



CiS-St Edmunds
Public Lectures

Science and the Bible: are they incompatible?

The creation story as a test case

Ernest Lucas

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Discussion

This lecture by the Revd Dr Ernest Lucas was delivered on 13th May 2004 in the Winstanley Lecture Theatre in Trinity College, Cambridge. The lecture was followed by questions from the audience and later a dinner/discussion at St Edmunds College. A transcript of this discussion can be found at the CiS-St Edmunds website (along with an archive of other lectures in the series):

<http://www.st-edmunds.cam.ac.uk/cis>

Brief Biography

Ernest Lucas has an MA in Chemistry from Oxford University and a PhD in Chemistry from the University of Kent. He did post-doctoral research in biochemistry in the University of North Carolina, Chapel Hill and Oxford University before studying Theology at Oxford. After being ordained as a Baptist Minister he was minister of Baptist Churches in Durham City and Liverpool. He obtained a PhD in Oriental Studies from Liverpool University. He was Associate Director of the Institute for Contemporary Christianity in London before moving to Bristol Baptist College (and affiliated college of Bristol University) where he is Vice-Principal and Tutor in Biblical Studies. The course he teaches on Science and Christianity has received a Templeton Award as has a paper he has published on 'Science, Wisdom, Eschatology and the Cosmic Christ'. Among his recent books is *Can we believe Genesis today?* (IVP, 2001). He is married to Hazel, a physics teacher, and they have two sons.



God and the World

When I was studying theology in Oxford in the 1970s there was the tradition of 'College Collections'. This was the Oxford name for internal college examinations set at the beginning of term to test whether or not students had done the work that had been set for them to do during the vacation. I remember one of those examinations because it contained a question that was rather unusual in its form:

1. THE WORLD = GOD
 2. THE WORLD - GOD = THE WORLD
 3. THE WORLD - GOD = 0
- Discuss

Students who had done their vacation reading were expected to realise that the question was an invitation to display what they had learned about the Christian doctrine of creation. The three quasi-equations express, in a rather crude way, three understandings of the relationship of God to the world that were around in the early Christian centuries. The first is an expression of *pantheism*, the view that the world itself is the divine entity, that God and the world are identical, or so intimately related, that one cannot exist without the other. This was the view of the Stoics. The second equation is a way of expressing *dualism*, especially the form that views matter as eternally existent. God is then thought of as fashioning the world from this pre-existing matter. This is the view expressed by Plato in his dialogue *Timaeus*, and it was taken up by most of the Gnostic writers. The early Christian theologians concluded that neither pantheism nor dualism were compatible with the biblical picture of the God-world relationship. The passages in the Hebrew Bible that speak most directly of God as Creator¹ clearly present God as separate from, and as transcending, the world, which has been brought into being by God's word. This view is taken up in the handful of NT passages which speak of the pre-existent Son as the agent in creation². Scholars differ over quite when the religion of Israel became truly monotheistic. However, there is general agreement that Isa. 40-55 expresses genuine monotheism, and does so in a way that explicitly rejects any dualism. Statements such as the following are examples of this.

Isaiah 45:5a I am the LORD, and there is no other; beside me there is no god.

Isaiah 43:10c Before me no god was formed, nor shall there be any after me.

Isaiah 44:6b I am the first and I am the last; besides me there is no god.

These verses present, in Hebraic terms, a monotheistic understanding of God as an eternal and self-existent being. Dualism in which matter is co-eternal with God may be ruled out by:

Isa. 48:12b-13 I am He, I am the first, and I am the last. My hand laid the foundation of the earth, and my right hand spread out the heavens; when I summon them, they stand at attention’.

The third equation is an expression of *theism*, the biblically-rooted understanding of the God-world relationship which the early Christian theologians adopted in conscious rejection of pantheism and dualism. Theists hold that God is the only eternal, self-existent being and that the world exists only because God willed it into being and continues to sustain it in existence.

Science and Theology

The point of this discussion is to highlight the fact that from the beginning the emphasis of the Christian doctrine of creation, following the emphasis of the Bible, has been on the *relationship* between God and the world. Questions about *how* or *when* God created the world have been secondary issues. When the early theologians came up with the formula that ‘God created the world out of nothing’ they did so as a way of expressing the God-world relationship in theistic terms over against pantheism and dualism. For them, the importance of the statement was that it makes clear that God and the world are separate, that the world is not made out of eternally existing matter, and that the world only exists because God chose to create it.



St Augustine of Hippo (354-430), a medieval view.

Because they fail to appreciate that this is the emphasis of the Christian doctrine of creation scientists who occasionally dabble in what they see as the theological implications of science often miss the point. For example, in a passage that is often quoted from his book *A Brief History of Time*, Prof. Stephen Hawking³ suggests that because his version of the ‘big bang’ cosmology removes any dateable ‘beginning’ it leaves no room for a Creator God. He seems to think that the doctrine of ‘creation out of nothing’ requires that there be a point in time that can be identified as the moment of creation. However, ever since the fourth century Christian theologians have recognised that this is not necessary.

St. Augustine of Hippo made this clear in his *Confessions*⁴. As Prof. Alister McGrath⁵ puts it, 'Augustine argued that God could not be considered to have brought the creation into being at a definite moment in time, as if "time" itself existed prior to creation. For Augustine, time itself must be seen as an aspect of the created order ... Augustine thus speaks of the creation of time (or "creation with time"), rather than creation *in* time'. Since time is part of the created order, God could well have created time with the character that it has in Hawking's cosmology, which does not allow the identification of a dateable 'beginning'. Therefore it is by no means the case that the absence of such a beginning 'leaves no room for a Creator God'.

This example illustrates the limits beyond which science cannot take us. By its very nature science deals with what theologians call 'secondary causes', that is, with interactions within nature. It cannot deal with 'primary causes', that is, the ultimate origin and purpose of nature. An inflationary big-bang cosmology may claim to explain the origin of our universe in terms of a fluctuation in the energy field that physicists refer to as a quantum vacuum. That, however, is still an answer in terms of secondary causes, not primary causes. We are left wondering why there should be such a thing as a quantum vacuum, and why it should have the properties which mean that a fluctuation in it can produce an inflationary big-bang. As Prof. Paul Davies⁶ puts it, 'though science may explain the world, we still have to explain science. The laws which enable the universe to come into being spontaneously seem themselves to be the product of exceedingly ingenious design'. What he says about the origin of the cosmos can be said about the origin of life as well. It may be that in due time a combination of chemistry, molecular biology and biology will provide a coherent and convincing argument that, given the right conditions on some planet, intelligent life is bound to arise by a natural process. But again we are left wondering why the properties of matter and the laws of nature are such that impersonal matter should be able to give rise to intelligent persons. Of course, it is always open to someone to shrug their shoulders and say, 'We're here because we're here' and leave it at that. However, Prof. Davies expresses the intuition that many people have had down the centuries that an intelligent mind behind a universe in which intelligent life has appeared is a satisfying, and reasonable, primary cause, especially when otherwise we are left simply with a chain of secondary causes which have no ultimate explanation. Since it is not my brief this evening to pursue the question of reasons for belief, or non-belief, in God, I will not develop this line of thought any further.

To summarise, what I have tried to argue so far, all too briefly, is that there is no incompatibility between the biblically-based classical Christian doctrine of creation and modern science, provided one understands the different levels at which science and theology work and the limitations this puts on each of them. For the sake of those who may think that what I've said so far is all rather abstract I will round off this section of my lecture with a story, a parable (and there is good precedence for Christians telling parables) which I hope will make it more concrete, though it inevitably runs the risk of over-simplification⁷.

The parable. It was a warm summer evening. Two people were walking along the beach listening to the gentle lapping of the waves and looking at the star-studded sky. They both spotted a light flashing out at sea. One of them was a professor of physics, the kind of scientist who thought of nothing but his work. Science was his life. He rushed to his car where, being the sort of person he was, he kept all kinds of scientific equipment. He got out a stopwatch and timed the flashes. He got out a photometer and measured the brightness of the flashes. He set up a spectrometer and recorded their spectrum. He noted the position of the light against the background stars. As he drove home along the coast road he stopped a couple of times and noted its position again as it appeared to move against the background stars, and did some triangulation calculations on his laptop. When he got home his wife said, 'You look excited dear, did you see something interesting tonight?' 'Yes,' he said, 'I saw what I deduced was a heated tungsten filament, enclosed in a silica envelope, emitting a regular pattern of flashes of visible radiation at an intensity of 2,500 lumens from a distance of about 850 metres offshore.' The other person on the beach that night was a teenager going home from Sea Scouts. When she got home her mother said, 'You look excited dear, did you see something interesting tonight?' 'Yes,' she said, 'I saw a boat signalling SOS. I phoned the Coastguard, and they sent out the lifeboat.'

This 'parable' illustrates the fact that the same event may have more than one level of explanation. Science, by the very methods which it uses, is restricted to the study of material things - matter and energy - and so its explanations are always expressed in materialistic terms. As a result it explains the *mechanisms* of nature - in the parable, how the flashing light was produced. It cannot answer questions about *meaning* and *purpose* - in the parable, why someone was shining the light and the message it carried. The scientific explanation could only go as far back as the tungsten lamp (the secondary cause). It couldn't get back behind it to the mind of the person using it (the primary cause).

Science and the Bible

There are both atheists and Christians who might respond to what I have said so far by asserting that whatever may be true about science and theology seeking for explanations at different levels there is at least one place where the Bible and science are working on the same level, and clash head-on. This is because they see the creation story in Genesis 1:1-2:4a as providing a rival account to the 'creation story' told by modern science.

This is the position taken by Prof. Richard Dawkins. In *The Blind Watchmaker* he refers to the creation story in Genesis as an alternative to the theory of natural selection⁸.

It is also the position held by fundamentalist Christians, who have been particularly vocal

in the USA in their opposition to the teaching of evolution in state-supported schools. Here is part of a submission made by the *Creation Research Society* to a court in the USA in a case concerning the teaching of evolution in schools.

The Bible is the written Word of God, and because we believe it to be inspired thruout, all of its assertions are historically and scientifically true in all the original autographs. To the student of nature, this means that the account of origins in Genesis is a factual presentation of simple historical truths.

The problem with this submission is its simplistic assumption that all of the Bible's assertions are 'historically and scientifically true'. The assumption is simplistic because it ignores the reality that we use language and literature in many different ways. As a result it soon leads us into absurdity.

On numerous occasions, in the original Hebrew and Greek, the Bible asserts that people think things in their heart, decide things in their heart, or hide God's word in their heart⁹. The *Creation Research Society* submission would commit us to the conclusion that these are scientific assertions that the heart is the physical seat of intellectual and volitional activity, contrary to all that modern neurophysiology tells us. However, a commonsense approach to language tells us that there is as much scientific validity in these biblical statements as in the statement that I love my wife with all my heart. In saying this I am not asserting that the heart is the physical seat of our strong emotions. I am simply using a common idiom of our culture. In ancient Hebrew culture the idiom was different. They linked the heart with intellectual activity. When they wanted to talk about deep emotions they linked these with the intestines, 'the bowels of compassion' as the old KJAV translated the phrase. If we had taken over the ancient Hebrew idiom one wonders what it would have done for the Valentine's Day card industry!

The fact is that both Prof. Dawkins and his fundamentalist Christian opponents ignore the importance of making sure we interpret the Genesis creation story properly. It is not a question we can duck, because in reality we interpret everything we hear or read. Most of the time, our interpretation of what we read or hear is done subconsciously. If my wife came home from school and said, 'I've been banging my head against the wall all day', I wouldn't start looking for bruises. However, if she'd been working in the garden and suddenly came in crying and said, 'I've banged my head against the wall', I would look for bruises. In neither case would I need to stop and consciously analyse what she said. However, sometimes it is particularly important to do our interpretation consciously and thoughtfully, to ensure that we do it well.

I am well aware of the debates that have gone on among academics for the past few decades about textual hermeneutics, concerning such issues as authorial intent, deconstruction, the role of the reader, and so on. However, for our purpose this evening it seems to me appropriate to stay at the level of what I have referred to as the 'commonsense approach' to reading texts. This, after all, is the level at which the average person operates. It is at this level that I want to deal with Genesis 1:1-2:4a as a case study in considering the question, 'Are Science and the Bible Incompatible?'. It is, after all, the passage that seems to come to most people's mind when that question is asked. Such a commonsense approach to understanding

any text involves asking questions like the following:

- What kind of language is being used?
- What kind of literature is it?
- What is the expected audience?
- What is the purpose of the text?
- What relevant extra-textual knowledge is there?

Now, while these questions are appropriate when seeking to understand any text, it seems to me that they are particularly appropriate with regard to the Bible because they cohere with the biblical doctrine of God. The first three are related to the fact that the God of the Bible is the God of the Incarnation. God has chosen to be revealed through what Christian theologians sometimes call ‘the scandal of particularity’. Christians claim that God has been revealed most fully in a particular person who lived at a particular time in a particular culture. This was, moreover, the culmination of God’s method of self-revelation recorded in the Hebrew Bible, in which God’s word comes to us clothed in the words of particular human authors, using particular languages and particular forms of literature, all rooted in the history and culture of a particular nation. Hence the need to ask the first three questions about everything we read in the Bible.

The fourth question is one that many literary scholars today consider problematic, if not unanswerable, because of their rejection of the concept of ‘authorial intent’. I, however, agree with those scholars who argue that it is a valid question because I think it is arguable that often there are clues given by such things as the literary genre, the structure of the text, the kind of language used, and so on, which do make it an answerable question.

The God of the Bible is the God of both creation and revelation. Moreover, humans have been made in the image and likeness of God, and are therefore able to understand the truth that is to be found in the created order. It can be shown that this belief was an important one for the founders of modern science in late medieval Europe. In the light of it we would expect that what we learn by the study of the created order will relate in some way with what we learn through the Bible. Here, in the light of what I said in the first part of this lecture, I think we need to heed something said by Prof. Donald MacKay¹⁰ about using scientific knowledge in understanding the Bible.

Obviously a surface meaning of many passages could be tested, for example, against archaeological discoveries, and the meaning of others can be enriched by scientific and historical knowledge. But I want to suggest that the primary function of scientific enquiry in such fields is neither to verify nor to add to the inspired picture, but to help us in eliminating improper ways of reading it. To pursue the metaphor, I think the scientific data God gives us can sometimes serve as his way of warning us when

we are standing too close to the picture, or at the wrong angle, or with the wrong expectations, to be able to see the inspired pattern he means it to convey to us.

With that as a background, we will now turn to using these questions as a basis for understanding the creation story in Genesis 1:1-2:4a.

In what follows I shall be quoting a number of times from the writings of two outstanding theologians and biblical scholars, Augustine of Hippo (354-430) and John Calvin (1509-1564), and one outstanding scientist, Galileo Galilei (1564-1642). I have chosen Augustine and Calvin because they both wrote important commentaries on *Genesis*, and did so before the rise of modern science and all the subsequent debate about science and the Bible. As a result, I think they help us to get back behind the smoke of the subsequent battles and so to see certain things more clearly. I have chosen Galileo because, as far as I am aware, his *Letter to the Grand Duchess Christina*, written in 1615, was the first systematic treatise on relating the Bible to science¹¹.

The Use of Extra-Biblical Knowledge

I am going to start with the last of the set of questions. The fact is that from the early centuries onwards, most Christian biblical scholars have recognised the need to do their interpretation of the Bible in the light of wider scholarship and knowledge. Augustine has some strong words to say about those who do not do this¹².

Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics (i.e. astronomy etc.); and we should take all means to prevent such an embarrassing situation ... the shame is not so much that an ignorant individual is derided, but that people outside the household of faith think our sacred writers held such opinions, and, to the great loss of those for whose salvation we toil, the writers of our Scriptures are criticized and rejected as unlearned men. (p. 42f)

From this it is clear that Augustine had great respect for scholarly learning, including what we might call 'scientific' activity, and believed that due account had to be taken of it when interpreting the Bible.

Calvin took much the same view. In his *Institutes of the Christian Religion* (1559) he addresses the question of what might be learned from 'secular writers'. He says¹³, 'If we regard the Spirit of God as the sole fountain of truth, we shall neither reject the truth itself, nor despise it wherever it shall appear, unless we wish to dishonor the Spirit of God' (2.2.15). As we shall see, in his exegesis of Genesis 1 he takes seriously the discoveries of the astronomy of his day.

Prof. Stillman Drake, probably the leading authority on Galileo in the latter part of the 20th century, argued convincingly that the traditional understanding of the ‘Galileo affair’ is seriously flawed. He argued¹⁴ that ‘Galileo was a zealot not for the Copernican astronomy, but for the future of the Catholic Church and for the protection of religious faith against *any* scientific discovery that might be made’. In other words, he was more concerned about preventing the Roman Catholic Church making a serious mistake than about promulgating Copernicanism. In his *Letter to the Grand Duchess Christina* it is clear that Galileo sees the ‘protection’ Drake speaks of as lying in part in a proper understanding of the relationship between knowledge gained from the Bible and from the study of nature. The following quotes from the *Letter* give the main points of his argument.



Galileo Galilei (1564-1642)

- A1. ...the Holy Bible and the phenomena of nature proceed alike from the divine Word, the former as the dictate of the Holy Ghost and the latter as the observant executrix of God’s commands. (p.182)
- A2. ...it being true that two truths cannot contradict one another, it is the function of wise expositors to seek out the true sense of scriptural texts. These will unquestionably accord with the physical conclusions which manifest sense and necessary demonstrations have previously made certain to us. (p. 186)
- A3. I do not feel obliged to believe that the same God who has endowed us with senses, reason, and intellect has intended us to forego their use and by some other means to give us knowledge which we can attain by them. (p. 183)
- A4. I would say here something that was heard from an ecclesiastic of the most eminent degree: “That the intention of the Holy Ghost is to teach us how one goes to heaven, not how heaven goes”. (p. 186)

The argument is clear. The ‘two books’ of the Bible and nature have one author, and so are complementary, not contradictory. God has given us the capacities which mean that science is a valid and necessary path to truth about nature. The Bible has a limited purpose, which does not include teaching us about astronomy.

We will come back to the question of the purpose of the creation story later, after we have considered some of the other questions on our list.

What kind of Language?

When talking about Genesis 1 I am sometimes asked whether, in the original language, it is written in poetry or prose. The answer is that while it is not written in classical Hebrew poetry,

neither is it ordinary Hebrew prose. It is what some scholars call 'elevated prose', that is, prose which is carefully structured and has some of qualities of poetry. This is the kind of prose that, in many cultures, is used in religious liturgies.

Another aspect of the language of Genesis 1 is brought out by Calvin¹⁵. Commenting on v5 he notes that the days are reckoned to begin in the evening. He then says this is because God, speaking through Moses, 'accommodated his discourse to the received custom'. In other words, the way things are expressed is accommodated to the cultural idioms of the people addressed.

When discussing v6-8 he makes another important point about the language used.

For, to my mind, this is a certain principle, that nothing is here treated of but the visible form of the world. He who would learn astronomy and other recondite arts, let him go elsewhere. Here the Spirit of God would teach all men without exception and therefore ... the history of the creation ... is the book of the unlearned. The things, therefore, which he relates, serve as the garniture of the theatre which he places before our eyes.

Here he expresses a principle which he uses elsewhere in his biblical interpretation, namely that the language used in the Bible is that of the common person, and that when referring to the natural world it is therefore the 'language of appearance'. Things are spoken of in terms of the way they appear to be to the ordinary 'unlearned' person. Calvin repeats this point when commenting on v14, 'Moses does not speak with philosophical acuteness on occult mysteries, but relates those things which are everywhere observed, even by the uncultivated, and which are common use'.

Calvin expands further on this principle in discussing Genesis 1:16, 'God made the two great lights – the greater light to rule the day and the lesser light to rule the night'. He accepted that, if taken literally, this is scientifically incorrect because he accepted that the astronomers of his day had shown convincingly that Saturn is larger than the Moon. His response to this is the following comment.

Moses wrote in a popular style things which, without instruction, all ordinary persons, endued with common sense, are able to understand; but astronomers investigate with great labour whatever the sagacity of the human mind can comprehend ... this study is not to be reprobated, nor this science condemned ... (men) ought not to neglect this kind of exercise ... since the Spirit of God here



John Calvin (1509-64)

(i.e. Genesis) opens a common school for all, it is not surprising that he should chiefly choose those subjects which would be intelligible to all ... Moses therefore, rather adapts his discourse to common usage.

Calvin accepted Aristotle's teaching that, because the Moon is a heavenly body, it must be made of 'quintessence' (the 'fifth element') and so be self-luminous. Therefore, in his view, it could rightly be called a 'light' in the same sense as the Sun. However, Calvin accepted that the Moon needs to 'borrow' light from the Sun in order to give us sufficient light at night. We, of course, know that the Moon is not self-luminous but simply reflects sunlight. Therefore, to be anywhere near scientifically true if taken literally in the way the *Creation Research Society* says it should be, this verse ought to say that God made a great light and a great mirror!

As far as I am aware, there is no evidence that Galileo had any direct knowledge of Calvin's writings. Nevertheless his understanding of the nature of the language used by the Bible when referring to the natural world is the same as Calvin's as the following quotations from the *Letter to the Grand Duchess Christina* show.

- B1. These propositions set down by the Holy Ghost were set down in that manner by the sacred scribes in order to accommodate them to the capacities of the common people, who are rude and unlearned. (p. 181)
- B2. It is necessary for the Bible, in order to be accommodated to the understanding of every man, to speak many things which appear to differ from the absolute truth so far as the bare meaning of the words is concerned. (p. 182)
- B3. For that reason it appears that nothing physical which sense-experience sets before our eyes, or which necessary demonstrations prove to us, ought to be called in question (much less condemned) upon the testimony of biblical passages which may have some different meaning beneath their words. (p. 182f)
- B4. ...having arrived at any certainties in physics, we ought to utilize these as the most appropriate aids in the true exposition of the Bible and in the investigation of those meanings which are necessarily contained therein, for these must be concordant with demonstrated truths. (p. 183)

The first two quotations express the same 'accommodation' understanding of biblical language as Calvin adopted. The third recognises that, as a result of this, the literal sense of the biblical text may sometimes be at variance with the scientific understanding of the natural phenomenon described. In the final quotation Galileo makes the point made by Prof. McKay that one reason why biblical interpreters should take scientific knowledge into account is that it will help them to recognise when the biblical writers are using the language of appearance or cultural idioms, and so help them avoid the kind of misinterpretation made by those who condemned Galileo.

It is probable that both Calvin and Galileo derived their 'accommodation' view of biblical language from Augustine, since it is evident that both were aware of his writings. Speaking of the Bible in general he said, 'Perhaps Sacred Scripture in its customary style is speaking with the limitations of human language in addressing men of limited understanding' (1.14.28). With regard to Genesis 1, which as we shall see he understood as a symbolic story, he comments, 'The narrative of the inspired writer brings the matter down to the capacity of children' (2.6.13).

What kind of literature?

At least as early as the 2nd century there were some Christian thinkers who argued that the opening chapters of Genesis were never intended to be taken as a chronological account of how God created the world. This was long before the rise of modern science, so they were not trying to make the Bible agree with science. They saw things in the text of these chapters themselves which led them to understand them in a non-literalistic way. Origen (ca. 185-254) wrote¹⁶,

What man of intelligence, I ask, will consider that the first and second and the third day, in which there are said to be both morning and evening, existed without sun and moon and stars, while the first day was even without a heaven? And who could be found so silly as to believe that God, after the manner of a farmer “planted trees in a paradise eastward in Eden” ... I do not think anyone will doubt that these are figurative expressions which indicate certain mysteries through a semblance of history.

That last sentence is very important. In it Origen is recognising that it is wrong to come to a piece of literature with a preformed idea of what kind of literature it is. We might be completely wrong and therefore totally misunderstand it. The sensible thing to do is to look for clues *within the piece of literature itself* that indicate what kind of literature it is, and therefore how we are to understand it. Origen argues that the clues in Genesis chs. 1&2 suggest they are not to be read as straightforward history but as symbolic stories which express ‘mysteries through a semblance of history’.

The structure of Genesis 1:1-2:4a suggests that the account is not intended as a ‘simple historical account’ but as a symbolic one which expresses important truths about the nature and purpose of the creation. At this point all I want to do is point out the way in which the story conveys the idea of a planned and ordered creation. In a symbolic story God is depicted as a worker who does a week’s work. At the end of each day God stands back and surveys what has been achieved. At the end of the week he decides that he has done a very good week’s work! God initially brings into being something that is ‘formless’ and ‘empty’. The first three days are spent giving it form, through a series of ‘separations’. The result is an empty structure. The next three days are then spent filling the structure with creatures that are appropriate to the different aspects of the ‘form’. The creation of the heavenly lights on the fourth day can now be seen to make perfect sense logically within the structure of the story even though it does not make sense if the passage is read with the assumption that it is a scientific account of creation.

For Augustine of Hippo the ‘literal’ interpretation of the Bible did not mean a wooden ‘literalism’. The literal meaning of a text can be a figurative one, and in fact he understood

Genesis 1 as a symbolic story. In large part this was because of his understanding of the nature of time, as mentioned earlier. As we have noted, he argued that the account of creation was written in the form it is so that finite humans would be able to understand something of the nature and purpose of God's work of creation. Moreover, he (like Basil of Caesarea before him) understood the commands, 'Let the earth/waters bring forth ...' as not having just a once-for-all result, but as giving to the earth and the waters the power to go on producing things down through the history of the earth. In his commentary on Genesis he argues that God's creative activity has two aspects:

'...Some works belonged to the invisible days in which he created all things simultaneously, and others belong to the days in which he daily fashions whatever evolves in the course of time from what I call the primordial wrappers' (6.6.9).

By the 'invisible days' he means the days of the account in Genesis 1. This he understood not as a chronological account of creation but rather as a kind of 'inventory' of what God created simultaneously in a single act. This is expressed in a symbolic account in order to make it understandable by ordinary people. This original creation contained within it the 'seeds' of things which were then to be brought forth by the earth and waters 'in the course of time'. He compares this to the way a tree is contained in its seed, and says,

In the seed, then, there was invisibly present all that would develop in time into a tree. And in the same way we must picture the world, when God made all things together, as having had all things together which were made in it and with it when day was made. This includes not only heaven with sun, moon, and stars ... but it includes also the beings which water and earth produced in potency and in their causes before they came forth in the course of time as they have become known to us in the works which God now produces' (5.23.45)

Christopher Kaiser¹⁷ has shown that Basil and Augustine were notable exponents of an aspect of the Christian understanding of creation that he calls the doctrine of 'the relative autonomy of nature'. By this he means 'the self-sufficiency nature possesses by virtue of the fact that God has granted it laws of operation ... The autonomy of nature is thus 'relative' in the sense of being relational (to God), as well as in the sense of not being self-originated or entirely self-determined'. Kaiser shows how this concept is rooted in the Hebrew Bible and is taken up in both pre-Christian Jewish writings and in the New Testament before being adopted by some early Christian theologians.

It would be wrong to present Basil and Augustine as Darwinists before Darwin, but their thinking does provide a theological basis for understanding an evolving universe in terms of a biblically based Christian doctrine of creation. Prof. Howard Van Till¹⁸ has developed their

thinking in somewhat wider terms as what he calls ‘the doctrine of Creation’s Functional Integrity’. This doctrine, he says,

... envisions a world that was brought into being (and is continuously sustained in being) only by the effective will of God, a world radically dependent upon God for every one of its capacities for creaturely action, a world gifted by God from the outset with all of the form-producing capacities necessary for the actualization of the multitude of physical structures and life forms that have appeared in the course of Creation’s formative history, and a world whose formational fecundity can be understood only as a manifestation of the Creator’s continuous blessing for fruitfulness (p. 23).

According to this view there would be no ‘gaps’ in the developmental processes of the world, no need for acts of ‘special creation’ by God. Yet this is not because God has ‘left it alone’, since it is a world that is radically dependent on God both for its origin (primary cause) and its continuation and development (secondary causes). Once again we must leave an interesting line of thought and return to our exegetical questions.

What was the Original Audience?

This can be answered fairly readily. The creation story was intended to be read by or, more likely, read to, ancient Hebrews who were worshippers of the Yahweh, the God of Israel. Indeed, since, as noted earlier, the language used has a liturgical character, Genesis 1:1-2:4a may have been written to be used in an act of worship. Scholars differ over the actual dating of the text. Most date it, in the form we now have, to the early post-exilic period, say about 500 BC. However, the exact date does not matter much for our purpose because if, as I shall argue, it interacts with ideas about creation that were around in the ancient Near-East, the basic nature of these did not change much in the period between the exodus and the return from exile.

What was its Purpose?

Augustine, Calvin and Galileo are united in seeing the main purpose of the creation story in Genesis 1:1-2:4a as theological. Although Calvin, unlike Augustine, treats the seven days as 24-hour days, it is still the case that for him the real importance of them is not as a chronological account of creation but as a teaching aid to lead us to a proper understanding of God’s purpose in creating the world and its creatures. As he puts it, ‘Six days were employed in the formation of the world; not that God, to whom one moment is as a thousand years, had need of this succession of time, but that he might engage us in the consideration of his work’ (on Gen. 2:3).

As our knowledge of the religions of the ancient Near-East has increased vastly over the past 150 years or so, thanks to archaeological discoveries of relevant texts and their decipherment, biblical scholars have increasingly come to see the creation story as a primarily a piece of theological polemic¹⁹. Its main purpose was to set out the Hebrew, Yahwistic, understanding of creation over against the ideas that were prevalent in the religions of the peoples among whom the Hebrews lived. I have time to give only a few examples of this.

Perhaps the most obvious example of this to the average modern reader, aware of the prevalent polytheism of the ancient world, is the story's monotheism. The other stories we have from the ancient Near-East begin with 'theogony', the origin of the gods. It is then one of these gods who brings the cosmos into being, using pre-existing 'matter' of some kind. The Hebrew story is different. There is only one God in the story, the Creator of all else that exists. It is a true 'cosmogony', an account of the origin of the cosmos. The existence of God is simply assumed.

The other examples are not so obvious because they require the reader or hearer to be attuned to the ideas that were prevalent in the ancient Near-East, as the Hebrews would have been. First there is the fact that the Sun and Moon are not called by their names but are referred to only as 'lights'. Any attentive reader ought to ponder why this is, since there are perfectly good, common words for Sun and Moon in Hebrew. The probable answer is that in the Semitic languages, of which Hebrew is one, the words 'sun' and 'moon' are also the names of gods. The peoples around the Hebrews worshipped the heavenly bodies as gods and goddesses. The Hebrews themselves were tempted to follow their example, as indicated by the prohibitions against the worship of 'the Sun and the Moon and the stars, all the host of heaven' in the Hebrew Bible²⁰. Genesis 1:14-19 is an attack on all such worship. The heavenly bodies are simply 'lights' (like big oil lamps!) created by the God of Israel. Moreover, humans do not exist to serve these so-called 'gods', rather the 'lights' are there to serve humans, as sources of light and as calendar-markers. The ideas that led to modern astrology, rather than astronomy, were debunked by Hebrew theologians at least 2,500 years ago!

Secondly, there is the way the Hebrew verb *bara'* ('create') is used in the story. In the Hebrew Bible this verb, in its active form, is only ever used of God's creative activity. It occurs in only three places in the story. In the other places God is simply said to 'make' things, using a verb that can be used of various kinds of human 'making' activity. The use of *bara'* in v1, the programmatic statement of God's creative activity, is understandable. So, too, is the three-fold use of the verb with reference to the final act of creation, the creation of humans (v27). But why is it used in v21 of the creation of the sea monsters? This has puzzled many commentators down the years. The only convincing answer has to do with the significance of sea monsters in one of the creation stories of Mesopotamia (and possibly Canaan too). Here the creator god

has to battle with and subdue the forces of chaos, depicted as sea monsters in raging waters, before he can create the heavens and the earth. Genesis rejects this by stressing that the sea monsters are just part of the world created by the God of Israel. He did not have to fight and subdue them, he made them! Indeed for him creation is effortless, he speaks and things come into being. There is an important underlying theological issue here. Mesopotamian religion has been described as 'anxiety-ridden' because there was always the fear that the cosmos would collapse back into chaos. Hebrew religion was different. The emphasis, as we see in Psalm 93:1, 'He has established the world, it shall never be moved' (which was quoted, wrongly, against Copernicus), was on the stability of the world-order created by Yahweh.

My final example is the status given to humans. In the Mesopotamian creation stories humans are viewed simply as the slaves of the gods. They are created to avoid the need for the gods to do any work, by building houses (temples) for them and providing them with food and drink (sacrifices). The importance of human beings is emphasised in various ways in Genesis 1. Humans are the last creatures to be created. The 'deliberation' about their creation in v26 puts a spotlight on the importance of this act, as does the threefold use of *bara*' in v27. Only humans are made in the image and likeness of God, and to them God gives dominion over all the other creatures. Rather than humans providing for God's needs, creation is there to provide for human needs. To some people this sounds very politically incorrect and anti-environmental. Commenting on Gen. 1:26-28 in his book *Design With Nature* the environmental activist Ian McHarg wrote²¹:

'If one seeks licence for those who would increase radio-activity, create canals and harbours with atomic bombs, employ poisons without constraint, or give consent to the bulldozer mentality, there could be no better injunction than this text.'

His comments are rather extreme, but his assertion that Christianity inevitably encourages environmentally harmful attitudes, is quite widely held by environmental activists. Some of them argue that the words for 'dominion' and 'subdue' in v28 are strong words which encourage an aggressive and exploitative attitude to nature. Now some Christians may sometimes have adopted such an attitude, but it cannot be justified by any sound exegesis of these verses in Genesis. It is a basic rule of semantics, which people all too often ignore, that the meaning of words is strongly dependent on their context. A careful study of the use of the Hebrew words for 'dominion' and 'subdue' shows that aggressive or exploitative action is not part the inherent meaning of the words. Where they are used of such action the nature of the action is made clear by the context, not the words themselves. The context of Genesis 1 indicates a very different kind of action. Humans are given dominion and told to subdue the earth because they are made in the image of God. This surely implies that we are to reflect the character of the Creator in the way we carry out these commands. We are to do it with wisdom, care, love and justice. Moreover, we do not have dominion 'in our own right' as it were, but as God's

representatives, as God's vice-regents. We are answerable to our Creator for the way in which we exercise this dominion. Among other things this should lead us to accept and respect God's evaluation of the creation, that it is 'very good' (v31). In what we do we should seek to preserve and develop this 'goodness', not damage or destroy it.

Calvin's comment on Genesis 2:15, written 450 years ago, shows that 'green theology' is not some nothing new and can be derived quite naturally from the biblical creation story.

The earth was given to man with this condition, that he should occupy himself in its cultivation ... The custody of the garden was given in charge to Adam, to show that we possess the things that God has committed to our hands, on the condition, that being content with frugal and moderate use of them, we should take care of what shall remain ... Let everyone regard himself as the steward of God in all things which he possesses. Then will he neither conduct himself dissolutely, nor corrupt by abuse those things which God requires to be preserved.

We do not have time to pursue the interesting question of what is meant by the statement that humans were created in the 'image' and 'likeness' of God. It is arguable that, at least in part, the western concept of human rights has its roots in this statement. It is certainly the case that with the loss of this theological basis for the distinctness and dignity of humans, philosophers and ethicists are struggling to maintain the concept against pressures for widening it to include 'primate rights' or even simply 'sentient being rights'.

Conclusion

Several times our study of Genesis 1 could have taken us off down interesting and important pathways that we do not have the time to follow and that would have lead us away from our main topic. The fact that I have sign-posted a number of such paths as we have gone along does, I hope, make the point that if Genesis 1 is read as I think it should be, as a theological polemic expressed in a symbolic story addressed to ancient Hebrews, and not as a scientific text, it is extremely fruitful and relevant today. Far from being incompatible with science it provides a framework within which we can pursue our science and technology for the positive benefit of humankind and the rest of creation.

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