INTERNATIONAL FUND FOR THE
INVESTIGATION OF SCIENCE AND
THEOLOGY NAMED AFTER P.A.
FLORENSKY

OF ORIGINS OF THE WORLD IN SCIENCE AND THEOLOGY

PETROPOLIS
St.-Petersburg
1993

ФОНД ИЗУЧЕНИЯ ПРОБЛЕМ НАУКИ И
ТЕОЛОГИИ имени П.А. ФЛОРЕНСКОГО

О ПЕРВОНАЧАЛАХ МИРА В НАУКЕ И ТЕОЛОГИИ

ПЕТРОПОЛИС
Санкт-Петербург
1993 г.

Содержание:

кое единство). Одно рождает два, которое обозначает Инь и Ян. Два рождает три, которое обозначается Инь, Ян и гармония.Три рождает все вещества, в которых проявляется Дао.

3. Начало мира есть конец мира. С одной стороны, Дао является началом мира,Дао рождает все, с другой стороны, весь мир возвращается в Дао, т.е. конец мира—Дао. Все возникает из Дао и превращается в Дао.

4. Дао как начало и конец мира представляет собой всеобщий закон мироздания.Дао рождает все существа, одновременно Дао проявляется во всех вещах через Дэ, при воздействии Инь и Ян. Под Дэ понимается индивидуальная конкретизация вещей. В этом смысле Дэ отличается от конфуцианского понятия, по которому Дэ есть нравственная сила человека.

Вышеописанные школы и направления принадлежат к древней китайской философии,главным образом до династии Хань (206 г. до н.э.—220 г. н.э.). Как мы уже видели, в самом начале китайской философии проблема первоначала мира не была поставлена, философы искали причину этого мира. Только на более зрелом этапе развития китайской философии, когда появились такие крупные философы, как Конфуций, Лао-Цзы, т.е. в эпоху Чунцю-Чжанго философы (Лао-цзы,Гуан-цзы) начали рассматривать проблему первоначал мира. А в древнегреческой философии, при ее зарождении, философы начали острые дискуссии вокруг проблемы первоначала мира. Так, Фалес выдвинул в качестве первоначала мира воду, Анаксимандр—беспредельное, Анаксимен—воздух, Гераклит—огонь и т.д. Однако дело не в том, что они нашли в качестве первоначала мира. Суть этой проблемы заключается в стремлении философов понять окружающий мир. в этом смысле, по сути дела, проблема первоначала и проблема первопричины окружающего мира одна и та же. Древние каким-то путем стремились понять этот постоянно изменяющийся мир, эта онтологическая традиция была и в Древней Греции, и в древнем Китае.

Литература
1. Древнекитайская философия. Эпоха Хань. М., 1990. С.233.
2. История китайской философии. М., 1989. С. 18-19.
3. Общая история китайской философии (на кит. яз.). В 5 т. Т.1. Пекин, 1988. С. 13.

Willem B.Drees

TIMELESSNESS IN COSMOLOGY AND ITS RELEVANCE FOR PHILOSOPHY AND RELIGION.

or "IS TIMELESSNESS A RELIGIOUS PROBLEM?"

Bezinninsgcentrum Free University
De Boelelaan 1115
1081HV Amsterdam
Nether-lands

phone (0)20 — 548 3844/3812
fax (0)20 — 429 634

I ntroduction

In his Gifford lectures, which may become a classic like his earlier texts on religion and science, Ian Barbour seems to speak for quite a few when he concludes as metaphysical implications of current pnysics:

- Time is not the unwinding of a pre-determined scroll of events but the novel coming-to-be of unpredictable events in history. In relativity, time is inseperable from space. There are no purely spatial relationships, only spatiotemporal ones. All of this is radically different from the Newtonian world of absolute space and time, in which change consisted of the rearrangement of particles that are themselves

> unchanging. We will find a similar emphasis on change and the emergence qf genuine novelty in astronomy and evolutionary biology. The historicity of nature is evident in all the sciences. (Barbour 1990, 123).

In his emphasis on time, Barbour is a typical representant of contemporary anglo-saxon discussions on 'religion and science', *which either tend to result in a position based on* 'process philosophy' or in some form of evolutionary theism.

Big bang cosmology has been related to theological ideas with respect to the beginning of the Universe, to its contingency, and to its dynamic nature. This latter emphasis has its roots in the dialogue between theology and evolutionary biology, but Big Bang cosmology is often invoked as an additional scientific discovery which shows the dynamic, evolving character of the Universe. For example, 'astrophysics adds its testimony to that of evolutionary biology and other fields of science. Time is irreversible and genuine novelty appears in cosmic history' (Barbour 1989). Most discussions about the future assume such a dynamic nature of the universe.

However, some cosmologists, especially quantum cosmologists, interpret their own field differently. As Stephen Hawking expressed it in an interview with **Time** (Feb.8 1988), 'the universe would not be created, not be destroyed: it would simly be. What place, then, for a Creator?'

There seem to be three challenges from modern cosmology to the notion of a dynamic, evolving Universe. Firstly, physics does without the notion of a unique present. All moments qualify as a possible present. Hence, there is no way to incorporate the idea of a flow of time. Secondly, fundamental physical and cosmological theories deal with whole possible histories of a system aside of, or perhaps instead of, describing the system as evolving in time. And thirdly, in quantum cosmologies time is a phenomenological construct and not a basic aspect of reality (section 2).

In the article, I want to call into question the emphasis on temporality in religious views of the universe. The traditional focus on the 'beginning' is both unconvincing, expecting too much out of the Big Bang cosmology, and religiously misguided (section 3). However, when timelessness receives more credit than it regularly receives, it may well be that God is more understood as a platonistic supreme good than as an actor in time.

I will argue (in section 5), after a brief view of some theological stances with respect to divine timelessness and divine activity (section 4), that the presence of those two different perspectives offers opportunities for theology.

This is not to deny that there is a problem of time, in that the cosmological perspective (no flowing present, etc.) seem to conflict with our common sense experinece. We have learned to accept that modern science suggests an understanding of reality which appears to be against 'common sense', at least since the Earth was understood to be moving. For example, we now consider, still speculatively, an understanding of space as having many other (compact) dimensions aside of the three experienced. But such a problem about the tension between common sense and a cosmological understanding of time need not be a problem for a religious understanding of the Universe.

2. TIME IN COSMOLOGY

- Phrases like "evolution in time", "beginning", and "end" are 'a psychologycal hangover from the peculiar human experience of time, not as positing any sense in which a point actually "moves" along the path in S', the abstract space of possible states (C.J.Isham 1988).

Time is a terribly complex subject, discussed in many philosophical treatises; I mainly following the discussion by Peter Kroes (1985).

2.1. The absence of a flowing present.

There is a common-sense awareness of the present as special moment, the boundary between the past and the future. Besides, this present is 'moving' towards the future as 'time is passing away'.What is this special moment in the context of physics and cosmology? Is this an objective phenomenon or is it mind-dependent? If it would be mind-dependent, absent from pnysical reality, how does one reconcile mental events,which have the property of becoming, and physical events without that property? Unless one also holds that there is no becoming in the mind — but why is the illusion so persistent? If one opts for an objective, mind-independent view, one needs to face the question of whether the flow of time can be made part of the physical description.

Questions about the flow of time have often been mixed up with issues of **order**, a linear order relation, and with **asymmetry** between the past direction and the future direction. However:

1. An order relation seems necessary for flow, but is not sufficient — we do not perceive anything flowing along the line representing the real numbers; a present is necessary for the notion of a flow of time.

II. Time asymmetry is neither sufficient nor necessary. In an asymmetric process all moments qualify as potential presents. There is no way to single out on the basis of a time-asymmetric describtion a present as our present. And even in purely symmetric reversible systems, say a frictionless pendulum or a planet orbiting a star, we still have the impression that there is a present position, which immediately is superseded by another 'present' position, and so forth.

Events in the past seem necessary and fixed in memories, while events in the future seem contingent. It has been attempted to use this **modal** difference to formulate a distinction between the past of the present moment and its future and hence an objective notion of 'the present'. However, this cannot 'be reformulated into a physical discourse so as to allow a physically significant distinction between past, present and future' (Kroes 1985, 200).

The language of physics is, at least at the present moment, unable to deal adequately with the notion of a flow of time (Kroes 1985, 211). Physicists eliminate in their study of physical reality those aspects that make phenomena unique, including the unique 'here' and 'now'. An objective theory of the flow of time would precisely do the opposite, as it would single out a unique moment of time as the present. Subjective, mind-dependent, theories are, still according to Kroes, not better off.

2.2. The whole of time in spacetime descriptions

One could compare a universe to a film — each single picture representing a three dimensional universe at a certain moment. Either one can take the perspective of the viewer, who sees all the pictures subsequently in time, and hence sees action, movement, 'evolution' or the perspective of the manufacturer, who handles the whole film as a single entity, for instance in selling or storing. The film still has a 'story', but there is no movement, no action or 'evolution'. The same holds for books. This section wants to point to a similar feature of physical descriptions. This need not imply determinism — which seems to be the case in the example of a film.

Whithin physics there often are two descriptions.

(1) General relativity, which is the theory behind the Big Bang theory and hence the basis for the notion of a dynamic universe, has as its most fundamental entity four dimensional space-time. That level of description is like having the whole film: all are equally present, there is nothing like flow or movement. It is, however, often possible to decompose the four dimentional description in a description of three

dimentional space evolving in time (Misner,Thorne, Wheeler 1973).

(2) Physical theories as different as Newton's mechanics, thermodynamics, and quantum theories have been formulated in terms of abstract spaces (with as many dimensions as the number of parametes like position and velocity of each particle), which represent all possible states of the system by points. A trajectory, a line of such points, represents a possible 'history' of a system. At this level of description, the theory is not about evolving systems, but about whole histories represented by the different trajectories. Formulating a theory as being about the set of possible histories (trajectories) means that one abstracts from the specific intitial conditions.

(3) Light takes the fastest path from a source to a receiver. In a homogeneous medium this is a srtaight line. One very useful description is in terms of all possible paths, and then having a selection rule (principle of least action) to determine which path is actually taken. As before, the physical description works with complete 'possible histories'. Such principles of least action are very pervasive in physics. This idea has been incorporated in the path integral formalism, which is extensively used in contemporary field theory (particle physics).

It seems as if the 'holistic' picture of theories about whole histories implies determinism — one can only sell complete films once they are complete. However, selling is an action in time , and hence leads to the other type of description. The timeless approach, without claiming to have the final perspective of one's world at a certain moment of time, does not imply determinism. This can be explained with the notion of 'universe pictures'.

A universe picture is, according to McCall (1976), a complete description of a history of universe, including past, present and future. Assuming that the past is fixed and the future is a set of possibilities, a universe picture at a certain *moment is like a tree: one stem (fixed past) and many branches* (future possibilities). The present of a universe picture is the point where the branching begins. McCall hopes to formulate an objective flow of time in terms of such trees, as later trees are subtrees of earlier trees. That, however, does not single out a unique tree as corresponding to the present (Kroes 1985, 203f.).

One can about the whole set of trees, hence possible universe pictures, without implying that the future is determined or even already should have happened — as is necessary for having the complete film. One course, having the 'last' tree of a series — which would consist of only a stem without branches — would mean that everything is fixed relative to the present defined by that tree, but then everything is in the past. Talking about systems in terms of such trees provides a language for talking about complete histories without implying determinism. Determinism is a feature of some physical theories which can be formulated in this 'complete history' way, like classical mechanics and General Relativity. But that does not warrant the inverse argument, that such a timeless description is necessarily tied up with determinism.

Both the difficulties in giving a physical expression of the flow of time and the presence of a timeless imply that one cannot appeal to modern cosmology and physics for support for the claim that we live in a dynamic, evolutionary world. However, the conclusion need not be only negative. The presence of two different perspectives offers also some opportunities for theology, as I will argue below.

2.3. Time's onological status in quantum cosmologies.

If a theory deals with space-time or complete histories, there still is time as an order parameter form one side of history, its beginning, to the other side, the end. However, even such a status for time is disputed in quantum cosmologies. In general terms, once space and time become subject of description in terms of quantum physics they lose the property of definite location in space and time. What would a moment in time be if it would not have a definite location in time?

Andrej Linde seems to understand time as phenomenological notion which can be introduced by an observer inside a 'bubble', if this bibble is sufficiently long-lived (1985, 289). Time is also a phenomenological construct in the cosmology of Stephen Hawking. Time, as a parameter ordering different states representing universes at a single moment, could be defined on the basis of the fields and the geometry of the respecrive states. In both cosmologies the notions of time and space-time are approximations which are not valid for 'small' space where quantum effects are important.

James Hartle, Hawking's co-author in the fiest technical exposition of his on quatum cosmology, has developed these ideas in a somewhat different direction. He consider two options. The first is to abandon the spacetime, and thereby time (e.g., the work of Wootters). We only have features in the present which are interpreted as records of the past, but that past might well be an illusion. Hartle rejects this as an overreaction to a technical problem in the formalism of quantum mechanics. An alternative, which Hartle seeks to develop, is to assume that (not to be split as space-time) is fundamental, and to develop a fitting way of calculating quantum probabilities. As a consequence, some features of ordinary descriptions are lost; among them causality and the idea that the Universe has a specific state at a moment of time His formalism allows, in principle, the prediction of all possible observations. But it does not allow for an organization of those possible observations into a series of spaces at subsequent times. The spacetime is essential upon this view; causality and separate moments of time are approximations.

A more fundamental role for time seems involved in the work of Roger Penrose. He suggests that it is guantum physics that is only approximately valid. Time might therefore be meaningful for small spaces as well. However, the most fundamental formalism will not have objective reality of space and time. Rather, these notions will be consequences of more fundamental entities. (Penrose's twistor program, which has not been very successful so far, intends to describe both space-time and particles in terms of a single type of fundamental entities, twistors.)

Frank Tipler follows an approach more similar to those of Linde, Hawking, and Hartle. He too consider time to be a phenomenological construct. 'At the most basic ontological level, time does not exist' (Tipler 1989, 237). We only observe relationships between objects in space and the theory encodes all possibilities at once in the wave function of the Universe. Tipler assumes a boundary condition which requires all classical to terminate in an omega point. He therefore needs a well defined time (as ordering parameter) in at least one series of subsequent spatial universes. The possibility of a temporal ordering seems more or less accidental in Hawking's cosmology. By contrast, Tipler's cosmology requires such a possibility; it has been shown by Tipler that the Teilhard Boundary Condition (requiring an omega-point) implies the existence of a global time (as parameter).

Conclusion: time's status is, at least, disputed. Time might still have some fundamental status, but it might also be recognizable only 'for large spaces'. Anyhow, such cosmologies are not directly in line with evolutionary biology as dealing a dynamic and evolving Universe. Therefore, theological insights developed in the dialogue with the evolutionary understanding of the natural world are not directly extendable to the dialogue with cosmology. The Big Bang model is often presented as describing an evolutionary universe. That a possible representation. However, the more speculative ideas at the frontier of cosmological research, and even standard theory of space-time (General Relativity), suggest that the evolutionary presentation is one of limited validity, and not the most fundamental one.

One might object, against taking the timeless view seriously, that the timelessness is a feature of those theories, and need not be a feature of the world. However, we do not access to the world independent of our theories. Theories generate the ontology, the way we take the world to be. Hence, in taking these cosmological theories seriously we need to consider the timeless perspective they suggest.

3. CREATION AND BEGINNING.

The Big Bang theory has been understood as support for a theistic understanding of the Universe, either through a cosmological argument (see 3.1) or through apparent parallels with either the first chapter of Genesis (3.2) or the doctrine of **creatio ex nihilo** (3.3). However, all such arguments are wanting due to the limited validity of the Big Bang theory as well as for other reasons.

3.1. A Cosmological Argument

The argument has a simple logical structure of two premises and a conclusion, at least in the version of Craig (1979, 63):

'1. Everything that begins to exist has a cause of its existence.

2. The universe began to exist.

3. Therefore the universe has a cause of its existence.'

The first premise

- Is so intuitively obvious that no one in his right mind really believes it to be false....Indeed the that anything, especially the whole universe, could pop into existence uncaused is so repugnant that most thinkers intuitively recognise that the universe's beginning to exist entirely uncaused out of nothing is incapable of sincere affirmation. (Craig 1979, 141).

This premise — nothing from nothing, everything has cause — is a metaphysical assumption. Hoyle used it against the Big Bang model with a finite past; other , e.g. Craig, use it to argue for the existence of something 'beyond' the Universe. I shall concentrate on the use of science as support for this premise.

'Nothing from nothing' understood as the requirement of previous material appears simmilar to the conservation law in science. Therefore, this rule seems supported by evidence for the conservation of energy, momentum, charge and the like. However, those conservation law that are believed to be valid for the Universe as a whole conserve a total quantity which is zero, as for the total charge. Other conservation laws, like conservation of mass and energy, are not applicable to the Universe as a whole or total to zero as well. As far as the scientific conservation laws are concerned, the Universe might come from a 'nothing'. If one objects to this on the basis of **ex nihilo nihil fit**, one is using a metaphysical principle, something like 'concervation of actuality', which is not equivalent with or justified by the scinntific conservation laws.

'Nothing from nothing' as a requirement of a preceding cause seems also similar to the mathodological principle of sufficient reason: one should always seek reasons. Scince 'could not abandon the presupposition that reasons can be given for the properties or patterns things are found to have, without surrendering its very character as a continuing and endless quest for such reasons, and for continually better ways of expressing these reasons' (Munitz 1974, 105). However, as emphasized by Munitz, this methodological rule should be distinguished from the metaphysical principle of sufficient reason, which states that there must be such reasons, whether we can find them or not. This latter principle is outside, although it is supported by the instances that in searching for reasons science has been successful. Quantum theory might be interpreted as an example where the metaphysical principle is not valid. The evolution according to the Schrodinger equation is determinate, but the 'reduction' to one of the possible states is indeterminate, unpredictable and 'without cause'.

The second premise is defended on philosophical grounds, especially through an argument for the impossibility of the existence of an actual infinite set. Although I have doubts about this reasoning, I leave that to focus on the use of natural science. Craig claims empirical confirmation for this premise.

He makes two claims:

(1) The Big Bang theory shows that there was a 'beginning'. The Steady State theory is observationally ruled out, while the oscillating model is incorrect since our Universe is ever expanding.

(2) The entropy (discorder) of the Universe is increasing, because 'by definition the universe is a closed system, since it is all there is' (Craig 1979, 131). An eternal universe would have reached its state of maximal entropy and be in total equilibrium. Thus follows that our Universe must have had a beginning. The idea, originally due to Boltzmann, that a universe at low entropy might be a gigantic fluctuation in a universe in equilibrium, is rejected since the fluctuation would have to be so big, and hence so improbable, as to be ruled out.

Quantum effects are complety absent in these two empirical arguments for the second premise, which is a serious omission, since they bear on entropy, on the possibility of an oscillating universe, and on a 'universe from nothing'.

(1) Although there were in 1979 nearly no results in quantum cosmology, there was consensus among cosmologists that a complete theory needed a quantum theory of gravity. A philosopher could (and should) have known that there was a limit to the validity of the standard Big Bang theory. The consensus, which perhaps existed a decade ago, about the Universe having had an absolute beginning some ten to twenty billion years ago, has disappeared. In current cosmological research (see 3) there are a few different approaches to the period before the standard model, and these different

approaches have different implications for the cosmological argument. Some are eternal, without a 'beginning', others have an uncaused 'appearance out nothing' — which challenges the first premise. I will argue that some scientists claim too much. The 'nothing' is like a physical vacuum; existing and a philosophical nothing. But still, to reach Craig's conclusion, one needs to make clear why only those programs which work with a 'beginning' are correct science. And, as it stands today, there is no such criterion for what counts as good science — at least not one used by the scientific community in selecting articies for inclusion in their journals.

(2) Besides, I have doubts concerning the use of thermodynamics. There are three meanings of 'open' involved in this section:

(a) Open as forever expanding with diminishing density. In this sense, the Universe might be open according to Big Bang cosmology.

(b) Open as having interaction with an environment.

(c) Open as regarding the applicability of the Second Law of Thermodynamics.

Craig, and others as well, mix those meanings by saying that the Universe is by definition closed (having no environment, meaning b) and so the Second Law is applicable (meaning c). However, that is not correct for an expanding universe. Entropy 'is carried away into the expanding space' by the background radition. The expansion works as if there is an enviroment, although there is none. (More precisely, the maximal entropy increases in an expanding universe, and this increase goes faster than entropy production during most phases. As Frautschi (1982, 595) concludes, the universe does not approach a maximal entropy. Rather, the non-equilibrium becomes more pronounced. However, the entopy per comoving (expanding) volume approaches a constant value. Hence, there is a kind of 'heat death' for the Universe according to this reasonong based upon the standard Big Bang model.) Meanings b and c are equivalent if the notion 'environment' is unproblematic, but not for expanding universes.

Besides, the absence of a clear concept of entropy in relation to gravity makes the application of the concept of entropy to the whole Universe disputable. And the statistical character of the Second Law might allow for the occasional occurrence of states of low entropy in an otherwise eternal universe in equilibrium. In combination with the inflationary scenario the fluctuation does not need to be big, nor is it obvious that a much smaller universe with observers like us would be more probable. In Craig's book the belief in the unrestricted validity of laws like the Second Law is too strong. I am not defending the skeptic view that we can not know anything about the very early universe, but I call for cautiousness in the use of common sense notions or law known to be valid under 'ordinary' circumstances.

The conclusion: a cosmological argument for the existence of God which is based on the 'beginning' of the universe does not work, and certainly not on the basis of the Big Bang theory — which has a limited domain of validity. It must be a philosophical argument, without appeal to empirical evidence for a beginning of the Universe or for ex nihilo nihil fit.

3.2. Paralleis with Genesis?

- In the beginning God created the heavens and the earth. The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. Gen.1:1-2.

Before evaluating the nature of apparent parallels between biblical references to creation and the Big Bang theory we will first briefly present the way major contemporary biblical scholars understand the biblical narratives.

Cosmogonic legendes serve a variety of functions. Besides explaining the actual world with its tragic elements like death and decay, they legitimize social or religious structures and traditions, present an ideal against which the actual practices are measured, provide a background to the ethics of a culture, and so on.

In the Bible, the world is seen as created. But it does not present just one view of 'how'. Dominant is the emphasis on 'who', the one God related to Israel. Monotheism is not primarily a philosophical statment. It expresses an existential interest: one God implies that enemies don't have a God as powerful as Israel's God. Important is that the God who is present in the life and history of Israel is also the One who was at the beginning, and who has the power to create or change whatever is nessesary to his people. The world itself is not divine; there is a qualitative difference between God and his creatures.

Genesis 1, the well-known story of the creation in seven days, is not the major and certainly not the only, text where reflections on God as the Creator can be found. The first few chapters of Genesis have been overemphasized as the stories about creation and fall, the sources for cosmogony and anthropology. Such an emphasis neglects the variety of Biblical images concerning creation. Besides, it tends to misinterpret Genesis as if it were an answer to our cosmological questions. From the second verse on , the story of Genesis 1 concentrates on 'the earth' as the context of life. This includes a vision of social life, especially through its emphasis on the Sabbath, the seventh day, which is a major element in the identity of the people of Israel.

Both the Big Bang idea and the biblical narratives evoke the image of a sudden appearance of the world. A similarity of such a general nature is not very surprising; there are at that level only two possibilities: either the Universe had a sudden beginning or it had not such a beginning. In many cultures there have been narratives expressing such a sudden beginning of the world.

Parallels with a more informative content fail upon closer inspection. For instance, the supposed parallel that both the Big Bang idea and Genesis describe a sudden appearance out of nothing is not based on reading of Genesis 1 in its context. Genesis 1 does not answer questions about the (non)existence of primordial matter. And similarly for other biblical references to 'creation'. Statements that appear to say something about the 'out of nothing' have a different function, mostly to express a certain view of God, God's power and God's relation to mankind, especially the people of Israel. Besides, there is not one single coherent biblical concept of the creation process. A couple of images are used, some more in line with **ex nihilo**, like God ordering as a king that there must be light, others more at odds with it, like God working as a potter.

In general, claiming such parallels is only possible if the text or idea is taken out of its context. The content is read — in a certain way —, but its function is neglected. Sal Restivo (1984) has analyzed the claimed 'parallelism' between physics and Eastern mysticism. Parallels can only be established if there is something to be compared, namely statements in a common language. I agree with Restivo about major problems with such a procedure:

1. Translations. Both statements are translations, both in the linguistic (from Hebrew and from mathematics) and in the cultural sense (a culture of a far past and the scientific. theoretical culture).

2. Representativity. If two statments are used to argue for a parallel between two conceptual structures (moden scientific and biblical world view), the question arises whether the statements are representative for the whole. Genesis 1 is not representative for the whole Bible, or even the Old Testament, wich is mostly about the history of Israel. A parallel between Genesis 1 and the Big Bang idea would not imply that the Big

Bang theory confirmed a religion based on the Old Testament, since the most important aspect from the biblical point of view, God's presence throughout history, is missing. Similarly for the scintific side, since the Big bang theory describes the evolution of the Universe after 'the first fraction of a second', and not the 'beginning', which is beyond the limits of its applicability.

3. The different functions of language. In science the main function is the communication among scientists about observations, experiments and theories. Conceptual clarity and logical consistency are impotant for such a purpose. Religious language serves other functions , like reassuring and comforting people and evoking moral attitudes. Whether there is some common aspect of language is to be discussed later, but there is surely much difference in this respect. Claiming parallels without paying attention to the function of language is not satisfactory.

4. The languages of science and religion influence each other. Words used one context get used — with another meaning — in a different context. Parallels based on the use of the same world might be a consequence of such 'corruption of languages'. Notoriously risky are words like 'energy', 'order', 'nothing', and also 'creation'. The use of the **creatio ex nihilo** formula in articles treating the beginning of the Universe as a quantum event might be of such a nature.

3.3. Parallel with creatio ex nihilo?

Creatio ex nihio as a philisophical statement expressing the christian view of creation arose in the second century A.D. As for other parts of Christian doctrine, the doctrine of creation became what it has become by accepting and refusing elements of other religious and philosophical ideas, especially in confrontation with Gnosticism, Marcionitism, and Platonism. Gnosticism and Marcionitism have ifluenced the decisions about the canon (retaining the Old Testament) and the formulations of confessions ('I believe in God, the Creator of the heavens and the earth'), which are at the basis of all subsequent theological thought about creation. For gnostics and for Marcion the origin of evil and the origin of the material world go together. Therefore, the world cannot be the intended product of the good God who is the father of Jesus Christ. It must have been made by a different God. According to the Christian theologians, the whole creation (material and spiritual) is distinct from God, but made by the same God who is present in Israel and Jesus, and so the creation is not the product of a lesser or other God. Being distinct from God is included in **creatio**, while being made by no one else but the God of Israel and Jesus is part of **ex nihilo.**

Platonism had a cosmogony which assumed a few enternal principles: the Demiurge who made the world, the ideas, and the Matter. **Creatio ex nihilo** expresses objections against independent eternal principles aside from God. The ideas are interpreted as God's thoughts, and the existence of eternal, ungenerated matter is denied.

Necessity in history is disputable, but I agree with May (1978, 153) that . given the philosophical context in the second century of Christianity, **creatio ex nihilo** as an ontological statement was to be expected as a nessesary consequence of Biblical traditions in a critical confrontation with the philosophical ideas about 'principles'.

The majority of western theologians in the **twentieth century** have taken the doctrine of creation as unrelated to the natural sciences. Many deny the significance of metaphysics or cosmology, philosophical as well as scientific, for faith and theology. Separation has been based on dichotomies between God's self-revelation in Christ and man's discovery (Barth, neo-orthodoxy), or between subjective involvement and objective detachment (existentialism, Bultmann), or on an analysis of different functions of language. In the neo-orthodox approach, creation is interpreted from the perspective of salvation. In the existentialist approach, belief in God as the Creator is an expression of a new understanding of one's own life. In the linguistic approach, saying that the world has been created is not a factual statmen, but an expression of a way of looking at the world, having a certain attitude with respect to the world.

The concept of **creatio ex nihilo** is, even if impotant, used in many ways. Eberhard Wolfel (1981) warns against substantiating the **nihil.** In the context of **creatio ex nihilo** the **nihilo** expresses that God was alone and that the act of creation is a self-limitation of God. God, the necessary existent, is the ontological **principium ex quo**, from which all contingencies result. As a result, the creatio **ex nihilo** is not really ex nihilo, but out of the fullness of God. This is neither substantial nor causal, but 'mystical'. As such, there is no conflict with the philosophical principle **ex nihilo nihil fit.**

Process philosophers and theologians defend a view for which the word pan-en-theism has been coined as a middle between theism , God transcending the world, and pantheism, God totally immanent in the world. God , according to process theologians, is not the cosmic moralist, nor the unchanging and passionless absolute, nor the controlling power, nor the sanctioner of the status quo (Cobb and Griffin 1976, 8f.). 'Process theology rejects the notion of **creatio ex nihilo**, if that means creation out of absolute nothingness. That doctrine is part and parcel of the doctrine of God as absolute controller. Process theology affirms instead a doctrine of creation out of chaos' (Cobb and Griffin 1976, 65). Charles Hartshorne (1948, 30) defended that divine creativity nonetheless was different from human creativity.

- What does distinguish God is that the preceding phase was itself created by God , so that he, unlike us, is never confronted by a world whose coming to be antedates his own entire existence. There is no presupposed 'stuff' alien to God's creative work; but

> rather everything that influences God has already been influenced by him, where as we are influenced by events of the past with we had nothing to go. This is one of the ways in which eminence is to be preserved without falling into the negations of classical theology.

The Universe is coeternal to God, but there are no enduring things within that Universe, thus preserving God's uniqueness.

The basic things about claims to parallels have already been said in the conclusion to the section on the creation narratives. In the case of creatio ex nihilo one could make a stronger argument for a parallel. Unlike the narratives, it is supposed to be part of coherent systematic reflection. The other functions of the narratives, like comforting people or evoking certain attitudes, have moved to the background. However, event if there would be a parallel of the **ex nihilo** formula and current scientific cosmology, it should be forgotten that the religious doctrine serves other functions besides the cognitive one, functions which are not part of the parallel with science.

There is a variety of views within Christianity. A beginning of the Universe seems similar to **creatio ex nihilo**, but for many theistic theologians today an eternal Universe is also acceptable. It would, in their opinion, still need a ground (not a temporal cause) for existence, or the Christian attitudes can be expressed without making a claim about an original event. Process theologians think that only an eternal Universe is compatible with their ideas. They defend an analogy between divine and human activity, both using other entities. This analogy is also present in the linguistic structure of the theistic 'God creates **ex nihilo**'. But the analogy is so strongly qualified by the **nihil** that a fundamental difference between God's creativity and that of humans is expressed.

3.4. Beyond the Big Bang theory: Hawking's example.

- The conclusion of the affort so far: universe with no edge in space,no beginning or end in time, and nothing for a creator to do. (Carl Sagan 1988, x).

In the introduction to Stephen Hawking's bestseller **A Brief History of Time,** Carl Sagan suggests that there might be nothing for a creator to do. He thus ties the notion of God to the notion of a beginning. This view rests on a view of God's role in creation which is not the view of most more developed theologies (i). The second issue is the claim that physical cosmology is now able to describe creation out of nothing, as claimed, for instance, by Hawking. Such a physical concept of nothing is not indentical to the philosophical concept. This brings *us to the contingency of existence* (II). **Creatio ex nihilo** has traditionally two components, origination and dependency at all moments. Deism, in general, emphasizes only the first, God's role in the beginning. However, most of the recent cosmologies emphasize a structural similarity of all moments. Therefore, the understanding of **creatio ex nihilo** as dependency, which might be seen as the counterpart of God's sustaining activity, fits easier wich recent cosmological ideas. Henc, if one looks for a religious interpretation, a theistic interpretation fits better than a deistic one (III).

(I) Edges en deism

For Carl Sagan *the issue is simple: if* Hawking *is right that* there is no absolute beginning of reality, than there is no need for a creator. This is quite similar to arguments by others a that beginning in the Big Bang sense supported belief in a creator. However, this is not the only possible position. Quite a number of theologians and others have argued that the two — a physical beginning and belief in God — are relatively independent.

One could have an image of God as the great watchmaker who constructed the world and wound the spring — before letting it run by itself according to the original design. In relation to such an image of God the beginning is very important, for it is there that the watchmaker did his (or her) job. This kind of theological imagery has been quite widespread in the seventeenth and eighteenth centuries and it is perhaps still the most widespread image, aside from that of God as 'an old man up there'. Belief in the watchmaker-God been labelled deism, in contrast to theism, which holds that God is also actively involved in the processes of the world at later moments. Contemporary theologians have, in many different ways, argued that it is of major importance to see God as related to the present. A purely deistic concept of God is not a serious option within contemporary theology, because such a God would not be relevant to us and the ways we shape our lives.

The removal of a beginning would imply that the 'watchmaker' God is not a defendable image. That seems to be the essence of Sagan's remark. However, that is not a death blow to theism, as it is not the King of God theism defends. For some theologians it is even the other way round. For instance, process theology argues that there is no absolute beginning , but only an eternal process in which the world and God exert influence on each other. This particular one does not fit the Hawking theory either, because the view of the nature of time is very different. But the example of such a theology, which is intellectually quite well developed, shows that theology is not necessarily tied up with an absolute beginning, an edge to time.

Whether it is possible to develop a theological view which fits the whole picture, not only the edgelessness but also the nature of time, the determinism and the completeness suggested in the Hawking cosmology remain to be seen. But Sagan's argument 'no edge, hence no God' is not decisive. Aside from the possibilities which might still be present in the context of the Hawking cosmology, one needs to keep in mind also the status of this cosmology, the presistent pluralism in contemporary cosmology, especially where cosmologies touch on fundamental metaphysical questions.

(II) Nothing

Hartle and Hawking interpreted their own proposal for the wave function of the Universe as giving the probability 'for the universe to appear from Nothing' (Hartle and Hawking 1983, 2961). In this subsection I will argue that the Hartle-Hawking theory does not describe such an 'appearance out of nothing' *if that is taken in its absolute sense. Neither do other theories*, such as those of Vilenkin. In the next subsection I will argue that the Hartle-Hawking theory can be interpreted in the sense of **creatio ex nihilo** (creation out of nothing), but that this theological notion should then be understood as a view of the Universe as being sustained by God at every moment rather than as a cosmogonic expression.

There is one sense in which this theory can most clearly be understood as creation from 'nothing'. Ordinary calculations often assume a state at one moment and laws to calculate the state at another moment. In such situations one might say that the second state arises out of the first state. There is in the Hartle-Hawking approach at the timeless level no reference to a state other than the 'resulting' state. As it is compact, it is the only boundary present in the calculation. The theory gives a precise meaning to the notion of 'nothing' as absence of other boundaries in the calculation.

However, this should not be misunderstood as appearance out of nothing. Appearance is a temporal notion, which does not fit with this level of description.Expressions like 'tunneling from nothing' are of a mixed nature, and not suitable to describe the basic idea of this theory. Tunneling connotes a temporal process, while the 'from nothing' applies to a kind of time-independent actuality.

The 'nothing' is not an absolute nothing. One 'must still grant the existence of quite a body of preexisting laws of Nature in order to get away with this trick' (Barrow 1988, 231;

similarly Heller 1987, 421), for example quantum laws and fields as well as mathematical logic. The 'nothing' which has a precise meaning in the context of this proposal is not an absolute ' nothing' in a more philosophical sense.

There are serious problems when one tries to combine the language of probabilities with the notion of 'nothing'. I will first formulate two objections in general terms, and then formulate one in the terms of the quantum cosmology of Hartle and Hawking.

(1) The probability of finding "head" when tossing a coin is +, but there 50% chance of getting an actual "head" is only there if and only if someone tosses a coin, so if and only if one of the possible outcomes is realized. A mathematical idea of getting a universe from nothing does not give physical universe, but only the idea of a physical universe—assuming that there is a difference between the Universe and a mathematical idea about the Universe. There has to be some input of 'Physical reality'. Perhaps that is an aspect of the nothingness, but that makes it into a physical entity and not nothing at all.

(2) Physical probabilities, as exemplified by radioactive decay, start with something, an initial situation (a particle in space and time) becoming another situation (other particles in space and time). The probability is the chance that the transition from situation one to situation two happens during a certain interval of time, or that the particle is found in a certain volume of space, or something of that nature. Even if one reduces the entities in the first situation as much as possible (no energy, no matter fields, etc.), talking about probabilities only makes sense if there is some structure with measure (like time) present in the first situation.

These two arguments both are in the description from within time. It is difficult, if not impossible, to get outside that when talking about probabilities. That also shows up in the third, more technical, argument.

(3) Before interpreting a wave function as an amplitude for probabilities, the normalization must be established. In the case of a single particle, without creation or destruction , the wave function is normalized by requiring that the integral of the probabilities over the whole space must yield one at any moment: the particle must be somewhere. Hartle use for the wave function of the Universe something similar (Hartle and Hawking 1983, formula 4.3). It is the requirement that the probability of having a metric at a three dimensional spacelike 'surface' is one. If this is the way notmalization is achieved , the wave function gives the amplitude not that a state arises from nothing, but that a certain state is there, given that there must be a metric, i.e., a universe. (There are some technical difficulties as well, as I learned from C.J.Isham. It is not only that the normalization implicitly introduces the assumption that there is universe (by setting the outcome to one). Under some simple assumtions the outcome of such calculation turns out to be infinite, hence there is no way in which it can be normalized to one .This can also be understood physically. The integration is done while the time variable is still included. This would even for a single particle lead to an infinite outcome.'A more plausible scenario is one in which the physical Hilbert space [space which represents all states] is only obtained after abstracting out the intrinsic time variable. This means that, like the concept of real time/Lorentzian spacetime, the probabilistic interpretation of the theory only "emerges" from the formalism in some sort of semi-classical limit' (C.J.Isham in letter to the author, December 16 1987). Tipler (1986) deals extensively with the non-normalizability.)

Interpreting the Hartle-Hawking wave function as giving probabilities for appearance out of nothing is too strong, Rather, more defendable and modest, this approach 'determines the relative probability of universes corresponding to different classical solutions' (Hawking 1984, 377).

(III) Cosmogony and dependency

Traditional theological ideas **creatio ex nihilo** have two poles. On the one hand they refer to cosmogony, the coming into being of our Universe. On the other hand they denote an eternal sustaining by God, ultimate dependence at each moment. Chris Isham states that the latter 'is somewhat decoupled from modern scientific thought' (Isham 1988, 376), a view that is probably widely shared among theologians and scientists. In my view, the Hawking cosmology lends itself much more to an interpretation in terms of sustaining than of making. The basic entities are the three dimensional spaces with their material content (fields). Therefore, these are to be seen in this context as the basic entities of creation, the "what" that is created. The calculations of their relative probabilities can be calculated on the timeless level. It is not that one results from the other or comes after the other. From the timeless perspective they are all coenternal, or they are all created "timelessly". Hence they all equally related to the Ground of Being.

Another way to argue for the same conclusion: this shceme *does not have an initial event with a special status. There is no* way to pick one slice as the first of the sequence. Hence, all moments have a similar relation to the Creator they are all "just brute facts", or they are all equally created.

This view of God "sustaining" the world in all its "times" was transformed by Isham into another image, 'one can almost imagine the universe ... being held in the cup of God's hand '(Isham 1988, 405).

To summarize: this theory allows for a precise interpretation of **ex nihilo**, and it fits better with the idea that every space (with content) is equally created by God than with the idea that God created 'in the beginning'. Questions about the relation between the two components of **creatio ex nihilo** follow. Understanding it as a cosmogonic process seems to single out a certain event as having a special relation to God. Sustaining tends to stress the similarity of states in their relation to God . Theologians who want to defend both components of **creatio ex nihilo** need to clarify the similarty and dissimilarty between the first and the later states in their relation to God. In the theory discussed here there is no moment with a special status, and therefore the cosmogonic interpretation loses its force.

(IV)

Different cosmologies provide different contexts for theological thought. A theology which fits one cosmology need not be in accord with the other cosmological research programs. Hawking's cosmology, as one of the well developed contemprary programs, does not fit theologies with a strong emphasis on processes in time. Amazingly, this quantum cosmology seems much closer to two seventeenth century views. The cosmology might perhaps be made consonant with tradition reformed theology, which saw everything as predetremined by God. It might also be combined with a Spinozistic view of God and the world, where the world is one of God's enternal modes of being. As does the traditional reformed view, this approach accepts strict determinism. In a sense, the Spinozistic view fits even better, as the Universe acquires in Hawking's cosmology some of God's characteristics, being timelessly, eternal, and 'necessary'.

There is one major difficulty in case one tries to combine Hawking's cosmology with a Christian view of the world. In the way it has been presented here, the theory is about three dimensional spaces with material contenrt. They may be ordered in time-sequences, but that is secondary. Therefore, the model lacks continuity between subsequent events, like the reading of the first and the second word of a sentence. One might evoke God as the One who gives continuity, but that makes God 'closing the gaps', to turn a phrase. In the major Christian traditions there is sense of continuity, as God's great deeds in the past (e.g. Exodus, covenant on Sinai, Incarnation, Resurrection) are supposed to have relevance for today and for the future. In a Christian perspective, the past has to be taken up into the present in some way.

A final word of caution: this theory is not to be taken as the conclusion of science today. It is still in development, and it is one program among others, although one of the most elegant and coherent schemes. The special feauture of the Hartle-Hawking scheme is the absence of boundary as its proposal for a boundary condition. This absence of a boundary could be a model, of limited validity, for reflection on **creatio ex nihilo.**

4. DOCTRINE OF GOD

4.1. The coherence of divine timelessness: Christianity and Plato

The statment that God is eternal may be understood in two ways (Pike 1970, IX):

— God is everlasting, hence God has an unending duration.

— God is timeless, without duration.

Friendrich Schleiermacher seems have defended the second position, God being timeless as well as spaceless. Following Pike, this implies both that God has neither location in space or time, say existing one meter to the right of ... or existing before or after another event, nor has he extension in space (filling a certain volume) or time (duration). As Augustine has it (in Confessiones, Book XI, Ch 13):

- "Thy years do not come and go; while these years of ours do come and go, in order that they all may come. All Thy years stand together, for they stand still, nor are those going away cut off by those coming, for they do not pass away. (...) Thy day not a daily recurrent, but today. Thy present day does not give place to tomorrow, nor, indeed, does it take the place of yesterday".

Or, with Anselm of Canterbury (Proslogium, Ch. XIX):

- "thou wast not, then, yesterday, nor wilt thou be tomorrow; but yesterday and today and tomorrow thou art; or rather, neither yesterday, nor today nor tomorrow thou art; but simply, thou art, outside all time. For yesterday and today and tomorrow have no existence, except in time; but thou, although nothing exists without thee, nevertheless does not exist in space or time, but all things exist in thee".

Discussing Boethius, Pike concludes that according to *Boethius God is aware of time. though there is no way to* predicate a time of awareness (Pike 1970, 12)

Pike analyses the logical relations of this classical understanding of *divine eternity* as *divine timelessness* with other doctrines, like **immutability, omnipresence** and **omniscience.** Timelessness has consequences for the interpretation of other attributes; consequences which he does not like. It is a Platonic influence with hardly any scriptural basis. 'What reason is there for thinking that a doctrine of God's timelessness should have a place in a system of Christian theology?' (Pike 1970, 189f).

Whithin the context of philosophy of religion, explicitly seeking to stand in the Biblical tradition, **Paul Helm** has argued strongly that divine eternity might be understood as timelessness. He understands timelessness not as a seperate attribute, but rather as God's way of posessing certain attributes. For God's timelessness "justification can be found in the need to draw a proper distinction between the creator and the creature" (p.17). Thus, "properties which the creator and his creatures have in common are distinguished by their mode of possession" (19). Though the Biblical narratives speak about God as speaking, etc., etc., the "introduction of timelessness offers a etaphysical underpinning for God's Functioning as the biblical God" (21).

Timelessness may be understood with Boethius:

- "Eternity , then , is the complete possession of all at once of illemitable life. ...Therefore, whatever includes and possesses the whole fullness of illimitable life at once and is such that nothing future is absent from it and nothing past has flowed away"

One of the problems concerning the conception of a timeless God concerns personality; as Hume has said:

- "A mind, whose acts and sentiments and ideas are not distinct and successive; one, that is wholly simple, and wholly immutable, which has no *thought, no reason, no will, no sentiment, no love*, no hatred; or in a world, is no mind at all" (Hume, **Dialogues concerning natural religion**, as quoted by Helm p.57).

As the concept of person or mind may be anthropocentric, it might well be that one might be willing to concede that God is not a person in that sens, though the unattainabilkity und non- manipulability might be reason to use 'person'— rather than 'thing'-language in talking about God.

Against Pike's "I see no reason", I see a couple of reasons coming out of the encounter with cosmology why timelessnes might have a place:

(1) Time is part of the created order. This is Augustine's view of **creatio cum tempore,** and seems a reasonable interpretation of most contemporary cosmologies, the phenomenogical understanding of time. It might be combined with the rejection of a straightforward cosmogonic interpretation of **creatio ex nihilo.** Hence, it is not meaningful to talk about God as if there was time before the creation — God as everlasting.

(2) The presence of a timeless description, where the whole is a unit including all moments, suggests that it is possible to talk about the relation of God to this whole — and not God at

one moment to the Universe at that moment, differentiating moment in God.

(3) A platonistic realism about mathematics has recently been defended by Penrose (1989); cosmology (and hence our understanding of the world) tends to share more in that platonistic mathematics.

I therefore maintain that it is useful to understand, at least partly, God's transcendence with respect to space and time as timelessness. This emphasizes God's unity with respect to the world.

That leaves us with, at least, two possibilities.

(I) If God is understood as a being — more or less the mainline theistic understanding, an assumption shared by Pike and Helm, — there still might be an order, and perhaps even a flow, within God which could be labelled God's time. As my teacher in philosophy of religion , Hubbeiling, liked to ask : how could God otherwise enjoy music? If music is not enjoyable when all notes are played at the same moment, God's perfection, also with respect to esthetical appreciation, requires that God has God's time. Karl Barth seems to have defended a similar distiction between ordinary time and God's time when he understood Jesus as the lord of time and distinguished between an uncreated time which is one of the perfections of the divine being ánd created, with its succession of past, present, and future (**KDIII/2**, par.47). However, such a notion of 'God's time' is hard to fit in once time is thoroughly physicalized (2.3) —lust like one isn't free to add one spatial dimension in contemporary superstring theories, another temporal dimension might be problematic as well.

(II) An alternative would be to deny that God should be understood as '**a being** — a single individual possessing negative as well as positive attributes' (Pike 1970, 1) God might, perhaps, be understood differently, say as ' being itself', 'the Good', or — in the context with the natural sciences perhaps appropriate, 'intelligibility', perhaps a name for the law of nature.

In a sense, three positions may be distinguished, connecting three epistemological attitudes to three metaphysical stances:

—Upon a critical realistic perspective, God migh be seen as a being up there, having certain properties. This being could either have an infinite temporal extension, may be while changing through experiences with the world, or have 'a time' of his (her) own.

— A more platonic understanding of God as an abstract eternity, Good, Intelligible or whatever,

— And, thirdly, a more pragmatic line of thought, which sees human understanding closely related to human acting. 'God' then doesn't refer to an objective realm, but rather is the term used whenever one wishes to claim the specific nature of values as something that go beyond any specific situation. The eternal wouldn't be located in some other realm (heaven), nor be awaited in some other time (Kingdom), but rather be experienced now and here.

4.2. Creative acts, a single act, or creative values?

As Gordon has formulated:

- *For a monotheistic theology ... it is* **the whole course of history** *from its initiation in God's creative activity to its consumation whan God uitimately* achieves his purposes, that should be conceived as *God's act in the primary sense*" (Kaufman *in* "On the meaning of 'act of God'" in **God the Problem,** Harvard U.P. 1972, p. 139 as quoted by Wiles 1986, 29).

This revisionary position, compared with the emphasis on many specific acts of God, has been defended strongly by Wiles. As he sees it, allowing for specific acts of God not only runs into trouble with the natural sciences; it also would lead up to the question why God doesn't interfere — God would seem to be morally blameworthy. I need not develop here further the discussion whether the world should be seen as a single act of God , or whether specific acts are imaginable and plausible. However, it still is more or less the classical theistic picture of a being, a person, acting. It is this concept of God creating the Universe which has been defended by the philosopher of religion Richard Swinburne as plausible , or at least as preferable over the idea that the Universe might simply be, a brute fact.

Swinburne thinks that, in description of the evolution of the Universe, God might come as either responsible for the state, as considered above, or as responsible for the laws. Each state of the Universe will have a full explanation in terms of a prior state and the natural laws. The most fundamental law is scientifically inexplicable. It must either be completely inexplicable, or have a non-scientific explanation, i.e., a God who brighs it that the law operates. 'The choice is between the universe as stopping-point and God as stopping-point' (Swinburne 1979, 127).

According to Swinburne, a universe is more complex than God, so the latter stopping-point is preferable. The supposition that there is a God is an extremely simple supposition . A God of infinite power, knowledge, and freedom is the simplest kind of person which there could be, since the idea has no limitations in need of explanation. The Universe, on the other hand, has a complexity, particularity, and finitude 'which cries out for explanation' (Swinburne 1979, 130).

There is no explicit use of science in this argument. It might be rational and valid, but that is to be debated at the level of philosophical reasoning without support from science. The scientific contribution lies in the description of the Universe.

However, if the choice between accepting the Universe as a brute fact or as needing an explanation of a different kind is justified by comparing the simplicity of the two hypotheses (as Swinburne does), it is a matter of the utmost importance to understand how complex or simple the two alternatives are. Many cosmologists believe that their theories are of an impressive simplicity and elegance in structure and assumptions, even if the mathematics is difficult. Whether this makes it more or less reasonable to regard the Universe as a 'creation' is not clear (why could one not believe that God made a universe with a simple structure?), but it does undermine Swinburne's argument based on simplicity.

Alternative, closer to a platonic strand: Leslie: creative values.

5. ETERNAL AND PRESENT: THEOLOGY IN TWO PERSPECTIVES

Almost all current theologians who take science seriously opt for a dynamic picture. Often, cosmic evolution is considered as an extension of biological evolution. When the physical view of time is discusses, there is a strong emphasis on the flow of time and the asymmetry of time. This is especially true for process theologians. An exception is the physicist and anglican priest John Polkinghorne, who sees an analogy between the duality of a timeless level of description aside of a description from within time with the duality in theology between 'the God of the philosophers' with emphasis on the static perfection and remoteness, and 'the God of Abraham, Isaac, and Jacob', with the danger of too much anthropomorfism. "A true account will hold the two in balance" (Polkinghorne 1988, 6; see also p. XIII) A similar balance of theological notions related to the two descripyions is what will be searched for in this section.

5.1. Opportunities of the two descriptions

Philosophical theology and theoretical science take some distance from common sense experience. At that level both descriptions, considering evolution in time and whole 'histories', might be useful. They allow for different clusters of associations, and thereby help to see the world differently. However, they both have their own disadvantage as well.

Combining both perspectives in relation to a present seems to me the most promising theological approach. The precise meaning of all the terms is dependent upon the further system in which the ideas participate. The following provides a brief overview of the two networks of associated concepts.

A description within time takes history and evolution as basic. Evolution is here a broad category, including cosmic, stellar, geological and cultural change. This resonates with a theological emphasis on 'Heilsgechichte' (salvation history). **Creatio ex nihilo** is most easily associated with questions about ultimate origins, hence cosmogony. **Creatio continua** will be the theological doctrine that deals with God's relation to the processes of change, especially God's relation to the emergence of novelty. Time is always there. Contingency is primarily about events; instead of those events that happened something else could have happened, and the events of the future are still contingent. Initial conditions could have been different. Necessity seems reflected in the laws, which are the same for all moments in time. Value is easily related to the future — the qualities of decision will be judged by the consequences. Hence, one has a teleological or utilistic kind of ethics. The eschaton, say the Kingdom of God , is closely related to the future. God's relation to the world is most easily formulated in terms of immanence or temporal transcendence (e.g., being before the world, or as luring towards a better future).

The timeless perspective, or rather the perspective that incorporates the whole of time, might be understood as a view **sub specie aeternitatis**, a 'bird's-eye view', the whole of history as if seen from beyond.

Creatio ex nihilo is not correlated with questions about the origin. Rather, it reflects the question about the ground of everything. (For an atemporal understanding of 'ground' one could think of the role of aximata in a mathematical system — they may come first in arguments. In the order of knowing, although they are, historically speaking, formulated only after some time. They are not prior to the system in the order of being. They are the ground of the system, with the system.) **Creatio ex nihilo** might also be understood as expressio of God sustaining the world at all moments. **Creatio continua** might also express this notion of sustaining, or in more traditional terms, God's **conservatio.** However, it is stripped from the emphasis on change and novelty, which it has in the other perspective. 'Novelty' is not a concept that fits in this timeless perspective, it belongs to the other language.

Time is more explicitly seen as part of the created order. Contingency is primarily the ontological kind: why is there anything at all? Besides, the contingency of the law is more explicit: why this package and not another? The events are no longer seen as contingent: they are all necessary relative to the whole of history. Value must be understood as being there for every event, just by being part of the whole web — or perhaps even more primitively, just by being. This lends itself more readily to a deontological view of ethics, as expressed in Immanuel Kant's second formulation of the categorical imperative, the ground rule for his ethical system, which states that one should never treat others only as means towards ends.They are always ends in themselves. Eschatology is less connected with the future, are more with God's transcendence. Transcendence is less easily underdtood as temporal (before and after the world); rather is a radical beyond — as if in a completely different dimension.

Both these approaches are in danger of missing something essential. The perspective incorporating the whole of time might result in a conservative, **status-quo** affirming, understanding of eternal values — and thus divert attention from corcrete contexts of injustice and suffering to a timeless and eternal 'other place'. Doing without the perspective from within time would mean the loss of concreteness. It might well fit with a more purely Platonic philosophical thinking, or an

Eastern perspective, but Christianity has emphasized the value of particulars, and the importance of God's activities in the world, for instance in the history of Israel. Taking only the timeless perspective might, just as might an over-emphasis on unity, make it difficult to maintain this characteristic of Christianity.

However, we need not take only the description from within time. The timeless perspective also allows the expression of valuable convictions. It is especially valuable as it may open our thoughts to the possibility of something other than the temporal, and hence to considerations about God's transcendence. An evolutionary faith is in danger of subsuming present suffering and injustice under a future happiness, and thus becoming the optimistic expectation of an 'other time'. Besides, the combination of the two perspectives might be more valuable than a mere juxtaposition of them. Prophetical criticism appeals to God's otherness or transcendence — that is its Archimedean point to criticize the present.

5.2. The view sub specie aeternitatis

Speaking about God in a space-time framework which takes the whole at once is not all that one could say about God as the Eternal One. It only offers an entrance. With respect to the whole of time one may make a similar suggestion of a beyond which has an atemporal transcendence, the Eternal. This is not caught in the description. From the scientific perspective it can be, at most, an assumed supplement 'out of the plane of the space-time description'. This notion of atemporal transcendence, and the correlated view of the whole of time, might be useful as an understanding of God. An ethical analogy has been development by Sutherland.

As Sutherland argues, a view **sub specie aeternitatis** is not one that can be attained definitely. But it can be a notion, which expresses the intention to aim at an understanding of human affairs which goes beyond any limited outlook, whether of an individual, of a community or even of humanity (Sutherland 1984, 88). The idea functions like the transcendental regulative ideas of reason, as directing the understanding towards a certain goal.

The unattainability, the transcendence, is essential. It is sane to allow self-questioning in relation to a perspective other than one's own. If this 'other perspective' is accessible, like a list of eternal values, it might result in fanatism without self-questioning. The idea of the eternal as referring to something transcending even one's most cherished view keeps faith open (Sutherland 1984, 110).

5.3. Axiological eschatology

> • But the true longing of humanity is not for an afterlife; it is for the establishment of a justice here and now that will make an afterlife unnecessary.
>
> *John Fowles 1980, 30.*

In this section I will sketch a framework for an eschatogy from the perspective of the present, which emphasizes an atemporal transcendence.

Transformation as personal conversion or social change is an important theme in many theologies, especially in evangelical and political theologies. Natural theologies arising out of experiences with the natural world mostly lack this; they tend to overemphasize the actual state of affairs as one deserving wonder. However, a theologically adequate natural theology should, in my opinion, attempt to disclose the possibilities for transformation of the natural order.

The idea of tranmsformation might suggest emphasis on another state, either a future Kingdom or a Heaven 'up there'. Using a distinction made by John Hick (1977), a developmental view directed towards a future state of perfection might be called Irenean. To struggle and to cope with evil is part of the process of growing , of maturing. Emphasis on the process might offer relief from the evil we do, as all things are supposed to work together for the final good. Such a view is in danger of diverting our attention from present responsibility to the anticipation of a future perfection will come anyhow, effected by God. An 'Augustinian' view doesn't focus on future proces of perfection. Rather, as expressed in the Reformed traditions, evil is taken very seriously. The worldly process will not lead to perfection; the perfection is to be expected in another realm, easily imagined to be spatially distinct, solely effected by God. Both views diminish the relevance of the present, and of our activities in the present, by locating perfection in another time, a future state of maturity, or another place, a heavenly state of bliss.

Combining the emphasis on transformation and on the present as the location of our responsabilities leads to a praxiological emphasis in theology, agaonst escapism to heaven or to an indefinite future.

In the further interpretation of a present oriented eschatology which deals with injustice, three elements should be present (in my option, if one wishes to keep core elements of the prophetical tradition):

(1) judgment on the present, a valution;

(2) appeal to action in response to that judgement, conversion;

(3) consolation in contexts of injustice, failure, and suffering.

In oder to develop an adequate eschatology which correlates with the concern for justice, especially with the dimensions of judgment and appeal, we need to develop a metaphysical scheme which is au fait with science. Such metaphysics should allow a theology which is primarily prophetical, aimed at critical relativizing the status quo , and evoking a response. Such a theology needs a difference between what is possible and what is actual. The future is one which we make, not one which is definitely enfolded in the cosmic process. God might be understood as the source, or even the locus, of the values and the possibilities. Four elements are needed.

1. The present is the central state of reference, and not a far past or a far future.

2. Each actual present is correlated with a set of possibilities, alternatives for the near future of the present.

3. The consequences of the different options in a given present are to some extent predictable.

4. A reference frame for evaluating the different options is needed, an orientation on the space of alternatives.

Ad 1. The unique moment which is the actual present is not caught by the language of physics. To take the present as a basic notion in one's view implies that one reaches beyond the scientifically describable. It seems preferable to do so, as it is the locus of existence, the locus of decisions and actions the locus where God should be relevant, if relevant anywhere.

Ad 2 and 3 .Total determinism eliminates the second condition. There are no alternatives, there is no morally accountable behavior. Nobody can make a difference for the sake of justice. The issue which needs further consideration, in, my opinion, in the reflection on faith and cosmology is not whether God is to be understood as timeless or acting in time, but whether reality is of such a complexity and time is of such a nature that one can speak meaningfully about responsible human actions in time.

Unpredictability of consequences, which follows from total indeterminism, eliminism, eliminates accountablity as well. There should be a partial predictability, at least a reasonable expectation of the consequences for the near future, if one prefers one alternative for action over another.

In actual practice, the predictability of complex systems like the weather is limited. In most cases, predictions are better for the near future than for the far future. The study of complex and chaotic systems has developed rapidly over the last decade. 'Chaos' sciences seem to offer possibilities for a scientifically adequate expression of a limited predictability while denying the possibility of a complete predictability, as one can never, in principle, know with sufficient accuracy all relevant conditions. If, and this is a very sizable if, the epistemological unpredictability in chaos theories is integrated with ontological indeterminacy as a possible interpretation of quantum physics, one might perhaps be able to formulate a framwork the conditions 2 and 3 are fulfilled.

Ronger Penrose has in his recent **The Emperor's New Mind** argued that one should distinguish between the computable and the true. Intuition plays a role in 'seeing the truth' of a mathematical statement, even if it isn't provable within the system. May be that such distinctions offer more promise than the appeal to chaos-theories in integrating deterministic aspects of cosmology with human thought and action.

Ad4. The existence of moral, esthetic, or other, criteria relevant to the choices is the most a-scintific. It is transcendent with respect to the space-time framework. It might bring in the Augustinian 'other place' as a reference, relevant to the steps towards the near future.

I therefore suggest to understand God both as the ground of reality and as the source of values and possibilities. The first element, God as the ground, expresses the affirmation of the goodness of finite reality and envisages a locus for objective immortality. The second component, of possibilities and values, corresponds to the call for conversion for the sake of a more just future. In such a way one could combine the dimensions of depth and future, of mysticism and history.

Whether that might be conceived of intelligible in the context of contemporary cosmology with its platonistic tendencies, needs further consideration. Among the issues to be considered thus, the constructive side of science should also come into the picture. The theories suggest a platonic reality, but they are made by humans from their limited point of view, from 'the (conceptual and physical) world within the world' (John Barrow).

REFERENCES

Barbour, I.G. 1990, Religion in an Age of Science. San Franc.:Harper & Row.

Barrow, J.D. 1988. The World Within the World. Oxford Univ. Press.

Cobb, J.B., D.R.Griffin. 1976. Process Theology: an Introductory Expresition. Manchester Univ.Press & Philed.: Westmister Press.

Craig, W.L. 1979. The Kalam Cosmological Argument. London: Macmillan.

Dress, WB 1990. Beyond the Big Bang: Quatum Cosmologies and God. La Salle: Open Court.

Fowles, J. 1980. The Aristos. Flmouth (Cornwall): Triad/Granada.

Frautschi, S. 1982. Entopy in an expanding Universe. Science 217: 593-9.

Hartle, J.B. 1988. Quantum kinematics of spacetime. Physical Review D37: 2818-2832, D38:2985-2999.

Hartle,J.B., S.W. Hawking. 1983. Wavefunction of the Universe. Physical Review D28: 2960-2975.

Hartshorne, C. 1948. The Divinc Rclativity. Yale University Press.

Hawking, S.W. 1982. The Boundary Conditions of the Universe. In Astrophysical Cosmology: Proceedings of a Studyweek on Cosmology and Fundamental Physics, eds. H.A. Breck, G.V.Coyne, M.S.Longair. Vatican: Pontifica Academia Scientiarum.

—1984 . Quantum cosmology. In Relativity, Groups and Topology II. eds. B.S. Dewitt,, R.Stora. Amsterdam: North Holland.

— 1988. A Brief History of Time. New York; Bantam Books.

Heim, Paul. 1989. Eternal God. Oxford: Clarendon.

Heller, M. 1987. Big Bang on ultimate questions. In Origin and Early History of the Universe: Proceeding of the 26th Liege International Astrophysics Colloquium, July 1 — 4 1986. Cointre -Ougree (Belgique),

Hick, J. 1966. Evil and the God of Love. London :Macmillan. (Rev. ed. 1977).

Isham, C.J. 1988. *Creation of the universe as a quantum process. In* Physics, Philosophy and Theology, eds. R.J.Russell, W.R.Stoeger, and G.V.Coyne. Vatican: Vatican Observatory; distributed by Univ. of Notre Dame Press.

Kroes, P. 1985. Time: its structure and role in physical Theories. Dordrecht: Reidel.

Leslie, J. 1979. Value and Existence. Oxford: Basil Blackwell.
— 1990. Univrses.
Linde, A.D. 1985. Particle physics and cosmology. Progress of Theoretical physics, Supp. 85: 279-291.
May, G. 1978. Schopfung aus dem Nichts: Die Entstehung der Lehre von der creatio ex nihilo. Berlin: Walter de Gruyter.
McCall, K. 1976. Objective time flow. Philisophy of science 43: 337-362.
Misner, C.W., K.S.Thorne, J.A.Wheeler. 1973. Gravitotion. San Franc.: Freeman.
Munitz, M.K. 1974. The Mystery of Existence. New York Univ. Press.
—1986. Cosmic Understanding. Princeton Univ. Press.
Penrose, R. 1971. Time asymmetry and quantum gravity. In Quantum Gravity 2, eds. C.J.Isham, R.Penrose, D.W.Sciama. Oxford:Clarendon.
—1986. Big Bangs, Black Holes and 'Time's Arrow'. In The Nature of Time, eds. R.Flood, M. Lockwood. Oxford: Basil Blackwell.
—1989. The Emperer's New Mind. Oxford Univ. Press.
Pike, N. 1970. God and timelessness. London: Routledge and Kegan Paul.
Polkinghorne, J. 1988. Science and Creation. London: SCM.
Sagan, C. 1988. Introduction. In S.W.Hawking (1988).
Smart, J.J.C. 1990. Our Place in the Universe. Oxford: Blackwell.
Swinburne, R. 1979. The Existence of God. Oxford U.P.
Tipler, F.J. 1989. The Omega Point as Eschaton: Answers to Pannenberg's Questions to Scientists. Zygon.
Wiles, Maurice.1986. God's Action in the world. London: SCM.

Dr. M.C. Duffy
School of technology
Surnderland Politechnic
United Kindom, SR1 3SD

CLOCK—TIME, PHYSICAL MEASUREMENT, AND THE AGE THE UNIVERSE

Physical time and metaphysical time

Physics is about measurements wich rods and clocks, and therefore the identification of the most accurate available