe.

Perhaps the most intriguing unknown, however, concerns the cosmic role played by intelligent life itself. As the physicist Freeman Dyson notes, 'It is impossible to calculate in detail the long-range future of the universe without including the effects of life and intelligence. Much of the earth has been transformed, for better and worse, by the presence here of an intelligent species capable of manipulating its environment for its own benefit.
Similarly, advanced civilizations in the far future might be able to melt down stars and even entire galaxies to make gigantic campfires, or otherwise tilt the long-term odds in the favor. Life in the waning cosmic twilight might jejune, but it could last a long time. Consider the marshaled resources of all the natural and artificial intelligences in the observable universe over the next, say, trillion years.' [37]

In a heat death Universe Dyson suggested that biological life would adapt first through genetic engineering to redesign organisms that could cope in such a Universe. Then consciousness would be transferred to new kinds of hardware that would be able to cope with the ultra low temperatures of a heat death Universe, including for

---

[35] J.C. Polkinghorne & M.Welker, 'Introduction' in J.C. Polkinghorne & M.Welker, (eds.) *The End of the World and the Ends of God: Science and Theology on Eschatology,* (Harrisburg, PA, Trinity Press International, 2000) p. 11.
[36] R. Bauckham and T. Hart, *Hope Against Hope: Christian Eschatology in Contemporary Context,* (London, DLT, 1999)

example a complex dust cloud. Such a cloud could maintain itself forever and collect an endless amount of information. Thus he concluded, 'life and intelligence are potentially immortal'.

As Davis has pointed out, such a view is dependent on a number of controversial assumptions[38]. First, consciousness is simply defined as a type of complex physical structure. Even if a computer or dust cloud could mirror the complexity of the human brain, would this infer consciousness? For example, could consciousness survive without any other consciousness to relate to? Second, Dyson's scenario is dependent on the survival of matter. If as some theories of particle physics predict, the proton does decay there will come a point when the Universe will only consist of radiation, and the complex structures cannot be maintained.

Such an interest in immortality has been pursued also by Tipler[39]. In contrast to Dyson he pursues the future of humanity, or more strictly human intelligence within a Universe which collapses back to a Big Crunch.

Tipler has been one of the cosmologists at the forefront of thinking concerning the anthropic principle. Extending the anthropic principle into the future, he proposed with John Barrow what they called the Final Anthropic Principle, that is, 'Intelligent information processing must come into existence in the Universe, and once it comes into existence it will never die out'[40].

In order to get to this, Tipler first notices that although the present Universe is 10 billion years old, its future even in a closed model is at least another 100 billion years. He speculates about what might be possible technologically in such a long future. He suggests that although humans themselves might die, information processing would continue within computers. Indeed, our consciousness may be transferred to computers. As computers expand across space then information processing would increase. He argues that it is possible on such a model that a point will be reached when an infinite amount of information will have been processed, and 'life' has expanded everywhere in the Universe.

This 'Omega Point' contains all the information of the Universe and could change the nature of the Universe itself. Life has achieved 'God-like' attributes. Immortality for Tipler is simply that there are an infinite number of thoughts before the Big Crunch. Such a picture is a long way from the Christian belief in resurrection and new life within a personal relationship with a Creator God.

Once again this scenario is dependent on a number of assumptions. First, Tipler's speculations are dependent on the Universe being closed, in fact this is a particular prediction of his theory. As we saw earlier the present evidence is that the Universe is not closed, in fact it is increasing in its expansion rate. Second, as with Dyson, can consciousness be so easily transferred to digital computers? Third, there seems little justification for believing that complex structures necessary for life could be maintained anywhere near the final state of Big Crunch[41].

---

[38] J.J. Davis, 'Cosmic Endgame: Theological Reflections on Recent Scientific Speculations on the Ultimate Fate of the Universe', *Science and Christian Belief*), **11**, 15-27(1999)
[39] F.J. Tipler, *The Physics of Immortality* (London: Weidenfeld & Nicolson, 1994)
[40] J.D. Barrow and F.J. Tipler, *The Anthropic Cosmological Principle*, (Oxford: OUP, 1986)
[41] See G.F.R. Ellis & D.H. Coule, 'Life at the End of the Universe', *General Relativity and Gravitation*, **26**:7, 738

Nevertheless both Dyson and Tipler represent a cosmic version of the myth of human progress. They imagine that through scientific and technological development human beings will be able to achieve some sort of immortality. Yet what sort of immortality is achieved? It seems to be a desperate way of responding to the futility of the Universe.

I have argued elsewhere that such optimism in future technology and indeed a critique of it is a major feature of recent science fiction[42]. Within certain works of science fiction, in particular the Star Wars movies of George Lucas, the myth of human progress is seen to be inadequate and hope is based on the belief in transcendence. It seems that Tipler is striving for such a thing in his 'Omega Point' theory.

Bauckham and Hart show that the Christian hope is based on the belief in transcendence. George Steiner has pointed out that it is the most creative people in art and poetry who resist ascribing meaninglessness to the world and history[43]. They 'wager' on the meaningfulness of the world. Bauckham and Hart suggest that this in fact is a wager on God, for it is only through faith in a transcendent God that you actually get meaning or ending. The Christian is able to wager on God of the resurrection, which at the same time affirms the physical creation, disrupts the pessimism of the world and offers hope of a new beginning. They conclude:

'In faith we shall see duly, our imagination is engaged, stretched and enabled to accommodate a vision of a meaningful and hopeful future for the world, a meaning which could never be had by extrapolating the circumstances of the tragic drama of history itself'[44].

Neither the despair of Weinberg or the confidence in human progress of Dyson and Tipler give the hope that faith in a transcendent God gives.

Does this search for hope concerning the end of the Universe fall into the revised natural theology so popular in terms of the beginning of the Universe in anthropic balances and intelligibility? There, scientists on the basis of the science see pointers towards transcendence. The futility of the end of the Universe may be another pointer to the hope that only a transcendent God gives. Polkinghorne has rightly pointed out that even suggestions in quantum cosmologies of inflationary universes bubbling up all of the time can be seen as the hope of endless fertility[45].

6. What does the end of the Universe mean for ethics?

There are ethical questions about the future that already being mentioned by scientists and philosophers. It would seem that within the next century, human beings will have the technological and financial ability to live beyond the atmosphere of the Earth. Cities in space or 'terraforming' on planets such as Mars are theoretical possibilities.

---

[42] D.A. Wilkinson, *The Power of the Force: The Spirituality of the Star Wars Films*, (Oxford, Lion, 2000).
[43] G. Steiner, *Real Presences: Is there anything in what we say?* (London: Faber, 1989) p. 227
[44] Bauckham and Hart, op. cit., p. 51
[45] C.J. Isham, 'Quantum Theories of the Creation of the Universe' in *Quantum Cosmology and the Laws of Nature: Scientific Perspectives on Divine Action*, ed. R.J. Russell et al (Berkley, Center for Theology and the Natural

The ethical questions concerning these possibilities are very real. Terraforming has been considered as a way out of the ecological crisis. Put bluntly, you do not have to worry about global pollution or using up all the resources because you can simply move on to another planet. However, it seems likely that the only ones who will 'move on' will be the rich and powerful leaving the rest to the polluted, over populated and exploited planet Earth.

Yet in terms of the end of the Universe, even terraforming or cities in space are limited. Does this long-term end of the Universe have any bearing on ethical questions? Bridger makes an interesting comment on this in the context of ecology. Noting that most ecological ethics stem from some understanding of creation in terms of its beginning alone, he argues that eschatology should not be neglected:

'The primary argument for ecological responsibility lies in the connection between old and new creation. We are called to be stewards of the Earth by virtue of our orientation to the Edenic command of the Creator and also because of our orientation to the future. In acting to preserve and enhance the created order, we are pointing to the coming rule of God in Christ. Ecological ethics are not, therefore, anthropocentric; they testify to the vindicating acts of God in creation and redemption. Paradoxically, the fact that it is God who will bring about a new order of creation at the end, and that we are merely erecting signposts to that future need not act as a disincentive. Rather it frees us from the burden of ethical and technological autonomy and makes it clear that human claims to sovereignty are relative. The knowledge that it is God's world, that our efforts are not directed toward the construction of an ideal utopia, but that we are (under God) building bridgeheads of the kingdom, serves to humble us and to bring us to the place of ethical obedience'[46].

In the integration of the scientific and theological pictures, does the holding together of creation and eschatology give a stronger basis for ethics?

Hardy has pointed out that in earlier times, moral patterns as well as the physical conditions of the world suggested 'the fundamental shape of the eschata'[47]. He suggests that apocalyptic accounts identify the moral issues taken into account in final times, and show how they will be resolved. Does the scientific view of the end of the Universe itself pose a moral question that has to be taken into account in any understanding of how God relates to the last things?

Conclusion

Einstein once wrote to a child anxious about the fate of the world, 'As for the question of the end of it I advise: Wait and see!' It may be wise advice but sometimes Christian theology may be taking it too literally. We may need to be tentative in our theological speculation about the future. Yet the God of the future who reveals himself in the death and resurrection of Jesus gives us a basis for considering the future now.

The questions I have attempted to outline above may provide a link from the scientific picture to the theological

[46] F. Bridger, 'Ecology and Eschatology: A Neglected Dimension' *Tyndale Bulletin* **41.2** 200-201 (1990)

picture, helping in some way a fruitful integration or at least interaction. In some cases I have made some suggestions on how these questions might be addressed. In other cases I have simply raised questions for further work. In some cases, the scientific picture of the end of the Universe may have no theological significance at all. However, it is difficult to be confident of such a conclusion when so little work that takes seriously both the science and theology has been done in this area.

In particular, I suggest the resurrection of Christ needs more consideration in this integration. It provides some basis for the relationship of creation and new creation, it raises questions for providence, becomes the foundation of hope and has been argued to be the ground for Christian ethics[48]. In the face of those who view the futility of the future of the Universe with great despair, it is in the words of Moltmann not only 'a consolation in a life…doomed to die, but it is God's contradiction of suffering and death'[49].

David Wilkinson is Fellow in Christian Apologetics and Associate Director of the Centre for Christian Communication, St Johns College, University of Durham.

[48] O. O'Donovan, *Resurrection and Moral Order: An Outline for Evangelical Ethics*, (Leicester, IVP, 1986)