

Time, Eternity and the Cosmos

Abstracts for the 2000 CiS London Conference

Interpreting Genesis 1-11

Revd. Dr. Ernest C. Lucas

Basic Issues

When seeking to understand what we read we need to ask some basic questions.

- What kind of language is being used? The prose/poetry distinction is the most obvious one, but there are different kinds of prose.
- What kind of literature is it? Every culture has its 'genres' of literature, which most people within the culture recognise intuitively.
- For what purpose was it written? Genre can guide us here, but so can a knowledge of the historical and cultural context of the text.

When interpreting the Bible we also need to take into account our doctrine of God. The God of the Bible is the God of both revelation and creation. We therefore cannot ignore truth from extra-biblical sources when interpreting the Bible. The God of the Bible is the God of the Incarnation. God spoke to people in their own context. The Bible comes to us as God's word expressed in the words of particular human authors, using particular human languages and forms of literature.

Genesis 1:1-2:4a

What kind of language? It is neither ordinary Hebrew prose nor ordinary Hebrew poetry. It is 'elevated prose', such as is often used in religious liturgies. The language is sometimes clearly 'the language of appearance' (e.g. 'the two great lights'). Taking it 'literally' sometimes creates 'errors' ('firmament', 'lights').

What kind of literature? The structure of the passage suggests that it is a 'logical' account of God's activity, not a 'chronological' one. This, plus the nature of the language, suggests that it is a piece of symbolic prose, an extended 'figure of speech' depicting God's creation as the archetypal piece of work.

What is its purpose? Comparison with other ancient Near-Eastern creation stories suggests that it is a 'theological polemic' setting out the Hebrew theology of creation over against others, e.g. the use of 'to create', 'lights', 'image/likeness'.

The Flood Story

This is written in ordinary Hebrew prose. It has many similarities with the Mesopotamian Flood Stories, which are clearly concerned with religious and social issues, not geology. There are indications that the flood depicted is a local one: Gen. 2:10f; Gen. 10; 'erets' normally means 'land' in a limited sense; 'all' and Semitic hyperbole.

Early Hebrew and Christian Ideas of Time and Eternity

Justin Marston

The intention of this paper is to investigate the views of the Jews and early Christians regarding the nature of time and eternity, and the relationship of God to these. This paper follows a view reflected in the present author's recent paper for the Journal, that contemporary interpretation of the Hebrew bible can shed light on the views of the people of that time. In this paper the LXX, targum and Vulgate will again be considered, and in addition word study will be carried out on words such as olam and aionios.

Midrash and Dead Sea literature as well as pseudographia and apocrypha will also be considered, as well as other Jewish figures such as Philo. From a Christian perspective a variety of early church father will be examined eg Clement, Origen, Augustine and Boethius. From these sources a complex picture of attitudes, explicit and implied, towards the ideas of time and eternity, can be built up.

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God and time

John Polkinghorne

General relativity ties together space, time and matter, so that time is a created reality, as Augustine knew 1600 years before Einstein. The linear character of time, so important to the Abrahamic faiths with their emphasis on unfolding history, corresponds to the existence of five distinct, but parallel arrows of time.

There are three principal and distinct metaphysical concepts of time currently argued for. Each corresponds to a different conception of how God relates to time:

(1) The block universe: the flow of time is a trick of human psychological perspective; the actual reality is the whole spacetime continuum. This is consonant with classical theology's idea that an atemporal God knows all of history 'at once'.

(2) Time measures the development of a causally closed universe. This would be consonant with the God of deism.

(3) The process of the universe is open to the future. This requires us to treat the undoubted unpredictabilities discerned by modern science (quantum theory, chaos theory) as being ontological opportunities rather than merely epistemic deficiencies.

Theological consequences of this view include:

(a) God acts providentially in history, yet providence cannot be disentangled from other forms of agency.

(b) God engages with time. There is a temporal pole in the divine nature as well as an eternal pole.

(c) [more controversially] Even God does not yet know the unformed future. Creation has involved a kenosis of divine omniscience as well as divine omnipotence.

The Universe - The First Three Nanoseconds

E.P.S. Shellard (DAMTP, Cambridge)

The purpose of this talk is to discuss insights offered by modern cosmology about time and eternity.

First, I want to go on a journey backwards in time towards the moment of creation. This will take us from the present day at about 15 billion years back through a well-established sequence of physical events to 1/100th of a second after the Big Bang. We continue then to travel backwards until 1/100th of a nanosecond into regimes when known physical laws operated, but for which quantitative details remain elusive. From here we venture back into the progressively more mysterious until 10^{-43} seconds when our concepts of space and time break down.

Secondly, I want to discuss some recent speculative ideas about the origin of our universe and the beginning of time, concentrating on Hawking's "no boundary proposal". I will briefly comment on the apparent resonance between modern notions, such as creation "out of nothing", and an Augustinian view of the relationship between God, creation and time.

Finally, I want to consider eschatology in the light of modern cosmology. What is the physical fate of the universe and what hope (or lack thereof) does it offer in eternity?

A model of time for physics and theology

Anthony P. Stone

A paper by the author on time in relativistic physics ('A program model of becoming', *Physics Essays*, 10, 150-163, 1997) is explained briefly in a non-technical way. Giving up the idea that the present involves simultaneity in clock time, there can be an objective universal present which is the same for everyone and extends throughout the universe. (The same construction was explicitly proposed in 1985 by N. Maxwell, and subjective experience of the present was treated fictionally on this basis by Fred Hoyle & Geoffrey Hoyle in 1963.)

In relativity, the 'time' in space-time orders events as earlier-simultaneous-later, and no event is distinguished as happening 'now'. This aspect of time will be called 'chronos'. When events are ordered as past-present-future, this is a different aspect of time which will be called 'kairos'. (The Greek words are used as technical terms.) Chronos is time as usually employed in physics, and is confined to space-time. Kairos is thought of as not so confined, and is taken as more fundamental.

The open future is modelled by a tree of branching general-relativistic 'possible space-times', branching being at presents. The changing 'now' is produced by a program, analogous to a computer program, running in kairos and advancing the present in small steps. At each step there is input of the state of affairs in the near future, which is postulated to be the intentions of various agents, inside and outside of space-time, edited by the 'highest agent'.

The events in space-time belonging to a particular present belong to more than one present outside space-time. This allows input into the program to be a process in kairos while nothing happens in chronos. Agents outside space-time are postulated to 'make' their own kairos; thus kairos is free of 'the pressure of time' experienced in chronos. This gives the 'program model of becoming', which provides simple understandings of time's arrow and wave-function collapse, the theoretical possibility of empirical effects of the present, and a justification of tense logic.

A theological model for time is obtained by taking God as the 'highest agent', and replacing possible space-times by 'feasible worlds', where a feasible world is logically possible world with the property that God might actualize it.

Brief applications are suggested to time and eternity, miracles, laws of nature and God's action in the world. More detailed discussion is given of divine sovereignty, human freedom, predestination and God's knowledge of the future, in the cases where the number of feasible worlds is one or more than one.

The Age of the Earth

Professor Bob White, (Cambridge)

Understanding the ages and sequences of rocks and correlating them across large areas has always been and remains one of the pre-eminent concerns of geologists. Even in the earliest days of geological study, it was clear that the relative ages of rock strata could be determined from the order in which they were deposited, and that rocks of the same age could be recognised worldwide. Since the fossil content of rocks changes throughout the earth's history, fossils were used initially simply as 'markers' of different aged strata.

Early in the development of geological study it became clear that the wide variety of rock types and their settings found in the geological record could be explained by the on-going processes observable at the present day: This, indeed, is what marked out geology as a scientific subject in its own right. It was also clear that extremely large time periods were required to build the variety and volumes of rocks observed.

By the second half of the twentieth century, the subject moved from relative dating (strata A is younger than strata B). to absolute dating (strata A is x million years old). Part, but not all, of the capability for deducing absolute ages arose from the recognition of a variety of radioactive decay sequences. By comparing the ratio of daughter to parent isotopes, and knowing the half-life, the age of the rock could be deduced. A wide variety of radioactive decay sequences with widely different half-lives have been utilised in dating rocks of different ages. But there are also many other techniques available for dating, which are used to cross-check and to calibrate the different methods. They include, for example, simply counting back through layers that have an annual signal: tree rings, deep ice cores, and fine-grained lake deposits have all been used in this way.

Other techniques include assessing damage to crystals from cosmic rays, using the irregular polarity flips of the earth's magnetic field as a clock and, recently, measuring the rates of continental drift directly using satellite navigation systems that have precisions in the range of centimetres. A striking recent discovery has been that the regular orbital changes in the positions of the planets drive a repetitive cycle – the Milankovitch cycle – that enables some sedimentary rocks hundreds of millions of years old to be dated to a precision of better than 100,000 years.

The geologists' view of the development of the earth, however, is far from the common perception of endless ages of infinitesimal changes. Rather, much of the rock record now preserved is the result of abrupt, short-lived catastrophic events: massive ash falls or lava flows from volcanic eruptions; landslides and stratal disruption from earthquakes; alluvial sediments laid down primarily by the one-in-a-hundred or thousand-year flood; beach deposits dominated by the largest storms; worldwide, instantaneous sea level changes caused by glaciations; and even global catastrophes caused by extra-terrestrial impacts. In the light of all these, it is perhaps even more remarkable that environmental conditions on earth have remained in the narrow range that has allowed life to flourish throughout almost all its history, from shortly after the earth was first formed to the present time.

Along with the longevity of life on earth the other striking consequence of an understanding of geological timescales is that humans have been around for such a short period: only for less than one-thousandth of one percent of the history of the earth. From a Christian perspective, this is cause for wonder and worship of the creator God whom the bible repeatedly proclaims has placed mankind at the pinnacle of his creation, for the purpose of relationship with himself. Furthermore, it underlines God's bountiful and generous creativity: from the initial formation of the stars which generated the elements from which our very bodies are made, through the long history of the earth prior to the arrival of humankind, he has been preparing a place for us. And as Hebrews 1:3 proclaims, he has sustained, and continues to uphold his created universe throughout all its, and our history.