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THE SCIENCE-RELIGION DEBATE : AN  
HISTORICAL-PHILOSOPHICAL  
OVERVIEW WITH REFERENCE TO THE  
ORIGIN OF THE UNIVERSE

By

FRANCOIS JOHANN STRAUSS

Submitted in part fulfillment of the requirements for the  
degree of

Doctor Philosophiae

In the Department of

Science of Religion

In the Faculty of

Arts

At the University of Durban-Westville.

Supervisor (promoter) : Prof. P.KUMAR

Joint Supervisor (joint-promoter) : Dr. D. Buchner

September 1998



## **FORWORD**

I wish to thank all persons directly or indirectly involved in the completion of this study.

A special word of appreciation to my wife Mary, my daughter Naomi and my son Karl for their acquiescence, sacrifices, encouragement and moral support without which I could not have sustained the effort in bringing about this study. Naomi's inspiring debates on theological/religious issues and Karl's inputs on the scientific issues were well received and used.

I would also like to add a special word of appreciation towards my promoters Professor Pratap Kumar and Dr. Dirk Buchner for their stimulating critique and inspiration throughout.

I shall forever be grateful to my friend Professor Pippen Oosthuizen whose open mind and heart (and available library!), sound advice and persistent forbearance was like nectar to the hummingbird. Dr. Pieter Joubert's support and encouragement is once again noted.

To the library staff of both the University of Durban-Westville, as well as the University of Natal, my deepest appreciation for the hours of assistance in the search for material.

For the proof reading and editing, Mrs. Lynn Thomson's effort is greatly appreciated.

*Study astronomy and physics if you desire to comprehend  
the relation between the world and God's management of it.*

*Maimonides  
The Guide for the Perplexed*

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*To every man is given the keys of the gates of heaven, the same key opens the gate of hell.*

*Buddhist Proverb*

## SUMMARY

The science-religion debate forms the general basis for discussion in this study and special reference is made to the origin of the universe from the biblical as well as the scientific perspectives. The biblical perspective forms a vital part in this discussion and it gives immediate direction when the issue of the existence of God is taken up in **Chapter 1**. The question which needed to be addressed is whether evidence (if not proof) for the existence of a Supreme Being can be reasonably/philosophically contemplated.

In **Chapter 2** an overview of the general state of the science-religion debate is given. The historical development of the debate is highlighted and this elaborate account not only explains the somewhat hostile relationship between religion and science, but also helps to trace the general direction of these developments. The reader is exposed to the development of *Liberal* and *Process Theology* which paved the way for the possibility of cooperation between science and religion.

Any attempt to indicate possible cooperation between religion and science should take note of the concept of *worldviews* so as to be able to properly distinguish between similar aspects in science and religion. **Chapter 3** represents an effort to describe the concept of *worldviews*.

Religious fundamentalism with the literal interpretation of the Bible and a vengeful “God of the gaps”, are aspects of religion with which science has obvious differences. The role *Liberal* and *Process Theology* can play to integrate science and religion on these and other issues is described in **Chapter 4**.

*Theology* can play to integrate science and religion on these and other issues is described in **Chapter 4**.

**Chapter 5** describes the biblical story of creation. Various logical as well as practical inconsistencies are placed within the *reader oriented approach* to the interpretation of the Genesis account of creation and the literal interpretation of biblical creation is challenged. A plausible non-fundamentalistic alternative interpretation of this story is upheld.

The scientific version of the origin of the universe in the form of the *Big Bang Theory* is the subject of **Chapter 6**. The question whether there was a beginning is elaborated upon as this issue, together with God's apparent continued participation in the process of creation, seem to be the real focus of efforts to take tentative steps in the direction of some form of integration between science and religion.

An evaluation of biblical creation and cosmological theories of the origin of the universe forms the basis for the contents of **Chapter 7**. Arguments for the existence of the universe based on *chance*, *necessity* or *design* are postulated and the role of *faith* (which says nothing about the age or nature of things) and *science* (which says nothing about the origin of things) are brought together.

**Chapter 8** summarizes this study and some general conclusions are reached.

Finally the author wishes to draw attention to the existence of a book which was not available by the time of publication of this study, but which should be read by anyone who intends to pursue the study of the science-religion debate. The particulars of this book are as follows:

J Wentzel Van Huyssteen, 1998: *Duet or Duel? Theology and Science in a Postmodern World*, Harrisburg, Pennsylvania, Trinity Press

**TITLE: THE SCIENCE-RELIGION DEBATE : AN HISTORICAL-PHILOSOPHICAL OVERVIEW WITH REFERENCE TO THE ORIGIN OF THE UNIVERSE**

**KEY TERMS: Philosophy of religion; Science-religion debate; World Views; Origins; Creation; Genesis 1 – 2:4a; Big Bang Theory**



# CHAPTER 1

*Mistress of high achievement, O lady of Truth,  
do not let my understanding stumble  
across some jagged falsehood.  
Pindar*

## THE SCIENCE-RELIGION DEBATE : EXPLORING THE PHILOSOPHY OF RELIGION

### INTRODUCTION

Probably the biggest challenge the Christian Church has to face today is to give grounds for seeing Christian perceptions on nature, humanity and God plausible and believable. The Enlightenment's onslaught on Christian belief has placed these beliefs in jeopardy and more so during this century because of the continued pressure exerted by the growth in scientific knowledge and influence. If "truths" and traditional modes of thinking from the past are to be passed on to the future, they have to be re-thought - new images have to be re-born in the light of the best contemporary knowledge. This simply means that "... the perspectives of the sciences have to be taken in account in any viable 20<sup>th</sup> century theology."<sup>1</sup> Like the householder of the Gospel of Matthew, we need to bring out of our store "... things new and old."<sup>2</sup> A prominent liberal theologian, Alec Vidler, said: "When theologians are on speaking terms only with themselves they are doomed to frustration and indeed to damnation."<sup>3</sup>

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<sup>1</sup>D.W. Hardy and P.H. Sedgwick (eds.), *The Weight of Glory - A Vision and Practice for Christian Faith : The Future of Liberal Theology*, Edinburgh, T & T Clark, 1991, p. 37

<sup>2</sup> Matthew 13:52 "Then said he unto them, Therefore every scribe *which is* instructed unto the kingdom of heaven is like unto a man *that is* an householder, which bringeth forth out of his treasure *things* new and old." (KJV) See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

<sup>3</sup> John Habgood, *Reflections on the Liberal Position*, in D.W. Hardy and P.H. Sedgwick (eds.), op. cit., p. 8

Both Christian theology as well as science endeavor to give answers to fundamental questions not only as to the origin of the universe, but also the purpose and meaning of it. Judeo-Christian theologians take the Bible as the main point of departure and science is invariably invoked to explain the finer detail to which the Bible ostensibly remains elusive. Scientists, on the other hand, traditionally form two distinct groupings who either make provision for some role by an undefined Being<sup>4</sup> in this process, or explicitly and purposefully deny the existence and/or role of any supernatural influence in the process<sup>5</sup>. This so-called *science-religion* debate is one in which a considerable number of scientists as well as theologians from all over the world are participating.<sup>6</sup>

Both theology and science aim to depict reality and they both do so in a metaphorical language. Their language is, furthermore, revisable within the context of the continuous communities which have generated them. It is thus imperative that theology takes seriously the results of scientific endeavour, but at the same time remains critically realistic. Whilst the broadly accepted history of the natural order has to be noted, some recent scientific speculation cannot be taken seriously. An example of this position is Charles Raven's continuous and concentrated efforts to advocate science and scientific ways of thinking, whilst he abandoned particular elements of evolution.<sup>7</sup>

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<sup>4</sup> References to God are often to be found in the writings of cosmologists. Even Einstein constantly refers to God, albeit in a somewhat vague form - See G. Joubert, *Die Groot Gedagte*, Kaapstad, Tafelberg-Uitgewers, 1997, p. 278. See also: P. Davies, *God and the New Physics*, London, J.M. Dent, 1983; G. Ellis, *Before the Beginning : Cosmology Explained*, London, Boyars & Bowerdean, 1993; S. Hawking, *A Brief History of Time*, New York, Bantam, 1988

<sup>5</sup> See "Logical Positivism" in A. J. Ayer, *Language, Truth, and Logic*, 2<sup>nd</sup> edition, London, Victor Gollancz Ltd., 1946

<sup>6</sup> The names of 1000 theologians and natural scientists are referred to by R. Stannard, *Doing away with God? Creation and the Big Bang*, London, Pickering, 1993, p. 135

<sup>7</sup> *Ibid.*, p. 6

The resources of theology remains Scripture and tradition as well as our own experiences, but one has to acknowledge that the ways in which God speaks to the world cannot only be based on God's past revelation and interpreted through frameworks of the past alone. God is still revealing himself and our frameworks of thought need to be contemporary. In applying reason to these resources, we have to be aware of the full spectrum of reality, as John Habgood aptly puts it "... it needs to take seriously the questions posed by fundamental sea-changes, and be ready to live with loose ends, partial insights, and a measure of agnosticism, without losing its grip on the essentials of faith".<sup>8</sup>

The scope and purpose of this study is rooted in another attempt at synthesis of a religious-scientific world which can be brought together in at least a provisional harmony, particularly amongst the proponents of the Western intellectual theology in the South African situation. It is, furthermore, evident that "traditional" theology pays relatively little attention to God's work in nature and in describing especially the views of Process Theology, an effort will be made to highlight the theological concept of *creatio continua* (continuing act of creation). While the enormity of such an effort is only too well understood, it may perhaps be more appropriate to attempt to present a (limited) factual basis which might have an influence on existing mindsets which may thus far have precluded any such attempts at synthesis in especially amongst the traditional Judeo-Christian segments of the South African scene.

South Africa is currently experiencing a new era of freedom where traditional one-sided limitations on the actions and thoughts of individuals are being removed. Traditional Christian churches, having their governmental support restricted, now face a process of modernization where competition with not only non-Christian

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<sup>8</sup> Ibid., p. 9

churches/beliefs are prevalent, but also where the onslaught on traditional beliefs will surely be challenged to a greater extent than before. Symptomatic of this process of modernization is the fact that automatic support for the orthodox Calvinistic approach to Christian life is openly challenged surprisingly even e.g. by prominent “Afrikaners” such as the brother of the last “apartheid” State President and prominent theologian, Prof. W.A. de Klerk<sup>9</sup>, and a leading Afrikaans author/linguist, Madelein van Biljon.<sup>10</sup> The challenge is particularly directed at the literalistic and fundamentalist interpretation of the Bible.

It is similarly foreseen that the scientific challenge on traditional orthodox beliefs will also increase. The combined effect will certainly impact negatively on the survivability of the Christian church in these changing times - without the conviction that the only way to knowledge is through open inquiry, this survivability will be placed under tremendous strain.

This study is thus in a sense a plea aimed at Judeo-Christian theologians for a broader minded approach to religion, which would provide for a greater need to keep abreast of new developments in the scientific world that may impact on traditional beliefs. This plea would also include the incorporation of new developments in religious language. How else would the onslaught from a purely scientific oriented mindset successfully be accounted for especially amongst the younger generation who are being taught about e.g. evolution without any effort to reconcile it with current similar religious beliefs? It is almost as if there is an awakening where new knowledge actually places people in a position to choose between scientific knowledge and orthodox traditional religious beliefs.

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<sup>9</sup> Prof W. A. de Klerk, *Die Vreemde God en sy Mense*, Human & Rousseau, Kaapstad, 1998

<sup>10</sup> Madeleien van Biljon, “Ongeloof”, *Finesse*, May 1998, p.64

This study is structured in order to form a coherent deployment of arguments from an initial questioning about the philosophical basis for the existence of God, through the development of the natural sciences, to an effort to offer a plausible way of a tentative and hypothetical interaction between theology and science.

Despite the advent of science and the developments in the scientific world which increased the dependency on science, religion still plays a major role in people's lives. The way the world is seen and the methods of investigation needed in our search for more knowledge, have brought about changes which ultimately increased the role of science whilst the role of religion as sole judge of the world we live in, has decreased.<sup>11</sup>

Modern scientific discoveries about the origin and development of the universe have led to theories which seem to draw closer to what theologians claim to have been saying all along. Opponents of such observations, purport on the other hand that, when taken literally, some "facts" presented in the Bible indicate incompatible differences to the position held by scientists in key areas<sup>12</sup>.

The question arises as to what may philosophically be construed to be acceptable "truths", and what should be rejected within the *science-religion* debate. Is there any basis for an argument which supports the possibility that both theology as well as science may have the "right" general view about the origin of the universe? Can any differences be scientifically reconciled or is it as Comte insists "... one of the major problems of philosophy is the unification and harmonization of the

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<sup>11</sup> J.P. Moreland (ed.), *The Creation Hypothesis*, Illinois, Inter Varsity Press, 1994, p.

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<sup>12</sup> Eugene Y.C. Ho, "Is a Liberal Interpretation of the Creation Story Compatible with Science?", Hong Kong, Intellectus, Issue 39 (January - April 1997), *INTERNET*

findings of the different sciences”<sup>13</sup>. Is it at all possible to make a scientifically based comparison between what the Bible says on the one hand, and science on the other about the origin of the universe? It seems appropriate then that religion as well as science should be investigated from a philosophic perspective in order to establish whether common ground exists for a comparison of the theme of this research study.

What philosophical propositions should thus be scrutinized? The next section will deal with the Science of Religion, with reference to those elements that may have a bearing on the subject of this discussion:

The Philosophy of Religion

The God-concept in Religion

The Attributes of God

Grounds for the belief in God

The Ontological Argument

The Cosmological Argument

The Teleological Argument

Other Arguments

Grounds for Disbelief in God

The Sociological Theory of Religion

The Freudian Theory of Religion

The Challenge of Modern Science

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<sup>13</sup> Comte divides the history of philosophy into three distinct phases. The religious phase is the first period in which man explains the world in which he lives in terms of his own nature. Then comes the stage in which metaphysical speculations and abstract rational principles appear. The third stage is the period of the positive sciences, which leads to what he calls “Positivistic Philosophy”. See A.K.

## Religious Language

Logical Truth  
 Theoretical Truth  
 Empirical Truth  
 Metaphysical Truth  
 Religious Truth  
 The doctrine of analogy of Aquinas  
 Religious Statements as Symbolic (Tillich)  
 Religious Language as noncognitive  
 Randall's Noncognitive Theory  
 Braithwaite's Noncognitive Theory  
 The Language-game Theory  
 The meaningfulness of religious language  
 Logical Positivism  
 Verifiability Principle of Meaning  
*Bliks*

## THE PHILOSOPHY OF RELIGION

The Philosophy of Religion is "... *philosophical thinking about religion* ... (it is) a branch of philosophy". It seeks to analyze concepts such as God, dharma, Brahman, salvation, worship, creation, sacrifice, nirvana, eternal life, etc., and to determine the nature of religious utterances in comparison with those of everyday life, scientific discovery, morality, and the imaginative expressions of the arts.<sup>14</sup> Rowe explains this concept in terms of what it is not, i.e. it must not be confused with the study of the history of the major religions on the one hand, and it is also not to be confused with theology (which is a

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Reischauer, *The Nature and Truth of the Great Religions - Toward a Philosophy of Religion*, Vermont & Tokyo, Charles E. Tuttle Company, 1966, pp. 205-206

<sup>14</sup> J.H. Hick, *Philosophy of Religion*, 3<sup>rd</sup> ed., New Jersey, Prentice-Hall, Inc., 1983, pp.1-2

discipline largely within religion)<sup>15</sup>. It is an aspect of religion, rather than a study about it. Thus the Philosophy of Religion critically examines basic religious beliefs, the reasons that have been given for and against the beliefs with the view of determining whether there is any rational justification for holding that belief to be true or false. Reese aptly describes it as “The discipline of Philosophy of Religion is simply philosophical analysis applied to religious data”.<sup>16</sup>

The scope of this study is restricted to one concept embedded in the Philosophy of Religion, namely the Judeo-Christian views on creation on the one hand, and scientific views on the other hand. It is, however, necessary to briefly refer to other concepts of the Philosophy of Religion so as to be able to understand the philosophical basis for the ensuing arguments and to be able to value the developments within philosophy which may have a bearing on this study. Most authors e.g. refer to the so-called “cosmological argument” as one of the traditional grounds for the belief in God.<sup>17</sup> As cosmology is the subject of one of the necessary chapters of this study, one will have to understand where this (and many other related concepts) fits into the philosophical contemplation which follows. In another example it surfaces that some cosmologists explain God’s role in the universe in terms of the deistic view, namely that He set the wheels of motion on course at the time of creation, whereafter he quietly watches how everything develops without interfering.<sup>18</sup> The latter view has e.g. specific

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<sup>15</sup> W.L. Rowe, *Philosophy of Religion - An Introduction*, California, Wadsworth Publishing Co., 1993, pp.1-2

<sup>16</sup> W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, p. 489

<sup>17</sup> Authors on the Philosophy of Religion seemingly always include this aspect in their discussions. It is interesting to note that no explanation is given as to why it is never left out. This probably indicates a universal acceptance of the fundamental role that, what today is defined as “cosmology”, has been playing historically in the Philosophy of Religion.

<sup>18</sup> T. Ferris, *The Whole Shebang - A State of the Universe(s) Report*, London, Weidenfeld & Nicolson, 1997, pp. 310-311



implications for the so-called “steady state” theory as an alternative to the “big bang” theory.<sup>19</sup>

**THE GOD-CONCEPT IN RELIGION.**<sup>20</sup> The various worldviews provide for *atheism* (there is no God of any kind), *agnosticism* (God’s existence cannot be confirmed or denied), and *skepticism* (doubts as to the existence of God). *Naturalism* holds that all explanations must finally make reference to objects and events in space-time. Every human experience, including one’s moral and religious life, can be described in terms of our existence as gregarious and intelligent animals whose life is organic to our material environment. *Deism* refers to the idea that God set the universe in motion and has thereafter left it alone. *Theism* is the belief in a personal deity, whilst *polytheism* is the belief in the existence of a multitude of personal gods. On the other hand *henotheism* refers to the existence of many gods, but individuals restrict their belief to one of them. *Pantheism* is the belief that God is identical with nature or with the universe as a whole. *Monotheism* is the belief that there is only one supreme Being.

**THE ATTRIBUTES OF GOD.** God is conceived of as a supremely good Being, separate from and independent of the world, all-powerful, all-knowing, holy, and the Creator of the universe. It is the latter attribute that needs a closer look. Judeo-Christian tradition conceives God as “the Author and Guide of everything that has been created, and that He alone has made, does make, and will make all things”<sup>21</sup>. This activity is not seen as the making of something using existing materials, but as *creatio ex nihilo*, i.e. creation out of nothing. A further development of the idea of *creatio ex nihilo*, namely that reality

<sup>19</sup> R.R. Young, “The Steady State Galaxy Theory As An Alternative To The Big Bang Theory”, Rufus’s Galaxy Web Page, *INTERNET*, 1996

<sup>20</sup> These introductory notes as well as the other general concepts of the Philosophy of Religion are reflected in Hick, J.H., op. cit., p. 5 *et. seq.*

<sup>21</sup> S. Singer, *The Authorized Daily Prayer Book of the United Hebrew Congregations of the British Empire*, 23<sup>rd</sup> ed., London, Eyre and Spottiswoode Ltd., 1954, p. 89

is permanent, although constantly undergoing ceaseless modifications, was already accepted by Aristotle and Thomas Aquinas and had a profound influence on Western philosophers<sup>22</sup>.

The scientific implications for *creatio ex nihilo* have been that the creation of the universe took place at a specific moment in time. Augustine also thought that creation not only took place at a specific point in the past, but that time itself was created at that point<sup>23</sup> - which, as will be seen later in this study, has very real scientific implications in terms of Einstein's Special Theory of Relativity.

**THE GROUNDS FOR BELIEF IN GOD.** The so-called "theistic proofs" of the existence of God are of great philosophical interest and have received attention from both secular as well as religious writers. These arguments are commonly divided into an *a posteriori* argument, where the argument depends on a principle or premise that can be known only by means of our experience in the world, and an *a priori* argument, where the argument rests on principles all of which can be known independently of our experience of the world, by just reflecting on and understanding them. Philosophical grounds for the belief in God, include the following:

**THE ONTOLOGICAL ARGUMENT.**<sup>24</sup> Saint Anselm was a medieval philosopher who formulated the ingenious argument that God is "that than which nothing greater can be conceived", which means that He must therefore exist, because to argue that such a Being does not exist would mean that something/someone greater can be perceived to exist. If such an absolute perfect Being does not exist, one would be able to conceive of something still more perfect. It is absurd to

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<sup>22</sup> Reese, W.L., op. cit., p.111

<sup>23</sup> Hick, J.H., op. cit., p. 10

<sup>24</sup> Rowe, W.L., op. cit., pp. 29-43

entertain the possibility that something more perfect than the most perfect Being can exist. Therefore God must exist.

Arguments against the ontological argument firstly center around questions as to the assumption that to exist, enhances the attributes of the object. Anselm may thus constitute that non-existing objects which may possibly exist, do in fact exist simply on the basis that they are conceived to be so great that no other similar object can exist. Anselm counters the argument by making it clear that his argument applies ONLY to God and not to any other object.

There is also the question that if such a most perfect Being is conceivable, is it not conceivable that a more perfect Being can exist? It is also pointed out that it cannot be known if “the being than which none greater is possible” is a possible object.

Thus if we do not know if such a Being is a possible object, Anselm’s argument cannot enable us to know that God exists.<sup>25</sup> The ontological argument is thus an *a priori* argument as it begins with the already existing concept of God.

**THE COSMOLOGICAL ARGUMENT.**<sup>26</sup> The Cosmological Argument seeks in its first part to establish the existence of a self-existent being, while the second part of the argument tries to prove that this self-existent being is the theistic God. Thomas Aquinas offers “five ways” of providing for the existence of a divine Being. This argument is an *a posteriori* argument because it starts off from a general view of the world around us - the world as we perceive it with its particularities could not have existed unless an ultimate reality (which we call God), existed. Things exist because they are caused by other things.

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<sup>25</sup> Ibid., p. 37

<sup>26</sup> Hick, J.H., op. cit., p. 20-23. See also Rowe, W.L., op. cit., pp. 16-43

The First Way argues that some things are in the process of changing and nothing changes itself - whatever causes something to change, must itself exist.<sup>27</sup> There cannot be an endless number of things causing change, so the fact that things change, means that there is something causing change which does not change itself. The fact that things undergo change means that there is an “unchanged changer”.

The Second Way (also known as the “First-Cause Argument”) argues that everything that happens, must have a cause. Aquinas excludes the possibility of an infinite number of things that can happen and concludes that there must have been a beginning from where all things started to happen. Thus this “First Cause” is what we call God.

These two arguments (the First and Second Ways) are basically the same. The arguments have been criticized on the basis that Aquinas does not allow for the possibility of an infinite number of changes/happenings. Later arguments in favour of this model, include this possibility and conclude that the universe would be an “unintelligible brute fact”<sup>28</sup> had there not been a reality which offers the ultimate explanation of the whole. All changes that take place and all things that happen must have an ultimate Reason or the universe would, in total, be incomprehensible and meaningless.

The counter arguments firstly contest the assumption that the universe is intelligible - skeptics believe just the opposite. A shortcoming is thus that the argument leaves little choice - either there is an Unmoved Mover/First Cause, or the universe is unintelligible.

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<sup>27</sup> Change as Aquinas sees it, involves change of quality, change of quantity and change of place. See B. Davies, *An Introduction to the Philosophy of Religion*, New York, Oxford University Press, 1982, p. 38

<sup>28</sup> Hick, J.H., op. cit., p. 21

The second counter argument questions the assumption that causality renders intelligibility. Contemporary science views causal laws as statistical probabilities, observed sequences, or are studyions of the structure of the human mind.<sup>29</sup>

When the word “change” as in “change of place” is applied to cosmology, it has been said that it conflicts with Newton’s First Law of Motion.<sup>30</sup> According to Anthony Kenny, this law “wrecks the argument of the First Way”. At any given time the rectilinear uniform motion of a body can be explained by the principle of inertia in terms of the body’s own previous motion without appeal to any other agent.<sup>31</sup> This view can, however, be contested on the basis of the Second Way : The body referred to came into being because of a complex set of scientifically observed processes (which will be referred to later in this study). The motion of such a body was also caused by these processes. In this sense, something caused the motion which cannot alone be explained by the principle of inertia.

The Third Way constitutes that all things might not have existed or might have existed differently - the proof being that at some time, certain things did not exist. At the same time some other things come into existence and then pass out of it. Some things are thus corruptible and if everything was corruptible, there would eventually have been a time when nothing would exist. In such a case, nothing would have come into existence thereafter as there would be no causal agency - nothing would exist, not even the causal agency. This has not happened, which means that not all things are generated and corruptible. The fact that things still exist means that some things are

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<sup>29</sup> Ibid., p.21

<sup>30</sup> Newton’s First Law of Motion states as follows: A body at rest will remain at rest and a body in motion will continue in motion in a straight line at constant speed unless acted on by an outside force. See R. Sullivant, “When the Apple Falls”, in *Astronomy*, April 1998, p. 56

<sup>31</sup> Davies, B., op. cit., p. 40

ungenerated and incorruptible (necessary things, according to Aquinas<sup>32</sup>). Only a self-existent reality can constitute the grounds for the existence of anything else which is incorruptible - a "necessary being" - and this being is what we call God.

Is it correct to assume that if a thing is corruptible, it will be corrupted? Or as Davies aptly puts it: "My cat is kickable, but does that mean that I have to kick it?"<sup>33</sup> Furthermore, assuming that all things corrupt at some time, does this mean that there is some specific point in time when everything has corrupted? The so-called "Quantifier-shift Fallacy" is also made and this can be illustrated by the following quote : "... the existence of the universe must be caused. Russell replies: I can illustrate what seems to be your fallacy. Every man who exists has a mother, and it seems to me that your argument is that therefore the human race must have a mother, but obviously the human race hasn't a mother - that's a different logical sphere".<sup>34</sup>

The Cosmological Argument thus seems acceptable only on the basis of the above dilemma, i.e. either there is a necessary being, or the universe is ultimately unintelligible. This is, however, where a fatal flaw is illustrated - there can only be acceptance of the first part of the argument by those who do not need proof of God's existence. It is, however, not those who do not need such proof who have to be convinced, but the skeptics and they see the universe as unintelligible. The two parts of the statement hold opposing implications for people with different world views. The skeptics, in other words, can thus not accept the first part of the argument, while those who do not need proof of God's existence do not accept the second part of the argument. It should also be noted that, although the skeptics would ultimately argue against the existence of God, it can also be argued that there is no

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<sup>32</sup> Ibid., p. 39

<sup>33</sup> Ibid., p. 41-42

<sup>34</sup> Ibid., p. 42

logical reason why God can NOT exist. Rowe, however, claims that “...we cannot reasonably claim to know that the premises of the Cosmological Argument are true ... even if it succeeded in showing that a self-existent being would have the ... attributes of the theistic God, the Cosmological Argument would still not provide us with good rational grounds for belief in God.”<sup>35</sup>

**THE TELEOLOGICAL ARGUMENT**<sup>36</sup>. William Paley’s famous argument from design using the watch goes like this: “... suppose I pitched my foot against a *stone*, and were asked how the stone came to be there: I might possibly answer, that, for anything I knew to the contrary, it had lain there forever; nor would it, perhaps be very easy to show the absurdity of this answer. But suppose I found a *watch* upon the ground, and it should be inquired how the watch happened to be in that place. I should hardly think of the answer I had before given - that, for anything I knew, the watch might always have been there. Yet why should not this answer serve for the watch as well as the stone? When we come to inspect the watch, we perceive (what we could not discover in the stone) that its several parts are framed and put together for a purpose , e.g. that they are so formed and adjusted to produce motion, and that motion so regulated as to point out the hour of the day ...”<sup>37</sup>

It would be improbable to assume that the design and assembly of the watch can be attributed to natural factors of chance. Paley then infers that the universe resembles the watch because of its complex nature and must therefore be accounted for in terms of an intelligent agency,

<sup>35</sup> Rowe, W.L., op. cit., pp. 27-28

<sup>36</sup> F. Ferre, *Basic Modern Philosophy of Religion*, London, George Allen & Unwin Ltd., 1968, pp. 149 - 174

<sup>37</sup> *Natural Theology*, in Volume IV of *The Works of William Paley*, Oxford, 1838, p. 1, quoted in Davies, B., op.cit., p.51. The Teleological Argument is also known as “the Argument from Design”.

or as Rowe puts it : “The Teleological Argument endeavors to answer the question of whether our universe results from intelligent design”.<sup>38</sup>

The Teleological Argument is still in active commission, especially in more conservative theological circles, but the Darwinian theory of natural selection stands in competition with it. The Darwinian theory, however, does not provide for design (or lack thereof) outside the realm of what can be considered to constitute life. Criticism against the Teleological Argument can be reduced to the following three points (following David Hume’s arguments as mentioned by Hick<sup>39</sup>):

Could the order not have come about otherwise than by conscious planning? Hume suggests the so-called Epicurean hypothesis, according to which the point is made that the universe is made up of a finite number of particles in random motion. In unlimited time, they go through every combination that is possible to them. If one of them happens to constitute a form of stable order, this order would in due course manifest itself in the cosmos. (This is what is called a simple model for a naturalistic explanation of the orderly character of the universe.<sup>40</sup>) This argument has to a great extent been successfully refuted with scientific calculations that there simply has not been enough time in terms of the age of the universe, to have made life possible in a spontaneous and casual way.<sup>41</sup>

The analogy between the universe and a watch/machine is questioned. Although a watch is made up of many parts, they all play a role in letting the watch perform a singular function, i.e. indicate time. The universe on the other hand is made up of a myriad number of completely separate and independent subsystems, many of which can be likened to machines themselves. The universe can also be likened

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<sup>38</sup> Rowe, W. L., op.cit., p. 46

<sup>39</sup> Hick, J.H., op. cit., p. 25

<sup>40</sup> Ibid., p. 25



to a plant, but only when it is likened to a human artifact, can the existence of a designer successfully be inferred.

The traditional argument from design is based on the principle of causal analogy, i.e. similar effects imply similar causes. The Teleological Argument makes provision for the design of an artifact (effect) by an intelligent being (cause), therefore the design of nature must have been caused by a similar - not superior - intelligence. Thus, even if we could infer a Divine Designer, we cannot postulate it as the infinitely wise, good, and powerful God of the Judeo-Christian tradition.

We may perhaps conclude from the philosophical arguments that the universe is the result of intelligent design, but it seems inappropriate to go beyond this in trying to prove that the Designer is perfect.

Despite the latter arguments, Davies indicates that even if we agree that the Designer postulated here as the philosophically acceptable one differs from classical theism, it comes very close to it - the design arguments are therefore reasonable.<sup>42</sup>

**OTHER ARGUMENTS FOR THE BELIEF IN GOD.**<sup>43</sup> There are other philosophical arguments for the belief in God which will briefly be mentioned here as they either form an extension of those already mentioned, or are not particularly necessary for this study. The first one centers around *Theism and Probability*. This argument is essentially a broader form of design argument. Its proponents claim that a theistic interpretation of the universe is superior as it takes account of a comprehensive range of data - not only the teleological character of biological evolution, but also religious, moral, aesthetic

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<sup>41</sup> Joubert, G., op. cit., p. 288

<sup>42</sup> Davies, B., op. cit., p. 63

<sup>43</sup> Hick, J.H., op. cit., pp. 27 *et. seq.*

and cognitive experiences. Accordingly, it is stated that it becomes cumulatively more probable that there is a God than that there is not. Questions based on the main theories of probability hold that probability has no proper application to this argument.

*The Moral Argument* claims that ethical experience, and particularly one's sense of obligation to fellow human beings, presupposes the reality of God as in some way the source and grounds for this obligation. This argument obviously has some (limited) value, but it cannot be presented as proof of God's existence on the basis that this moral obligation cannot be construed as having sovereign authority.

*The Argument from Special Events and Experiences* asserts that special happenings of a publicly observable kind (such as miracles and answers to prayers), prove the reality of God. While such acts may be psychologically true, it does not offer general proof of divine existence.

**GROUND FOR DISBELIEF IN GOD.**<sup>44</sup> A number of grounds for the disbelief in God exist, namely the *Sociological Theory of Religion* (the conscious power of society moulds for good or ill the minds of its members), the *Freudian Theory of Religion* (religious beliefs are illusions, fulfillments of the oldest, strongest and most insistent wishes of mankind), and *The Challenge of Modern Science*. Because of the central role this issue has traditionally played, it will form the basis of a later discussion in more detail. Suffice to say the tremendous expansion of scientific knowledge especially in the modern era has had a profound influence upon religious belief.

Whilst the existence of God as supreme Being is challenged from some quarters, others assign a special place and task for Him, which paves

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<sup>44</sup> Ibid., pp. 31 - 39

the way for the assumption that it cannot be decisively proved (from a philosophical point of view) whether God exists or not.<sup>45</sup>

## RELIGIOUS LANGUAGE

Problems or perceived problems created by distinctively used religious language form the basis for philosophical discussion. The peculiarity of religious language concerns mainly two aspects, namely the special meanings of descriptive terms when they are applied to God on the one hand, and the other aspect is concerned with the basic function of religious language. According to Rowe, e.g. : “When theists assert that God created the heavens and the earth ... they believe that what they assert is true.”<sup>46</sup> Because of the peculiarities of religious language, critics are challenging the meaningfulness of such religious statements, arguing that they are neither true, nor false.

It may thus be useful to first take a survey of the main kinds of conceptual truth. It is by no means the idea to treat this vast philosophical terrain fully here, but rather to initiate some clarification in respect of the problem of religious language. Ferre<sup>47</sup> distinguishes the following:

**LOGICAL TRUTH.** When language is successful in this function, not needing correction, logicians call it the “logical truth”. The rules concerning consistency, transformation and implication, proper syntactical form, etc. are applicable here. Conceptual reliability of symbolic abstractions is determined by inquiring whether a set of symbols is in fact functioning according to stipulated rules.

**EMPIRICAL TRUTH.** This is commonly known as “factual truth”, but it may be that this label - if it is suggested that the only possible

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<sup>45</sup> Davies, B., op. cit., p. 63

<sup>46</sup> Rowe, W. L., op. cit. p. 90

<sup>47</sup> Ferre, F., op. cit., pp. 400 - 403

factual truths are highly specific empirical truths - is perhaps misleading. The question that has to be answered is whether an assertion is successful in helping to anticipate particular experiences. Conceptual reliability of empirical hypotheses is determined by inquiring whether an assertion is successful in helping to anticipate particular experiences.

**THEORETICAL TRUTH.** Conceptual reliability of limited theories is determined by inquiring whether the metaphors and models employed in the theories are successful in giving us an awareness of analogies that sustain whatever respects are important for our purposes.

**METAPHYSICAL TRUTH.** Conceptual reliability of metaphysical theories, including the speculative use of theism, are determined by inquiring whether the broadest speculations concerning the unavoidable features of things, attain an acceptable degree of success in providing an adequate picture.

**RELIGIOUS TRUTH.** The issue of religious truth poses complications. What is classified as religious truth, display attributes which are questioned on the basis of its arbitrariness. Unless the existence of an all powerful Being can be affirmed, the theoretical basis of religious truths are founded in hope and faith alone. What is described as "religious theory", is sometimes referred to as "valuational commitment". This, however, does not deviate from the fact that religious truth is distinct from other types of truth because it is used solely within the confines of the religious enterprise. Ferre argues that "... at its most *adequate*, it provides a compliment to other varieties of truth. At its most *coherent* it affirms passionately that all truths is one. And, finally, at its most *effective* it insists on the life-supporting guidance of critically controlled understanding."<sup>48</sup>

Do all the same words/terms have the same meaning whether they are used in a secular or a theological sense? For example, when it is said that "God is great", it does not signify that God occupies a large volume of space. Or that "God is good", it also does not mean that moral values exist independent of the Divine nature in relation to which God can be judged as being good or not good. Hick refers to this situation when he comments "... although the ordinary, everyday meaning of such words as "good", "loving", "forgives", "commands", "hears", "speaks", "wills", and "purposes" is relatively unproblematic, the same terms raise a multitude of questions when applied to God" ... and ... "When words occur in both secular as well as theological contexts, its secular meaning is primary in the sense that it developed first and has accordingly determined the definition of the word."<sup>49</sup>

To put this in the context of this study, what meaning can be attached to the words as presented in the Bible? When we read that God created heaven and earth in the beginning<sup>50</sup>, can the words be interpreted as having the same meaning both scientifically as well as theologically?

Some clarification is offered by Hick, Charlesworth, Ferre and Rowe<sup>51</sup> and others. The following is noted:

**THE DOCTRINE OF ANALOGY OF AQUINAS.** Words that are used to describe both God as well as created beings are not used *univocally* (i.e. with the exact same meaning), nor *equivocally* (i.e. with a completely different meaning), but rather *analogically*. The latter word thus means, when we say that God is good, we use the term to describe an attribute in an infinite sense. At the same time when the

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<sup>48</sup> Ibid., p. 403

<sup>49</sup> Hick, J.H., op. cit. p. 77

<sup>50</sup> B. Gemser et. al., *Die Bybel Met Verklarende Aantekeninge*, Deel 1, Kaapstad, Protestante Uitgewers (Edms.) Bpk., 1976, p. 3

word is applied to describe man, the meaning of it also contains some elements of the same meaning, but it is restricted to what mortal "goodness" can be. It is not exactly the same, nor is it totally different - it is analogical. The purpose of this distinction is not to try and describe Divine nature whose existence is presupposed, but to provide a framework for a limited number of statements about God.

**RELIGIOUS STATEMENTS AS SYMBOLIC (TILLICH).** For Tillich, religious language is symbolic.<sup>52</sup> He distinguishes between a *sign* and a *symbol* - both point to something else beyond themselves. Thus a sign points to something by arbitrary convention - a red light signifies that drivers should stop. A symbol, on the other hand, "participates in that to which it points" (Tillich's theory of participation). Everything that exists, participate in God. A flag participates in the power, prestige, dignity, pride, etc. of the nation that it represents, it opens up levels of reality which otherwise are closed to us, and at the same time it unlocks dimensions and elements of our soul. There is only one literal - nonsymbolic - statement we can make about God ... that God is Being-itself (Tillich's name for God). All other statements, such as that God is eternal, living, good, personal, the Creator, are all symbolic.<sup>53</sup>

A number of questions arise in connection with the theory of participation which basically does not clarify what "participation" means. For example, if God is good, does the symbol refer to God's goodness, or the proposition that He is good? What is the difference in which symbols participate in "Being-itself" and everything else? It seems apt to come to the same conclusion as Hick when he says,

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<sup>51</sup> Hick, J.H., op. cit., pp. 77 et. seq.; M.J. Charlesworth, *Philosophy of Religion : The Historic Approaches*, London, A. Wheaton and Co., 1972, pp. 145 - 171; Ferre, F., op. cit., 335 -407; Rowe, W.L., op. cit., pp. 90 - 99

<sup>52</sup> Hick, J.H., op. cit., p. 79

<sup>53</sup> P. Tillich, *Dynamics of Faith*, New York, Harper & Row, p. 42, as quoted in Hick, J.H., op. cit., p. 80.

“Religiously, this doctrine constitutes a warning against the idolatry of thinking of God as merely a greatly magnified human being (anthropomorphism).”<sup>54</sup>

**RELIGIOUS LANGUAGE AS NONCOGNATIVE.** An assertion of a fact constitutes the cognitive usage of language. Such a sentence is either true or false. There are other types of utterances which are neither true nor false - such utterances are not made to describe facts. The question here is whether religious sentences are cognitive or noncognitive, i.e. 1) are such sentences intended to be construed cognitively, or 2) can their logical character, regardless of intention, be either true or false? Although religious people treat religious statements as both cognitive and true, there are a growing number of theorists who treat religious language as noncognitive. Three of these theories are briefly expounded hereunder.

**RANDALL'S NONCOGNITIVE THEORY.** According to Randall, the distinctive material with which religion works is a body of symbols and myths which are nonrepresentative and noncognitive.<sup>55</sup> Religious symbols have four functions, 1) they arouse emotions and stir people to action; 2) they stimulate people to cooperative action and thus bind people together who recognize the same symbols; 3) they communicate qualities of experience that cannot be expressed by the literal use of language; and 4) they evoke and serve to foster and clarify the human experience of an aspect of the world that can be called the Divine. God does not exist as a reality independently of the human mind, but is “... an intellectual symbol for the religious dimension of the world.” “God is not ... the creator and the ultimate

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<sup>54</sup> Hick, J.H., op. cit., p. 80

<sup>55</sup> J.H. Randall (Jr.), *The Role of Knowledge in Western Religion*, Boston, Beacon Press, 1958, as quoted in Hick, J.H., Ibid.

ruler of the universe ... but a fleeting imagination in a tiny corner of space-time”.<sup>56</sup>

Randall's theory of religion and of the purpose and functioning of religious language represents a widespread way of thinking which is characteristic of the culture of particularly the West today. Religion is seen as an aspect of human culture and God is defined in terms of “religion”, instead of religion being defined in terms of God. This view of religion is, according to Hick, increasingly prevalent in our technological society and as such forms a logical development of what has been called *scientism*, *positivism* and *naturalism*.<sup>57</sup> The assumption, which has its roots in ever the increasing growth of scientific knowledge and achievement, is that truth can only be found through the application of scientific knowledge and methods of investigation.

The historic role religion has played manifests itself as the object for studying from the very perspectives of history, phenomenology, psychology, sociology, etc. It is thus very applicable to point out that while God is not available for scientific study, religion is.

**BRAITHWAITE'S NONCOGNITIVE THEORY.** For Braithwaite, religious assertions serve mainly an ethical function, and the purpose of ethical statements is to express the speaker's adherence to a certain policy of action.<sup>58</sup> They express the intention of the asserter to act according to what the assertion alludes. Thus if someone says “God is good”, he means that he intends to follow a life which can be construed to be good.

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<sup>56</sup> Ibid., p.85

<sup>57</sup> Ibid., p. 87

<sup>58</sup> R.B. Braithwaite, *An Empiricist's View of the Nature of Religious Belief*, Cambridge, Cambridge university Press, 1955, quoted in Hick, J.H., op. cit., pp. 87 - 90



As in Randall's theory, religious statements are considered by Braithwaite to be different from the way they have been used by religious persons. To accept that a person will in fact act in a way specified in an assertion, is simply not always true - while we say "it is wrong to steal" and according to Braithwaite we will thus refrain from stealing, the logical inference does not hold. If we say "stealing is wrong" it means "I intend never to steal", and it would thus be logically impossible to steal. If not, "stealing is wrong" could then also mean "I intend to steal". The statements Braithwaite refers to as assertions which should be analyzed on an ethical basis, are furthermore, limited in terms of the totality of religious statements and his evaluation is thus restricted to a part of religious language only. There are many more types of religious statements than those which can be assessed according to his scheme.

These and other objections to his noncognitive theory limit Braithwaite's contribution to the extent that it may be seen as of only general interest.

**THE LANGUAGE-GAME THEORY.** Wittgenstein developed what is sometimes called the "Pluralist Theory of Meaning". He used the term "language-games", which he described as "... or groups of concepts which we use in talking about, for example, mental states, or about pleasure or pain, or about perception."<sup>59</sup> According to this view, different kinds of language, e.g. the languages of religion and of science, constitute different "language-games", which are the linguistic aspects of different "forms of life". Each language-game is independent and has its own criteria in determining what is true or false. According to Hick, "The internal transactions constituting a given language-game are thus invulnerable to criticism from outside

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<sup>59</sup> Charlesworth, M.J., op. cit., p. 151

that particular complex of life and language ... religious utterances are (thus) immune to scientific and other non-religious comment.<sup>60</sup>

Basic criticism against Wittgenstein's theory of religious language is that it does not seem to assess normal religious language, but rather proposes a radical new interpretation of an element thereof, i.e. religious utterances. Wittgenstein goes so far as to say that he would reject any attempt to explain religion as factually significant.<sup>61</sup> A later proponent of this theory (Philips) says "... what the believer learns is religious language; a language which he participates in along with other believers. What I am suggesting is that to know how to use this language is to know God" ... and ... "to have the idea of God is to know God".<sup>62</sup> The latter argument cannot be accepted - as the skeptic might comment, one might have an idea about God and know the religious language, but still be convinced that there is no God.

**THE MEANINGFULNESS OF RELIGIOUS LANGUAGE.** When theists claim that "God created the universe", or "God loves all His children", or "God buried Moses"<sup>63</sup>, there is an inherent belief that this is the truth. Critics - as seen above - have always maintained that these claims are either false or groundless because there are no acceptable reasons for them to be true. In addition to these criticisms, it is also asserted that religious claims are meaningless and therefore neither true nor false. The Logical Positivists thus claim that only propositions of the natural sciences are meaningful and "... only empirically verifiable propositions fulfill the logical conditions for meaningfulness."<sup>64</sup> Thus

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<sup>60</sup> Hick, J.H., op. cit., pp. 91 et. seq.

<sup>61</sup> C.L. Creegan, *Wittgenstein and Kierkegaard : Religion, Individuality and Philosophical Method*, London, First published in 1989 by Routledge, HTML release, *INTERNET*, January, 1997 by the author © 1989, 1997 Charles L. Creegan

<sup>62</sup> Hick, J.H., op. cit., p. 93

<sup>63</sup> Deut. 34:6 in F.C. Thompson (ed.), *The Thompson Chain-Reference Bible, 2<sup>nd</sup> Improved Version*, New International Version, Indiana, B.B. Kirkbridge Bible Co. Inc., 1990, p. 236

<sup>64</sup> Charlesworth, M.J., op. cit., p. 149

theology and philosophy are meaningless. It is therefore necessary to investigate the meaning of the so-called *Verifiability Principle of Meaning*.

According to this principle, a statement is literally meaningful only if it is either *analytic* or *empirically verifiable*. Analytic statements are those where the words used in the statement indicate their truth or falsehood, e.g. the statement "Mary is a spinster" can be confirmed to be true or false simply by asking Mary whether she is in fact a spinster. On the other hand, ... "A statement is empirically verifiable just in case some possible sense-experience is relevant to the determination of its truth or falsehood."<sup>65</sup> This is of course an extremely liberal way in which to practice scientific investigations and to limit the meaning of theological and philosophical analysis. The statement "There is a God" is thus considered to be meaningless because it is neither analytic, nor verifiable through a sense-experience. It is, on the other hand, acceptable to state "There must be intelligent life elsewhere in the universe" meaning that, although there is no means of verifying this, it may or may not be true because it is logically possible to do so.

Many objections can be raised against logical positivism and its own criteria are suspect from the onset. The assumption that a statement is literally meaningful only if it is either *analytic* or *empirically verifiable* is in itself not an analytical statement. If we accept that it is empirically verifiable is to imply that it is a general claim about meaningful statements - it is not a test to verify whether it is meaningful or not. Is sense-experiencing the only form of experiencing? What about mystical experiencing?

While logical positivism was dealt severe blows, it has had an effect on theology and philosophy, which now have to contend with the

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<sup>65</sup> Rowe, W. L., op. cit., p. 91

perception that they are not really meaningful unless empirical consequences can be presented.

This debate then shifted from verifiability to the idea of *falsifiability*. Karl Popper's contribution in this regard is based on the assumption that scientific theories emerge from many fields, including pseudo-science, philosophy, the prejudices of ordinary life, etc. The criteria of "verifiability" becomes less reliable and falsifiability is then held to be a more reliable criterion of both meaning and truth. Thus "... we must seek hypotheses which are "falsifiable", which can be disproved by negative instances ... if negative instances are not found we begin to gain confidence in its truth."<sup>66</sup> The more falsifiable the hypothesis, the more valuable it is thus likely to be.

Antony Flew, a proponent of logical positivism, points out that religious people will probably not concede that there may be an event which may cause them to accept that there is no God, or that God does not love us. When they are asked to explain the statement "God loves His children", they would probably answer that God's love is like that of an earthly father, and also that this kind of love is inscrutable, which would indicate that such kind of suffering is compatible with the truth of the assertion that God loves us. It can then be asked what the purpose of such love is, signifying that the statement "God loves His children" (and by inference not only this statement, but also religious language in general) is meaningless.<sup>67</sup>

The statement "God loves His children" is thus unfalsifiable because religious people are unwilling to allow anything to count against it.

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<sup>66</sup> Reese, W.L., op. cit., p. 449

<sup>67</sup> A. Flew, *New Essays in Philosophical Theology*, London, S.C.M. Press Ltd., 1956, pp. 98 - 99

Hare then replies that a statement such as “God loves His children” is not an assertion, but a *blik*. A blik is not an assertion “... for (while) what happens in this world can count against an assertion, nothing is allowed to count against a blik”<sup>68</sup>, and as such a blik cannot be true or false (unverifiable and unfalsifiable). Bliks can be right or wrong, or insane and sane. Examples of sane bliks include the assumption that the physical world has a stable character and objects will e.g. not suddenly appear or disappear.

While Hare probably genuinely tried to put religious language in a positive perspective by trying to do away with the logical positivistic notion that religious language is meaningless because it cannot be verified, it does little to prove logical positivism wrong. Bliks can only be proved to be meaningful (right/wrong or sane/insane) by verification.

A modification of Hare’s theory of bliks comes with Mitchell’s stressing the similarity between religious language and factual beliefs. Parts of religious beliefs are factual in character even though they may not be verifiable or falsifiable. He (Mitchell) thus underlines the similarity rather than the dissimilarity between religious beliefs and ordinary, unproblematic factual beliefs.<sup>69</sup>

## SUMMARY AND CONCLUSION

In an effort to assess the possibility of a logically and scientifically acceptable comparison between some elements within theism and the scientific theories and evidence in respect of the way in which the universe began, it was necessary to refer to some of the basic elements surrounding the Philosophy of Religion. The latter discussion thus

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<sup>68</sup> B. Mitchell, B (ed.), *Faith and Logic*, London, George Allen & Unwin, 1957, as quoted in Ferre, F., op. cit., p. 367

<sup>69</sup> Hick, J.H., op. cit., p. 99

serves as a map in respect of the rest of this study in the sense that it could be shown that *the creation* is in fact considered to be one of the elements of philosophical as well as scientific investigation.

A description was given of the meaning as well as the terrain of the ***Philosophy of Religion***, with specific reference to the ***God-concept in religion*** and ***Attributes of God***. It was necessary to expound on especially those elements which would be encountered later when the *language of religion* is discussed, namely that God is the Author and Guide of everything that has been created. God is conceived of as a supremely good Being, separate from and independent of the world, all-powerful, all-knowing, holy, and the Creator of the universe. It was pointed out that this latter activity is not seen as the making of something using existing materials, but as *creatio ex nihilo*, i.e. creation out of nothing and that reality is permanent, although constantly undergoing ceaseless modifications.

The philosophical grounds for the belief in God include the ***Ontological Argument*** (if an absolute perfect Being does not exist, one would be able to conceive of something still more perfect - therefore God must exist), the ***Cosmological Argument*** (things exist because they are caused by other things, and things change and nothing changes itself - whatever causes something to change, must itself exist), and the ***Teleological Argument*** (which endeavors to answer the question of whether our universe results from intelligent design). Other arguments were briefly mentioned, namely :

***Theism and Probability*** (a theistic interpretation of the universe is superior as it takes account of a comprehensive range of data because of which it becomes cumulatively more probable that there is a God than that there is not), the ***Moral Argument*** (ethical experience, and particularly one's sense of obligation to fellow human beings, presupposes the reality of God as in some way the source and grounds

for this obligation), and the *Argument from Special Events and Experiences* (special happenings of a publicly observable kind (such as miracles and answers to prayers), proves the reality of God).

The grounds for disbelief in God includes the *Sociological Theory of Religion* (the conscious power of society moulds for good or ill the minds of its members), the *Freudian Theory of Religion* (religious beliefs are illusions, fulfillments of the oldest, strongest and most insistent wishes of mankind), and *The Challenge of Modern Science* (the tremendous expansion of scientific knowledge especially in the modern era has had a profound influence upon religious belief).

The peculiarity of *Religious Language* concerns mainly two aspects, namely the special meanings of descriptive terms when they are applied to God on the one hand, and the other aspect is concerned with the basic function of religious language. A survey of the main kinds of conceptual truth included *Logical Truth* (when language is successful in this function, not needing correction), *Empirical Truth* (conceptual reliability of empirical hypotheses is determined by inquiring whether an assertion is successful in helping to anticipate particular experiences), *Theoretical Truth* (conceptual reliability is determined by inquiring whether the metaphors and models employed in the theories are successful in giving us an awareness of analogies that sustain whatever respects are important for our purposes), *Metaphysical Truth* (conceptual reliability is determined by inquiring whether the broadest speculations concerning the unavoidable features of things, attain an acceptable degree of success in providing an adequate picture), and *Religious Truth* (the issue of religious truth poses complications as it displays attributes which are questioned on the basis of its arbitrariness, but this does not deviate from the fact that religious truth is distinct from other types truth because it is used solely within the confines of the religious enterprise).

In trying to answer the question of whether “religious words”, e.g. words used in the Bible, can be interpreted as having the same meaning both scientifically as well as theologically, the following was discussed:

- ♦ ***The doctrine of analogy of Aquinas.*** Words that are used to describe both God as well created beings are not used *univocally* (i.e. with the exact same meaning), nor *equivocally* (i.e. with a completely different meaning), but rather *analogically*.
- ♦ ***Religious Statements as Symbolic (Tillich).*** Religious language is symbolic. A symbol participates in that to which it points and everything that exists, participate in God.
- ♦ ***Religious Language as Noncognitive.*** An assertion of a fact constitutes the cognitive usage of language. The question here is whether religious sentences are cognitive or noncognitive, i.e. 1) are such sentences intended to be construed cognitively, or 2) can their logical character, regardless of intention, be either true or false? A growing number of theorists treat religious language as noncognitive. Three of these theories were briefly expounded upon:
  - ♦ ***Randall's Noncognitive Theory.*** The distinctive material with which religion works is a body of symbols and myths which are nonrepresentative and noncognitive. Religion is an aspect of human culture and God is defined in terms of this “religion”, instead of religion being defined in terms of God. This view of religion is increasingly prevalent in our technological society and as such forms a logical development of what has been called *scientism*, *positivism* and *naturalism*, which supposes that scientific knowledge and achievement (truth) can only be found through the



application of scientific knowledge and methods of investigation.

- ◆ ***Braithwaite's Noncognitive Theory.*** Religious assertions serve mainly an ethical function and the purpose of ethical statements is to express the speaker's adherence to a certain policy of action. Religious statements are considered by Braithwaite to be different from the way they have been used by religious persons.
  
- ◆ ***The Language-game Theory.*** Language-games are groups of concepts which we use in talking about, for example, mental states, or about pleasure or pain, or about perception. Different kinds of language, e.g. the languages of religion and of science, constitute different "language-games", which are the linguistic aspects of different "forms of life". Each language-game is independent and has its own criteria in determining what is true or false. The internal transactions given by a language-game are invulnerable to criticism from outside that particular complex of life and language - religious utterances are thus immune to scientific and other non-religious comment.

*The meaningfulness of religious language* was then discussed because critics - as seen above - have always maintained that religious claims are either false or groundless because there are no acceptable reasons for them to be true. It is asserted that religious claims are meaningless and therefore neither true nor false. The ***Logical Positivists*** thus claim that only empirically verifiable propositions fulfill the logical conditions for meaningfulness. Thus theology and philosophy are meaningless.

In order to put assertions in respect of the meaningfulness of religion into perspective, the *Verifiability Principle of Meaning* (a statement is literally meaningful only if it is either *analytic* or *empirically verifiable*) was noted.

The meaningfulness of religious language is questioned on the grounds that it is not *falsifiable*. When this principle is put in a proper perspective, its shortcomings also indicate that it too can serve only in a limited environment (such as within the language-game of the natural sciences). There are also some who argue that religious language is meaningful because some religious statements are neither true nor false because some of them are not assertions, but *bliks*. Nothing can count against bliks, but at the same time some religious statements are true by virtue of their meanings. Finally, it was indicated that there are certain similarities between religious beliefs and ordinary, unproblematic factual beliefs.

It is thus clear that theism can successfully hold its ground against scientific arguments on its usefulness within the realm of what is considered to be knowledge. Not only has it been possible to demonstrate that arguments against the existence of a supreme Being can be countered by arguments to the effect that the existence of such a supreme Being cannot be disproved (and thereby giving body and content to the study of religious data), but it has also been possible to demonstrate firstly that the application of logical positivism is restricted to only certain elements within the natural sciences, and secondly that religious language can be considered to be cognitive (bearing in mind that certain difficulties exist and that these difficulties need to be properly addressed when religious language is part of such a study) both within the so-called religious language-game, as well as within the realm of certain elements of general knowledge.

The above remarks are not made with the view of initiating further debate on the issue whether God exists or not. The author readily

accepts that God's existence is a matter of faith which cannot be brought into the realm of scientific proof. The only point made here is that allowance has to be made for both arguments.

It thus seems fair to allow for the following:

- ◆ God cannot be proved ... *He has to be believed in*
- ◆ The science-religion debate has a multi-level nature in which both the natural sciences as well as theology participate
- ◆ The claim that science presents the only road to knowledge seems to be questionable
- ◆ Religious language can be adequate, coherent and effective

Given the aforementioned, it now also seems possible to draw the attention to how these assertions may be incorporated into this study. Firstly, it is not the intention to merge cosmological data and data found in the Bible to prove one or the other right or wrong. It is the intention to *compare* data in respect of how the universe began. Thus, the text of the story of Biblical creation will be researched in order to come to an exact set of factual statements. These statements will then be compared to the facts as presented by Cosmology.

Secondly, this comparison will be done against the philosophical background from the perspective of the Philosophy of Religion on the one hand, and the Philosophy of Science on the other hand.

Thirdly, it is hoped that this study will constitute constructive participation in the science-theology debate, especially in the event of finding similarities which may enhance the total picture *vis a vis* the question of how the universe began.

It is perhaps fair to say that the present science-religion debate has historical roots as far back as the turn of the previous century when the emergence of scientific data began challenging traditional religious beliefs. To put the existing debate into perspective, it may thus be prudent to investigate the historical reasons and build up of apprehensions. The latter aspect will be the subject of the next chapter.

## CHAPTER 2

*Truth is not revealed as a whole ... it has to be progressively discovered.*

*Julian Huxley*

### **THE GENERAL STATE OF THE SCIENCE-RELIGION DEBATE : AN HISTORICAL OVERVIEW<sup>1</sup>**

#### **INTRODUCTION**

This chapter will endeavour to give an historical account of the general development of the relationship between science and religion. The purpose is to describe a number of incidents and issues of scientific nature, which until well after the Middle Ages was influenced by church thinking. As the picture unfolds, the exact nature of the developing relationship between science and religion will possibly become clearer, especially with reference to the strong stand the natural sciences have developed against any form of prescriptiveness, or any form of influence outside the realm of scientific method.

In a philosophical sense the science-religion debate probably started with the first contact between Greek science (natural philosophy) and Judaism. The first real contact between Judaism and the world came about because of the military quests of Alexander the Great during the late 4<sup>th</sup> century BC, when the traditions of Egypt, Phoenicia, Babylon and Persia, were forcefully brought together. The first record of

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<sup>1</sup> Extensive use will be made of A.D. White, *A History of the Warfare of Science with Theology* (1896), New York, Dover Publications, Inc., 1960, in this chapter as it represents the most comprehensive work concerning the previous century in this regard.

dialogue between the faith of the Jews and the science of the Greeks, dates back as far as the late 3<sup>rd</sup> and early 2<sup>nd</sup> centuries BC.<sup>2</sup>

As scientific information i.r.o. astronomy, geology, zoology, chemistry, biology and physics increased steadily, views on issues which science started to put into a scientific perspective challenged interpretations based on traditional Biblical interpretation. Churchmen resisted, often with great vehemence and passion, scientific evidence that conflicted with their traditional beliefs. The latter resistance was the result of the assumption "... that all statements in the scriptures are God's statements; consequently, to question any of them is either to accuse God of lying or deny that the Bible is divinely inspired".<sup>3</sup>

This belief led to conflict between the church and science which was epitomized by ugly incidents which included for example the forcing of Galileo Galilei to make the following statement, thirty years after he announced that his astronomical discoveries verified the Copernican theory of a heliocentric universe :

*I, Galileo Galilei, now on my knees before your eminences, the cardinals of the Holy See, having before my eyes the Holy Bible, which I touch and kiss, do adjure, curse and detest the error and heresy of the movement of the earth.*<sup>4</sup>

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<sup>2</sup> C.B. Kaiser, *Creation and the History of Science*, London, Marshall Pickering, 1991, pp. 1 - 2. Kaiser notes that this contact was interestingly enough, from some quarters, notably those Jews who feared undue negative influences on and the undermining of the Jewish Law (the Torah), much like Western European science and technology are perceived in many parts of the Third World today. The attitude was to seek the benefits of Western science and technology while insisting on retaining traditional values and beliefs.

<sup>3</sup> J.H. Hick, *Philosophy of Religion*, (3<sup>rd</sup> ed.), New Jersey, Prentice-Hall Inc., 1983, p. 37

<sup>4</sup> F.E. Trinklein, *The God of Science*, Michigan, William B. Eerdmans Publishing Company, 1971, p. 107. Trinklein also points out that this famous incident

Could the science-religion debate, which was sighted by White as *the warfare of science with theology*,<sup>5</sup> have had a more fruitful outcome had there been a greater tolerance on both sides and especially a greater open-mindedness by theologians (or “toleration rather than dogmatism” as the Cambridge Platonists described it.<sup>6</sup>) The following discussion will endeavour to give an historical perspective on this debate, with reference to the various aspects which will be treated not chronologically, but thematically. The discussion will thus include the following themes:

### **The Pre-Twentieth Century Era**

The Creation and Evolution

The Form of the Earth

Astronomy

General Astronomy

Comets and Eclipses

Geology

The Age of Man

Meteorology

Chemistry

Medicine and Madness

The Origin of Language

### **Philosophical Developments**

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demonstrated in actual fact a conflict between science and the church, not between science and religion.

<sup>5</sup> The history of this debate prior to the turn of the 19<sup>th</sup> century was documented in the work of Dr. A.D. White : A.D. White, *A History of the Warfare of Science with Theology* (1896), New York, Dover Publications, Inc., 1960, as quoted in E.L. Mascall, *Christian Theology and Natural Science*, USA, Archon Books, 1965, p. 7

<sup>6</sup> R. Gregory (Sir), *Religion in Science and Civilization*, London, Macmillan & Co. Ltd., 1940, p. 38

*The Results of Philosophical Development up to the  
19<sup>th</sup> century*

God and Nature

Man and Nature

The Methods of Science

Methods in Theology

*Methods in religion as influenced by modern science  
(late 19<sup>th</sup> to 20<sup>th</sup> centuries)*

Contrasts of Theology and Science - Neo-  
Orthodoxy, Existentialism, Linguistic Analysis

The Parallels of Theology and Science - Liberal  
Theology and Process Philosophy

Derivations of Theology From Science -  
Arguments from Design, and Arguments from  
Physics and Biology

**Summary**

**Conclusion**

**THE CREATION AND EVOLUTION.**<sup>7</sup> According to White, we find records of the creation among the early accounts of nearly all the great civilizations. They mention the existence of a Creator of whom man is an imperfect image and who literally and directly created the visible universe with his hands and fingers. This view was later

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<sup>7</sup> White, A.D., op. cit., HTML Version, *INTERNET*, Chapter 1 ("From Creation to Evolution"), Copyright © Internet Infidels 1995-1997



adapted by the Egyptians to the effect that the earth and heavenly bodies were brought into existence by His word on the one hand, and that God created everything out of nothing on the other hand. The first of the two accounts given in Genesis extended the creative operation through six days, each comprising of an evening and a morning. But the second account speaks of "the day" in which "the Lord God made the earth and the heavens."<sup>8</sup> The view of the creation of the universe as instantaneous and also as in six days, each made up of an evening and a morning, became virtually universal. Calvin opposed the idea of an instantaneous creation and laid special stress on the creation in six days. As late as the middle of the 18<sup>th</sup> century when Buffon attempted to state simple geological truths, namely "...that all things visible and invisible were created not only out of nothing but in exactly six days ...", the theological faculty of the Sorbonne forced him to publish a retraction which ended with these words: "I abandon everything in my book respecting the formation of the earth, and generally all which may be contrary to the narrative of Moses."<sup>9</sup>

Christian theologians, having thus settled the manner of the creation, the material used in it, and the time required for it, now exerted themselves to fix its date. Thus Dr. John Lightfoot, vice-chancellor of the University of Cambridge and one of the most eminent Hebrew scholars of his time, declared, as a result of his most profound and exhaustive study of the Scriptures, that "heaven and earth, centre and circumference, were created all together, in the same instant, and clouds full of water," and that "this work took place and man was created by the Trinity on October 23, 4004 BC, at nine o'clock in the morning."<sup>10</sup>

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<sup>8</sup> According to Genesis 2:4 "...the day that the LORD God made the earth and the heavens, (KJV) . See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

The fathers of the Church at that stage generally received each of the two conflicting creation legends in Genesis literally and then, having done their best to reconcile them with each other and to mould them together, made them the final test of thought upon the universe and all things therein. At the Reformation the vast authority of Luther was thrown in favour of the literal acceptance of Scripture as the main source of natural science.<sup>11</sup> The literal account of creation given in Genesis was also supported by Calvin. He warned those who, by taking another view than his own, "insult the Creator". He insisted that all species of animals were created in six days, each made up of an evening and a morning, and that no new species has ever appeared since. As to difficulties in the scriptural account of creation, he held that God "wished by these to give proofs of his power which should fill us with astonishment."<sup>12</sup>

The general idea of evolution in Nature, which was reflected in Greek thought in many ways, was probably the result of the Babylonian idea of an evolution of the universe out of the primeval flood or "great deep," and of the animal creation out of the earth and sea. In the early Church the idea of a direct creation and by means like those used by man, was so powerful that conceptions based on evolution could not be contemplated. The world was then led into a new realm of thought in which a theory of the evolution of the visible universe was presented. When Copernicus, Kepler, Galileo, Descartes and Newton came along, the old theological conception of the universe was gone. These five men had given a new divine revelation to the world and through the last (Newton) had come a vast new conception - he had shown that the natural scientific laws we find on earth, prevailed throughout the

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<sup>11</sup> The scientific ideas of the early 17<sup>th</sup> century were taken to be challenges to the authority of both Aristotle as well as the Bible. In the educational reforms by Luther's follower, Melancthon, extensive use was made of Aristotle. Much of the early opposition to science was thus a product of the respect for Aristotle - see Gregory (Sir), R., *op. cit.*, p. 29

<sup>12</sup> *Ibid.*

universe. Newton also believed that God has a continuing function in adjusting the solar system and that He somehow prevents the stars from collapsing together under gravitational attraction. The latter scientific inadequacies of Newton's references to divine intervention thus became known as the doctrine of *God of the Gaps*,<sup>13</sup> which entailed that the Bible was conveniently called upon to fill in where science was unable to supply the answers.

Thus a *sacred science of creation* was developed and of the divine purpose in nature, which went on developing from the fourth century to the 19<sup>th</sup>. Like all else in the Middle Ages, this "sacred science" was developed purely by theological methods. Neglecting the wonders which the dissection of the commonest animals would have afforded them, these naturalists attempted to throw light onto nature by the ingenious use of scriptural texts, by research among the lives of the saints, and by the plentiful application of metaphysics. We thus find two camps clearly emerging in the late 11<sup>th</sup> and early 12<sup>th</sup> centuries, where the one group stressed the absolute power of God (*potentia absoluta*) in creation, and the other who stressed the autonomy of nature as created and ordained by God (*potentia ordinata*).<sup>14</sup>

The inquiry into nature having thus been pursued nearly two thousand years theologically, we find by the middle of the 16<sup>th</sup> century some promising beginnings of a different method, which entailed inquiry into nature scientifically - the method which seeks not possibilities, but facts.

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<sup>13</sup> Ian G. Barbour, *Issues in Science and Religion*, Study Edition, London, Redwood Press Ltd., 1972, p. 42. Mesle says in this regard "Since there are always things we do not yet know, people have tended to use God to plug the gaps in our knowledge". See C. Robert Mesle, *Process Theology*, St. Louis (Missouri), Chalice Press, 1993, p. 44

<sup>14</sup> Kaiser, C., op. cit., p. 65

This better method of interrogating nature soon led to the formation of societies for the same purpose. In 1560 an Academy for the Study of Nature was founded in Naples, but theologians, becoming alarmed, suppressed it. For nearly one hundred years there was no new combined effort of that sort, until in 1645 the meetings in London of what afterwards became known as the Royal Society, began. Then came the Academy of Sciences in France and the *Accademia del Cimento* in Italy. Others followed in all parts of the world and a great new movement began.

Fortunately, one thing prevented an open breach between theology and science at this stage. While new investigators had mainly given up the medieval method so dear to the Church, they had very generally retained the conception of direct creation and of design throughout creation - a design having as its main purpose the profit, instruction, enjoyment, and amusement of man. On this the naturally opposing tendencies of theology and science were compromised. Science, while somewhat freed from its old limitations, became the handmaiden of theology in illustrating the doctrine of creative design.

The development of the theory of the evolution of species, or "... the divisions of the animal kingdom ..." as White<sup>15</sup> refers to it, deserves special attention as it is rarely placed in a proper historical context. A view that mankind, instead of having fallen from a high intellectual, moral and religious condition, has slowly risen from low and brutal beginnings appeared at an early period. One of the first aspects which the inquiring mind in this regard took up, concerned the existence of so-called useful as well as not-so-useful animals and plants. The theological answer was then given with relation to sin. Because of man's first disobedience "all woes were due". It was thus accepted that before Adam's disobedience there was no death, neither ferocity nor

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<sup>15</sup> White, A.D., *op. cit.*

venom. Even to Luther, a fly was not merely superfluous, "... it was noxious - sent by the devil to vex him when reading".<sup>16</sup>

However, geological finds which revealed the remains of carnivorous creatures, many of them with half-digested remains of other animals in their stomachs, all extinct long ages before the appearance of man upon earth, became a victory won by science over theology in this field.

Theological reasoning on the difference between the creation of man and that of other living beings also became a bone of contention, namely while man was directly moulded and fashioned separately by the Creator's hand, the animals generally were evoked in numbers from the earth and sea by the Creator's voice.

It became necessary to believe that each and every difference of species was impressed by the Creator "in the beginning," and that no change had taken place or could have taken place since. Difficulties arose as zoology progressed and revealed ever-increasing numbers of species, but through the Middle Ages, and indeed long after the Reformation, these difficulties were easily surmounted by making the ark of Noah larger and larger, and especially by holding that there had been a human error in regard to its measurement.<sup>17</sup>

In the first years of the 18<sup>th</sup> century Dr. Nehemiah Grew of the Royal Society, published his "Cosmologia Sacra" to refute anti-scriptural opinions by producing evidence of creative design. He broke decidedly from the doctrine that dangerous things in Nature are caused by sin, and showed that they, too, are useful.

About the middle of the 17<sup>th</sup> century Francesco Redi published the results of his inquiries into the doctrine of spontaneous generation. For

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<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

ages a widely accepted doctrine had been that water, filth and decay had received power from the Creator to generate worms, insects and a multitude of the smaller animals. This doctrine had been especially welcomed by St. Augustine and many of the Church fathers, since it relieved the Almighty of making, Adam of naming, and Noah of living in the ark with these innumerable despised species. Through Redi's research which was difficult to refute, he showed that every one of these animals came from an egg. Each, therefore, must be the lineal descendant of an animal created, named, and preserved from the beginning.<sup>18</sup>

For as far back as the 17<sup>th</sup> century some theologians thus had begun to discern difficulties more serious than any that had before confronted them. More and more it was seen that the number of different species was far greater than the world had hitherto imagined. Greater and greater had become the old difficulty in conceiving that, of these innumerable species, each had been specially created by the Almighty hand, that each had been brought before Adam by the Almighty to be named, and that each, in couples, had been gathered by Noah into the ark.

But the difficulties thus suggested were nothing compared to those raised by the distribution of animals. The voyages of Columbus, Vasco da Gama, Magellan, Amerigo Vespucci and other navigators of the period of discovery brought home tidings of new species of animals and of races of men living in parts of the world where the theologians had for ages declared there could be none.

The theological theory, therefore, had by the end of the 18<sup>th</sup> century undergone some changes. The wiser theologians waited, while the unwise indulged in exhortations to "root out the wicked heart of unbelief," denouncing science as being wrong, and declaring that "the

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<sup>18</sup> Ibid.

Bible is true" (by which they probably meant that *their* limited understanding of it was true).

St. Augustine then accepted the possibility that "certain very small animals may not have been created on the fifth and sixth days, but may have originated later from decomposed matter."<sup>19</sup> He later developed the view that in the creation of living beings there was something like a growth, that while God is the ultimate author, He also works through secondary causes.

At the close of the Middle Ages, in spite of the devotion of the Reformed Church to the letter of Scripture, the revival of learning and the great voyages gave an atmosphere in which better thinking on the problems of Nature began to gain strength.

**THE FORM OF THE EARTH.**<sup>20</sup> The ancient Egyptians considered the earth as a table, flat and oblong, the sky being its ceiling consisting of a huge firmament of metal. At the four corners of the earth were the pillars supporting this firmament and on this solid sky were the waters above the heavens. From these and doubtless from earlier sources common to them all, came geographical legacies to the Hebrews. Various passages in their sacred books regarding the foundation of the earth upon the waters, the fountains of the great deep, the compass upon the face of the depth, the firmament, the corners of the earth, the pillars of heaven, the waters above the firmament, the windows of heaven, and doors of heaven, point to these ancient origins of thought.

As civilization evolved, especially among the Greeks, ideas that the form of the earth is spherical, became accepted. These ideas were vague and mixed with absurdities but they started developing to the point where the idea that the earth is a globe, was established. Some of

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<sup>19</sup> Ibid.

<sup>20</sup> White, A.D., op. cit., HTM Version, Chapter 2 ("Geography").

the Church fathers were willing to accept this view, but to the majority of them it at first seemed fraught with dangers to Scripture. Among the first, for example, who took up arms against it was Eusebius.<sup>21</sup> New Testament texts indicated the immediately approaching end of the world and he endeavored to bring the idea that the earth's shape was spherical in disrepute by challenging scientific studies. Speaking of these scientists, he said, "It is not through ignorance of the things admired by them, but through contempt of their useless labour, that we think little of these matters, turning our souls to better things."<sup>22</sup> The great champion of the orthodox view was St. Augustine. Though he seemed inclined to yield a little in regard to the idea that the earth was shaped like a ball, he fought the idea that men exist on the other side of it, saying that men could not be allowed by the Almighty to live there, since if they did they could not see Christ at His second coming descending through the air.

But the strictly biblical men of science, such as Theophilus of Antioch in the second century, and Clement of Alexandria in the third, were not content with merely opposing what they stigmatized as an old heathen theory - they drew from their Bibles a new Christian theory which claimed that the universe was like a house. The earth is its ground floor, the firmament its ceiling (under which the Almighty hangs out the sun to rule the day and the moon and stars to rule the night). This ceiling is also the floor of the apartment above and in this is a cistern, shaped "like a bathing-tank" and containing "the waters which are above the firmament." These waters are let down upon the earth by the Almighty and his angels through the "windows of heaven." As to the movement of the sun, there was a citation of various passages in Genesis, mixed with metaphysics in various proportions, and this was thought to give ample proof from the Bible that the earth could not be a sphere.

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<sup>21</sup> Ibid.

<sup>22</sup> Ibid.



But the ancient scientific truth that the earth was a sphere still lived. Although the great majority of the early fathers of the Church had sought to crush it, it was slowly but surely being accepted within church circles. The Reformation, however, did not at first yield fully to this theory. Luther, Melanchthon, and Calvin were very strict in their adherence to the exact letter of Scripture. Even Zwingli, broad as his views generally were, was closely bound down in this matter and held to the opinion of the fathers that a great firmament (or floor) separated the heavens from the earth - above it were the waters and angels, and below it the earth and man.

Throughout the "ages of faith" it was also generally accepted that Jerusalem was the middle of the earth and all other parts of the world as set around the holy city. The book of Ezekiel speaks of this<sup>23</sup>, and it was seen as a direct revelation from the Almighty regarding the earth's form. Nor did medieval thinkers rest with this perception. In accordance with the dominant view that physical truth must be sought by theological reasoning, the doctrine was evolved that not only the site of the cross on Calvary marked the geographical centre of the world, but that on this very spot had stood the tree which bore the forbidden fruit in Eden. Thus was geography made to reconcile all parts of the great theological plan.<sup>24</sup>

In summing up the action of the Church upon geography, it must be said, that the dogmas developed in strict adherence to Scripture and the conceptions held in the Church during many centuries were on the whole, steadily hostile to truth. Thus the supremacy accorded to theology resulted in the tendency towards dogmatism which has shown itself in all ages as the enemy not only of scientific inquiry but of the

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<sup>23</sup> According to Ezekiel 5:5, "Thus saith the Lord GOD; This *is* Jerusalem: I have set it in the midst of the nations and countries *that are* round about her." (KJV). See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

higher religious spirit itself. While from the love of truth for truth's sake, which has been the inspiration of all fruitful work in science, nothing but advantage has ever resulted to religion.

**ASTRONOMY.**<sup>25</sup> In the early Church, the literal interpretation of the New Testament doctrine that the earth was soon to be destroyed and that there were to be new heavens and a new earth, resulted that astronomy, like other branches of science, was generally looked upon as futile. At the same time the evolution of scientific thought continued and the geocentric doctrine (the doctrine that the earth is the centre and that the sun and planets revolved around it) became generally accepted. The *Ptolemaic Theory* (as it was known in scientific circles) was a symbol of the earth placed in the middle of the universe and as such the geocentric theory was fully adopted by the Church and universally held to agree with the letter and spirit of Scripture.

Having said this, the passage that follows will now be divided into subheadings of *General Astronomy* and *Comets*.

## GENERAL ASTRONOMY

During the middle of the 12<sup>th</sup> century a theologian, Peter Lombard, produced a collection of "Statements by the Fathers", which remained until the end of the Middle Ages the universal manual of theology. It was especially developed to present the theological view of man's relation to the universe. The author tells the world: "Just as man is made for the sake of God - that is, that he may serve Him, so the universe is made for the sake of man - that is, that it may serve him;

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<sup>24</sup> White, A.D., op. cit., Chapter 2 ("Geography")

<sup>25</sup> White, A.D., op. cit., Chapter 2 ("Astronomy")

therefore is man placed at the middle point of the universe, that he may both serve and be served."<sup>26</sup>

Nicholas Copernicus was a professor at Rome who, as early as 1500 announced his doctrine that the sun and planets do not revolve about the earth, but that the earth and planets revolve about the sun. To publish his thoughts was evidently dangerous and for more than thirty years it lay slumbering in the mind of Copernicus and that of some of the friends to whom he had privately entrusted it. At last he prepared his great work on the "Revolutions of the Heavenly Bodies" and dedicated it to the Pope himself. He next sought a place of publication. He dared not send it to Rome, because he feared that the rulers of the older Church would seize it. He dared not send it to Wittenberg either, because the leaders of Protestantism there, were no less hostile. He therefore decided to entrust it to Osiander, at Nuremberg. Osiander's courage, however, failed him and he wrote a cowering preface in which he tried to excuse Copernicus for "his novel idea". He inserted the apologetic lie that Copernicus had introduced the doctrine of the earth's movement not as a fact, but as a hypothesis. He declared that it was lawful for an astronomer to indulge his imagination and that this was what Copernicus had done. During nearly seventy years the Church authorities evidently thought it best not to stir the matter until 1616, when the Copernican doctrine was upheld by Galileo as a truth (and indeed proved to be a truth by his telescope!).<sup>27</sup> The statements of Copernicus were condemned, "until they should be corrected" and the corrections required were simply such as would substitute for his conclusions to the old Ptolemaic theory. Galileo was forbidden to teach or discuss the Copernican theory and all books which affirmed the motion of the earth were forbidden. Henceforth to read the work of

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<sup>26</sup> Ibid. Belief in a flat earth as the centre of the universe was not only a Christian doctrine for many years but also a general and popular conviction. See Gregory (Sir), R., op. cit., p. vi

<sup>27</sup> Galileo has been called the father of modern science because of his combination of theory with experiment - see Ian G. Barbour, op. cit., p. 24

Copernicus was to risk damnation. All branches of the Protestant Church - Lutheran, Calvinist, Anglican - competed with each other in denouncing the Copernican doctrine as contrary to Scripture.

White quotes Martin Luther in this regards as follows: "People gave ear to an upstart astrologer who strove to show that the earth revolves, not the heavens or the firmament, the sun and the moon. Whoever wishes to appear clever must devise some new system, which of all systems is of course the very best. This fool wishes to reverse the entire science of astronomy; but sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth."<sup>28</sup>

It now seems quite obvious why this view was so widely accepted at the time. The guardians of learning, both Catholic and Protestant, in that age, were theologians. To them it was so important to have "sound learning" guarded and "safe science" taught, that in many of the universities, as late as the end of the 17<sup>th</sup> century, professors were forced to take an oath not to hold the "Pythagorean" (the Copernican-idea as to the movement of the heavenly bodies). As the contest went on, professors were forbidden to make known to students the facts revealed by the telescope.

The real war only started when Galileo's discoveries took the Copernican theory out of the list of hypotheses and placed it before the world as a truth. The supporters of what was called "sound learning" declared his discoveries deceptions and his announcements blasphemy. Semi-scientific professors, endeavoring to carry favour with the Church attacked him with accusations that he was promoting a sham science. Earnest preachers attacked him with perverted Scripture, theologians, inquisitors, congregations of cardinals and lastly two popes dealt with him and, as was planned, silenced his impious doctrine forever.

Galileo's little telescope, however, kept on sweeping the skies and new knowledge piled up. This included the following:

- The moons of the planet Jupiter were discovered (and promptly rejected), which showed that the earth was not in the centre of all motions.
- His discovery of the mountains and valleys in the moon and the statement that the moon shines because it reflects light from the sun, directly contradict an interpretation of a the statement in Genesis, that the moon is "a great light."<sup>29</sup>
- The existence of sunspots and their motion indicating the sun's rotation.
- The doctrine of the double motion of the earth around its axis and around the sun (which was denounced by the church on the grounds that "Animals, which move, have limbs and muscles; the earth has no limbs or muscles, therefore it does not move. It is angels who make Saturn, Jupiter, the sun, etc., turn round. If the earth revolves, it must also have an angel in the centre to set it in motion; but only devils live there; it would therefore be a devil who would impart motion to the earth.")<sup>30</sup>

The Church's battle with Galileo is well known. The effect that this battle had on the development of the science-religion debate can perhaps best be illustrated by the Church of the time's position, namely

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<sup>28</sup> Ibid.

<sup>29</sup> Genesis 1:14 and 16 mentions "... lights in the firmament of the heaven to divide the day from the night ..." (verse 14), and "And God made two great lights; the greater light to rule the day, and the lesser light to rule the night (verse 16) (KJV).

See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

<sup>30</sup> White, A.D., op. cit., Chapter 2 ("Astronomy")

that his “pretended” discoveries diminishes the whole Christian plan of salvation - it casts suspicion on the doctrine of the incarnation. “It upsets the whole basis of theology. If the earth is a planet and only one among several planets, it cannot be that any such great things have been done specially for it as the Christian doctrine teaches. If there are other planets, since God makes nothing in vain, they must be inhabited; but how can their inhabitants be descended from Adam? How can they trace back their origin to Noah's ark? How can they have been redeemed by the Saviour?”<sup>31</sup>

Galileo was eventually forced to appear in the presence of the dreaded tribunal without defender or adviser. He was subjected to indignity, imprisonment and to threats equivalent to torture and was at last forced to pronounce publicly and on his knees his famous retraction.

To the end of his life - even after his life ended - the persecution of Galileo continued. He was kept in exile from his family, his friends, from his employments and was held rigidly to his promise not to speak of his theory. When, in the midst of intense bodily and mental sufferings from disease and from hardship in his family he sought some liberty, it was met with threats of committal to a dungeon. When at last a special commission reported to the church authorities that he had become blind and wasted with disease and sorrow, he was allowed a little more liberty, but even that little was hampered by close surveillance. He was forced to bear contemptible attacks on himself and on his works in silence and to see the men who had befriended him severely punished. He lived to see the truths he had established carefully weeded out from all the Church colleges and universities in Europe. He begged to be buried in his family tomb in Santa Croce, but this request was denied. His friends wished to erect a monument over him, but this too was refused.

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<sup>31</sup> Ibid.

When Kepler came along, he led science on to greater victories. Where Copernicus was unable to disengage scientific reasoning entirely from the theological bias, the doctrines of Aristotle and Thomas Aquinas as to the superiority of the circle which degraded the minor features of his system and left breaches in it, Kepler saw these errors and gave to the world his "three laws". His battle was also severe. He was solemnly warned by the Protestant community of Stuttgart "... not to throw Christ's kingdom into confusion with his silly fancies..." and was solemnly ordered to "... bring his theory of the world into harmony with Scripture". He too was sometimes abused, ridiculed, and sometimes imprisoned.<sup>32</sup>

The losses to the world during this complete triumph of theology were even more serious than at first appears - only on the 11th of September 1822, the cardinals of the Holy Inquisition graciously agreed that "the printing and publication of works treating of the motion of the earth and the stability of the sun, in accordance with the general opinion of modern astronomers, is permitted at Rome."<sup>33</sup>

Any history of the victory of astronomical science over dogmatic theology would be incomplete without some account of the retreat made by the Church from all its former positions in the Galileo case. The retreat of the Protestant theologians was not difficult. A little skillful warping of Scripture, a little skillful use of that time-honoured phrase, namely that the Bible was given to teach us not how the heavens move, but how men go to heaven, sufficed. But the process of retraction by the Catholic church was stretched out over a longer period of time. It would, however, be unjust to cast special blame for all this resistance to science on the Roman Church. The Protestant Church, though rarely able to be so severe, has been more blameworthy. The persecution of Galileo and his peers by the older

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<sup>32</sup> Ibid.

<sup>33</sup> Ibid.

Church was mainly at the beginning of the 17<sup>th</sup> century but the persecution of some scientists by various Protestant authorities was near the end of the 19<sup>th</sup> century. Those earlier persecutions by the Catholic church were, furthermore, strictly in accordance with principles held at that time by all religious people - Catholic as well as Protestant - throughout the world.

### COMETS AND ECLIPSES<sup>34</sup>

The study of comets has underlined the struggle between theology and science like very few things in the astronomy. Comets were perceived as fire-balls flung by an angry God for the purpose of scaring a wicked world by theologians, and as of natural in origin and obedient to law of movement by scientists. Hardly anything throws a more vivid light upon the danger of extorting texts of Scripture to preserve ideas which observation and thought have superseded and on the absurdity of trying to illustrate ecclesiastical power over scientific discovery.

Eclipses were regarded in a very different light, which were supposed to express the distress of Nature at earthly hardship. This view of the relations between Nature and man continued among both Jews and Christians. Tertullian e.g. thought an eclipse an evidence of God's wrath against unbelievers.<sup>35</sup>

The belief that every comet is a ball of fire flung from the right hand of an angry God to warn the inhabitants of earth was received into the early Church, transmitted through the Middle Ages to the Reformation period and in its transmission was made all the more precious by "textual proofs" from Scripture. Just before the middle of the 17<sup>th</sup>

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<sup>34</sup> White, A.D., op. cit., Chapter 4 (From "Signs and Wonders" To Law In The Heavens)

<sup>35</sup> Ibid.



century a well known scientist of the time, Sir Thomas Browne expressed his doubts whether comets produce such terrible effects, "since it is found that many of them are above the moon." Melanchthon, however, in various letters refers to comets as heralds of heaven's wrath, classing them with evil conjunctions of the planets and abortive births among the "signs" referred to in Scripture.<sup>36</sup> Even up to the end of the 17<sup>th</sup> century it was required by professors of astronomy over a large part of Europe to take an oath that they would refrain from teaching that comets are heavenly bodies obedient to law.

A book was published in which eighty-six biblical texts "prove" that the Almighty uses heavenly bodies for the instruction of men as to future events. This manual was considered to be a triumph of "religious science". In 1673 the reverend Father Augustin de Angelis, rector of the Clementine College at Rome, wrote a book entitled "Lectures on Meteorology", which represented an attempt to make a compromise between theology and science i.r.o. comets. In this book he claims that comets are not heavenly bodies, but originate in the earth's atmosphere "below the moon". Everything heavenly is eternal and incorruptible, but comets have a beginning and ending - therefore comets can not be heavenly bodies.<sup>37</sup>

Scientific skepticism could no longer contain itself and began to rear its head. Thomas Erastus, a professor of medicine at Heidelberg, e.g. cautioned against superstition and argued that there could be no natural connection between the comet and pestilence, since the burning of gas emitted by comets must tend to purify rather than to infect the air. In the following year a Hungarian theologian, Dudith, argued that if comets were caused by the sins of mortals, they would never be absent from the sky. But these utterances were for the time brushed aside as shallow or impious by the theological leaders of thought. However, in

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<sup>36</sup> Ibid.

<sup>37</sup> Ibid.

the 17<sup>th</sup> century arguments against superstition began to multiply. Pierre Bayle in a series of philosophic arguments, scandalized Catholics and Protestants alike. He argued that comets are bodies subject to the ordinary law of Nature and not prodigies amenable to no law. He showed that historically there was no reason to regard comets as indications of earthly evils. As to the fact that such evils occur after the passage of comets across the sky, he compares the person believing that comets cause these evils to a woman looking out of a window into a Paris street and believing that the carriages pass because she looks out. He further pointed out that the public will remember one prediction that comes true better than all the rest that have proved false.

In 1577 the first scientific evaluation which led to the distinct foundation of the latter modern doctrine came about. A comet appeared which again plunged Europe into alarm. In the midst of all this uncertainty a few men quietly but steadily observed the monster and Tycho Brahe announced, as the result, that its path lay farther from the earth than the orbit of the moon. Another great astronomical genius, Kepler, confirmed this. This distinct beginning of the new doctrine was bitterly opposed by theologians - they denounced it as one of the evil results of scientific meddling with the designs of Providence.<sup>38</sup>

Attempts were then made to compromise. It was declared that, while some comets were doubtless supralunar, some must be sublunar. However, this admission was also fatal on another account. During many centuries the theory favoured by the Church was that the earth was surrounded by hollow spheres, concentric and transparent, forming a number of glassy strata encasing one another like the different coatings of an onion, and that each of these in its movement about the earth carries one or more of the heavenly bodies. The admission that comets could move beyond the moon was fatal to this theory.

All these well-meaning defenders of the faith caused great numbers of thinking men to believe the idea that there is a necessary antagonism between science and religion. It was, however, not the fault of religion but rather the fault of those short-sighted individuals who tried to link theological dogmas to scriptural texts and who substituted the word and works of God, for religion.

**GEOLOGY.**<sup>39</sup> In the 7<sup>th</sup> century St. Isidore took up the challenge to bring the creation into satisfactory relations with the book of Genesis and *inter alia* declared that fossil remains resulted from the flood of Noah. An Irish monk and scholar, in order to diminish the difficulty arising from the distribution of animals, especially in view of the fact that the same animals are found in Ireland as in England, held that various continents that are now separated were once connected. However, in order to satisfy theology, he had to declare that the separation took place later than the flood. (Unfortunately it was not yet known that the kangaroo is found only on an island in the South Pacific - if this is to be matched by the prevailing theory they must have migrated there without any predators following them!)

The next developments of geology under Church guidance were contributions such as :

- In the 11<sup>th</sup> century Avicenna accounted for the fossils by suggesting a "stone-making force"
- In the 13<sup>th</sup> century, Albert the Great attributed them to a "formative quality"
- In the following centuries some philosophers proposed the idea that they grew from seed and the Aristotelian doctrine of spontaneous

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<sup>38</sup> Ibid.

<sup>39</sup> White, A.D., op. cit., Chapter 5 (From Genesis To Geology)

generation was constantly used to prove that these stony fossils possessed powers of reproduction like plants and animals.

In 1760 news of the discovery of marine fossils in various elevated districts of Europe reached Voltaire. He argued that the fossil fishes were remains of fishes intended for food but spoiled and thrown away by travelers, that the fossil shells were accidentally dropped by crusaders and pilgrims returning from the Holy Land, and that the fossil bones found between Paris and Etampes were parts of a skeleton belonging to the cabinet of some ancient philosopher. Through chapter after chapter, Voltaire, obeying the supposed necessities of his theology, fought desperately the growing results of the geological investigations of his time.

The strict adherence to the text of Scripture which made Luther and Melancthon denounce the idea that the planets revolve around the sun was naturally extended to every other scientific statement at variance with the sacred text. A declaration by Peter Martyr to the effect, was that if a wrong opinion should be obtained regarding the creation as described in Genesis, "all the promises of Christ fall into nothing, and all the life of our religion would be lost."<sup>40</sup> The tendency to cling to literal interpretations of the sacred books was the only recognized method of theology. To say that stones and fossils were made before or since the beginning was contrary to Scripture - they showed the terrible dangers arising from the revelations of geology, which make the earth older than the six thousand years. Again we find theological substitutes for scientific explanation ripening into phrases more and more hollow.

About the middle of the 18<sup>th</sup> century Buffon made another attempt to state simple geological truths, but the theological faculty of the Sorbonne sacked him from his position, forced him to retract and to

print his retraction which runs as follows: "I declare that I had no intention to contradict the text of Scripture; that I believe most firmly all therein related about the creation, both as to order of time and matter of fact. I abandon everything in my book respecting the formation of the earth, and generally all which may be contrary to the narrative of Moses."<sup>41</sup> This humiliating document reminds us painfully of that forced upon Galileo a hundred years before.

During the 18<sup>th</sup> century a long line of the greatest minds in the universal Church found it necessary to counter geologists in the belief that death entered the world by sin. John Wesley, for example, basing his theology on the declaration that the Almighty after creation found the earth and all created things "very good"<sup>42</sup>, declares that no one who believes the Scriptures can deny that "sin is the moral cause of earthquakes, whatever their natural cause may be". Again, he declares that earthquakes are the effect of that curse which was brought upon the earth by the original transgression. Bringing into connection with Genesis the declaration of St. Paul that "the whole creation groaneth and travaileth together in pain until now,"<sup>43</sup> he finds additional scriptural proof that the earthquakes were the result of Adam's fall. He declares that before the sin of Adam there were no agitations within the bowels of the earth, no violent convulsions, no concussions of the earth, no earthquakes, but all was unmoved as the pillars of heaven. There were then no such things as eruptions of fires, no volcanoes or burning mountains.<sup>44</sup>

Up to approximately 1830, the prevailing geological theory had been "catastrophism", according to which God had created new species in

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<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> See Genesis 1

<sup>43</sup> Romans 8:22 "For we know that the whole creation groaneth and travaileth in pain together until now." (KJV) See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

between great cataclysms (such as Noah's flood). This theory was compatible to Genesis and at the same time could account for fossils discovered in successive rock strata.<sup>45</sup>

With this special attack upon geological science by means of the dogma of Adam's fall, the more general attack by the literal interpretation of the text was continued. Especially precious were the six days - each "the evening and the morning" - and the exact statements as to the time when each part of creation came into being. To save these, the struggle became more and more desperate.

Of course, a science which showed that earthquakes had been in operation for ages before the appearance of man on the planet and which also showed that those very earthquakes which he considered as curses because of The Fall were really blessings, producing the fissures in which we find today those mineral veins so essential to modern civilization, was entirely beyond comprehension.

On the question of fossils, the position was taken that they were produced by the Deluge of Noah. In especially the 16<sup>th</sup> century, weight began to be attached to this idea by those who felt the worthlessness of various scholastic explanations. Strong men in both the Catholic and the Protestant camps accepted it but the man who did most to give it an impulse into modern theology was Martin Luther. He easily saw that scholastic phrase-making could not meet the difficulties raised by fossils and he naturally urged the doctrine of their origin at Noah's Flood.<sup>46</sup>

John Woodward, a leader in scientific thought at the University of Cambridge, a collector of fossils and an earnest investigator of their

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<sup>44</sup> White, A.D., op. cit., Chapter 5 (From Genesis To Geology)

<sup>45</sup> Barbour, I.G., op. cit., p. 82

<sup>46</sup> White, A.D., op. cit., Chapter 5 (From Genesis To Geology)

meaning, in 1695 published his "Natural History of the Earth" in which he destroyed the foundations for the old theory of fossils showing that they were not "sports of Nature," or "models inserted by the Creator in the strata for some inscrutable purpose," but that they were really remains of living beings.<sup>47</sup> But the text of the Old Testament narrative and the famous passage in St. Peter's Epistle were too strong for him and he too insisted that the fossils were produced by the Deluge.

It was during the 19<sup>th</sup> century that geologists began to examine the caves and beds of drift in various parts of the world and within a few years from that time a series of discoveries began in France, Belgium, England, Brazil, Sicily, India, Egypt, and in North America, which established the fact that a period of time much greater than any which had before been thought of had elapsed since the first human occupation of the earth. The chronologies of the great authorities on which theology had securely leaned, were found worthless. The most conservative geologists were gradually obliged to admit that man had been upon the earth not merely six thousand, or sixty thousand, or one hundred and sixty thousand years.

Thus declared Dr. Arthur Stanley<sup>48</sup> : "It is now clear to diligent students of the Bible that the first and second chapters of Genesis contain two narratives of the creation side by side, differing from each other in almost every particular of time and place and order. It is well known that, when the science of geology first arose, it was involved in endless schemes of attempted reconciliation with the letter of Scripture. There were two modes of reconciliation of Scripture and science, which have been each in their day attempted and each has totally and deservedly failed. One is the endeavour to wrest the words of the Bible from their natural meaning and force it to speak the language of science. This is the earliest instance of the falsification of Scripture to

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<sup>47</sup> Ibid.

<sup>48</sup> Ibid.

meet the demands of science and it has been followed in later times by the various efforts which have been made to twist the earlier chapters of the book of Genesis into apparent agreement with the last results of geology - representing days not to be days, morning and evening not to be morning and evening, the Deluge not to be the Deluge, and the ark not to be the ark."

**THE AGE OF MAN.**<sup>49</sup> According to traditions contained in the Old and the New Testaments the age of our planet and the life of man on it is recorded in a series of periods extending from Adam to the building of the Temple at Jerusalem. During the first three centuries it was thought that man's creation took place about six thousand years before the Christian era. Confirmation of this view was found in a simple piece of purely theological reasoning. It was felt that the six days of creation prefigured six thousand years during which the earth in its first form was to endure. As the first Adam came on the sixth day, Christ (the second Adam) had come at the sixth millennial period. Theophilus, Bishop of Antioch in the 2<sup>nd</sup> century, clinched this argument with the text, "One day is with the Lord as a thousand years."<sup>50</sup> At the Reformation this view was not disturbed. Luther, Melanchthon and the Protestant leaders generally, to oppose the Copernican theory, fixed them firmly in this biblical chronology. Luther said "We know, on the authority of Moses, that longer ago than six thousand years the world did not exist." Melanchthon, more exact, fixed the creation of man at 3963 BC, and the Roman Catholic Church declared in 1580 that the creation of man took place 5199 years before Christ.<sup>51</sup>

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<sup>49</sup> White, A.D., op. cit., Chapter 6 (The Antiquity Of Man, Egyptology, And Assyriology)

<sup>50</sup> According to 2 Peter 3:8, "... one day is with the Lord as a thousand years, and a thousand years as one day." (KJV). See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

<sup>51</sup> White, A.D., op. cit., Chapter 6



This theological reasoning carried on through the 18<sup>th</sup> century, "substantiated" by the biblical researches of leading commentators within the ranks of both Catholic as well as Protestant circles, until the 19<sup>th</sup> century.

However, scientific thought started to undermine this theological chronology. It became evident that, whatever system of scriptural chronology was adopted, Egypt was the seat of a flourishing civilization at a period before the "Flood of Noah" and that no such flood had ever interrupted it. Bunsen, a Christian scholar, for example declared that not less than ten thousand years were necessary for the development of civilization up to the point where we find Egypt in Mena's time (the reign of Mena was approximately three thousand years BC).<sup>52</sup>

Another line of observation and thought was slowly developed, even more fatal to the theological view. From a very early period there had been dug from the earth, in various parts of the world, strangely shaped masses of stone, some rudely chipped, some polished. In ancient times the larger of these were very often considered as thunderbolts, the smaller as arrows and all of them as weapons which had been hurled by the gods and other supernatural beings. In 1730 Mabudel presented a paper to the French Academy of Inscriptions on the so-called "thunder-stones," and also presented a series of plates which showed that these were stone implements which must have been used at an early period in human history.<sup>53</sup> During the year 1800 another fact came into the minds of thinking men in England. John Frere presented to the London Society of Antiquaries a number of flint implements found in the clay beds near Hoxne, which were made by humans. In view of the undisturbed depths in which they were found, the theory was suggested that the men who made them must have lived at a very

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<sup>52</sup> Ibid.

<sup>53</sup> Ibid.

ancient geological epoch. Then in 1828 Tournal discovered specimens of human industry in a cave, with a fragment of a human skeleton among bones of extinct animals.

In 1847 a large number of engravings of typical flint implements and weapons were discovered in northern France. This discovery indicated that a series of geological changes must have taken place since the time when these implements were made, requiring adjustments to the cycles of time postulated by the orthodox chronologists.<sup>54</sup>

In 1856, in the Neanderthal, near Dusseldorf, a skull was found bearing evidence of an underdeveloped human type. The skulls and bones found at other localities were compared and it was thus ascertained that various races had already appeared and lived in various grades of civilization even in pre-historic times. Even then there were various strata of humanity ranging from races of a very low development to those of a very high type. The theory of the origin of mankind from a single pair was questioned on the basis that two things were evident, namely that long and slow processes during vast periods of time must have been required for the differentiation of these races and for the evolution of man up to the point where better specimens started showing up. Secondly, there had been an upward tendency from the first appearance of man. The general result of investigations was that the first civilization used stone implements which were more or less smooth, showing a progress from the earlier crude Stone Age. Then came a later progress to a higher civilization, marked by the use of bronze implements (Bronze Age). Finally, a still higher development came when iron began to be used (Iron Age).

Out of all the earlier efforts to demonstrate opposition to science, a school of theology developed which held that the Egyptians had no

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<sup>54</sup> White, A.D., op. cit., Chapter 7 (The Antiquity of Man And Prehistoric Archaeology)

Stone Age and were born civilized. Southall in a book published in 1875, quoted an eminent Egyptologist as having said "Egypt laughs the idea of a rude Stone Age, a polished Stone Age, a Bronze Age, an Iron Age, to scorn." He proposed as a final solution of the problem, the declaration that Egypt, with its high civilization in the time of Mena, with its races, classes, institutions, arrangements, language, monuments were a sudden creation which came fully made from the hands of the Creator.<sup>55</sup>

From all sides thus came evidence of the existence of examples of all the main stages in the development of human civilization. This evidence suggested a period when man appears little above savages, with little if any religion in any accepted sense of the word, leading to the highest planes which humanity has reached.<sup>56</sup> The history of art, as shown especially by architecture of the most enlightened nations of antiquity, also gives abundant proofs of the upward tendency of man from the rudest and simplest beginnings. So, too, general history has come in, illustrating the unknown from the known - the development of man in the prehistoric period from his development within historic times. In this regard White sights the example of Alexander Winchell, a scholar who in 1875 had already won eminence as a teacher and writer in the field of Geology and who, in an effort to reconcile science and Scripture, taught that there had been men earlier than the period assigned to Adam and even that all the human race are not descended from Adam. He was shortly afterwards told by Church leaders that "our people are of the opinion that such views are contrary to the plan of redemption," and was requested to quietly resign his chair.<sup>57</sup>

Science, especially within the 18<sup>th</sup> and 19<sup>th</sup> centuries, has thoroughly changed the intelligent thought of the world in regard to the antiquity of man upon our planet.

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<sup>55</sup> White, A.D., op. cit., Chapter 8 (The "Fall Of Man" And Anthropology)

<sup>56</sup> White, A.D., op. cit., Chapter 9 (The "Fall Of Man" And Ethnology)

<sup>57</sup> White, A.D., op. cit., Chapter 10 (The "Fall Of Man" And History)

**METEOROLOGY.**<sup>58</sup> The popular beliefs of classic antiquity regarding storms, thunder and lightning included myths where Vulcan was represented as forging thunderbolts, Jupiter as flinging them at his enemies, and Aeolus entrusting the winds in a bag to Aeneas. As the Christian Church rose to power the letter of Scriptures were, however, used to recognize them as sacred. Tertullian for example held that many passages of Scripture prove lightning identical with hell-fire. In meteorology, St. Augustine based everything on the letter of the sacred text and he thought it his duty to guard especially the whole theory of the "waters above the heavens." About the beginning of the 9<sup>th</sup> century appeared the notion from the first chapter of Genesis, drawn from Ezekiel, that the firmament is strong enough to hold up the "waters above the heavens," because it is made of ice.<sup>59</sup>

During the Middle Ages the doctrine of the diabolical origin of storms went on gathering strength. Thus at a later stage even Luther supported the superstition, asserting his belief that the winds themselves are only good or evil spirits. In addition to this the theological literature of the Middle Ages was enriched with countless statements regarding modes of Satanic influence on the weather - many people were tortured on suspicion of involvement in witchcraft and the creation of diabolical weather patterns. To relieve their sufferings, they confessed to anything and everything that would satisfy the inquisitors and judges. All that was needed was that the inquisitors should ask leading questions. The prisoners, to shorten the torture, sooner or later to gave the answer required even though they knew that this would send them to the stake or scaffold.

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<sup>58</sup> White, A.D., op. cit., Chapter 11 (From "The Prince Of The Power Of The Air" To Meteorology)

<sup>59</sup> In Ezekiel 1:22 mention is made of "...the firmament upon the heads of the living creature *was* as the colour of the terrible crystal, stretched forth over their heads

Protestantism also supported the idea of superstition as fully as Catholicism. In a book by John Wier published in 1563 he proclaimed his belief in witchcraft, but suggested that the compacts with Satan, journeys through the air on broomsticks, bearing children to Satan, raising storms and producing diseases, were delusions suggested and propagated by Satan himself, and that the persons charged with witchcraft were therefore to be considered "as possessed", that is rather as sinned against than sinning.<sup>60</sup> By the beginning of the 18<sup>th</sup> century the doctrine was evidently dying out. Where torture had been abolished, or even made milder, "weather-makers" no longer confessed and the fundamental proofs in which the system was rooted were evidently slipping away. The old sacred theory received its death blow in 1752, when Franklin made his famous experiments with the kite and at the moment when he drew the electric spark from the cloud, the whole tremendous fabric of theological meteorology collapsed.<sup>61</sup>

In the 17<sup>th</sup> century Pastor Georg Nuber issued a volume of "weather-sermons," in which he discusses nearly every sort of elemental disturbance, such as storms, floods, droughts, lightning, and hail. These, he says, come direct from God for human sins, yet no doubt with discrimination, for there are five sins which God especially punishes with lightning and hail - impenitence, incredulity, neglect of the repair of churches, fraud in the payment of tithes to the clergy, and oppression of subordinates, each of which points he supports with a mass of scriptural texts.<sup>62</sup> During the 18<sup>th</sup> century a professor of mathematics, Scheuchzer, published a book with the Bible as the basis, in which he asserts that the elements, in the most literal sense, represent the voice of God.

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above. (KJV). See Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994

<sup>60</sup> White, A.D., op. cit., Chapter 11

<sup>61</sup> Ibid.

<sup>62</sup> Ibid.

The first lightning conductor in England on a church was not put up until 1762, ten years after Franklin's discovery. The spire of St. Bride's Church in London was damaged by lightning in 1750 and in 1764 a storm wrecked its masonry to such an extent that it had to be rebuilt. Yet for years after this the authorities refused to attach a lightning-rod. St. Paul's Cathedral (in London) was not protected until sixteen years after Franklin's discovery and the tower of the great Protestant church at Hamburg not until a year later still.<sup>63</sup>

**CHEMISTRY.**<sup>64</sup> In all the earliest developments of human thought we find a strong tendency to ascribe mysterious powers over Nature to specially gifted or skilled men and women. The system of deducing scientific truth from scriptural texts was, however, a development of scholastic theology acting through thousands of subtle channels, made to aid this development. The old idea of the futility of physical science and of the vast superiority of theology constantly reminded thinkers of the "right" ways. Although for example Albert the Great's main effort was to Christianize science, he was dealt with by the authorities of the Dominican order, by being subjected to suspicion and indignity. He only escaped persecution for sorcery by yielding to the ecclesiastical spirit of the time and working finally in theological channels by scholastic methods.

Roger Bacon's process of reasoning regarding the refraction of light led to his eventual explanation of the causes and character of the rainbow. It was a clear and cogent step in the right direction as regards physical science but it was thought to be in conflict with the book of Genesis, which described it as a sign placed in the heavens for the purpose of assuring mankind that there was not to be another universal deluge. The theological attack on him included the idea of Satanic intervention in science and he was charged of using magic and having a contract

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<sup>63</sup> Ibid.

<sup>64</sup> White, A.D., op. cit., Chapter 12 (From Magic To Chemistry And Physics)

with Satan. As a further result of his (Bacon's) findings, the Dominicans interdicted every member of their order from the study of chemistry in 1243. Bacon was imprisoned in 1278, where he remained for fourteen years.<sup>65</sup>

To question the theological view of physical science was, even long after the close of the Middle Ages, exceedingly perilous. The theological atmosphere, which in consequence settled down about the great universities and colleges, seemed likely to stifle scientific effort in every part of Europe and it is one of the great wonders in human history that in spite of this deadly atmosphere, a considerable body of thinking men, under such protection as they could secure, still persisted in devoting themselves to the physical sciences.

As a rule, both in Protestant and Catholic countries instruction in chemistry and physics was for a long time discouraged by Church authorities and when its suppression was no longer possible, great pains were taken to subordinate it to instruction supposed to be more fully in accordance with the older methods of theological reasoning.

There also developed something which in many respects was more destructive - the influence of mystic theology, penetrating, permeating, vitiating and sterilizing nearly every branch of science for hundreds of years. Among the forms taken by this development in the earlier Middle Ages we find a mixture of physical science with a pseudo-science obtained from texts of Scripture. In this process the sacred books were used as a fetish - every word, every letter was considered to have a divine and hidden meaning. By combining various scriptural letters in various abstruse ways, new words of prodigious significance in magic were obtained. Why should men seek knowledge by observation and experiment in the "Book of Nature", when the book of

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<sup>65</sup> Ibid.

Revelation, interpreted by the Kabbalah, opened such treasures to the ingenious believer?<sup>66</sup>

Thus we see the sacred power of the number seven in the seven golden candlesticks and the seven churches in the Apocalypse, in the seven cardinal virtues and the seven deadly sins, in the seven liberal arts and the seven devilish arts, and, above all, in the seven Roman Catholic sacraments. And as this proved in astrology that there could be only seven planets, so it proved in alchemy that there must be exactly seven metals. The twelve apostles were connected with the twelve signs in the zodiac and with much in physical science. The seventy-two disciples, the seventy-two interpreters of the Old Testament, the seventy-two mystical names of God, were connected with the alleged fact in anatomy that there were seventy-two joints in the human frame.

The Bible was used everywhere, both among Protestants and Catholics, to support these mystic adulterations of science and one writer, as late as 1751, based his alchemistic arguments on more than a hundred passages of Scripture.<sup>67</sup>

It will doubtless seem amazing to many that for ages the weight of theological thought in Christendom was thrown against the idea of the suffocating properties of certain gases - especially of carbonic acid. Although in antiquity we see men forming a theory of gases in mines which later proved to be correct, we find that, early in the history of the Church, St. Clement of Alexandria put forth the theory that these gases are manifestations of diabolic action and that, throughout Christendom, suffocation in caverns, wells and cellars was attributed to the direct action of evil spirits.<sup>68</sup>

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<sup>66</sup> Ibid.

<sup>67</sup> Ibid.

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But in all the greater modern nations warfare of this kind became more and more futile after the first quarter of the 19<sup>th</sup> century. While conscientious Roman bishops (and no less conscientious Protestant clergymen in Europe and America) continued to insist that advanced education, not only in literature but also in science, should be kept under careful control in their own sectarian universities and colleges. Protestant clerical authorities in Great Britain and America were keeping scholars away from professorships who upheld “unsatisfactory” views regarding the ideas of Darwin.

It was not until the 1850's that a movement in favour of scientific education began in Great Britain and America, where men of wealth and public spirit began making contributions and thus came the growth of a new system of instruction in which Chemistry and Physics took their rightful place. This process eventually also followed in Europe, albeit in a more controlled fashion.

**MEDICINE AND MADNESS.**<sup>69</sup> The influence of Christianity on the healing art was twofold - there was first a blessed impulse - the thought, aspiration, example, ideals, and spirit of Jesus of Nazareth which promoted self-sacrifice for the sick and wretched. Another stream of influence was the theology developed out of sacred literature, namely that the cure of disease was twofold. Firstly there was an idea that physical disease is produced by the wrath of God or the malice of Satan, or by a combination of both. (Theology was thus especially called in to explain it) Secondly there evolved theories of miraculous methods of cure, based upon modes of appeasing the Divine anger, or of thwarting Satanic malice.

During the early history of the Church and throughout the Middle Ages testimony to miraculous healings began to be accepted by the leaders of thought and some of the miracles of healing undoubtedly proved to

be factually based. Miraculous cures were, however, not only ascribed to persons. Another development by the early Church took shape in that miracles for example "became possible" by bathing in specific streams and pools of water and by relics. Hence, St. Ambrose declared that "the precepts of medicine are contrary to celestial science, watching, and prayer"<sup>70</sup> and from ideas such as these there evolved a fetishism which for ages stood in the way of the development of medical science among the first Christians.

Yet a more serious stumbling-block, hindering the beginnings of modern medicine and surgery, was a theory regarding the unlawfulness of meddling with the bodies of the dead. The so-called "Apostles' Creed" had in its teachings regarding the resurrection of the body come to dread mutilating the body in such a way that some injury might result to its final resurrection at the Last Day, and additional reasons for hindering dissections in the study of anatomy. The arguments against dissection were also strengthened by the policy that "the Church abhors the shedding of blood."<sup>71</sup> Thus on these grounds the Council of Le Mans forbade surgery to monks in 1248 and many other councils then followed suite. This idea was so deeply rooted in the mind of the universal Church that for over a thousand years surgery was considered dishonourable and it was only in 1406 that a better beginning was made, when the Emperor Wenzel of Germany ordered that dishonour should no longer be attached to the surgical profession.

Perhaps the best known development of a theological view in the Protestant Church was the belief in the efficacy of the royal touch in diseases, especially epilepsy and scrofula (tubercular condition affecting the lymphatic glands and bones). "Evidence" of this miraculous gift is for example found in the case of Charles II, who

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<sup>69</sup> White, A.D., op. cit., Chapter 13 (From Miracles To Medicine)

<sup>70</sup> Ibid.

<sup>71</sup> Ibid.

touched nearly one hundred thousand persons. John Brown, surgeon of Charles II, published accounts of sixty cures due to the touch of this monarch. Sergeant-Surgeon Wiseman devotes an entire book to proving the reality of these cures, saying, "I myself have been frequent witness to many hundreds of cures performed by his Majesty's touch alone without any assistance of surgery, and these many of them had tried out the endeavours of able surgeons before they came thither." <sup>72</sup>

Early in the 17<sup>th</sup> century Boyer presented inoculation as a preventive of smallpox in France and physicians in England followed his example. Theology soon found reasons against the new practice. The French theologians of the Sorbonne solemnly condemned it, the English theologians in 1772 preached and published a sermon entitled "The Dangerous and Sinful Practice of Inoculation". In this was declared that Job's distemper was probably confluent smallpox, that he had been inoculated by the devil, that diseases are sent by Providence for the punishment of sin, and that the proposed attempt to prevent them is "a diabolical operation." <sup>73</sup>

The central idea on which the whole theological view rested - the idea of diseases as resulting from the wrath of God or malice of Satan - was steadily weakened during the last half of the 19<sup>th</sup> century and at the same time the theological hold upon medical education was also eroded.

A very striking feature in recorded history has been the recurrence of great pestilences. In the middle of the 14<sup>th</sup> century, more than half the population of England died and twenty-five million people perished in various parts of Europe. In 1552 sixty-seven thousand patients died of the plague in Paris alone and in 1580 more than twenty thousand. Such pestilences were attributed to the wrath of God and scriptural records

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<sup>72</sup> Ibid.

<sup>73</sup> Ibid.

of various plagues indicate that they were sent upon the earth by Divine order as a punishment for sin. This view of the early Church was enriched greatly by a new development of theological thought regarding the powers of Satan and evil angels, the declaration of St. Paul that the gods of antiquity were devils being cited as its sufficient warrant.<sup>74</sup>

The main cause of this immense sacrifice of life is now known to have been the lack of proper hygiene. Theological reasonings, however, came in to resist the evolution of a proper sanitary theory in these times. The theological idea was that the humiliation of man adds to the glory of God, that indignity to the body may secure salvation to the soul and while cleanliness represents pride, filthiness represents humility. Living in filth was regarded by "holy men", who set an example to the Church and to society, as an evidence of sanctity. St. Jerome and the Breviary of the Roman Church supported the fact that St. Hilarion lived his whole life long in utter physical uncleanness, St. Athanasius glorifies St. Anthony because he had never washed his feet, St. Abraham's most striking evidence of holiness was that for fifty years he washed neither his hands nor his feet, St. Sylvia never washed any part of her body save her fingers, St. Euphraxia belonged to a convent in which the nuns religiously abstained from bathing.<sup>75</sup>

There was also a theological idea that it was Satan causing pestilences and that he used especially Jews and witches as his emissaries. The proof of this belief in the case of the Jews was seen in the fact that they escaped with a lesser percentage of disease than did the Christians in the great plague periods. This was doubtless due in some measure to their remarkable sanitary system. They observed more careful sanitary rules and more constant abstinence from dangerous foods than was usual among Christians, but the public at large could not understand so

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<sup>74</sup> White, A.D., op. cit., Chapter 14 (From Fetish To Hygiene)

<sup>75</sup> Ibid.

simple a cause and jumped to the conclusion that their immunity resulted from protection by Satan. This protection was repaid and the pestilence caused by their wholesale poisoning of Christians. As a result of this mode of thought, attempts were made in all parts of Europe to propitiate the Almighty, to thwart Satan, and to stop the plague by torturing and murdering the Jews. Throughout Europe during great pestilences we hear of extensive burnings of this devoted people. In Bavaria, at the time of the Black Death, it is computed that twelve thousand Jews thus perished in the small town of Erfurt, the number is said to have been three thousand in Strasburg. The Rue Brulee remains as a monument to the two thousand Jews burned there for poisoning the wells and causing the plague of 1348. Everywhere in continental Europe this persecution was carried out.

In Germany the development of the idea that witches were a great cause of disease, storms and various ills which afflict humanity was especially terrible. From the middle of the 16<sup>th</sup> century to the middle of the 17<sup>th</sup> century, Catholic and Protestant theologians vied with each other in detecting witches guilty of producing sickness or bad weather. Women were sent to torture and death by the thousands and from time to time, men and children as well. In north Germany Protestantism was just as conscientiously cruel. It based its theory and practice toward witches directly upon the Bible, and above all on the great text which has cost the lives of so many men, women, and children, "Thou shalt not suffer a witch to live." <sup>76</sup>

That sin caused the plague was certain, but it was *sanitary sin*. Both before and after this culmination of the disease cases of plague were constantly occurring in London throughout the 17<sup>th</sup> century, but around the beginning of the 18<sup>th</sup> century it began to disappear. The great fire had done a good job by sweeping off many causes and centres of infection and there had come wider streets, better pavements and

improved water supply. With the disappearance of the plague other diseases, especially dysentery which had formerly raged in the city, became much less frequent.

In summing up, it is clear that in this field, the triumph of scientific thought has gradually done much to evolve in the world not only a theology but also a religious spirit more and more worthy of the goodness of God and of the destiny of man.

In the 5<sup>th</sup> century BC, Hippocrates asserted that all madness is simply disease of the brain, thereby beginning a development of truth and mercy which lasted nearly a thousand years. This evolution of divine truth was, however, interrupted by theology. To the vast majority of people down to the end of the 17<sup>th</sup> century nothing was more clear than that insanity in most cases could be ascribed to demonic possession.

As a result of this idea the Christian Church at an early period in its existence virtually gave up the conquests of Greek and Roman science in this field and developed out of dogmatic theology. The afflicted, when not too violent, were generally admitted to the exercises of public worship and a kindly system of cure was attempted in which prominence was given to holy water, sanctified ointments, the breath or spittle of the priest, the touching of relics, visits to holy places, and submission to mild forms of exorcism. There can be no doubt that many of these things, when judiciously used in that spirit of love, gentleness and devotion inherited by the earlier disciples from "the Master," produced good effects in soothing disturbed minds and in aiding their cure.<sup>77</sup>

Fetishes were again noticed to be playing an important role in healing the sanity. Such ideas were mixed with a vague belief in medical treatment and out of this mixture were evolved such prescriptions as

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<sup>76</sup> Ibid.

<sup>77</sup> White, A.D., op. cit., Chapter 15 (From "Demoniacal Possession" To Insanity)

"For a fiend-sick man: When a devil possesses a man, or controls him from within with disease, a spew-drink of lupin, bishopswort, henbane, garlic. Pound these together, add ale and holy water." <sup>78</sup> As this theological theory and practice became more fully developed all mildness began to disappear. The admonitions to gentle treatment were forgotten and the treatment of lunatics tended more and more toward severity - more and more it was felt that cruelty to madmen was punishment of the devil residing within or acting upon them.

Interesting monuments of this idea still exist in the great cities of Europe - "witch towers" where witches and demon possessed were tortured and "fool towers" where the more gentle lunatics were imprisoned, may still be seen. This idea is demonstrated by artistic architecture in the cathedrals of the time which can still be viewed today. Devils and imps struck into stone clamber upon towers, prowl under cornices, peer out from bosses of foliage, perch upon capitals, nestle under benches, flame in windows. The portrait of Satan and the vivid picture of the devils cast out of the possessed and entering into the swine are typical examples of this period.<sup>79</sup>

Under the influence of such teachings in the older Church and in the new, superstition was developed more and more into cruelty and as the biblical texts, popularized in the sculptures and windows and mural decorations of the great medieval cathedrals, had done much to develop it among the people, so Luther's translation of the Bible, especially in the numerous editions of it illustrated with engravings, yielded enormous power to spread and deepen it.

Among the many facts on the last stronghold of demon possession were those indicated as "expectant attention" - the effects of the imagination upon bodily functions. Other classes of phenomena

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<sup>78</sup> Ibid.

<sup>79</sup> Ibid.

leading to epidemics were found to arise from a morbid tendency to imitation. Still other groups have been brought under hypnotism and more have been found under the forms and results of hysteria.<sup>80</sup>

It was only during the middle of the 18<sup>th</sup> century that the belief in diabolic possession had practically disappeared from all enlightened countries and during the 19<sup>th</sup> century it had lost its hold even in regions where the medieval spirit continued strongest. Despite opposition, science has steadily brought hand in hand with Christian charity in this field, a better future for humanity. The thoughtful physician and the devoted clergyman are now constantly seen working together.

**THE ORIGIN OF LANGUAGE.**<sup>81</sup> At a very early period in the evolution of civilization men began to ask questions regarding language and the answers to these questions were naturally embodied in the myths, legends and chronicles of their sacred books. The questions that begged answers were where languages as well as their diversity came from and which was the first language. The Hebrew answer to the first question is embodied in the Torah - God talks with Adam and is perfectly understood, the serpent talks with Eve and is perfectly understood, God brings the animals before Adam, who bestows on each its name. Language then was God-given and complete. There was evidently no suspicion of the fact that every language was the result of a growth process.

The answer to the second of these questions (regarding the diversity of languages) was much more difficult. The direct intervention of the Divine Will was brought in. As this diversity was felt to be an inconvenience, it was attributed to the will of a Divine Being in anger. To explain this anger, it was held that it must have been provoked by human sin - thus entered the legend of the Tower of Babel.

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<sup>80</sup> White, A.D., op. cit., Chapter 16 (From Diabolism To Hysteria)

<sup>81</sup> White, A.D., op. cit., Chapter 17 (From Babel To Comparative Philology)



The answer to the third question was simple. As each nation believed its own chief divinity to be "a god above all gods," - as each believed itself "a chosen people," - as each believed its own sacred city the actual centre of the earth, so each believed its own language to be the first - the original of all. This answer was from the first taken for granted by each "chosen people," and especially by the Hebrews: throughout their whole history, whether the Almighty talks with Adam in the Garden or writes the commandments on Mount Sinai, he uses the same language - Hebrew.<sup>82</sup>

The series of battles between theology and science in the field of comparative philology opened just on this point, namely the direct divine inspiration of the rabbinical punctuation. The Reformation with its renewal of the literal study of the Scriptures and its transfer of all infallibility from the Church and the papacy to the letter of the sacred books, intensified for a time the devotion of Christendom to this sacred theory of language. The belief was strongly held that the writers of the Bible were merely pens in the hand of God (*Dei calami*), hence the conclusion that not only the sense but the words, letters and even the punctuation proceeded from the Holy Spirit. Only on the one question of the origin of the Hebrew points was there any controversy. It began to be especially noted that these vowel points in the Hebrew Bible did not exist in the synagogue rolls, were not mentioned in the Talmud, and seemed unknown to St. Jerome, and on these grounds some earnest men ventured to think them no part of the original revelation to Adam.<sup>83</sup>

The discovery of Sanskrit suddenly threw its great light on the dogma of the multiplication of languages at the Tower of Babel as well as the

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<sup>82</sup> Ibid.

<sup>83</sup> Ibid.

dogma of the divine origin of language, as it put the old theory that Hebrew was the original language under unbearable stress.

Yet the battle was clearly won - the arguments irrefutable and despite the commands of bishops, the outcries of theologians, and the sneering of critics, the application of strictly scientific observation and reasoning carried the day. From this period the old sacred theory as to the origin of the Hebrew points was considered as dead and buried.

The different phases of development of the theory of the origin of languages thus in the first place made reference to the origin of speech. In the beginning the whole Church rallied around the idea that the original language was Hebrew, that this language, even including the medieval rabbinical punctuation, was directly inspired by the Almighty, that Adam was taught it by God himself in walks and talks, and that all other languages were derived from it at the "confusion of Babel." Next, parts of this theory started fading out as the inspiration of the rabbinical points began to disappear. Adam, instead of being taught directly by God, was now "inspired" by him. Then came the third phase, when advanced theologians endeavoured to compromise on the idea that Adam was "given verbal roots and a mental power."<sup>84</sup> Finally the theory that language is the result of an evolutionary process in obedience to laws more or less clearly ascertained, was accepted. Babel thus took its place quietly among the sacred myths.

It may thus fairly be said that the thinking leaders of theology have come to accept the conclusions of science regarding the origin of language, as against the old explanations by myth and legend. The result has been a blessing both to science and to religion. No harm has been done to religion - what has been done is to release it from the clog of theories which could no longer be maintained. No harm was done to the Bible. On the contrary this divine revelation through

science has made it all the more precious to us. In these myths and legends caught from earlier civilizations an evolution of the most important religious and moral truths for our race can be seen. Myth, legend, and parable seem, in obedience to a divine law, the necessary setting for these truths as they are successively evolved in ever higher and higher forms.

## PHILOSOPHICAL DEVELOPMENTS

An evaluation of the historical relationship between science and religion cannot be complete without referring to the philosophical developments at the same time. In the next section a summary of the results of philosophical development up to the 19<sup>th</sup> century will be given. This will be followed by *methods in religion as influenced by modern science* in which reference will be made to philosophy (*positivism, linguistic analysis, existentialism*) and theology (*new orthodoxy and liberalism*) in the 20<sup>th</sup> century. Each of these aspects influences viewpoints on the relations between science and theology.

### *The Results of Philosophical Development up to the 19<sup>th</sup> century.*

The effect that thoughts on evolution had on most scientists as well as the majority of theologians, manifested itself through an apparent shift in mindsets from both scientists as well as theologians. This is not to say that every aspect of biological change put forward by scientists was universally accepted on the same level, but rather that discussions on philosophical as well as scientific levels opened up a debate in which there was a place for conservative traditional thought on the one end of the scale, through “modernistic” and liberal thought on the same issues on the other end of the scale. The influence of evolutionary thought can thus be summarised as follows:<sup>85</sup>

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<sup>84</sup> Ibid.

<sup>85</sup> Barbour, I.G., op. cit., pp. 112 - 114

- ◆ ***God and Nature.*** What Newton did for physics, Darwin did for biology, i.e. it placed the role of God beyond that of the *God of the Gaps*. The liberal theologians now saw God not as a secondary cause which operates on the same level as natural forces, but as working continuously through the whole evolutionary process by means of secondary causes. The modernists emphasized God's immanence where He becomes a force within the cosmic process which was itself divine. The key issues thus remained the significance of the direction of evolution on the one hand, and the meaning of assertions that God works by means of, or through, natural causes on the other hand. The "Argument from Design" (the Teleological Argument) clearly has a direct link to this position.
  
- ◆ ***Man and Nature.*** Evolution challenges the traditional acceptance of man's special position in nature and declares that man has had humble origins. The traditionalist point of view is that man is unique because his soul was created in a divine act. The modernistic and liberal point of view is that although man had a humble origin, he also had an upward ascent through evolution. He thus becomes a "perfect" human being in the sense that he now has victory over nature. (The distinctiveness of man has recently been focused on by the biologists in terms of "... his rational powers, capacity for symbolic communication, freedom of choice, and cultural evolution ...", and theologians are now assessing human limitations in a more sober way than their 19<sup>th</sup> century counterparts.<sup>86</sup>)
  
- ◆ ***The Methods of Science.*** There can be no doubt that empirical observation as well as the process of formulating hypotheses were skillfully developed up till the 19<sup>th</sup> century, as indeed was shown by Darwin's work. But, as Barbour asks, can science effectively

and comprehensively deal with the implications of evolution for cosmology, historical progress and human ethics? Can ethical norms be derived from evolutionary evidence alone?<sup>87</sup> The lessons thus learnt were that theologians should be careful in their assessment of scientific questions on the one hand, while scientists should equally restrict themselves when theological questions are involved.

- ♦ ***Methods in Theology.*** The opposing views of scientists and theologians are illustrated by the rejection of revelation by modernists, and an insistence on the literal interpretation of the Bible by some conservatives respectively. The liberal view which developed is that it is accepted that the Bible represents an imperfect record of man's religious experience because it was written by imperfect human beings. Revelation is then viewed not as the result of God's direct dictation, but rather as proof of God's involvement with man.

The Argument from Design (Teleological Argument) was obviously in total opposition to the theory of evolution. The revised argument in this respect held that the laws governing life as well as the general direction of development, could be interpreted as purposeful design.

A new development in 19<sup>th</sup> century theology appealed to human experience - man's religious awareness and consciousness of God, as well as moral experience.

***Methods in religion as influenced by modern science.*** The schools of thought in this regard include the following:<sup>88</sup>

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<sup>86</sup> Ibid., p. 113

<sup>87</sup> Ibid.

<sup>88</sup> See Barbour, I.G., op. cit., pp. 115 *et seq*

- ♦ ***Contrasts of Theology and Science.*** The methods of science and religion differ completely. Their content and subject matter have nothing in common and the two should be independent of each other - there can be no conflict between science and religion and neither can contribute positively to the other. The aforementioned contrast between theology and science manifests itself philosophically in *inter alia* the so-called “Crisis Theology” of Karl Barth (1886 - 1968),<sup>89</sup> or ***Neo-Orthodoxy*** as it is better known. Barth, who was trained in 19<sup>th</sup> century liberalism, believed “... that the impact of the scientific tradition should not be over exaggerated as a cause of the demise of the orthodox development.”<sup>90</sup> According to Barth, God is always the “wholly other” or “wholly different one” who can only be known when He chooses to reveal himself. God revealed himself perfectly through Christ, while the Bible is merely human record of revelation. Criticism of the Bible is based on human limitations of the writers and cultural influences on their thought and such criticism can therefor be accepted. God is totally unlike the world which science studies, which means that the methods used by science to research and describe the real world, cannot also be used in theology. Science can neither contribute, nor conflict with theology. The Bible does not tell us anything authoritative about science and whatever is considered to be scientific ideas in the Bible, must likewise be rejected as “erroneous speculations of ancient times” - or “... we should take the Bible “seriously but not literally”.<sup>91</sup>

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<sup>89</sup> W.L. Reese, *Dictionary Of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, p. 50

<sup>90</sup> Karl Barth, *Die Protestantische Theologie im 19. Jahrhundert*, Zurich, 1947, p. 81, quoted in J. Dillenberger, *Protestant Thought and Natural Science - A Historical Interpretation*, Westport (Connecticut), Greenwood Press, Inc., 1977, p. 173

<sup>91</sup> Barbour, I.G., op. cit., p. 118

Barth's contribution is summed up by Dillenberger as having "... affirmed the independence of theological conceptions and of theological communication from all cultural conditioning, whether social, philosophical, or scientific."<sup>92</sup>

The contrast between theology and science manifests itself philosophically also in the form of the *Existentialism*. Existentialism stands for the recovery of the depth of man in a world where such depth was lost through the impact of evolution. Where science stands for existence in an indifferent way, it tends to conceal man in his totality - the mystery of man is lost. The contrast between what theology perceives as *personal selfhood* and what science perceives as *impersonal objects* thus manifests in the difference between the methods of science and religion. Barbour says "Existentialism in all its forms asserts that we can know authentic human existence *only by being personally involved* as concrete individuals making free decisions - not by formulating abstract general concepts or universal laws about man"<sup>93</sup>, while for Dillenberger "... a world which had reduced man to an animal or an idea, such an approach [existentialism] constitutes his rediscovery."<sup>94</sup>

One of the proponents of existentialism, Rudolf Bultmann, developed a distinctive form which he called *Christian Existentialism*. He *inter alia* addresses the language issue and claims that God and God's activities cannot be described in the language of space and time - such descriptions he calls *mythical*. Mythical language is not summarily dismissed as false (as 19<sup>th</sup> century liberalism did), but has to be interpreted from the point of view of what it means for man. The key question is thus "...what

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<sup>92</sup> Dillenberger, J., op. cit., p. 257

<sup>93</sup> Barbour, I.G., op. cit., p. 119

<sup>94</sup> Dillenberger, J., op. cit., p. 265

does the mythical imagery say about *my personal existence* and about *my relationship* to God.”<sup>95</sup>

Theology has no points of contact with science - science investigates impersonal phenomena in the world without personally involving the subject.

A third development in the 20<sup>th</sup> century is the concept of ***Linguistic Analysis***. Linguistic Analysis as a philosophical commentary on theology has its roots in *logical positivism* (also known as *logical empiricism*) - the assumption is that a statement is literally meaningful only if it is either *analytic* or *empirically verifiable*. The logical structure of language was a natural point of further interest by the logical positivists. It was asserted that only empirical statements which are verifiable through the senses have meaning - sentences in philosophy, metaphysics, ethics and theology are thus meaningless. The only function language has, was to report empirical facts. (For a more comprehensive discussion on Logical Positivism as well as Religious Language, see the previous chapter.)

- ◆ ***The Parallels of Theology and Science***. There are methodological parallels between science and religion, i.e. “considerable independence of content with significant similarities in structure”.<sup>96</sup> There are points of comparison among methods of inquiry and many of the rational and empirical attitudes of the scientist can be shared by the theologian.

***Liberal Theology*** views theology as the interpretation of religious experience (Schleiermacher’s contribution) and as the concentration on moral experience (Kant’s contribution). Liberal

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<sup>95</sup> Barbour, I.G., op. cit., p. 121

<sup>96</sup> Ibid., p. 125



theology stresses the immanence of God, rather than His transcendence. Most liberal theologians accept that “... *attitudes similar to those of the scientists are appropriate in religious inquiry.*”<sup>97</sup> Theology should be broadly empirical and rational and it should supply a comprehensive world view based on the critical interpretation of all human experience. The scientist’s spirit of openness and tentativeness should be adopted. The role of revelation is retained but fine-tuned : Biblical revelation’s uniqueness is minimised as it is not the only means employed by God to reveal himself. There are also the structures of the created order, man’s moral conscience, the various religious traditions of the world, and Christ (who is not considered to be an exclusive channel of revelation of God). It is also accepted that revelation is received by fallible man and can thus be distorted through his limited comprehension. The Bible is viewed as “... the record of a people’s progressive search for God and response to him.”<sup>98</sup> One of the proponents of liberal theology, Charles Raven, says the following about the methods of inquiry: “... the main process is the same whether we are investigating the structure of an atom or a problem in animal evolution, a period of history or the religious experience of a saint.”<sup>99</sup>

The methods of science and theology thus have much in common. The scientist’s field of work is not restricted to the laboratory only - he is aware of beauty and order and may display a sense of reverence and humility. What he sees as the universality of the laws of nature, may be described as a belief in a “cosmic mind”, but man’s religious experience may describe the same order as having a personal character and originating from an “ultimate Reality”. The gulf between science and religion is thus narrowed.

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<sup>97</sup> Ibid., p. 126

<sup>98</sup> Ibid.

Furthermore, science employs presuppositions and moral commitments the same way religions do. Human factors "... such as the scientist's personal judgment, commitment to truth, and participation in a community of inquiry"<sup>100</sup>, are accepted in science. Liberal Theology thus underlines many features of science which resemble that of theology, while the same can be said of theology.

**Process Philosophy.** Process philosophy attempts to include science and religion in a unified view of reality. The father of process philosophy, Alfred North Whitehead, tried to construct a system "... of ideas which bring aesthetic, moral and religious interests into relation with those concepts of the world which have their origin in natural science." Whitehead defines metaphysics as the study of the most general characteristics of events, and it must be coherent (i.e. logically consistent AND part of a unified system of interrelated ideas that presuppose each other) - "Metaphysics is nothing but the description of the generalities which apply to all the details of practice."<sup>101</sup> Metaphysics must also be applicable to experience and thus have empirical relevance. It is the task of any thought system to organise and elucidate experience. Religion contributes its own independent evidence and metaphysics must take it into account when describing it.<sup>102</sup>

Mascall points out in this regard that Whitehead leaned on the observation that the greatest contribution of medievalism to the

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<sup>99</sup> C.E. Raven, *Natural Religion and Christian Theology*, Cambridge, Cambridge University Press, 1953, Vol. 2, p. 10, as quoted in Barbour, I.G., op. cit., p. 127

<sup>100</sup> Barbour, I.G., op. cit., p. 128

<sup>101</sup> D.R. Griffin and D.W. Sherburne, (eds.), *Whitehead, Alfred North - Process and Reality: An Essay in Cosmology*, Corrected Edition, New York, Free Press, 1978, p.

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<sup>102</sup> A.N. Whitehead, *Process and Reality*, New York, The Macmillan Co., p. vi, quoted in Barbour, I.G., op. cit., p. 128

formation of the scientific movement, comes “from the medieval insistence on the rationality of God, conceived as with the personal energy of Jehova”, and “... that faith in the possibility of science, generated antecedently to the development of modern scientific theory, is an unconscious derivative from medieval theology.”<sup>103</sup>

The basic ideas of process philosophy are firstly *The Primacy of Time*, which holds that the world is a process of becoming. Contrary to the Aristotelian view, transition and activity is more fundamental than permanence and substance. Even on sub-atomic level real changes take place and the view that particles merely rearrange themselves whilst constituting unchanged substances, is rejected. The future is open and indeterminate as reality illustrates creativity, spontaneity and emergence. The second idea of process theology is *The Interfusion of events*. Reality consists of an ever-changing network of interdependent and interconnected influences. Nothing exists except by participation - for example, any individual is the sum total of his interpersonal roles. The third idea of process theology is the concept of *Reality as Organic process*. According to this concept the world is not analyzed by comparing it to a machine, but to a highly integrated organism with a dynamic pattern of interdependent events. “The parts contribute to and are also modified by the unified activity of the whole”,<sup>104</sup> while the integrity of each event is retained. The fourth idea of process theology is the concept of *The Self-creation of Each Event*, which holds that every event constitutes spontaneity and self-creation and contributes in a unique way to the world. “Reality thus consists of an interacting plurality of individual acts of experience”.<sup>105</sup>

<sup>103</sup> Mascal, E.L., op. cit., p. 95

<sup>104</sup> Barbour, I.G., op. cit., p. 130

<sup>105</sup> Ibid.

- ♦ ***Derivations of Theology from Science.*** A group of authors claim that theological conclusions can be drawn from the discoveries of science, for example that the existence of God can be inferred either from the general features of nature (such as design and order), or from specific findings (such as the “upward” tendencies of evolution). This group of authors are considered to be modern exponents of the age old “Natural Theology” (theology derived from nature), of which William Paley was one of the most vigorous proponents in the 17<sup>th</sup> century.<sup>106</sup> Two categories of proponents exist, the first of which is ***Arguments from Design and Order.***<sup>107</sup> Liberal Theology as well as Process Theology often invoke arguments from design and order, but the latter is also sometimes used independently. Whereas the Teleological Argument (see Chapter 1) was somewhat tarnished by the theory of evolution, a reformulated version makes provision for the incorporation of evolution, but evidence of design is invoked to explain the total systems of laws and conditions through which life as well as *intelligent* life could come into existence. The existence of human traits such as love, friendship and justice seem to indicate that it cannot be explained by biological and chemical laws alone.

Another category of proponents base their positions on ***Arguments from Physics and Biology.*** These authors claim that a number of specific scientific discoveries can be interpreted as evidence for theism. Examples of such discoveries include.<sup>108</sup>

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<sup>106</sup> Reese, W.L., op. cit., p. 380

<sup>107</sup> Dr. Hugh Ross has written extensively on “Astronomical Evidences for the God of the Bible”. A summary of the HTM version of his contribution is attached - see ANNEXURE A : Hugh Ross, Ph.D., *Astronomical Evidences for the God of the Bible : Design and the Anthropic Principle*, (Copyright “Reasons to Believe”, 1992 - HTM Version)

<sup>108</sup> Barbour, I.G., op. cit., p. 133

- \* Astronomical evidence for the “instantaneous creation” theory proves the finite timespan of the universe - the idea of God as Creator is supported.
- \* The Heisenberg Uncertainty Principle<sup>109</sup> is invoked by some in defence of the idea of human freedom.
- \* The abstract, mathematical character of 20<sup>th</sup> century physics is taken to support philosophical idealism (which is the basis for the argument that reality is basically mental).
- \* The directional advance of evolution is given as proof for creative design in nature.

## SUMMARY - PHILOSOPHICAL DEVELOPMENTS

- ◆ The results of philosophical development up to the 19<sup>th</sup> century showed the effect that thoughts on evolution had on most scientists as well as the majority of theologians. As far as *God and Nature* was concerned, it was showed that the key issues were the significance of the direction of evolution on the one hand, and the meaning of assertions that God works by means of, or through, natural causes on the other hand. In the section entitled *Man and Nature* it was stated that evolution challenges the traditional acceptance of man’s special position in nature and declares that man has had humble origins. *The Methods of Science* showed that empirical observation as well as the process of formulating hypotheses were skillfully developed up till the 19<sup>th</sup> century. But it was asked whether science could effectively and comprehensively deal with the implications of evolution for cosmology, historical

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<sup>109</sup> Also known as the *Indeterminacy Principle*, indicating that the position and trajectory of a particle cannot both be known with perfect exactitude. See T. Ferris, *The Whole Shebang*, London, Weidenfeld & Nicolson, 1997, p. 359

progress and human ethics. The lessons thus learnt were that theologians should be careful in their assessment of scientific questions on the one hand, while scientists should equally restrict themselves when theological questions are involved. In the section under *Methods in Theology* the opposing views of scientists and theologians are illustrated by the rejection of revelation by modernists and a literal interpretation of the Bible by some conservatives respectively.

- ◆ In the development of *philosophical contrasts between the methods of theology and science*, three aspects are mentioned, namely *Neo-Orthodoxy* which emphasizes the role of revelation, *Existentialism* which places personal involvement in the forefront, and *Linguistic Analysis*. This section thus described assertions that the methods of science and theology are radically different - scientific discoveries thus have no theological implications.

*Parallels of theology and science* addressed *Liberal Theology* which indicates that the gulf between science and religion is narrowed because both science as well as theology incorporate similar methods, and *Process Philosophy* which attempts to include science and religion in a unified view of reality. Parallels are thus indicated in the method of science and theology.

In the section dealing with *Derivations of Theology from Science* theological conclusions are drawn from science. Two categories of proponents exist, namely *Arguments from Design and Order* and *Arguments from Physics and Biology*. The arguments are basically reformulations of older ideas in the “Natural Theology” school of thought and in addition more recent scientific discoveries are put forward to prove the existence of a creative Designer.

## CONCLUSION

It has been noted that there are historically three periods or phases in the debate between theology and science. The first of these is marked by the general use of scriptural texts and statements against the new scientific doctrine. The second or intermediate period between these two is frequently marked by the putting against science of some great doctrine in theology. Examples are found in astronomy, when Bellarmine and his followers insisted that the scientific doctrine of the earth revolving about the sun is contrary to the theological doctrine of the incarnation. As far as geology is concerned, it was urged that the scientific doctrine that fossils represent animals which died before Adam contradicts the theological doctrine of Adam's fall and the statement that "death entered the world by sin." The third period is marked by attempts at compromise by means of efforts to reconcile textual statements with ascertained fact.

With the establishment of Christianity a new evolution of theology began, which may be said to have retarded the normal development of the physical sciences to some extent for over fifteen hundred years. The cause of this was the existence of an atmosphere in which the seeds of physical science could hardly grow and an atmosphere in which all seeking for truth as truth in nature was regarded as futile. The general belief derived from the New Testament was that the end of the world was at hand, that the last judgment was approaching, that all existing physical nature was soon to be destroyed. Hence the greatest thinkers in the Church generally poured contempt upon all investigators into a science of nature and insisted that everything except the saving of souls was a waste of time. For twelve centuries the physical sciences were thus discouraged or challenged by the dominant church orthodoxy.

It is also true that the positive role played by the Christian faith in the development of the natural sciences cannot be disputed.<sup>110</sup> Examples of this include that Kepler was influenced by mediaeval Christian mysticism, Giordano Bruno was a part of a Christian revitalization of classical humanism, and in the 17<sup>th</sup> century England, the “natural philosophers” were devoutly motivated to read “The Book Of Nature” (i.e. to study nature), which they regarded as written by God, alongside Holy Scripture.<sup>111</sup>

More than three centuries before Francis Bacon advocated the experimental method, Roger Bacon (1214 - 1294) practised it and the results were wonderful. He worked in many sciences and his knowledge was sound and exact. By him, more than by any other man of the Middle Ages, was the world brought into the more fruitful paths of scientific thought - the paths which have led to the most precious inventions and among these are clocks, and lenses which he gave to the world, directly or indirectly. In his writings are found formulae for extracting phosphorus and manganese. It is even claimed that he investigated the power of steam and he seems to have very nearly reached some of the principal doctrines of modern chemistry. But it should be borne in mind that his method of investigation was even greater than its results. In an age when theology alone thought to give the title of scholars, he insisted on real reasoning and the aid of natural science by mathematics. Thus the difference between the science of the Middle Ages and that of the 17<sup>th</sup> century was the new combination

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<sup>110</sup> It is also true that not only the Christian faith played a role in the development of the natural sciences. The following quote perhaps describes the situation more accurately : “The rise of modern science was due to a number of factors, prominent among them the Greek element in Western thought. But Judaism’s teachings regarding the unity of nature as the creation of the one God are not to be underestimated in their effects on early scientific thought. It is doubtful whether science could have emerged in its full boldness and confidence against a polytheistic backcloth in which each God is allotted only a portion of the world.” See *Encyclopaedia Judaica*, 1971/72, Vol. 10, London, Keter Publishing House, p. 397

<sup>111</sup> A.R. Peacocke (ed.), *The Sciences and Theology in the Twentieth Century*, London, Oriel Press, 1981, p. x



of mathematical reasoning and experimental observation.<sup>112</sup> In an age when experimenting was sure to cost a man his reputation, he insisted on experimenting and braved all its risks.

Bacon's contribution to science can also serve to explain a development which negatively impacted on the science-religion debate. To some of the prominent scientists of especially the 19<sup>th</sup> century, there was an overwhelming confidence in the finality of scientific theories. The predominant view was that "science had laid bare the last secrets of the universe and practically nothing of importance remained to be discovered".<sup>113</sup>

The growth of science in the 18<sup>th</sup> century profoundly influenced the thoughts of two of the greatest philosophers of the time. David Hume (1711 - 1776), who emphasized the empirical side of science, held that all knowledge is derived from sense-impressions - scientific theories and laws are summaries of observations. Immanuel Kant (1724 - 1804) on the other hand, gave prominence to the interpretation of knowledge. Religion, he claimed, formed the basis of man's practical life as well as inner experience, thus presenting reconciliation of science and religion.<sup>114</sup>

It should furthermore be noted that there has always been a "clash" between science and traditional beliefs "... whether (the latter was) relating to religion or to other humanistic standards of value."<sup>115</sup> The mistake has, however, been to confuse the conflict between what Gregory calls "obscurantism" and "enlightenment", with a conflict between Christianity and science<sup>116</sup>. It would also be a mistake to see developments through the Middle Ages to the 20<sup>th</sup> century only as a

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<sup>112</sup> Barbour, I.G., op.cit. p. 23

<sup>113</sup> Mascal, E.L., op. cit., p. 8

<sup>114</sup> Ibid., pp. 69-79

<sup>115</sup> R. Gregory (Sir), op. cit., p. vi

<sup>116</sup> Ibid.

clash between religion and science. Religion has contributed in various ways to the development of science. Barbour says e.g. that Western religious tradition played an important part in the moulding of man's unconscious assumptions about nature, thus "... we lesser rational beings might, by virtue of that Godlike rationality, be able to decipher the laws of nature."<sup>117</sup>

The era described above as "the war" between science and theology was probably to a great extent lost by Christian theologians because religious interpretation of reality became invalid, and "... a matter of private preference, if not as superstition."<sup>118</sup> While it became an accepted tradition that science would no longer appeal to theology in explaining the natural world, the 20<sup>th</sup> century, however, brought its own awareness that science alone cannot cope with the consequences and side effects of scientific discovery and their technological application. Appleyard says for example "Science now answers questions as if it were a religion and its obvious effectiveness means that these answers are believed to be the truth - again as if were a religion".<sup>119</sup> On the other hand, technological tragedies such as the atom bombs dropped on Hiroshima and Nagasaki, and the nuclear disaster at Chernobyl in 1986, caused a shift of faith in science as the only way available to the world to solve its problems.<sup>120</sup>

In the final instance the following observations can be made in respect of the history of the science-theology debate:

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<sup>117</sup> R.S. Cohen, "Alternative Interpretations of the History of Science", *The Scientific Monthly*, Vol. 80, (1955), 111, reprinted in P. Frank (ed.), *The Validation of Scientific Theories*, Boston, Beacon Press, 1954, as quoted in Barbour, I.G., op. cit., p. 48

<sup>118</sup> Peacocke, A.R. (ed.), op. cit., p. 3

<sup>119</sup> B. Appleyard, *Understanding the Present*, London, Picador, 1992, p. 228

<sup>120</sup> C.W. Du Toit (ed.), *The Action of God in the World*, Pretoria, UNISA, 1994 (Paper delivered at a seminar of the SA Science and Religion Forum of the Research Institute for Technology and Religion held at UNISA on 23 May 1994)

- ◆ There existed a period within which theological dogmatism probably retarded elements within the natural development of the sciences (e.g. the oppression of scientific facts in respect of the Copernican doctrine that the sun and planets do not revolve about the earth, but that the earth and planets revolve about the sun).
- ◆ Despite (or even perhaps because of) the somewhat negative results of this influence, the Christian faith played a significant role in the development of the natural sciences in especially Europe (e.g. the revival of classical humanism).
- ◆ For the last two centuries there has been an increasing alienation between theology and science. The relationship has at times been called “an uneasy truce” in modern times.<sup>121</sup>
- ◆ Recent indications are that there is an effort between both theology as well as the natural sciences to move closer. Scientists agree that they can no longer operate in a “shrine” completely free from criticism from theology (because of e.g. a number of ecological and other problems generated by modern industrial, biological and medical technology). There is also for example a growing acceptance and even a willingness to conduct certain pure scientific research in close cooperation with theologians.
- ◆ Changes have also occurred in theology. There is e.g. a growing acceptance of man’s position in and through our lives as biological organisms “... who are part of nature and living in society”.<sup>122</sup> There is also a growing awareness of the fallibility of Scriptural dogmatism because it was written by fallible people who are influenced by culture. “Today we are explained by culture; in the

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<sup>121</sup> Peacocke, A.R. (ed.), op. cit., p. x

<sup>122</sup> Ibid.

past our specific identity was attributed to the working of God's providence."<sup>123</sup>

- ◆ The role of *Liberal Theology* as well as *Process Theology* is perhaps indicative of a futuristic approach which may finally come to be the accepted form of relations between science and theology. The implications for possible harmony are strikingly illustrated by the following thoughts within *Liberal Theology*:
  - ◆ Theology should be *broadly* empirical and rational and it should supply a comprehensive world view based on the critical interpretation of all human experience.
  - ◆ The scientist's spirit of openness and tentativeness should be adopted.
  - ◆ The methods of inquiry are the same "... whether we are investigating the structure of an atom or a problem in animal evolution, a period of history or the religious experience of a saint."<sup>124</sup>
  - ◆ The role of revelation is retained but fine-tuned : Biblical revelation's uniqueness is minimised as it is not the only means employed by God to reveal himself. There are the structures of the created order, man's moral conscience, the various religious traditions of the world, and through Christ. This point of view probably was a deliberate attempt to navigate away from the troubled waters caused by the fundamentalist method of answering theological questions, i.e. "Theological questions were to be answered by careful

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<sup>123</sup> D. Cupit, *The Long-Legged Fly*, London, SCM, 1987, p. 103, as quoted in C.W. Du Toit (ed.), op.cit., p. 5

<sup>124</sup> See endnote 98 above.

study of the language of the Bible. Questions which fell outside this narrow circle of interest could safely be ignored.”<sup>125</sup> But can this insight not also be attributed to the science-religion encounter by the fact that a number of theologians had to come to grips with the rest of the world in terms of the existing variety of religions over and above the Christian religion?

- ◆ It is also accepted that revelation is received by fallible man and can thus be distorted through his limited comprehension. The Bible is viewed as the record of a people’s progressive search for God and response to him.
  
- ◆ The role of *Process Theology* explores the possibility of including science and religion in a unified view of reality. Religion contributes its own independent evidence and metaphysics must take it into account when describing it. The basic ideas of *Process Theology* facilitates a unified view through the concepts of *The Primacy of Time* (the world is in a constant process of changing), *The Interfusion of Events* (the latter process of change is interdependent as well as interconnected), *Reality is an Organic Process* (a dynamic pattern of interdependent events take place), and *Each Event is Self-Creating* (spontaneity self-creating contributes to change in a unique way).

It may thus be that the vigorous trend to draw closer from especially the side of Christian scientists by their contributions through *arguments from design and order*, as well as *arguments from physics and biology*, are indicative of this “new mood” in terms of closer cooperation. But is this the only way forward?

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<sup>125</sup> D.W. Hardy and P.H. Sedgwick (eds.), *The Weight of Glory - A Vision and Practice for Christian Faith : The Future of Liberal Theology*, Edinburgh, T & T Clark, 1991, p. 7

Peacocke tentatively identifies the following set of possible interactions between science and theology:<sup>126</sup>

- ◆ *Science and theology are concerned with two distinct realms:* the natural/supernatural; the spatio-temporal/the eternal; the order of nature/the realm of faith; the natural (physical)/the historical; the physical and biological/mind and spirit. Science and theology serve very different objects - the universe and God. This view corresponds to *Neo-Orthodoxy*, *Existentialism* and *Linguistic Analysis* approaches.
  
- ◆ *Science and theology are interacting approaches to the same reality.* Science and theology may influence each other. They can be mutually exclusive, logically consistent, but not mutually reinforcing. Both can be in accord in many ways. The *Liberal Theology* and *Process Theology* correspond to this view.
  
- ◆ *Science and theology are two distinct non-interacting approaches to the same reality.* Empirical observation with prediction and control is what science deals with, while theology is concerned with ultimate goals. Science seeks the answer to the question “how”, while theology tries to answer the question “why”. They adopt different standpoints asking and answering different kinds of questions, they employ different cognitive attitudes, and are constituted in different kinds of language games. This view would correspond with the *liberal theology* on the one hand, and *process theology* on the other hand.

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<sup>126</sup> Peacocke, A.R. (ed.), op. cit., pp. xiii - xv. J.P. Moreland also gives a strikingly similar set of possible models for science-theology integration. However, Moreland does not credit Peacocke in any way. See J.P. Moreland (ed.), *The Creation*

- ◆ *Science and theology constitute different language games.* There is little if any communication between science and theology because each has different logical preconditions which have no bearing on each other.
- ◆ *Science and theology are generated by quite different attitudes.* Science is seen as a rational, progressive and logical neutral, intellectual activity. Theology constitutes personal involvement and commitment. This view would also correspond with the *Christian existentialism*.
- ◆ *Science and theology are both subservient to their objects and can only be defined in relation to them.* Science has “faith” in the orderliness of the universe and the intelligibility of nature, while theology has faith in God. Both are intellectual disciplines shaped by the objectives - nature and God. There is a rational factor involved in both - theology is thus in a sense also considered to be a science. In the study of Scriptures extensive use is for example made of scientific methodology.
- ◆ *Science and theology may be integrated.* Science can fill out details and help to apply theological principles, and vice versa as many fields of investigation in both the natural as well as human sciences prove to be consistent and compatible. This view would correspond with the *Liberal Theology*.
- ◆ *Science generates a metaphysic in terms of which theology is then formulated.* The metaphysic develops either from the content of contemporary science or from the philosophy of science itself. Whitehead’s definition of metaphysics as the study of the most general characteristics of events, and that it must be coherent (i.e.

logically consistent as well as part of a unified system of interrelated ideas that presuppose each other), is at the basis. This view corresponds in part with the *Process Theology*.

The question now remains if it is indeed possible to constructively describe reality from the perspective of both theology as well as the natural sciences as is envisaged by the aforementioned models. From what was discussed in this chapter and the conclusions which have been reached, it does not seem surprising that there are numerous ways of relating modern science to the Judeo-Christian faith. It would, furthermore, appear that such avenues do indeed exist.

In the next chapter attention will be given to the world view of the natural sciences as well as responses from Christianity in order to further expound on the possibility of relating science to theology.



## CHAPTER 3

*The place does not honour the man; the man honours the place.*  
Talmud

### WORLD VIEWS AND THE SCIENCE-RELIGION DEBATE

#### INTRODUCTION

Drawing from the previous chapters, it becomes necessary to hone the angle of this study. Basic questions were initially asked not only as to the origin of the universe, but also to the purpose and meaning of it from a Christian point of view.<sup>1</sup> It was pointed out that two "sets of answers" have developed to these questions through the ages, namely the mainly Judeo-Christian theological one on the one hand, and a mainly scientific one on the other hand. The theological "answer" is based on the historical point of departure that God created everything from nothing (*creatio ex nihilo*), and that He maintained His creation in a "forceful" and "fearful" way. Sin was the root cause of all negative human experiences.

Scientific discoveries soon started questioning theological assertions and it did not take long before the relationship between science and theology became depicted as a "war". As each new discovery challenged the theologians' incapacity and/or unwillingness to accede to new evidence, the gap between science and theology widened. This conflict has indeed been called a conflict of world views.<sup>2</sup>

In freeing itself from the "bonds" of unsubstantiated/unwarranted restrictions, science developed to the point where it was accepted that

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<sup>1</sup> In a philosophical sense, this is called "Cosmology" - i.e. that branch of metaphysics which concerns questions of the origin and structure of the universe, its creation or everlastingness, vitalism or mechanism, the nature of law, space, time, and causality. See W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, p. 108

<sup>2</sup> R.M. Crewe, *The World View of the Natural Sciences*, Scriptura 61, 1997, p. 93

only those elements of reality which could be observed through the senses, were considered to be the domain of science (logical positivism). This position, however, ruled out the participation of philosophy, ethics as well as theology and a movement to counter the "radical" evaluation of the logical positivists came about.

The latter development resulted in modifications within both the scientific as well as the theological areas. Theology as well as the natural sciences accept that, whilst the extreme form of resistance exists which claims that the contrasts between the methods of theology and science are too radically different to bridge, there is also room for the acceptance of many parallels between theology and science. It is mainly the Liberal and Process Theology which now make the latter position possible.

In order to ultimately integrate thoughts on the Liberal as well as Process Theology on the relationship between science and theology, it is deemed necessary to understand the concept of *world views* as well as the difference between the world views of the natural sciences and theology's response thereto. By describing the world views of both the natural sciences as well as that of theology, the link between "opposing" world views will become clear and a map according to which Liberal and Process Theology can illustrate a possible form of science-theology integration as far as this study is concerned, may also become clear.

The following aspects will be dealt with:

## **World Views**

### **The Concept of "World Views"**

*World views are provisional, dynamic and interactive*

*World views as stories*

*World view development in the West*

### **The Pythagorean Model**

### **Aristotelian Science**

## The Renaissance and Newtonian Science Nineteenth and Twentieth Century Science

### The World View of the Natural Sciences

### Other Elements in respect of The World View of Natural Science

*One Specific Scientific World View does not Exist*  
*Science, value and belief*  
*Critical Realism as World View*

### Christian Reaction to the World Views of Science and Technology

*The close Relationship between Christianity and  
Natural Science*  
*The World View of Science and the Non-Christian  
Religions*  
*Christian Responses*

### The Christian World View

### Conclusion

## WORLD VIEWS

A world view is a complex set of ideas/perceptions of reality. Some definitions of world views include the following:

- ♦ A world view "... is a set of fundamental beliefs explaining our calling and future in the world."<sup>3</sup>
- ♦ A world view is a "... collection of beliefs, attitudes and assumptions that involves the whole person - not only the intellect - and has some kind of coherence and universality and imposes

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<sup>3</sup> J. Olthuis, "On World-Views", *Christian Scholar's Review* 14(2), 1985, p. 155

itself with a power far greater than the power of facts and fact-related theories."<sup>4</sup>

Taking some of the existing definitions of a world view into account, it is accepted that no specific definition exists which adequately explains the term, because of which it is perhaps feasible to distinguish at least the following elements:<sup>5</sup>

- ♦ It refers to the way in which one understands oneself and one's world, the view one has on ultimate questions such as where one is coming from and where one is going, what one's place in the world is and how one can live a meaningful life.
- ♦ A world view includes the philosophical, theological, scientific and popular generalizations of the world.
- ♦ World views are closed systems of belief, but they can never claim to be complete.
- ♦ World views are always positive.
- ♦ Intolerant world views seem to be becoming outdated because of increasing cultural interaction, an existing dynamic pluralism and the constant change of ideas within them.

## THE CONCEPT OF "WORLD VIEWS"

The following points in respect of the world views of science and technology are applicable:<sup>6</sup>

- ♦ ***World views are provisional, dynamic and interactive.*** World views are culturally bound and reflect the time in which they were developed. It reflects reality as it is perceived and not necessarily

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<sup>2</sup> P. Feyerabend, *Quantum Theory and Our View of the World*, as quoted in Hilgevoord J. (ed.), *Physics and our World*, Cambridge, Cambridge University Press, 1994, p. 152

<sup>5</sup> C. W. du Toit, *The Dominating World-views of Science and Technology : Responses from Christianity*, Scriptura, 1997:2, pp. 151 - 165

<sup>6</sup> Du Toit, C.W., op. cit., pp. 152 et. seq.

as it is. As perceptions change, so do world views. Science influences world views, but world views are also influenced by science.<sup>7</sup> A basic consistency exists in world views which is underpinned by current values (which is why, despite the dynamic nature of world views, they do not change easily). Redfield says in this regard that it is good to remember that world views are more often not static, a thing or an object - they are things constantly in process.<sup>8</sup>

- ♦ ***World views as a story.*** The world views operative in a society are the "master stories" by which the members of the society live. These stories are essential for the cohesion and dynamics of any society.

(It is in this sense vital that religion takes notice of the new cosmological story as told by scientists. This story, which has so many parallels with the story of the Biblical creation of the universe, influences man's perception of God, the creation, as well as his relationship with fellow man. This does not mean that the cosmology story of the scientist becomes religion, but rather that a new opportunity to integrate religion and science exists.)

- ♦ ***World view development in the West.*** Kuhn<sup>9</sup> mentions the following four models in the history of science:

**The Pythagorean Model**, which is based on the view that nature has a mathematical order. This view gave shape to the classical world-view stressing rational contemplation and harmonious unity as the foundations of justice and beauty, as well as the mystical union with the divine.<sup>10</sup>

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<sup>7</sup> A.F. Holmes, *Contours of a World View*, Michigan, Eerdmans, 1983, quoted in Du Toit, C.W., op. cit., p.153

<sup>8</sup> M.P. Redfield (ed.), *Human Nature and the Study of Society: The Papers of Robert Redfield*, Vol. 2, Chicago, University of Chicago Press, 1963, p. 281, quoted in P.F. Craffert, *The Stuff World-Views Are Made Of*, Scriptura 61, 1997, p. 194

<sup>9</sup>Ibid., p. 42

<sup>10</sup> Pythagoras' interest in order in the cosmos was directly interwoven with his love for mathematics as well as music - he is even reputed to have discovered that the chief musical intervals could be expressed in mathematical ratios. Mathematics was not only the key to understanding nature, but also provided direction to the soul to eternal reality. It was not only a research tool, but also a quasi-religious means of initiation

**Aristotelian Science** underlined change in nature and human art and stressed final causes or ends. It is not difficult to see that a teleological world view was immanent, which suggested a hierarchical arrangement in both creation as well as society. A natural-law ethic based on humanity's essential ends formed part of this world view.<sup>11</sup>

**The Renaissance and Newtonian Science** abandoned final causes and tried to explain the world in terms of matter and motion only - a mechanistic model.<sup>12</sup>

**Nineteenth and Twentieth Century Science** remodeled the mechanistic model and brought energistic physics (by Einstein's relativity theory) and by developmental biology (evolution). Thus the concepts of a *relational process* of an *organic* nature came into being.

During the Middle Ages the Christian view which dominated especially Western Europe, was based on the assumption that life was a mere stopover between creation and the final judgment. All developments on earth were part of God's divine scheme and nothing could happen outside His will. In the nineteenth century the idea began to grow that perfection was possible in this world. Thus *deism* was born, which perceives the world in a mechanistic way - God created the universe as a machine, set it in motion after having engineered and perfected it so that it could be left alone to run its predestined course.<sup>13</sup>

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into the mystery of being. See Colin Brown, *Christianity and Western Thought - A history of Philosophers, Ideas & Movements*, Vol. 1, Leicester, Inter-Varsity Press, 1990, p. 23

<sup>11</sup> The teleological argument is based on Aristotle's doctrine of the Prime, or Unmoved Mover. See Brown, C., *Ibid.*, p. 43

<sup>12</sup> Newton did not discard the role of God, but asserted that God set all things in motion whilst He was not set in motion himself - the First Cause of everything was thus certainly not mechanical. See Christopher Kaiser, *The History of Christian Theology, Vol. 3, Creation & the History of Science*, London, William B. Eerdmans Publishing Co., 1991, p. 182

<sup>13</sup> J. Rifkin, *Entropy*, New York, Viking, 1980, pp.17 - 18, quoted in Du Toit, C.W., *op. cit.*, p. 156

Progress is geared toward perfection of the machine - man loses his place in this world and Christian hope ceases to play an overriding role.

This mechanistic view ran into counter arguments in the twentieth century when questions were raised as to the possibility that reality could be represented in any truly objective way. Thus we find ourselves no longer part of a more or less unified world view, but rather in a culture of "...uncertainty, provisionality, contingency and conditionality ... [which] ... concerns values, truths, interpretations and world views."<sup>14</sup>

## THE WORLD VIEW OF THE NATURAL SCIENCES

The natural world should be described through empirical methods and attempts to do so by theologians amount to essentially allegorical descriptions. Furthermore, "... when natural phenomena require explanation, scientific explanations should take priority and the older religious ones should be regarded as superseded."<sup>15</sup>

The above view is not universally shared. Midgley<sup>16</sup> makes the point that scientists are generally poorly trained in areas of knowledge that fall outside the scientific domain. These areas are those that are not amenable to scientific analysis. Crewe also points out that questions such as : "Why are there any laws of physics, what determines their form, why does anything exist at all?", cannot be addressed in the same way as natural phenomena are investigated. They (scientists) are also unable to adjudicate on ethical issues and inquiries as to what is

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<sup>14</sup>Bohm even speaks of a postmodern physics which integrates matter and consciousness and does not separate facts, meaning and value. Science becomes inseparable from any kind of intrinsic morality, and truth and virtue would not be kept apart as they currently are in science. The latter point of view probably forms an extreme view on the other end of the scale of the integration of inter alia science and theology as mentioned by Crewe - see endnote 2 above. See also D. Bohm, *Post Modern Science and a Post Modern World*, in Griffin, D.R. (ed.), *The Re-Enchantment of Science*, Albany, State University of New York Press, 1988, pp. 67 - 69.

<sup>15</sup>Crewe, R.M., op. cit., p. 94

<sup>16</sup>M. Midgley, *Evolution as Religion*, London, Methuen, 1985, p. 180

good/bad, desirable/undesirable which are socially determined questions. Scientific answers cannot be given in relation to cosmology as far as questions to the ultimate origin of the universe are concerned.<sup>17</sup>

Adolf von Harnack gave an interesting view on world views. He proposed that *science* is "... knowledge of reality for purposeful action."<sup>18</sup> Science has the following stages:

- ◆ The first stage is that of *determining, analysing* and *ordering*. The natural sciences have tried to call this stage the *pure science* stage and also to have limited the natural sciences to this stage.
- ◆ The second stage is determined by the *knowledge of the original interrelationship amongst things*. Numbers, weights and measurements come into play as descriptive language of the mechanics of the world. According to Harnack a number of scientists were of the opinion that all science comprised of this knowledge of the mechanics of the world and that "... it also gives rise to and embraces a perfect and completely satisfying world-view ... the world-view of the natural sciences."<sup>19</sup>
- ◆ The third stage investigates *the life-movement of every living form* - life is seen as an unending variety of living groups each of which is a world unto itself.
- ◆ The fourth stage is directed towards *knowledge of human kind* - the conscious spirit meets up with ideas, norms, ad values.
- ◆ The fourth and highest stage flows into philosophy, which in itself is not a science.

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<sup>17</sup>Crewe, R.M., op. cit., p. 95

<sup>18</sup> M. Rumscheidt (ed.), *Adolf von Harnack - Liberal Theology at its Height*, London, Harper & Row, 1989, p. 43 et. seq.

<sup>19</sup> Ibid.



The abovementioned arguments, furthermore, represent one of the eight views postulated by Peacocke on the possibility of science-religion integration, namely that "*Science generates a metaphysic in terms of which theology is then formulated*".<sup>20</sup> As this is one of eight different models currently under discussion, it can not be "cast in stone", as there are many other such possibilities. It is merely presented here as an extremist view amongst others.

## OTHER ELEMENTS IN RESPECT OF THE WORLD VIEW OF NATURAL SCIENCE

- ◆ *One Specific Scientific World View does not Exist.* The assertion that a single natural science world view exists, does not correspond with the facts. A simple map of reality does not exist. According to Feyerabend<sup>21</sup> a single coherent world view that underlines all of science, is either a metaphysical hypothesis trying to anticipate a future unity, or a fake. Du Toit mentions "... for example, an over-emphasised materialism in molecular biology, and a radical subjectivism in, for example, some versions of quantum measurement and the anthropic principle."<sup>22</sup> In practice science does not always decide on how it is referred to, believed in, and integrated into a world view held in a specific society.

It is interesting to note that Schilling views the construction of world views as "strictly speaking" beyond the means of science and that it is the business of philosophy. The term "scientific world view" can thus be objected to. Science has contributed

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<sup>20</sup>A.R. Peacocke (ed.), *The Sciences and Theology in the Twentieth Century*, London, Oriel Press, 1981, p. xv

<sup>21</sup> P. Feyerabend, *Has the Scientific View of the World a Special Status Compared with other Views?*, as quoted in Hilgevoord J. (ed.), *Physics and our World*, Cambridge, Cambridge University Press, 1994, p. 141

<sup>22</sup> Du Toit, C.W., op. cit., p. 158

much of the basic material out of which world views are made, but world views are derived *from* science and not *by* science.<sup>23</sup>

- ♦ ***Science, value and belief.*** In addition to what Crewe<sup>24</sup> indicated as criticism of the world view of natural science, Du Toit highlights the following:<sup>25</sup>
  - The values, attitudes and orientations the world view of science exerts, cannot be overestimated. The domain of science does not, however, necessarily include the purpose and meaning of human existence.
  - Scientific assertions do not necessarily exclude the conveyance of facts, personal beliefs and commitments. It is not always possible to know how a specific world view influences scientific observations.
- ♦ ***Critical Realism as World View.*** In describing reality<sup>26</sup>, realism seems to be the only acceptable approach. Realism accepts that an objective world exists but that this reality (world) cannot be constructed. Some disciplines describe reality by means of text only, whilst others study it empirically after which it is then described. The reality is the same, but the description thus may vary. "To do justice to different ways of approaching reality, to different disciplines, epistemologies and modes of thinking, a pluralist critical rationalism ... seems to offer a solution".<sup>27</sup>

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<sup>23</sup> H.K. Schilling, *The New Consciousness in Science & Religion*, London, SCM Press Ltd., 1973, p. 43

<sup>24</sup> See footnote 2 above

<sup>25</sup> Du Toit, C.W., op. cit., p. 158 - 159

<sup>26</sup> According to Reese, *realism* is set to contrast *nominalism* and in the problem of the independence of the external world, *realism* stands in contrast to *idealism*. See W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, p. 480

<sup>27</sup> J. Agassi, "Pluralism and Science", *Methodology and Science* 24(1), 1991, pp. 99 - 118

It thus seems that the world views of realists should also relate to the individuals involved, whether they are dealing with empirical facts, theories, or the like.

## CHRISTIAN REACTION TO THE WORLD VIEWS OF SCIENCE AND TECHNOLOGY

- ◆ *The close Relationship between Christianity and Natural Science.* The relationship between Christianity and science in mainly Western Europe was described at length in Chapter 2. This close relationship was no coincidence as the same cultural background was shared. History showed that there was a distinct effort to link religion with science, but these efforts gradually decreased until a more or less autonomous state was achieved by the sciences. Theology did retain some form of autonomy - e.g. the rejection of evolution which removed the necessity of God creating out of nothing. It can, however, safely be asserted that, “theologies ... ignored most scientific theories, accepted some and rejected or reinterpreted others”.<sup>28</sup> The Christian world view today generally accepts the world view of science and technology. The interaction between science and theology seems a one way affair in that scientists generally refrain from taking moral positions on the one hand, while theologians equally accept most observations by scientists. Du Toit, furthermore, points out that the latter position is questionable as all members of society should take responsibility for ethical arguments - giving meaning to life and contributing to world views are the responsibilities of both science as well as theology.<sup>29</sup>
  
- ◆ *The World View of Science and the Non-Christian Religions.* The general world view of science seems to be universally accepted, but does this situation not impose a mould where other world views may have developed separately? Thoughts on the new cosmology for example

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<sup>28</sup> Du Toit, C.W., op. cit., p. 160

<sup>29</sup> Ibid.

invariably invoke similarities to the Christian theistic line - "... the overall picture is one in which the fascination, beauty, order and rationality of the cosmos with its finely-tuned and kenotic structure, are linked with the Christian God as creator, redeemer and sustainer, immanent in and responsible for the process."<sup>30</sup> Questions thus arise because it is almost as if a value judgment is cast as to the "suitability" of other religions to accept the presented facts.

The question of scientific objectivity is clearly under suspicion here.

It should not, however, be forgotten that there has always been a close relationship between Christianity and the development of science - see the conclusion of Chapter 2.

- ◆ ***Christian Responses.*** The world view of science affects the total cultural environment and the response to the science world view comes from many quarters (including philosophers, writers and ecologists) rather than from theology only. Du Toit lists the following criticism:<sup>31</sup>

- \* The protest against the effects of applied science
- \* The impossibility to slow down or halt technocracy with its detrimental environmental effects
- \* The unwillingness of scientists to admit the provisional nature of their theories
- \* The fact that most scientists seem to ignore the objections raised against a modernist approach
- \* The sustained claim that only science can better our lives.

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<sup>30</sup> Ibid.

<sup>31</sup> Ibid., pp. 162 - 163

For scientists issues like the language barrier, subject-object relationships, etc. are evidently not as important as for theologians, philosophers and language scientists, and they are criticised "... because they still hold to a literalistic text reading, discarding the works of historical criticism, ignoring the importance of the cultural and social background of biblical texts with their specific world view, style, genre, and so on."<sup>32</sup>

Science is sometimes construed as a religion, but science cannot be a religion because it lacks the essential features of a religion - if it is interested in linking its findings, fears, etc. to a god, it still has to look to religion.

It would, on the other hand, be self-defeating if religion ignores the knowledge generated by science, or if it refused to integrate it into its belief system. This mistake would certainly again lead to the confusing of "obscurantism" and "enlightenment", with a conflict between Christianity and science - see Chapter 2 (p. 90). By continuously integrating new knowledge, God would be kept "alive" and not be replaced by religion, with its negative effects on the world view of the theologies - the same sentiments can thus be expressed (albeit in different words).

- ◆ ***Christian Options.*** The nature of reality demands that both theological as well as scientific concepts be integrated in order to produce an effective and representative world view.<sup>33</sup> This does not mean that the theological doctrine is bound to any specific scientific hypothesis. It simply means that, to strive for comprehensiveness, it has to include the reasoning of the sciences. It can also be asserted that theologians as well as scientists play a role in the formulation and maintenance of world views and it is

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<sup>32</sup> Ibid.

<sup>33</sup> N. Murphy, "The Limits of Pragmatism and the Limits of Realism", *Zygon* 28(3), 1993, pp. 351 - 359, quoted in Du Toit, C.W., op. cit., p. 164

thus vital that cognisance is taken from various views and criticisms.

## THE CHRISTIAN WORLD VIEW

According to Cotterell the Christian's world view has three major components, i.e. his own awareness of the world, his understanding of the Bible, and his own self-interest.<sup>34</sup> The following is asserted:

- ◆ *The Christian's own awareness of the world.* The first stage of the development of a world view is the *observation* stage. What appears to be *normal* becomes invested with a moral quality - normal actions/observations become *right* actions, while unusual (*abnormal*) actions/observations actually become *wrong*. The second stage of the development of the world view is the *interrogation* stage and questions such as *why*, *who*, *when* and *how* are then asked.
- ◆ *The Christian's understanding of the Bible.* The task of answering fundamental questions is left to the Bible for Christians, as is the Bhagavat Gita for Hindus, the Qur'an for Muslims, the Book of Mormon for Mormons, the Tipitaka for Buddhists, etc. Thus we may find stories of beginnings (creation), ultimate consummation (afterlife) and for example a rationale for a particular lifestyle.
- ◆ *Self-interest.* Although there should theoretically be harmony between the world view and the text taken from Scriptures, it rarely happens that such harmony is absolute. This may be in part because of the individual's self-interest.

The Christian world view thus differs from other world views only in the belief in a self-revealing Creator who communicates with His creation.

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<sup>34</sup> P. Cotterell, *Mission and Meaninglessness*, London, SPCK, 1990, p. 25 et. seq.

## CONCLUSION

It was shown that one cannot assert that only one world view exists. It is furthermore questioned whether science can in fact claim to have constructed its own world view as some writers consider this is the sphere of philosophy. Reality does not exist in one unified form and when one analyses world views in general, one comes to the conclusion that there is a pluralism of multi-faceted and dynamic contributions to the establishment of world views.

The question is thus whether we should seek a unified world view? The inherent danger is that an integrated world view may distort one or the other through the initiation of alien concepts which may threaten its integrity. It is likewise true that a plurality of unrelated languages is equally problematic. The same reality is, after all, described. It thus seems prudent to explore possibilities of realistic integration - "... we must seek *a coherent interpretation of all experience*."<sup>35</sup>

It is appropriate then to inquire whether metaphysics<sup>36</sup> can bridge the gap between science and religion, because of its characteristic to actively seek an inclusive scheme to represent the most general characteristics of events. Metaphysics was bypassed as philosophical point of departure with the advent of *logical positivism* and *language analysis*, but (as has thusfar been pointed out at various stages of this study) there seems to have been a revival of a pluralism of thoughts in terms of general scientific inquiries (e.g. that scientists are generally poorly trained in areas of knowledge that fall outside the scientific domain and that they are also unable to adjudicate on ethical issues, and inquiries as to what is good/bad, desirable/undesirable which are socially determined questions).

The goal of theology should thus be "... neither isolation, at one extreme, nor closed synthesis at the other, but rather dialogue about

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<sup>35</sup> I. G. Barbour (ed.), *Science and Religion - New Perspectives on the Dialogue*, London, SCM Press Ltd., 1968, p. 27

<sup>36</sup> The term "metaphysics" means "beyond physics". It is thought of as the study of ultimates, of first and last things, its content going beyond physics, or any other discipline. See Reese, W.L., op. cit., p. 352

metaphysical assumptions and their coherence”.<sup>37</sup> The worlds of science and theology are in need of each other and “tentative” and “partial” integration of data could well illuminate a wider range of knowledge more adequately than any other alternative.

Liberal and Process Theology will thus be the subject matter in the next chapter, in an effort to explore the feasibility of some element of integration of specific parts of theology and science.

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<sup>37</sup> Barbour (ed.), I.G., op. cit., p. 28



## CHAPTER 4

*As scarce as truth is, the supply has always been in excess of the demand.*  
*Josh Billings*

### **LIBERAL AND PROCESS THEOLOGY AS POSSIBLE AVENUES FOR THE INTEGRATION OF ELEMENTS OF SCIENCE AND THEOLOGY**

#### **INTRODUCTION**

The science-religion debate in the West, the nature of which could just as well have been called a conflict, or even a war (depending on which era one was focusing), followed a pattern which could almost have been predicted. At the times when the prevailing authority was the church and during which time most power was centered in the church, pious pressure made sure that whatever scientific discovery surfaced, was moulded according to church thinking. Church thinking for a long time struggled to come to terms with the viewpoint that Scripture could not be interpreted literally and during all those years that the Bible was considered to be consisting of text literally dictated by God himself, anything which ran against this principle was simply considered to be blasphemous. How could anyone be allowed to say anything which was at variance with Scripture?

It is not difficult to see that the above situation brought about firstly a suppression of science, and secondly also a form of alienation from some scientific quarters. As the church began losing its grip politically, what was then perhaps rightly called the “war” of theology on science, gradually began to change into a more positive relationship but it initially bore little fruit to both theology as well as to science. The effect, however, in especially Western Europe, was that the role of religion was diminished to such an extent that some theologians

asserted that natural science is to be blamed for the secularisation of the West.

By the turn of the century the emancipation of science was completed to the extent that autonomy from theology was achieved. World views in which science as well as theology played a significant role began to manifest an interesting interplay. While a complete “severance of ties” was expected, writers on both sides took notice of developments within the “language games” of science and theology and the positive results of the philosophical labours rubbed off onto each other.

We thus had simultaneous modes of interpretations of the specific eras which correspond to what Du Toit<sup>1</sup> calls the *empirical* level (in which mainly the natural sciences played the dominant role), and the *existential (ethical)* level in which theology plays the dominant role. What was to follow, was the *metaphysical* level which would initiate tentative efforts in the process of integration. As indicated in the previous chapter, it thus seems appropriate to inquire whether metaphysics can bridge the gap between science and religion.

One result of the emergence of scientific knowledge about the origins and history of the development of the universe, was that existing knowledge about God was increased. This happened through the emergence of the so-called *natural theology*, which Barrett describes as “... the search for God through the exercise of reason and the observation of the world, especially *scientific* observation.”<sup>2</sup> The dialogue between science and religion and especially the role that science could play to “... purify religion from error and superstition ...

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<sup>1</sup> C.W. Du Toit (ed.), *The Action of God in the World*, Pretoria, UNISA, 1994 (Paper delivered at a seminar of the SA Science and Religion Forum of the Research Institute for Technology and Religion held at UNISA on 23 May 1994), p. 5

<sup>2</sup> Peter Barrett, Natural Theology in a Pluralist Society, in *Scriptura* 61, 1997:2, p. 167

from idolatry and false absolutes”<sup>3</sup> was for example mentioned by Pope John Paul II in 1988 in a statement in which he made a plea for dynamic interchange which should be initiated by theologians “... since they have in the past made so little effort to understand the findings of science.”<sup>4</sup> It is also noted that, in accordance with the belief of the Process Theology, God reveals himself not only through interpretation of Scriptures, but also through nature. The lack of effort by theologians to incorporate scientific findings in their “revealed messages” is thus considered to be somewhat incomplete. An objective of this chapter is thus also to argue for a greater use of scientific facts about nature in order to present a more complete picture of God’s revelation.<sup>5</sup>

It is intended to address the latter observation through a discussion of the following themes:

### **The Rise of Liberal Theology**

#### ***Characteristics of Liberal Theology***

#### ***Theological Liberalism***

#### ***Von Harnack’s Scientific Theology***

#### ***The Growth of Biblical Scholarship***

#### ***The Appeal to Religious Experience as the Basis for Justifying Religious Beliefs***

#### ***The Primacy of the Ethical in Religion***

### **Conclusion**

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<sup>3</sup> R.J. Russel *et al* (ed.), *Physics, Philosophy, and Theology: A common Quest for Understanding*, USA, Notre Dame Press, 1988, Introduction

<sup>4</sup> Barrett, P., *op. cit.*, p. 168

<sup>5</sup> The author wishes to point out that reference to the role of nature as another form in which God reveals himself should not be seen as moving in the direction of a natural

## Process Theology

### *Process Theology*

### *Process Conceptuality*

#### *Metaphysic of Becoming*

*Everything consists of events, occasions,  
occurrences and happenings*

*All is at the same time in process*

*Everything is related to everything else in the  
world*

*There is both freedom and responsibility*

*The most powerful thing in the world is  
persuasion*

### *Alfred North Whitehead's contribution*

### *John Cobb Jr's contribution*

### *A summary of the basic ideas of process philosophy*

#### *The Primacy of Time*

#### *The Interfusion of events*

#### *Nothing exists except by participation*

#### *Reality as Organic process*

#### *The Self-creation of Each Event*

## Process New Thought

### *Characteristics of Process New Thought*

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theology, but rather an affirmation of Pope John Paul II's plea for dynamic interchange between science and theology.

## Process Theology and Science

### *Process Theology's concept of God*

*The immanence of God*

*Divine creation and divine action*

*How does divine action work?*

*The doctrine that God changes*

*The dipolar nature of God*

*Eternal objects and creativity*

### A case study : Process Theology and the New Biology

*The existence of creative action of a deity of infinite goodness and power*

*The interconnectedness of all life forms and their inextricable continuity*

*The place of chance*

*The concept of a predestinarian deity*

*Omnipotence*

*The aspect of chance*

### Summary

### Natural Theology

### Conclusion

## THE RISE OF LIBERAL THEOLOGY

The origins of Liberal Theology goes back to the 18<sup>th</sup> century, when there was a rise of historical studies, post-Renaissance science and the

critical philosophy of the Enlightenment. Science challenged accepted orthodoxies one after the other. The Liberal Theology was born out of this crisis and Schleiermacher (1768 - 1834), often called the “father of Liberal Theology”, and his followers, wanted to think about the Christian faith “... in terms of modern knowledge so that the modern world could be faced with the Christian faith.”<sup>6</sup> The *characteristics of Liberal Theology* are:

- An acceptance of the methods and procedures of modern historical studies
- A concomitant rejection of verbal inspiration
- A clear anti-dogmatic emphasis
- A tendency to prefer existentially defined religion to creeds and confessional statements
- A considerable emphasis on the moral character of faith

The scholarly discipline (*Wissenschaft* according to Harnack), as one of the main proponents of Liberal Theology in this century, Adolf von Harnack, called his new found theology by the turn of this century, has its roots in *theological liberalism* which he related to “... the imperative freedom: the freedom of thought, of pursuing truth on every path, the freedom from interference from those who have been given authority in human institutions, from human declarations and rules so that conscience may develop as fully as possible.”<sup>7</sup> This freedom was inseparable from responsibility toward human actions as well as speech

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<sup>6</sup> Martin Camroux, “The Case for Liberal Theology”, *The Expository Times*, 103, March 1992, p. 168

<sup>7</sup> M. Rumscheidt (ed.), *Adolf von Harnack - Liberal Theology at its Height*, London, Harper & Row, 1989, p. 33

- speaking with responsibility, openness as well as modesty, is what he had in mind. Von Harnack assigned the following characteristics to Liberal Theology through his writings:<sup>8</sup>

- ♦ An incorruptible reasonableness and an unshakable Christian faith
- ♦ The acceptance of a freedom of theology, whilst at the same time a dependence on the “Absolute Spirit” to which Christians pray
- ♦ Liberal Theology is primarily and definitely interested in human (particularly Christian) religion
- ♦ Adopting a critical attitude towards God’s word and church tradition
- ♦ It is an anthropocentric<sup>9</sup> theology
- ♦ The task was to study Christian doctrine and illuminate it by considering the question of its real meaning, giving it a critical yet positive examination - in other words to raise it from the level of intuition, to pure concept.

Von Harnack (1851 - 1930), who lived approximately 100 years after Schleiermacher (1768 - 1834) and who for Camroux “... is the greatest liberal theologian of his age”<sup>10</sup>, summed up what he called *scientific theology* (Liberal Theology) with the following fifteen questions:<sup>11</sup>

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<sup>8</sup> Ibid., p. 33 et. seq.

<sup>9</sup> The view represents the assertion that man is the centre of reality. See W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, p. 17

<sup>10</sup> Martin F. Camroux, “Harnack to Jenkins - Liberal Theology in the Twentieth Century”, *The Expository Times*, 108, May 1997, p.233

<sup>11</sup> Rumscheidt (ed.), M., op. cit., pp. 85 - 87

- \* Is biblical revelation completely uniform and if not, should it not be interpreted from the basis of historical experience and critical reflection?
- \* Is biblical revelation not so incomprehensible and indescribable that one should also depend on godly inspiration in order to understand them?
- \* Is the experience of God (*Gotteserlebens*) different from or identical to faith, how can it come about without the preaching of the gospel, and how can the preaching of the gospel take place without historical knowledge and critical reflection?
- \* Is *Gotteserlebens* contrary to all other experience (*Erleben*), and if so, how can it be avoided that one should withdraw from this world? But because we belong to this world, we cannot withdraw because even withdrawal is based on a decision of will and thus something worldly.
- \* If “life in God” is completely different from “life in this world”, how can one reconcile the idea of “love of God” without the idea of “love of one’s fellow” (which is the central theme of the gospel)?
- \* If “life in God” is completely opposite from “life in this world”, how does one come to know what godliness/goodness is?
- \* If God is unlike anything we say about Him on the basis of the development of culture and on the basis of ethics, how can this culture and one’s own existence be protected against atheism?



- \* If Goethe's pantheism and Kant's conception of God are merely opposites of real statements about God, how can one avoid that these statements are ultimately given over to barbarism?
- \* But if the converse is true, that in all physical and spiritual developments opposites are at the same time opposite steps, how can this knowledge be grasped without historical knowledge and critical reflection?
- \* If the knowledge that God is love is the highest knowledge of Him and if this love, joy and peace are actually His domain, how can the Christian remain between absolute love and worldly love forever?
- \* If the knowledge that God is love, joy and peace is the highest knowledge of Him, how can barriers be erected between God and man's *Gotteserlebenis* where these emotions are experienced?
- \* If all sin was a lack of love, joy and peace, how can sin be checked without the preaching of the gospel which includes these emotions?
- \* If it is certain that whatever is subconscious remains subhuman as long as reason has not taken hold of it to comprehend it, protect it and purify it, how can one rebuke this reason and eradicate it?
- \* What else besides scientific theology is able to undertake the study of the role of Christ as the centre of the gospel?
- \* Is there any other religion which has the strong ties with science in general, despite without the preaching of the gospel its incompleteness?

It is important to understand that the Liberal Theology was born out of particular circumstances where the Christian faith was deprived of its

importance through *inter alia* the effect of scientific discoveries. Arguably the most important effect Liberal Theology brought about within the Christian faith, was the deviation from the orthodox notion of the Christian God, who should not be seen as "... a harsh authoritarian figure whom you approached with fear", but rather "... a loving father, a God of love and compassion".<sup>12</sup> This opened up the way for an acceptance of the view that scriptures should be studied critically, which in its turn probably made the Christian faith more amenable to the sciences. Barbour says in this regard that "its [Liberal Theology's] most distinctive feature was a new methodological approach, the appeal to human experience rather than to revealed ... theology"<sup>13</sup>, and he sums up the contribution of Liberal Theology as follows: *The Growth of Biblical Scholarship*. Objective methods of historical and literary research similar to those applied to other ancient documents became the standard way to analyse biblical text. That this method (the *comparative* approach) initiated a positive approach to the study of biblical text and the value of this approach, was soon confirmed. For example, the first five books of the Bible to which authorship was traditionally ascribed to Moses, was proved to have had multiple authorship.<sup>14</sup>

Attention began to be directed to the individual viewpoints and interests of authors, their purpose in writing and historical context in which they lived. It became evident that the authors were "very

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<sup>12</sup> Martin F. Camroux, Harnack to Jenkins - Liberal Theology in the Twentieth Century, op. cit., p.233

<sup>13</sup> Ian G. Barbour, *Issues in Science and Religion*, Study Edition, London, Redwood Press Ltd., 1972, p. 104 - 105, et. seq.

<sup>14</sup> Careful examination revealed a duplication of some stories, differences of style, vocabulary and thought. The details of priestly rituals in the Temple were for example shown to have been codified approximately 800 years after Moses. See Barbour, I.G., Ibid., p. 105. Modern Scripture analysts also for example agree that the Old Testament of the Bible was translated/compiled from two known sources (the Hebrew Masoretic Text and the Greek translation known as the Septuagint), as well as an unknown Hebrew translation found among the Dead Sea Scrolls - see Dirk L

human” with different styles and sometimes incorporating legend of the time. Whereas the *modernists* tended to want to discard the Bible altogether as having little religious value, liberal theologians accepted the human character of biblical record but also considered it to be a treasure of religious insights and teachings. God had revealed himself, not in the dictation of an infallible book, but in the presence in the lives of Christ, the prophets and the people of Israel. ***The Appeal to Religious Experience as the Basis for Justifying Religious Beliefs.*** Friedrich Schleiermacher held that the basis of religion is not revelation, nor cognitive reasoning, nor even ethics, but is a distinctive religious awareness. The 18<sup>th</sup> century left little room for God with the mechanistic world view and he proposed a nonrational aspect of religion - “religion arises not in our intellectual faculties but in the feelings of utter dependence that a finite creature experiences when faced with its own finitude and contingency.”<sup>15</sup> Religion is a living experience and not formal beliefs, practical ethics or speculative philosophy - it must be understood in its own terms. Religion has an objective connection i.e. man’s consciousness of God. The Bible’s value lies in its recording of religious life of Israel, Christ and the early church which mediated the awareness of God. Schleiermacher’s concept of belief in creation is this “feeling of absolute dependence” of human existence (*schlechthiniges Abhängigkeitsgefühl*).<sup>16</sup> ***The Primacy of the Ethical in Religion.*** Albrecht Ritschl’s “theology of moral values” is in agreement with Kant that no proper knowledge of God can be achieved by theoretical reasoning or philosophical speculation - religion is a matter of practical reasoning which is inseparable from conscience and judgments of value.<sup>17</sup> Like Schleiermacher he looked

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Büchner, The use of the Old Testament in the Letter to the Hebrews, *The South African Baptist Journal of Theology*, Vol. 5, 1996, p. 113

<sup>15</sup> D. Stewart, *Exploring the Philosophy of Religion*, New Jersey, Prentice-Hall Inc., 1976, p. 20

<sup>16</sup> A.R. Peacocke (ed.), *The Sciences and Theology in the Twentieth Century*, London, Oriel Press, 1981, p. 128

<sup>17</sup> Barbour, I.G., op. cit., p. 107

to man's religious experience, but his interpretation is that the focus is on man's ethical will. The transformation of man's life in response to the personality of Christ is the main experience and the historical life of Christ is thus of great importance to him. Although the past plays an important role in religion, the experience of forgiveness and reconciliation is what brings the present into play. The task of man is to bring about a Kingdom of God on earth in which love and service are expressed in human relationship. A sharp distinction was made between man and nature - the image of evolution was not rejected but "conquered" by affirming the victory of the spirit over nature. This in effect meant that liberal thoughts on evolution were more open and relaxed than the point taken by the modernists because the basis of theology was sought elsewhere, namely in the religious and moral experience rather than Scriptural revelation and natural theology. The knowledge of God "... comes primarily from man's religious and ethical consciousness, not from the Bible or the evolutionary process."<sup>18</sup> The Liberal Theology thus stresses the immanence of God rather than His transcendence (Christ's life as example is more important than His death, man's possible moral improvement rather than his sinful nature is underlined). Criticism against Schleiermacher's views mainly centres around the major flaw in Schleiermacher's proposal, namely that he proposes an entirely subjective kind of religion - religion arises in feelings, but feelings of what? What were the contents of these experiences? Schleiermacher tried to respond to these questions by indicating subjectivity in terms of awe, utter dependence, devotion etc.<sup>19</sup> A possible reply to this position is found in Sedgwick's assertion that it "... is necessary to understand the experience of the knowledge of God.", and there "... must therefor be a coherence and intellectual rigor about a theological

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<sup>18</sup> Ibid., p. 108

<sup>19</sup> See Stewart, D., op. cit., p. 21

restatement of the experience of revelation.”<sup>20</sup> It is noted that revelation is not disregarded, but rather “enhanced” by coherence and intellectual rigor. Liberal theology constantly makes an effort to seriously take into account the existing intellectual climate in which Christian theology is presented as faith.

In **conclusion**, the Liberal Theology adds the following to the science-religion debate:

- The great value of the Liberal Theology lies in the new attitude towards theology which brought a fresh breeze to orthodox dogmatism as it transformed orthodox dogmatism into a methodology which remains valuable even until today. Attitudes similar to those of the scientists thus became appropriate in religious inquiry - openness and tentativeness should be applied to human experience.
- According to Coulson, science involves presuppositions and moral commitments not unlike those in religion, e.g. that the world is lawful and intelligible, and that the scientist has an unprovable faith in the orderliness of the universe. Moral attitudes required by science are also similar to those required by religion - humility, cooperation, universality, integrity, the scientists personal judgment, commitment to truth, participation in a community of inquiry, etc.<sup>21</sup>
- Religion should provide a consistent and comprehensive world view based on the critical interpretation of human experience.

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<sup>20</sup> D.W. Hardy and P.H. Sedgwick (eds.), *The Weight of Glory - A Vision and Practice for Christian Faith : The Future of Liberal Theology*, Edinburgh, T & T Clark, 1991, p. 1

<sup>21</sup> Barbour, I.G., op. cit., p. 127 - 128

- The concept of revelation (see Chapter 2) is retained but fine-tuned : Biblical revelation's uniqueness is minimised as it is not the only means employed by God to reveal himself. There are also the structures of the created order, man's moral conscience, the various religious traditions of the world, and Christ (who is not considered to be an exclusive channel of revelation of God). It is also accepted that revelation is received by fallible man and can thus be distorted through his limited comprehension. Freedom of thought with respect to our knowledge of God and its relationships to other forms of knowledge thus forms the basis of the presence of God in contemporary life.

Theologically, Liberal Theology did not escape criticism. Heron<sup>22</sup> for example, questions Liberal Theology's interpretation of the essence of Christianity that it lies "...in its high spiritual, ethical and personal values, in 'the message' and 'the kingdom' rather than in Jesus Christ himself." While these and other criticisms may be valid, it is noted that those elements of Liberal Theology which are mentioned here in connection with the possible improvement of the relationship between science and religion, form arguments which can hardly be disputed in terms of their role in this particular sense.

## PROCESS THEOLOGY

For Alfred North Whitehead (1861 - 1947) and his intellectual followers *Process Theology* is the basic metaphysical scheme which emphasizes becoming, organism, experience and creativity.<sup>23</sup> It

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<sup>22</sup> Alasdair I. C. Heron, *A century of Protestant Theology*, Lutterworth Press, London, 1980, pp. 37 - 38

<sup>23</sup> M.L. Pieterse, "Orthodox Christianity, Wesleyanism, and Process Theology", HTML Version, *INTERNET*, 8 November 1997. (This article was also published in the *Wesleyan Theological Journal*, Vol. 15:2, pp. 45 - 58)

comprises the thesis of dynamism, development, and improvement as articulated in the work of Teilhard de Chardin (1881- 1955) and others such as the American philosopher, Charles Hartshorne (1897 - ), and yet others whom he substantially influenced.

For Norman Pittenger<sup>24</sup>, *process conceptuality* means the following:

- \* Firstly, *everything consists of events, occasions, occurrences and happenings*. This is true of the natural order which the physicist studies, the areas of investigation of the life-sciences (biology) studies, and it is equally true of human experience (psychology, sociology and physiology). God is not an essence, but rather a series of events - as much becoming as anything else.
- \* Secondly, *all is at the same time in process* - there are no fixed entities. God is not becoming more divine, He is more realising His divine reality in relationship to the cosmos with which He identifies himself unceasingly. In other words, God is viewed "... as active within the historical process", as Cobb describes it.<sup>25</sup>
- \* Thirdly, *everything is related to everything else in the world*. By the process of "prehension", everything is constantly in movement of give-and-take, outgoing and receiving, participation and interrelationship. "Whiteheadian process thought gives primacy to interdependence as an ideal over independence."<sup>26</sup> God is

<sup>24</sup> N. Pittenger, *Process Theology : A Whiteheadian Version*, in Cargas, H.J. and Lee, B (eds.), *Religious Experience and Process Theology - The Pastoral Implications of a Major Modern Movement*, New York, Paulist Press, 1976, pp. 4 - 7

<sup>25</sup> John B. Cobb Jr., and David R. Griffin, *Process Theology - An Introductory Exposition*, Philadelphia, Westminster Press, 1976, p. 14

<sup>26</sup> *Ibid.*, p. 21

not simply the main causative agency - He is also the chief recipient of all that happens in the created order.

- \* Fourthly, *there is both freedom and responsibility*. For man this means that most of the time, choices are made.
- \* Fifthly, *the most powerful thing in the world is persuasion* or love, tenderness or gracious concern. This is what Teilhard de Chardin called “amorization”.<sup>27</sup>

### *Alfred North Whitehead's contribution*

According to Whitehead, “Metaphysics is nothing but the description of the generalities which apply to all the details of practice.”<sup>28</sup> There are two kinds of contrasts in our experience of the world around us - *permanence* and *change* on the one hand. The metaphysician thus begins with asking questions such as: What is the persisting element? Is there some sort of unchanging essence in the world? Are there perhaps two spheres, one of timeless universals and another of changing particulars? On the other hand there are also contrasts between *those we can observe* and *those we cannot*. Metaphysicians thus ask “Is reality composed of two kinds of elements, mind and matter, or of only one kind?”<sup>29</sup> Metaphysicians thus begin their task with particular observations of data, with their own subjective experience rather than with prior principals. “The true method of discovery is like the flight of an aeroplane. It starts from the ground of particular observation; it makes a flight in the thin air of imaginative

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<sup>27</sup> Pittenger, N., op. cit., p. 6

<sup>28</sup> D.R. Griffin and D.W. Sherburne, (eds.), *Whitehead, Alfred North - Process and Reality: An Essay in Cosmology*, Corrected Edition, New York, Free Press, 1978, p. 13

<sup>29</sup> J. W. Massey, *The Process Metaphysics of Alfred North Whitehead and its expression in a Christian Pastoral Ministry*, University of Natal, Unpublished M.A. dissertation, 1982, p. 11



generalization; and it lands again for renewed observation rendered acute by rational interpretation.”<sup>30</sup>

Whitehead's whole philosophy is based on a highly abstract and general *metaphysic of becoming*. Central to this metaphysic is his notion of "actual occasion," which is his term for an actual entity. According to Whitehead, the entire world is composed of these actual occasions, each of which is a centre of experience. These actual occasions are fleeting and perishing, always making room for successive occasions which also perish in their turn. Although these subjects of experience are transitory, each one is able to unify and objectify its experience and transmit it to subsequent subjects. By what Whitehead calls "prehension" an actual occasion receives the data of experience (also called "feelings") from previous actual occasions. By "concrescence" the receptive occasion integrates the data into a unified whole. By "transition" each occasion then donates its initial data and subjective response as a completely new datum to successive occasions.

Ian Barbour considers the process philosophy of Alfred North Whitehead as perhaps the only new systematic metaphysics developed in the 20<sup>th</sup> century.<sup>31</sup> As observed in Chapter 2, Process Philosophy attempts to include science and religion in a unified view of reality. The father of process philosophy, Alfred North Whitehead, tried to construct a system "... of ideas which bring aesthetic, moral and religious interests into relation with those concepts of the world which have their origin in natural science." Whitehead defines metaphysics as the study of the most general characteristics of events, and it must be coherent (i.e. logically consistent AND part of a unified system of interrelated ideas that presuppose each other).<sup>32</sup> Metaphysics must also

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<sup>30</sup> D.R. Griffin and D.W. Sherburne, (eds.), op.cit., p. 5

<sup>31</sup> Barbour, I.G., op. cit., p. 128 et. seq.

<sup>32</sup> D.R. Griffin and D.W. Sherburne, (eds.), op.cit., p. 13

be applicable to experience and thus have empirical relevance. It is the task of any thought system to organise and elucidate experience. Religion contributes its own independent evidence and metaphysics must take it into account when describing it.<sup>33</sup> Mascall points out in this regard that Whitehead leaned on the observation that the greatest contribution of medievalism to the formation of the scientific movement, comes “from the medieval insistence on the rationality of God, conceived as with the personal energy of Jehova”, and “... that faith in the possibility of science, generated antecedently to the development of modern scientific theory, is an unconscious derivative from medieval theology.”<sup>34</sup>

### ***John Cobb Jr's contribution***

According to John Culp,<sup>35</sup> Cobb recognizes that the modern consciousness is dominated by a vision of reality expressed in scientific thought which has rejected such basic features of the Christian tradition as the reality of God and His direction of the world. However, Cobb is convinced that the Christian vision, or a vision influenced by Christian thought, remains a viable option. Not only is it a viable option, but Cobb finds that revision of the dominant vision is necessary. As evidence of this need for revision, he cites the shifts in modern scientific theory which challenge the deterministic and materialistic assumptions of past scientific theory. The first step in demonstrating the viability of a Christian view is the development of a metaphysics which is compatible with and influenced by the Christian perspective. The development of such a metaphysic will enable Christian thought to respond to the challenge of the scientific vision. A Christian metaphysic makes it possible to show the validity of the

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<sup>33</sup> A.N. Whitehead, *Process and Reality*, New York, The Macmillan Co., p. vi, quoted in Barbour, I.G., op. cit., p. 128

<sup>34</sup> Mascall, E.L., op. cit., p. 95

<sup>35</sup> John Culp, “A Dialogue with the Process Theology of John B. Cobb, Jr.”, HTML Version, *INTERNET*, 1998

Christian vision by meeting the demand for an interpretive scheme which provides a better explanatory model than the present scientific one.

***Charles Hartshorne's contribution***

According to Heron,<sup>36</sup> Hartshorne's main contribution to Process Theology is the belief in God's actions in the world which both causes change in the world, as well as in God. Traditional Theism's view of a static, unchanging and perfect God is thus modified. Following in the footsteps of Whitehead, he acknowledges the dipolar nature of God, making a distinction between God's unchanging nature on the one hand, and the developing (through participation) nature of God on the other hand.

***A summary of the basic ideas of process philosophy*** thus are:

- \* ***The Primacy of Time***, which holds that the world is a process of becoming. Contrary to the Aristotelian view, transition and activity is more fundamental than permanence and substance. Even on sub-atomic level real changes take place and the view that particles merely rearrange themselves whilst constituting unchanged substances, is rejected. The future is open and indeterminate as reality illustrates creativity, spontaneity and emergence.
- \* ***The Interfusion of events***. Reality consists of an ever-changing network of interdependent and interconnected influences.
- \* ***Nothing exists except by participation*** - for example, any individual is the sum total of his interpersonal roles.

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<sup>36</sup> Heron, A. I. C., op. cit., pp. 146 -147

- \* ***Reality as Organic process.*** According to this concept the world is not analyzed by comparing it to a machine, but to a highly integrated organism with a dynamic pattern of interdependent events. “The parts contribute to and are also modified by the unified activity of the whole”,<sup>37</sup> while the integrity of each event is retained.
- \* ***The Self-creation of Each Event,*** which holds that every event constitutes spontaneity and self-creation and contributes in a unique way to the world. “Reality thus consists of an interacting plurality of individual acts of experience”.<sup>38</sup>

## PROCESS NEW THOUGHT

According to Alan Anderson,<sup>39</sup> *Process New Thought* is a combination of the following :

- \* The broad idealistic outlines and techniques of conventional (substance-oriented) New Thought, with its practical application of metaphysics to daily life
- \* The essential insights of the process-relational, *panentheistic*<sup>40</sup> views of such thinkers as Whitehead and Hartshorne

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<sup>37</sup> Barbour, I.G., op. cit., p. 130

<sup>38</sup> Ibid.

<sup>39</sup> Alan Anderson, “Process Philosophy and the New Thought Movement”, The New Thought Movement Home Page, *INTERNET*, 1997

<sup>40</sup> Panentheism is the view that all reality is part of the being of God. The metaphysics of Whitehead, with feeling spread throughout a reality interpreted in organismic terms, declares that the deity is dipolar, both absolute as well as relative, and man’s immortality is his continued reality within the consequent nature of God. Another proponent of the Process Theology, Hartshorne, holds that panentheism is characterised by an organic and panpsychic reality where God includes the world like an organism includes its cells. God is not simply absolute, but dipolar, having absolute as well as relative characteristics. See W.L. Reese, *Dictionary of*

- \* An emphasis on the metaphysical centrality of personhood.

*Process New Thought is characterized* by the following:

- \* It accepts science's discovery of a process-relational outlook, but with a Whiteheadian recognition of the creative, living nature of the bursts of energy (called occasions of experience by Whitehead), with energy recognized as what we experience as feeling. There is nothing actual (concrete) except these units of experience. There is freedom in some degree at all levels of concrete existence since all experience has at least a little freedom. Process Philosophy is a panexperientialism; all concrete (actual) existence is experience, not passive stuff, whether considered matter or mind. Occasions of experience are the basic building blocks of reality.
- \* Life is that in which there is (a) *aim* (relatively free choice of possibilities), (b) *creative activity* (transforming potentiality into actuality), and (c) *enjoyment of the process* (of creating a new unity out of the combined many coming to an occasion from the past - which is composed of a multitude of earlier choices). Lifeless things are abstractions from (collections of) momentarily subjectively-aware, creative, living units (occasions of experience).
- \* The creative process is the taking of the many of the past and blending their influence with divinely-given possibilities, thus producing unique new creations, which are new unities of all that has been. The job of all existence is the creation of new unities. The many become one, and are increased by one.

- \* As the new many are created, they are added to God's awareness, resulting in God's endless growth.
- \* Process New Thought takes care not to commit the fallacy of misplaced concreteness (mistaking the abstract for the concrete). The concrete, actual is found in occasions of experience, rather than the aggregates (collections) of them (abstractions from them) that constitute physical things and ourselves as existing more than a moment. We have serial selfhood. Instead of being things that have experiences, we are the experiences that, considered together, make up the things. We (the moments-old or decades-old abstractions) are successions of occasions of experience - we have serial selfhood.
- \* Living in the moment is required by serial selfhood. Since concretely one has only a moment to live, one should make the most of it. Understanding that we are new creations moment by moment can provide a powerful psychological impetus to drop old limitations and to accept divinely-given opportunities for fullest living.
- \* After a moment of subjective (self-aware, not necessarily conscious) existence a subject (occasion of experience) becomes an everlasting object, which influences everything that comes later. Although doubted by some prominent process thinkers, there is personal subjective immortality, in which there is the perpetuation beyond bodily death of lines of development of personal occasions of experience (and probably less complex animal occasions) that preside over occasions making up physical bodies.
- \* Ultimate power is the lure of God's persuasive (rather than coercive) love-beauty.

- \* The wisdom-love-beauty of God is the initial aim that begins each occasion's reaction to the influence of the past constituting the situation in which it comes into existence. God's love-wisdom is offered not as general possibilities available to everyone, but as specific, tailor-made plans for the particular occasion of experience, taking into account the character of the occasions in the line of development with which the occasion in question is especially identified. The presence of God as initial aim (indwelling Christ, in New Thought terminology) justifies the New Thought claim that what is sought already has been attained - the ultimate that any occasion can accomplish is to accept completely its initial aim.
  
- \* The personality of God is the mind of the universe.
  
- \* The hierarchy of existence is explained in terms of increasing clarity of awareness of inclusiveness; the higher the level in the hierarchy, the clearer the awareness, the more obvious the intelligence, the more fully personal - God has the utmost in clarity-intelligence-personality. There is nothing beyond the personal God.
  
- \* Mystical experience is awareness of the larger context of existence, especially with regard to awareness of the divine love process, of providing initial aims, which is the giving activity of divine love, and the receiving of completed occasions, permanently keeping them, and making them available to all upcoming occasions - the receiving activity of divine love. The mystic leaps ahead of the usual human level of awareness in the continuum and realizes that order and love are one. Occasions have forward-looking poles, called mind, and backward-looking poles, called matter. The mystic is most consistently forward-looking, and universal-looking.

- \* The universe is the body of God, body understood as collection of immediate servants of presiding mind. One's own body is the servant both of God directly and of the portion of God that is one's "own" mind. Neither God nor the universe in some form (and perhaps many coexisting versions) had a beginning. God never was without a body of some type.
  
- \* Mind within mind is the universal pattern. Each mind (occasion of experience) contains all earlier minds. (Occasions are unaware of other occasions developing at exactly the same moment, but this is no more practically important than the fraction of a second that it takes a message to travel from toe to brain or the roughly eight minutes that it takes light from the sun to reach us. On no reasonable theory can we know anything exactly as it happens.) All is present to everything - extrasensory perception is the basic type of awareness - sensory perception is just a narrowing of attention.
  
- \* Time is real and is defined as the transition from one occasion of experience to the next. Experience is inconceivable apart from before-and-afterness. Freedom and creativity require a settled past and an open future. An "eternal now" of past, present, and future coexisting in their fullness is a denial of the reality of creative process; an "eternal now" may be an emotionally satisfying symbol of the comprehensiveness of God, but in reality their endless development. If process is basic to any part of reality, it must be basic to all of reality. Retrocognition is sharpened awareness of part of what is within an occasion. (It makes no difference whether one says that all the past is within God, or oneself, for each contains all - separation is only relative.) Precognition is awareness of what is likely to occur, sharing in God's knowledge of



probabilities - but the future holds surprises even for God, since freedom prevails.

- \* Natural laws are abstractions that cannot act - they are changing (generally over vast periods of time) habits of interaction of occasions of experience, but unchanging pattern by which creation takes place by blending of the past and the divinely-presented possible.
- \* Treatment (for health, happiness, or whatever) is understood as enrichment (by awareness of divine reality of the patient by healer, or by more conventional methods) of the most relevant part of the past of whoever or whatever is the object of concern (one cannot directly influence a developing occasion, so one influences the past out of which it comes, regardless of whether the healer understands that this is what is being done), in order to minimize contrast with the perfect possibility for new creation as offered by God in initial aim. Reduction of contrast makes it easier for the upcoming occasions to accept their initial aims. (The healer changes his or her own awareness by realizing the divine perfection of the one to be helped - or the physician administers a drug - and this changes part of the background out of which the upcoming occasions will arise, making it easier for the one being helped to select the divinely-offered aim.)
- \* A mind (occasion of experience) is not aware of anything beyond itself that is strictly contemporaneous, but this is no more inconvenient than the passage of a fraction of a second for a message to go from one's toe to his or her brain, or the roughly eight minutes for sunlight to reach us.

In short, Process New Thought is a practical, applied, clarified idealism, in which God is recognized as utterly personal, completely

impartial, totally reliable, all-inclusive, unimaginably intelligent, completely loving (sharing - uniquely adapted for each occasion of experience - perfect possibilities for realization and completely accepting and preserving whatever anyone or anything makes of the divinely-provided potentialities). God is fully available and all-availing. Process New Thought is New Thought minus any instances of the fallacy of misplaced concreteness such as notions of changeless (non-growing) impersonal God, enduring substance, changeless and/or active law, and with the addition of insights from such thinkers as Whitehead and Hartshorne.<sup>41</sup>

## PROCESS THEOLOGY AND SCIENCE

### THE CONCEPT OF GOD

The most important aspect of Process Theology, from where all further understanding of this philosophical point of departure originate, must certainly be its *concept of God*. Understanding Process Theology's concept of God opens up the way to understand its ultimate potential relationship with science. The following is relevant:

- \* The *immanence of God*, rather than the transcendence is underlined. John Cobb<sup>42</sup> says the following : "Whitehead vehemently rejected the notion of a transcendent creator God who by an act of will called all things into being and continues to govern omnipotently from outside his creation." This is an obvious rejection of *deism*, but more so a recognition of the reality of creative freedom in the universe. Although God is immensely powerful and more powerful than anything else, He is not all-powerful, as this would mean that He holds all the power that exists

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<sup>41</sup> Anderson, Alan, op. cit.

and nobody else has any independent power. This means that nobody can have creative capabilities, “... the genuine creative *selfhood* - which experience shows we all have.”<sup>43</sup> Process Theology thus rejects the notion of a God who omnipotently predestines everything that happens or who planned our existence down to the last detail.

- \* As far as *divine creation and divine action* in the world is concerned, a complex of highly technical “actual occasions” came into being. The beginning of this process comes from God and affects, but does not control or determine what they become. This means that “... God creates not by means of a one-off act of cosmic origination, but by an enduring, liberative and originaive influence upon everything that is real, which happens in the initial phase of the process of becoming on the part of every actual occasion, and is thus foundational for it, though not in any determinist sense.”<sup>44</sup> God can thus be seen to be ceaselessly facilitating the coming into existence of co-creators, bestowing creative power onto them, on all we consider to be reality.
- \* But *how does divine action work?* God’s immanence is illustrated by His constant involvement in “actual occasions”. But God’s involvement is based on persuasion rather than coercion. If other things share power with God, albeit how limited, God cannot overpower them without violating their basic nature. God thus invites free cooperation and always respects self-determination (however minimal it may be).

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<sup>42</sup> J.B. Cobb, Jr, *A Christian Natural Theology : Based on the Thought of Alfred North Whitehead*, Philadelphia, Westminster Press, 1965, p. 214

<sup>43</sup> M. Prozesky, *Process Theology and the New Biology*, in Du Toit, C.W. (ed.), *Nature, God and Humanity*, Pretoria, UNISA, 1996, p. 157

<sup>44</sup> *Ibid.*, p. 158

\* *The doctrine that God changes.* According to Process Theology, God is personal in a sense (i.e. He has contact with humans), and is greater than anything else, he possesses mentality, is perfect and must have a perfect knowledge of all things. Reality participates in the creation and God, who is in constant communication with reality, becomes aware of any addition to reality through e.g. our creative minds. All individual experiences are shared with God and this changes God. Our experiences are shared with God and God shares experiences with others through gentle persuasion, and "... through our influence on God we also influence the future possibilities of the world, because from the mind of God our contributions become available to all others through the ever present, but utterly unobtrusive, influence of God ..." <sup>45</sup> We are all part and parcel of the process and through our creative participation, we contribute to reality. <sup>46</sup>

\* *The dipolar nature of God.* The changing aspect of God is what Whitehead calls His *consequent nature*. There also exists an unchanging aspect of God which is called the *primordial* or *antecedent* nature of God. The primordial nature is the non-temporal and unchanging. The consequent nature depends upon the events of the world. It is always becoming because new events are always taking place. Neither of these natures of God can be adequately understood in separation from the other. Thus for Cobb, God Himself in His basic nature is becoming as well as being. <sup>47</sup>

The primordial nature of God "... offers to a creative cosmos - and facilitates by means of long-lasting, stable structures of the cosmos

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<sup>45</sup> Ibid., p. 159

<sup>46</sup> Cobb elaborates on the *consequent nature* of God. As knowledge becomes available to God, it does not simply mean that the "naked truth" in its temporal form becomes available to God as "bare facts" only - it includes sympathetic feeling with the worldly beings, all of whom have feelings. See Cobb, J.B., Jr., op. cit., p. 48

<sup>47</sup> Culp, J., op. cit.

in the form of the laws of nature - the lure of that unsurpassable condition which he called peace, attained through the discovery of truth and the creation of beauty.”<sup>48</sup>

- \* In addition to actual occasions, *eternal objects* and *creativity* must also be acknowledged in order to achieve a complete explanation of the nature and functioning of the universe as revealed by science and in our most intimate experience.<sup>49</sup> It is only when we consider all aspects of reality that we may know what grounds exist for the orderliness of the universe and what the nature is of creative power in the universe.
- \* As Mesle asserts ... “The God of process theology does everything within divine power to work for the good.”<sup>50</sup>

Mesle further motivates his passion for process theism as follows:

“First ... It [process theism] embraces and works with the confusing facts of life, suffering, ambiguity, scientific insight, religious pluralism, feminism, and ecology, while traditional theologies seem to me to view these as embarrassments to be accommodated or explained away. Process theology seems ... to be consistent with itself and consistent with the world ... Second ... In the Bible ... God has been described as directly willing and causing great evils: war, slavery, plague, famine [whilst] process theology ... presented me with a model of God who is genuinely loving.”<sup>51</sup>

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<sup>48</sup> Prozesky, M., op. cit., p. 160

<sup>49</sup> Ibid., p. 161

<sup>50</sup> C. Robert Mesle, *Process Theology*, St. Louis (Missouri), Chalice Press, 1993, p. 5

<sup>51</sup> Ibid.

## A CASE STUDY : PROCESS THEOLOGY AND THE NEW BIOLOGY

On the question of compatibility of Process Theology with science, Prozesky contemplates the following:<sup>52</sup>

- ♦ *The existence of creative action of a deity of infinite goodness and power* is compatible with the immense structural complexity of living things, the antecedent fine-tuning of the cosmos such that the conditions required for life evolved, and to biological support for the assertion that there are uniquely distinctive characteristics about human beings.
- ♦ *The interconnectedness of all life forms and their inextricable continuity* with nonliving things is compatible with the belief in a self-sufficient, infinite and omnipotent Creator. It is, however, the classical theistic notion of the unique and special position of humanity which poses the question that the scientist finds difficult to answer. Although the Process Theology is anthropocentric by nature, the position of humanity is only deemed special by virtue of its special characteristics, i.e. the ability to socialise, the ability to form conceptualised abstractions, and the ability to communicate meaningfully.
- ♦ *The place of chance* in biological evolution is compatible with Process Theology. Chance eliminates the notion of an all-powerful deity and facilitates the element of unpredictability. The element of control with which the new biology has a problem, is also addressed.
- ♦ *The concept of a predestinarian deity*, omnipotently controlling every detail of nature and human existence, is incompatible with

the new biology. Where there is complete divine control, there can be no place for chance.

- ♦ *Omnipotence* - the Process Theology's view that God is not omnipotent in an absolute sense, is more compatible because it explains pain and suffering logically. If God was absolutely omnipotent, He would be solely responsible for all pain and suffering. If a large asteroid for example strikes earth and the ensuing changing conditions result in the extinction of a species, this senseless set of conditions could either have been the result of chance (where God is not absolutely omnipotent), or God has to take the responsibility for it. "In the process perspective, while God is unsurpassably good and loving, he is not the omnipotent wielder or ultimate controller of all the power there is."<sup>53</sup>
- ♦ *The aspect of chance* can be linked to indeterminacy in nature, which is often mentioned in connection with physics. It makes it possible for entities to exert genuine creative and independent power and freedom thus becomes plausible in every way within the universe.

## SUMMARY

An intellectually defensible theism should be logically consistent with the empirical reality and with history. In this regard, it should be noted that Process Theology circumvents the problem of incoherence in moving away from classical theism's notion of the existence of an omnipotent God responsible for predestination, where blind chance, violent destruction, agony and death occurs. In asserting that such a God exists and at the same time concluding that He is infinitely good, is simply not logically rational. In asserting that Divine Power has

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<sup>52</sup> Ibid., p. 162 - 164

<sup>53</sup> Ibid.

limitations, while still being far greater than any other power, a genuine possibility that such a God exists becomes a more likely proposition.

## CONCLUSION

The question whether metaphysics can bridge the gap between science and religion, because of its characteristic to actively seek an inclusive scheme to represent the most general characteristics of events, was posed in the introduction of this chapter. It was pointed out that classical theism - especially dogmatism - questioned the validity of scientific discoveries on the basis that such discoveries must be compatible with a literalistic interpretation of the Bible, before they could be accepted. Historically this indicated phases of the *empirical* level (in which mainly the natural sciences played the dominant role), and the *existential (ethical)* level in which theology plays the dominant role.

With the advent of Liberal Theology and later the Process Theology, the *metaphysical* level followed which would initiate tentative efforts in the process of integration.

The contributions of the Liberal Theology were vital in that it lead the way forward to the application of scientific research methods to theology. These contributions can be summed up as follows:

- The new attitude towards theology which helped to transform orthodox dogmatism into a methodology which remains valuable until today. Attitudes similar to those of the scientists thus became appropriate in religious inquiry - openness and tentativeness should be applied to human experience.



- It was acknowledged that science involves presuppositions and moral commitments not unlike those in religion, e.g. that the world is lawful and intelligible, and that the scientist has an unprovable faith in the orderliness of the universe. Moral attitudes required by science are also similar to those required by religion - humility, cooperation, universality, integrity, the scientists personal judgment, commitment to truth, participation in a community of inquiry, etc.
- Religion should provide a consistent and comprehensive world view based on the critical interpretation of human experience.
- The concept of revelation is retained but fine-tuned : Biblical revelation's uniqueness is minimised as it is not the only means employed by God to reveal himself. There are also the structures of the created order, man's moral conscience, the various religious traditions of the world, and Christ (who is not considered to be an exclusive channel of revelation of God). It is also accepted that revelation is received by fallible man and can thus be distorted through his limited comprehension.

As far as Process Theology is concerned, it was noted that some writers consider the process philosophy of Alfred North Whitehead as perhaps the only new systematic metaphysics developed in the 20<sup>th</sup> century. Process philosophy is based on a highly abstract and general metaphysic of becoming. This means that everything consists of events, occasions, occurrences and happenings, all is at the same time in process, everything is related to everything else in the world, there is both freedom and responsibility, and the most powerful thing in the world is persuasion.

Understanding Process Theology's contribution necessitates the understanding of its concept of God. The immanence of God, rather

than the transcendence is underlined. Although God is immensely powerful and more powerful than anything else, He is not all-powerful, as this would mean that He holds all the power that exist and nobody else has any independent power. Process Theology thus rejects the notion of a God who omnipotently predestines everything that happens or who planned our existence down to the last detail.

In divine creation and divine action in the world, God can be seen to be ceaselessly facilitating the coming into existence of co-creators, bestowing creative power onto them, on all we consider to be reality. Divine action works in that things share power with God, albeit how slightly, and God cannot overpower them without violating their basic nature. God thus invites free cooperation and always respects self-determination (however minimal it may be).

The doctrine that God changes indicates that all individual experiences are shared with God and this changes God. God shares through gentle persuasion experiences with others, and through our influence on God we also influence the future possibilities of the world, because from the mind of God our contributions become available to all others through the ever present, but utterly unobtrusive, influence of God. Process theologians see revelation as an ongoing process of divine call and human response. "There are moments of greater insight by people who articulate that vision to us with greater clarity than most. But those moments and those people are always within a historical context. We must never think of revelation as final and complete, but always as continuing."<sup>54</sup>

According to the dipolar nature of God, He has a *consequent nature* and an unchanging aspect of God which is called the *primordial* or *antecedent* nature of God. The primordial nature is the non-temporal and unchanging. The consequent nature depends upon the events of

the world. Eternal objects and creativity must also be acknowledged in order to achieve a complete explanation of the nature and functioning of the universe as revealed by science and in our most intimate experience.<sup>55</sup>

In a case study of the new biology, it was shown that there is a wide area of consistency between the natural science and Process Theology. It was noted that an intellectually defensible theism should be logically consistent with the empirical reality and with history, and that the new biology finds Process Theology compatible in terms of its basic assertions.

It thus seems acceptable to conclude that compatibility between elements within the sciences and theology is possible. In the following chapters, it will be demonstrated that this foundation for an integration of knowledge is indeed possible. In the next chapter, the Biblical version of the stories of creation will thus be discussed. It will be followed by a discussion of the scientific evidence for the Big Bang Theory, in order to be able to compare the information thus presented.

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<sup>54</sup> C. Robert Mesle, *op. cit.*, p. 90

<sup>55</sup> Culp, J., *op. cit.*

## CHAPTER 5

*It is the way of God, who does all things gently,  
to put religion into the mind by reason and into the heart by grace.  
Pascal*

### CREATION : THE BIBLICAL VERSION<sup>1</sup>

#### INTRODUCTION

It has thus far been shown that the relation between science and religion steadily began to decline from the Middle Ages as scientific discoveries began to conflict with the interpretation of the Bible, and theologians at the same time steadfastly clung to the literal interpretation of the Bible. It is in this regard that the issue of creation remains central to the science-religion debate in that "... the plausibility of believing in God depends in a particularly decisive way on the possibility of interpreting the world as God's creation."<sup>2</sup> For the Christian God to remain God and the only true God, it is essential to believe that God is the creator of everything, as Genesis described it. Scientific discoveries tampered in a big way with the concept of God's power and this has tended to erode the persuasion of biblical concepts as to the beginning of the universe.

"The search for the origins of the universe is ultimately a search for self ...", according to Susan Niditch.<sup>3</sup> This search is universal and has existed as long as human beings have existed intelligently. Can it be

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<sup>1</sup> Biblical verses quoted in this Chapter refer to the New International Version. Hebrew text was taken from the Biblia Hebraica Stuttgartensia (Hebrew Old Testament). The source of these bibles is Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994.

<sup>2</sup> Wolfhart Pannenberg, "Theology and Science", *The Princeton Seminary Bulletin*, Vol. 13, 1992, p. 299

said that the search for our origins should be restricted either to the realm of science or to that of theology? Perhaps it was the true situation to a great extent until the turn of the century, in that "... A hundred years ago, the main concern of biblical scholarship was to reconcile Genesis 1-11 with the scientific discoveries of the nineteenth century."<sup>4</sup> It is interesting to note that Calvin viewed Genesis 1 as an account of the creation from the standpoint of the Hebrew observer and not a modern scientific account,<sup>5</sup> thus giving tacit support to the notion that the literalistic interpretation of the Bible was no longer universally accepted even then.

The question can rightly be asked why the issue of creation remains such a lively point of focus in the science-religion debate. Stephen Hawking's conclusions in this regard in his now famous book *A Brief History of Time: From the Big Bang to Black Holes*, perhaps sums it up best: (1) "This discovery [that galaxies are generally moving farther away from each other and that there once was a big bang which is connected to the observation that galaxies are moving away from each other] finally brought the question of the beginning of the universe into the realm of science" and (2) "An expanding universe does not preclude a creator, but it does place limits on when he might have carried out his job!"<sup>6</sup>

The natural starting point for Christian theology is the Bible. The question whether the Bible may be used in the science-religion debate

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<sup>3</sup> Susan Niditch, *Chaos to Cosmos - Studies in Biblical Patterns of Creation*, Atlanta, Scholars Press, 1985, p. 1

<sup>4</sup> J. Rogerson, (ed.) *Genesis 1 - 11*, Sheffield, JSOT Press, 1991, p. 11

<sup>5</sup> John Calvin, (translated by John King), *Genesis*, Edinburgh, Banner of Truth Trust (Reprint of the 1874 version), 1965, pp. 79 and 86

<sup>6</sup> Stephen Hawking, *A Brief History of Time: From the Big Bang to Black Holes*, New York, Bantam, 1988, p. 8 - 9. Hawking was later asked whether he believes that there is a God who created the universe and guides His creation, to which he replied: "No". See Michael White and John Gribben, *Stephen Hawking - A Life in Science*, Viking (Penguin Books), London, 1992, p. 3

was addressed in particular in Chapter 1 of this study. It was argued that, whilst a number of philosophical arguments exist which pose grounds for the belief in God (and thus a form of acceptance of the role of Scripture at least within the Christian theology), there are also a number of arguments for the disbelief in God. It was concluded that the existence of a supreme Being cannot be *disproved* and that body and content could be given to the study of religious data which includes the contents of the Bible. (It was pointed out that the latter remarks were not made with the view of initiating further debate on the issue whether God exists or not, that it was readily accepted that God's existence is a matter of faith which cannot be brought into the realm of scientific proof, and that the only point made was that allowance had to be made for both arguments.) It was also concluded that religious language can be considered to be cognitive as it adheres to the prerequisites of being adequate, coherent and effective (bearing in mind that certain difficulties exist and that these difficulties need to be properly addressed when religious language is part of such a study). The nature of such difficulties revolves around the interpretation of the Bible and this aspect - *the interpretation of the Bible* - could adequately be addressed.

In Chapters 2, 3 and 4, some philosophical points of departure were summarised which generally contribute to the view that knowledge can be integrated in order to describe a more complete picture of reality. It was concluded that theology should be broadly empirical and rational and it should supply a comprehensive world view based on the critical interpretation of all human experience. In asserting that theology should be broadly empirical, it was argued that Liberal Theology as well as Process Theology present the potential for the application of scientific methods in the research of religious data, which ultimately could be rationally grounded. According to the Liberal Theology, biblical revelation's uniqueness is affected by the assertion that it is not the only means employed by God to reveal himself. There are also the

structures of the created order, man's moral conscience, the various religious traditions of the world, and Christ (who is not considered to be an exclusive channel of revelation of God). It is also accepted that revelation is received by fallible man and can thus be distorted through his limited comprehension. The Bible is viewed as "... the record of a people's progressive search for God and response to him."<sup>7</sup>

It was shown that the Process Philosophy attempts to include science and religion in a unified view of reality. Alfred North Whitehead, tried to construct a system "... of ideas which bring aesthetic, moral and religious interests into relation with those concepts of the world which have their origin in natural science." He (Whitehead) defined metaphysics as the study of the most general characteristics of events, and it must be coherent (i.e. logically consistent AND part of a unified system of interrelated ideas that presuppose each other).<sup>8</sup> Metaphysics must also be applicable to experience and thus have empirical relevance. It is the task of any thought system to organise and elucidate experience. Religion contributes its own independent evidence and metaphysics must take it into account when describing it.<sup>9</sup> According to Peacocke, science and theology are thus considered to be interacting approaches to the same reality.<sup>10</sup>

Process Theology, furthermore, shows that nature is NOT left devoid of significant meaning, and that "... statements about nature do have an important though always secondary place in theology".<sup>11</sup> It is noted that this aspect, i.e. the role of nature in theology, is usually

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<sup>7</sup> Ian G. Barbour, *Issues in Science and Religion*, Study Edition, London, Redwood Press Ltd., 1972, p. 126

<sup>8</sup> D.R. Griffin and D.W. Sherburne, (eds.), *Whitehead, Alfred North - Process and Reality: An Essay in Cosmology*, Corrected Edition, New York, Free Press, 1978, p. 13

<sup>9</sup> A.N. Whitehead, *Process and Reality*, New York, The Macmillan Co., p. vi, quoted in Barbour, I.G., op. cit., p. 128

<sup>10</sup> See A.R. Peacocke (ed.), *The Sciences and Theology in the Twentieth Century*, London, Oriel Press, 1981, p. xiv

“neglected” as traditional orthodox theology’s focus is usually mainly restricted to that of God and His relationship with human beings. Process Theology’s contribution in the science-religion debate thus broadens man’s perception of God, as it brings into focus God’s continues involvement in an ongoing process of creation on a much wider scale than traditional orthodox theology demonstrates.

The purpose of this chapter is to analyse what the Bible says about the origin of the universe and a special effort will be made to restrict this analysis to biblical text instead of constantly involving theoretical explanations based on how such texts may be interpreted e.g. from the point of view of scientific discoveries. Scientific methods in the form of a comparative research of existing knowledge (on the interpretation of the relevant texts) will be used in order to get a clear picture which can be used to ultimately compare it to the scientific theory (the Big Bang Theory). The intention is to highlight one element of the creation, namely the universe as astronomical focus of God’s ongoing involvement in the creation. The following aspects will be addressed:

### **Introduction**

#### **The Use of the Bible in the Science-Religion Debate**

*The Fundamentalistic Approach*

*The Critical Realistic Approach*

*The Historical-Critical Approach*

*A Reader-Oriented Approach*

### **Creation**

#### **Creation As Depicted in Genesis 1 & 2**

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<sup>11</sup> Barbour, Ian G., op. cit., p. 454



**Introduction****The Relevant Bible Verses****“In the beginning”****“Created” (*bara*)*****Creatio ex Nihilo*****“Heaven and Earth”****Order-making*****Tohu Wabohu*****“And God said: Let there be light”****“And God called the light Day”****The Number Seven****The Sequence****Chronological Sequence?****“For a thousand years in thy sight are but as  
yesterday”****The Firmament****The Sun, Moon and Stars****“The heavens and earth and their host”****Two creation stories****The Role of Myth in the Ancient Near East****Genesis as “Mythical” Literary Genre****Examples of Possible Influences from Ancient Near  
East Texts****Enuma Elish****Ugaritic Literature****The Atrahasis Epic**

## Discussion

### The Purpose of Genesis

#### Summary

#### Discrepancies between biblical and extra-biblical data on creation

*The period of six 24-hour days*

*Separation of light from darkness*

*The firmament*

*Seed- and fruit-bearing plants*

*The sun, moon and stars*

*The creation of the "heavens and earth"*

*Creatures created on the fifth day before animal life*

*Man and animal*

*The creation of the "heavens and earth"*

#### Conclusion

## THE USE OF THE BIBLE IN THE SCIENCE-RELIGION DEBATE

When Scripture is used it is necessary to have a clear understanding of the purpose and the methods as it affects the interpretation and significance of such interpretation - and therefore the value - thereof. It has to be understood that "... the Bible does not do anything: it is read by people, studied by people, used by people in their arguments, interpreted by people. [It is] people who are doing all this as part of the texture of their life today."<sup>12</sup> Given the development of the argument in this study thus far, the pitfalls of *dogmatism*, the *literal*

*interpretation* of Biblical text, and the general tendency of theologians to be *prescriptive* as far as those aspects of nature are concerned where science cannot conclusively present plausible explanations (which have more than often resulted in excessive efforts to deny theologians any significant role in the science-religion debate), will especially not be part of this effort.

The first point to be made is that "... there is no 'unadulterated' reading of biblical text, no correct reading and, of course, no final interpretation" and that the Bible should be used "... in such a way as to be not only truly contemporary but also intellectually and sociologically credible."<sup>13</sup> This way of using the Bible is described as the *reader-oriented approach*. The latter approach stands in stark contrast to *fundamentalism* and it also differs from the *historical-critical* and *critical realism* approaches.

**Fundamentalism.** There are of course various approaches to the use of the Bible, but for the purpose of understanding the concept of the *reader-oriented approach*, it is perhaps necessary to briefly refer to the *fundamentalistic* and the *critical realistic* approaches. According to James Barr, fundamentalism is described as having:

- ♦ a very strong emphasis of the inerrancy of the Bible - the absence from it of any sort of error
- ♦ a strong hostility towards modern theology and towards the methods, results and implications of a modern critical study of the Bible

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<sup>12</sup> James Barr, *Fundamentalism*, London, SCM, 1977, p. 12

<sup>13</sup> J. Liebenberg, The Use of the Bible in the Science-Theology Debate, in Du Toit, C.W. (ed.), *Nature, God and Humanity*, Pretoria, UNISA, 1996, p. 120

- ♦ the claim that those who do not share the fundamentalists' religious viewpoint are not really Christians at all.<sup>14</sup>

Fundamentalism is to a large extent a reaction against *modernism* which, through the proponents of Liberal Theology (notably Adolf von Harnack and to a lesser extent Albrecht Ritschl), brought the application of modern critical methods to the study of Biblical text and to the history of dogma on the part of Protestants. This resistance against modernism of which Alfred Loisy formed part, was also affected by Roman Catholicism through the naturalist movement. (This latter "anti-modernism" movement is still in force and the requirement that every priest should take an "Oath against Modernism" is still in force.)<sup>15</sup> The fundamentalist approach is thus based on efforts to use the Bible in an authoritative manner without allowing for scientific methods to fully explain and enhance textual content. The net result is that the Bible usually also fulfills an evidential role.

Despite the rather obvious restrictions this approach places on biblical interpretation to fully explain textual content, conservative theological opinion continues to play an important role in various parts of the world.<sup>16</sup>

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<sup>14</sup> Barr, James, op. cit., p. 1

<sup>15</sup> See W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, New Jersey, Humanities Press, 1980, pp. 362 - 363

<sup>16</sup> Various examples of such conservative theological thinking in modern times exist. One of the striking actions of one such a group was on 4 July 1986, when members of the American Institute for Creation Research presented a document entitled "Statements of Affirmation and Denial" to President Reagan, which clearly states for example "We *affirm* that the Biblical record of history in Genesis 1-11 (including the creation of the universe ... in the six days of Creation Week ... is an accurate and historical account", and "We *affirm* that the ... earth is young". See The Christian World View of Science and Technology - Vital Articles on Science/Creation, *Impact*, No. 161, November 1986. See also Omar Gjerness, "Answers for Today - No date stamped on the earth!", *INTERNET*, November 1997, in which Rev Gjerness asserts that the belief of a young earth can be scientifically explained (although he does not give such explanations).

The principle of the inerrancy of the Bible has long been questioned and the modern critical study of the Bible is generally accepted outside fundamentalist circles. Fundamentalists still claim that "... the account of Genesis is 100 per cent true, and the Universal Flood was a Historical event ... and God spoke every single word the prophets ascribed to him."<sup>17</sup> At the same time various authors have concluded that the inerrancy of the Bible can no more be an accepted point of departure in the process of text interpretation and that a modern critical study of the Bible is appropriate.<sup>18</sup>

The fundamentalist approach to the use of the Bible is thus considered not to present a reasonable way to the interpretation of the Bible.

**Critical Realism.** Critical Realism encompasses efforts to present Biblical text in a rationally coherent and consistent way inherent in modernism. According to Polkinghorne, the Bible is to be read as "... being the record of historical events ..." and man should "... exercise all the scholarly skills at our disposal in order to assess it *as evidence* ..." <sup>19</sup> (italics added). There is also the mediative way of reading the Bible where "... we allow it to dissolve in our own minds and we submit ourselves to its authority ..." <sup>20</sup>

This approach incorporates the assumption that the Bible was written by fallible people and that it cannot be regarded as a textbook to answer questions. It thus constitutes a realistic form of criticism and

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<sup>17</sup> Ezequiel Gonzalez, "Hermeneutics", *INTERNET*, 1996 (Mailing address: Calzada 155, Mercedita, PR 00715, USA)

<sup>18</sup> See for example Kenneth Cauthen, "Interpreting the Bible", *Encounter*, Autumn, 1990, pp. 377 - 388; and by the same author - "The Authority of the Bible", in *Toward a New Modernism*, Lanham, MD, University Press of America, 1997, pp. 45 - 60; John Sweet, "Old Wine in New Bottles", in D.W. Hardy and P.H. Sedgwick (eds.), *The Weight of Glory*, Edinburgh, T & T Clark, 1991, pp. 321 - 239

<sup>19</sup> J.C. Polkinghorne, *Reason and Reality*, London, SPCK, 1991, pp. 64 and 109, quoted by Libenberg, J., in Du Toit, C.W., op. cit., p. 132

recognises the contingency of knowledge. Liebenberg, however, says that "... in its search for realism ... it fixes itself to the past in such a manner that the past becomes a theological strait-jacket ..." and that critical realism is "... inherently conservative ..." which will allow creative interaction between science and religion only "... *as long as fundamental belief systems about God are left unchallenged.*"<sup>21</sup>

Cauthen illustrates this dilemma by postulating the following two crucial assumptions for theology:<sup>22</sup>

- (1) All social and conceptual systems are human constructions that are historically relative and culturally conditioned.
- (2) A wide gap exists between the world view of the Bible and that of the modern world.

The question is thus how can the Bible written in historically relative language, provide an absolute revelation of God? Critical Realism thus does not offer any new understanding of God. In a sense, the science-religion debate is thus reduced to defending the contents of the Bible (the past), and in some ways (notably the use of the Bible in an evidential role) it does not differ from the point of view of the fundamentalist approach. Liebenberg, in criticising Polkinghorne's use of critical realism, sums up this dilemma as follows: "Why does his reflection on God and science, or on theology and science, not lead him to a new understanding of God, a contemporary God, not one clad in the drapes of sixteenth-century dogmatism?"<sup>23</sup>

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<sup>20</sup> J.C. Polkinghorne, *Science and Creation: The Search for Understanding*, Boston, New Science Library, 1988, p. 96

<sup>21</sup> J. Liebenberg, op. cit., p. 136

<sup>22</sup> Cauthen, K., "Interpreting the Bible Today", *INTERNET*, 23 October 1997 (An address to the Alumni Convocation of Colgate-Rochester Divinity School, Rochester, NY, in the Spring of 1989)

The object of the science-religion debate is certainly not primarily focused on defending the contents of the Bible, but rather to relate theology to science in a constructive way.

While the critical realistic approach to the use of the Bible offers the incorporation of scientific methods to broaden the scope of biblical revelation, it too is thus considered not to present a fully reasonable way to the interpretation of the Bible, as it also forces interpretation into a direction ultimately linked to the past.

***The Historical-Critical Approach.*** The point of departure of the *historical-critical approach* is that "... Scripture as a historical phenomenon can communicate absolute truth only in a relative, temporally conditioned form."<sup>24</sup> When Scripture is interpreted the historical context forms the basis for the description of its meaning. The principal of inerrancy of revelation is rejected and autonomous human reason unaided by revelation is sufficient to know reality. The grip of pre-Enlightenment supernaturalism and ecclesiastical domination is thus broken. Johnson defines the goals of historical criticism as "... the elucidation and testing of the historical accuracy."<sup>25</sup> According to Croatto, those adhering to the methods of the *historical-critical approach* concentrate on the history of the text rather than on its meaning, "... it places the emphasis on the formation of the text rather than on the text itself."<sup>26</sup>

The *historical-critical approach* has been advantageous to theology in a number of ways and Krentz lists among others, the following:

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<sup>23</sup> J. Liebenberg, op. cit., p. 136

<sup>24</sup> William J. Larkin Jr., *Culture and Biblical Hermeneutics*, Michigan, Baker Bookhouse, 1988, p. 39

<sup>25</sup> Elliott E. Johnson, *Expository Hermeneutics: An Introduction*, Michigan, Zondervan Publishing House, 1990, p. 41

<sup>26</sup> J. Severino Croatto, *Biblical Hermeneutics – Toward a Theory of Reading as the Production of Meaning*, New York, Orbis Books, 1987

Research tools such as lexica, concordances, etc. have been provided; the geographical and historical context of the life and history of Israel was given a new light; a better grasp of the original grammatical and historical sense of the Bible was achieved; the time-conditioned historical character of the Bible has been made evident; historical-criticism is self-correcting; and the acceptance of the introduction of probable results was affected.<sup>27</sup>

Criticism against the *historical-critical approach* lies in the test of historical accuracy – the problem arises when a textual record does not provide sufficient evidence to demonstrate with clear distinction its own historicity. Leaving the results of interpretation open to be reinterpreted by others means that, unless sufficient cause for final historicity is achieved, inconclusive interpretations are constantly challenged. Croatto's critique is further that attempting to reduce the meaning of text to its first/original production, "... would imply the exhaustion of the text at the very moment that it begins to demonstrate its polysemy."<sup>28</sup>

***A Reader-Oriented Approach.*** This approach does not deny the past, but at the same time more attention is given to creativity and much less to dogmatism. The aim is "... to approach biblical interpretation as a means of engaging in the science-theology debate in such a manner that the results will be authentic and relevant in contemporary society."<sup>29</sup> This means that biblical interpretation seeks to engage the reader objectively with text which is based on verifiable knowledge through the application of scientific methods. There is an interdependency between the reader and the text. Knowledge thus presented, has its foundation in life. Thus McKnight says : "A reader-oriented approach acknowledges that the contemporary reader's

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<sup>27</sup> Edgar Krentz, *The Historical-Critical Method*, Philadelphia, Fortress Pres, 1977, pp. 63 - 67

<sup>28</sup> See Johnson, E. E., op. cit., p. 42 and Croatto, J. S., op. cit., p.26



'intending' of the text is not the same as that of the ancient author and/or the ancient readers. This is not possible, necessary or desirable. The fact that the text is biblical does not change the picture, for the contemporary reader will no more find the pristine meaning and significance of the author in the biblical text than in any artistic text. But is there not continuity between the past and the present? It is not possible that the reader's 'intention' is of a piece with the author's intention and with the meaning and significance found by earlier readers with different views? [The answer to this is of course 'Yes there is!'] This will mean not that there is no meaning, but that meanings discovered with approaches that are informed by discourse and hermeneutic oriented insights are authentic in the same fashion - not final, but satisfying authentic.", and "... the challenge today is that our world-view does not dictate one perspective and approach."<sup>30</sup>

According to Cauthen<sup>31</sup>, two ways exist in which what is authoritative for today, can be retrieved from the Bible, i.e. "... to locate something that defines the Bible's own religious vision that can be restated in categories appropriate for a given cultural situation ..." and "... to claim for today only what is most excellent in the original Christian witness *as judged by contemporary Christians*." (Italics added). This means that the "best of Scripture" is considered to be authoritative because it is compelling as a way of contemporary believing and living, i.e. in the reality of God and the meaning of life. It also means that *Christians* must decide what in Scripture is worthy of belief today - only the Christian belief is, after all, what distinguishes them from non-Christians and other beliefs.

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<sup>29</sup> J. Liebenberg, op. cit., pp. 138 - 139

<sup>30</sup> E.V. McKnight, *Postmodern use of the Bible: The emergence of reader-oriented criticism*, Nashville, Abingdon, 1988, p. 150

<sup>31</sup> Cauthen, K., *Interpreting the Bible Today*, op. cit.

A pronounced shift from the critical realistic approach is thus found in the reader oriented approach in as far as it (the reader oriented approach), whilst projecting the preservation of biblical revelation on the one hand, it also focuses on the importance of the interpreter on the other hand.

The post-modern understanding of the use of biblical text is that it is one amongst many texts. This does not mean that biblical text is considered in any way to be of lesser value, but rather that a better understanding of reality is possible where reality and biblical text embrace each other. The post-modern understanding of reality does not entertain opposing views, but sees them rather as complementary views of the same reality. The relativity as well as the plurality of texts are thus acknowledged.<sup>32</sup>

Blenkinsopp, however, warns against the attitude that all Biblical texts are “infinitely interpretable”. The emphasis on the plurality of meanings may also mean that the essential point of reference may be lost to the individual interpreter where the hermeneutical distance between text and reader has been removed. Biblical text is then subordinated to the self-understanding of the reader. This is especially so “... when canonical texts are dealt with which have come to play a sustaining role in communities of memory and faith”.<sup>33</sup> But just what is meant by “the essential point of reference”? Is it not true that a great

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<sup>32</sup> Caulthen, K., *Interpreting the Bible Today*, op. cit. likens the Bible to a kaleidoscope to illustrate the latter point as follows: “The same pieces of glass produce a multitude of pretty patterns depending on how the instrument is turned. Does it make any sense to say that one of them is more right than the others? Doing theology is like playing with a kaleidoscope. We all read the same Bible and refer to the same classical texts from Tertullian to Barth. Many beautiful forms have been produced ... Which of these delightfully coloured arrays of brilliant arrangements is the right one? The Bible is a kaleidoscope. Which beautiful form is seen depends on how it is turned. It is the same Bible, but we produce a bewildering variety of images, alike in many respects, different in many others.”

<sup>33</sup> Joseph Blenkinsopp, *The Pentateuch - An Introduction to the First Five Books of the Bible*, New York, Doubleday, 1992, p. ix

number of such “essential points of reference” have through the ages been interpreted, accepted, rejected, reinterpreted again, and so on. Was the practice of slavery for example not universally accepted and taken for granted *inter alia* on biblical grounds until the Middle Ages, only to have been rejected later - also on biblical grounds? Was there not a time when it was accepted that women were forbidden to be teachers of men or to have authority over them? There are numerous such examples of text interpretation which were later altered, of which the principle that the interpretation of Scripture is determined by its historical context, is now generally accepted. The point in this discussion is simply to indicate that, while there may be a real danger of reducing the theological value of Scripture by entertaining the position that the hermeneutical distance between the text and the reader may be removed, such distancing has been happening all the time and has also generally been accepted all the time.

It is also noted that “infinitely interpretable” texts may lead to a situation where theology is conceived outside and independent of the Bible, after which such a “theology” is then arbitrarily imposed through some form of perceived plurality of knowledge. This would amount to a situation where, as Cauthen points out, “everything can be proved with the Bible”.<sup>34</sup> Whatever Christian theological knowledge is gained should thus first and foremost be connected to the Bible and the terms that define the final product should be the interpreting and reinterpreting of the Bible. This may also pose another problem: how can rival interpretations be adjudicated? While the study of the Bible as a whole “... reveals recurring themes, grand motifs, general patterns, ruling metaphors, and the like”<sup>35</sup>, the interpreter remains the creator of the final product. The reader thus remains the final judge of the meaning of the text.

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<sup>34</sup> Cauthen, K., *Interpreting the Bible Today*, op. cit.

<sup>35</sup> Ibid.

Rogerson makes the point that, while many Biblical scholars interpret Genesis in the context of the ancient Near Eastern background (they study for example parallel texts from ancient Mesopotamia to which biblical text is then compared), other biblical scholars are being influenced by liberation theology, feminist views, and the ecological crisis. He goes on to say that "... basically, scholars today are doing what all scholars have done in the past hundred years: they are interpreting the text from their own situation or context."<sup>36</sup>

When the Bible is interpreted by the feminist or the liberation theology standpoints, it forms partnerships against sexism and oppressive political and economic structures respectively, which will for example not necessarily take note of any possible influence of any other ancient writings. When academic institutions interpret Genesis, they may well include such material in their endeavour. Individuals may, furthermore, find themselves subscribing to more than one of these approaches at the same time, depending on the issue at hand. It may therefore be prudent to suggest that different interpreting groups should take note of each other's efforts so as to ultimately get a more complete picture. The mere existence of different approaches is encouraging as it is testimony to the fact that Scripture is alive and does not solely consist of dead letters.

This view thus also tends to represent the reader oriented approach. The reader oriented approach has thus been around for at least 100 years already.

In conclusion the following general principles for the interpretation of the Bible are postulated in agreement with Cauthen:<sup>37</sup>

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<sup>36</sup> Rogerson, J., op. cit., p. 11

<sup>37</sup> Ibid.

- No Christian allows the Bible to teach as the authoritative word of God what is known or believed (for whatever reasons) to be either untrue or immoral.
- Every Christian finds what the Bible teaches as the authoritative word of God to be identical or congruent with what is known or believed (for whatever reasons) to be true and right.

The reader oriented approach to the use of the Bible is therefore preferred as a means of investigating biblical references to creation as it is considered to present an adequate, coherent and effective means of such an endeavour.

## CREATION

It is noted that the purpose of this chapter is not to indulge in a process of exegesis of all biblical references to creation, as this would amount to reinventing the wheel. There probably does not exist any biblical subject about which as much effort to analyse, attest or assume “the real meaning” have been undertaken, as has been in the case of the theme of God’s creation “of all things visible and invisible” (Col. 1:16)<sup>38</sup>. Furthermore, the theme of creation usually combines two distinct areas, namely *the creation of the universe* and *the creation of life*. This study has as its objective only *the creation of the universe*. It is thus intended to rather concentrate on the general findings of research, as well as philosophical thought in this regard. The general

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<sup>38</sup> Howard J. van Till et al, *Portraits of Creation - Biblical and Scientific Perspectives on the World’s Formation*, Michigan, William B. Eerdmans Publishing Company, 1990, p. 221. See also Hudson who says in this regard: “Oceans of ink have been spilled on Gen 1,1-2, and as long as human kind exist on this earth and remains concerned about “the beginnings” these verses will never be fully plumbed”. See Don Michael Hudson, *From Chaos to Cosmos: Sacred Space in Genesis*, *Mitteilungen, Zeitschrift für die alttestamentliche Wissenschaft*, 108. Bd., S., 1996, p. 92

aim is to evaluate the purpose and meaning of biblical creation and to highlight the use of so-called “creation language” in the Bible, but not to use the Bible as “evidence” for the existing scientific theory of the origin of the universe (the Big Bang Theory).

The question in this regard is whether science and religion can compete in accounts of the same subject matter, or whether reality can and must be described from both perspectives (i.e. from the perspective of science on the one hand and religion on the other). Bowker says in this regard: “... the value of religions to their adherents does not lie in the extent to which they can be attached to the theories of science (because these, in any case, are approximate, provisional, corrigible, and always in the process of change).”<sup>39</sup> Although the latter suggestion may be true, the general inference that it is a mistake to view the origin of the universe from the perspectives of theology as well as science, is questionable. An attempt to describe both these views does not necessarily constitute competition, but rather complimentary attitudes. Furthermore, in terms of the reader oriented approach of the use of the Bible, it can be postulated that it is not only scientific theories that are incomplete, but also that theological interpretations are dynamic, relativistic as well as pluralistic (and thus also incomplete). Describing this reality may thus in fact result in a more complete picture of the same issue than would have been the case, had separate attempts been made to describe reality as two distinct realms.

The Biblical theme of creation is associated with only the first book of the Bible. In the ensuing part of this chapter, efforts will be made to describe biblical creation and the use of “creation language” in not only Genesis 1 and 2, but also in other texts such as Isaiah and Psalms.

## **CREATION AS DEPICTED IN GENESIS 1 - 2:4A**

## Introduction

When an attempt is made to analyse the creation of the universe from the Biblical perspective, one is immediately confronted with a number of limitations. It is estimated that the book of Genesis was compiled over a period of approximately 550 years. According to Hargreaves, Genesis 2:4 to 3:24 was written by someone who lived between 950 and 900 years before Christ, Genesis 1:1 - 2:4 by someone who lived 600 - 500 BC, and at about 400 BC, someone who may be called "an editor" combined and made the work of the different writers into the book called Genesis.<sup>40</sup> This underlines the obvious fact that Genesis is an ancient book "... from very different times and cultures, written according to quite different literary conventions, in a different language, and often very heavily edited."<sup>41</sup> Furthermore, although at least three different sources are usually quoted as having written different parts of Genesis, Hargreaves makes the point that reference to these three "writers" does not mean single persons, but rather three groups of people who did the work in each case.<sup>42</sup> Likewise, the final "editor" probably also consisted of a group of people. According to the chronological scheme of the Pentateuch itself, the events recorded cover, furthermore, 2,706 years.<sup>43</sup>

The difficulties in analysing the text of Genesis, and for that matter all other Bible books that came into being under similar conditions, can hardly be overstated. It is perhaps for this reason that Rogerson asserts

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<sup>39</sup> J.W. Bowker, "Cosmology, Religion, and Society", *Zygon*, vol. 25, no. 1, March 1990, p. 9

<sup>40</sup> John Hargreaves, *A Guide to Genesis*, London, SPCK, 1969, pp. 31 - 32

<sup>41</sup> Blenkinsopp, J., op. cit., p. ix

<sup>42</sup> Hargreaves, J., op. cit., p. 32

<sup>43</sup> Blenkinsopp, J., op. cit., p. 33

that "... there probably never has been a time when all interpreters were agreed about the meaning of Genesis 1-11."<sup>44</sup>

**The relevant Biblical verses<sup>45</sup>** are as follows:

#### Genesis 1

- <sup>1</sup> In the beginning God created the heavens and the earth.
- <sup>2</sup> Now the earth was formless and empty, darkness was over the surface of the deep, and the Spirit of God was hovering over the waters. <sup>3</sup> And God said, "Let there be light," and there was light.
- <sup>4</sup> God saw that the light was good, and he separated the light from the darkness.
- <sup>5</sup> God called the light "day," and the darkness he called "night." And there was evening, and there was morning -- the first day.
- <sup>6</sup> And God said, "Let there be an expanse between the waters to separate water from water."
- <sup>7</sup> So God made the expanse and separated the water under the expanse from the water above it. And it was so.
- <sup>8</sup> God called the expanse "sky." And there was evening, and there was morning -- the second day.
- <sup>9</sup> And God said, "Let the water under the sky be gathered to one place, and let dry ground appear." And it was so.
- <sup>10</sup> God called the dry ground "land," and the gathered waters he called "seas." And God saw that it was good.
- <sup>11</sup> Then God said, "Let the land produce vegetation: seed-bearing plants and trees on the land that bear fruit with seed in it, according to their various kinds." And it was so.

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<sup>44</sup> Rogerson, J., op. cit., p. 45

<sup>45</sup> New International Version, Logos Bible Software, Version 1.6g, Logos Research Systems Inc., 1994. Most modern scholars accept that the opening section of Genesis ends with 2:4a and not with 2:3. This is, however, not universally accepted as some interpreters feel that 2:4 does not conclude the section, but rather introduces a new development or section of Genesis. See Gordon J. Wenham, *Word Biblical Commentary, Volume 1 - Genesis 1-15*, Waco, Texas, Word Books Publisher, 1987, p. 6; See also Hargreaves, J., op. cit., p. 16



<sup>12</sup> The land produced vegetation: plants bearing seed according to their kinds and trees bearing fruit with seed in it according to their kinds. And God saw that it was good.

<sup>13</sup> And there was evening, and there was morning -- the third day.

<sup>14</sup> And God said, "Let there be lights in the expanse of the sky to separate the day from the night, and let them serve as signs to mark seasons and days and years,

<sup>15</sup> and let them be lights in the expanse of the sky to give light on the earth." And it was so.

<sup>16</sup> God made two great lights -- the greater light to govern the day and the lesser light to govern the night. He also made the stars.

<sup>17</sup> God set them in the expanse of the sky to give light on the earth,

<sup>18</sup> to govern the day and the night, and to separate light from darkness. And God saw that it was good.

<sup>19</sup> And there was evening, and there was morning -- the fourth day.

<sup>20</sup> And God said, "Let the water teem with living creatures, and let birds fly above the earth across the expanse of the sky."

<sup>21</sup> So God created the great creatures of the sea and every living and moving thing with which the water teems, according to their kinds, and every winged bird according to its kind. And God saw that it was good.

<sup>22</sup> God blessed them and said, "Be fruitful and increase in number and fill the water in the seas, and let the birds increase on the earth."

<sup>23</sup> And there was evening, and there was morning -- the fifth day.

<sup>24</sup> And God said, "Let the land produce living creatures according to their kinds: livestock, creatures that move along the ground, and wild animals, each according to its kind." And it was so.

<sup>25</sup> God made the wild animals according to their kinds, the livestock according to their kinds, and all the creatures that move along the ground according to their kinds. And God saw that it was good.

<sup>26</sup> Then God said, "Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground."

<sup>27</sup> So God created man in his own image, in the image of God he created him; male and female he created them.

<sup>28</sup> God blessed them and said to them, "Be fruitful and increase in number; fill the earth and subdue it. Rule over the fish of the sea and the birds of the air and over every living creature that moves on the ground."

<sup>29</sup> Then God said, "I give you every seed-bearing plant on the face of the whole earth and every tree that has fruit with seed in it. They will be yours for food.

<sup>30</sup> And to all the beasts of the earth and all the birds of the air and all the creatures that move on the ground -- everything that has the breath of life in it -- I give every green plant for food." And it was so.

<sup>31</sup> God saw all that he had made, and it was very good. And there was evening, and there was morning -- the sixth day.

## Genesis 2

<sup>1</sup> Thus the heavens and the earth were completed in all their vast array.

<sup>2</sup> By the seventh day God had finished the work he had been doing; so on the seventh day he rested from all his work.

<sup>3</sup> And God blessed the seventh day and made it holy, because on it he rested from all the work of creating that he had done.

<sup>4</sup> This is the account of the heavens and the earth when they were created. When the LORD God made the earth and the heavens -- (NIV)

The following points can now be noted:

- What is translated as “*In the beginning*”, forms the basis of many debates about the correct translation of these words. It is of particular importance here as it deals with the doctrine of *creatio ex nihilo*. According to Wenham four possible understandings of the syntax of verses 1-3 exist, namely:<sup>46</sup>
  - Verse 1 is a temporal clause subordinate to the main clause in verse 2: “In the beginning when God created ..., the earth was without form ...”
  - Verse 1 is a temporal clause subordinate to the main clause in verse 3 (verse 2 is a parenthetical comment). “In the beginning when God created ... (now the earth was formless) God said ...”

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<sup>46</sup> Ibid., pp. 11-12

- Verse 1 is a main clause summarising all the events described in verses 2-31. It is a title to the chapter as a whole, and it could be rendered “In the beginning God was the creator of heaven and earth.” What being creator of heaven and earth means is then explained in more detail in verses 2-31.
- Verse 1 is a main clause describing the first main act of creation. Verses 2 and three describe subsequent phases in God’s creativity. (This translation represents the traditional view adopted, which still has many adherents - probably because the antiquity of this interpretation is the greatest argument in its favor.)<sup>47</sup>

Apart from the last translation, all the others presuppose the existence of chaotic pre-existent matter before the rest of the work of creation began. Wenham, Westermann, Rogerson and others thus argue that it implies creation out of pre-existing matter, as opposed to the traditionally accepted doctrine of *creatio ex nihilo*.<sup>48</sup>

Wenham further points out that the Hebrew word for “beginning” *רֵאשִׁית* was prefixed with *ב* (meaning “in”). This causes the first two words of Genesis in Hebrew to begin exactly the same way *בְּרֵאשִׁית בָּרָא*. This word *בָּרָא* can also be translated as “he created”. Whether this was coincidence or literary conceit is open

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<sup>47</sup> Claus Westermann, *Genesis 1 – 11 : A Commentary*, Minneapolis, Augsburg Publishing House, 1984, p. 93 ff

<sup>48</sup> See Wenham, G.J., op. cit., p. 11; Westermann, C., op. cit., p. 109; and Rogerson, J., op. cit., p. 57. For Hargreaves, the “writer” of this particular text illustrates an activity which God does continually and he seems to infer that the interpretation that God once made something that had not existed before, is incomplete. See Hargreaves, J., op. cit., p. 9. Huber also asserts that the statement that God created the heavens and the earth is not that of creating the universe “ex nihilo” - see W. Dennis Huber, “The General Theology of Creation”, Chapter 1, ISCS Publishing Co., 1993, published on *INTERNET*, 22 March 1998

to question. The point is that the Hebrew word for creation (ברא) is not a term exclusively reserved for creation out of nothing, which supports the notion that the biblical story of creation depicts a *process* which had already started earlier.<sup>49</sup>

The prefix ב (meaning “in”) is the opening word/letter (*beth*) of the Hebrew Bible and according to Schroeder,<sup>50</sup> the shape of this letter, as all other aspects of the Bible, has significance. The shape of *beth* presents a picture which shows it is closed on three sides and open only in the forward direction (the Hebrew language is written from right to left). The sages thus saw a parallel between the written form of this opening letter/word and the study of the universe - events that occur after “the beginning” are those that are accessible for investigation and those that precede “the beginning” are not open to investigation.

- What does it mean when Genesis 1 says that God “*created*” (heaven and earth)? Christian doctrine of creation has thus far tended to focus almost exclusively on the origin of the creation in the beginning, because of which the verb “*bara*” came to be the word which is mostly associated with creation. Van Till *et al*, however, argue that the exclusive use of “*bara*” does not present a comprehensive picture - they illustrate in this regard numerous instances where other verbs are used also to depict “creation”.<sup>51</sup> The points made include the following:<sup>52</sup>

- The verb “*bara*” clearly expresses the idea of bringing something into being, but it does not signify giving

<sup>49</sup> Wenham, G.J., op. cit., p. 14

<sup>50</sup> Gerald L. Schroeder, *Genesis and the Big Bang - The discovery of harmony between modern Science and the Bible*, New York, Bantam Books, 1992, p. 56

<sup>51</sup> Van Till, Howard J. et al, op. cit. , p. 211

<sup>52</sup> Ibid., pp. 207 et. seq.

existence to something that has never before existed *in kind*, and it is not only used for physical entities. God for example creates a future human generation (e.g. Ps. 102:18), historical events (Num. 16:30), “darkness” and “evil” Isa. 45:7 (KJV) and “disaster” (NIV), “righteousness” (Isa. 45:8), etc.

- “*Bara*”, however, occurs in the Old Testament only when God is its subject and this seems to denote specifically a divine bringing into being, “... its significance for determining the specific semantic value of *bara*’ has been exaggerated ... God’s “creating” a “pure heart” (Ps. 51:10) or “Jerusalem a delight” (Isa. 65:18), or a new generation of people (Ps. 102:18), or of animals (Ps. 104:30; Neh. 9:6), or his “creating” the smith or the destroyer (Isa. 54:16), hardly depicts a divine act that does not involve an action upon some already existing being.”<sup>53</sup>
- At the same time, alternative words for “creating” do refer to materials used - e.g. in Genesis 2:7 God “fashioned” (*yasar*) man “from the dust of the ground” and in verse 22 God “built up” (*banah*) the rib he took from Adam into Eve. *Bara*’ thus seems to focus on the newness of the object created and the divine action through which it was created, rather than on the action involved.
- The word *bara*’ is also associated with *’asah*, e.g. “the Maker of all things” (*’asah* - Eccl. 11:5), Israel’s “Maker” (*’asah* - Ps. 95:6; 149:2), and the “Maker” of individuals (*’asah*, - e.g. Job 4:17; 32:22; 35:10). Furthermore, the verb *’asah* is interchanged with *bara*’ and while this

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<sup>53</sup> Ibid., p. 208

specific choice of words may sometimes be deliberate, "... but it can be of little consequence that God is said to "make" rather than "create" the expanse that divides the waters from above from the waters below (Genesis 1:7) and the heavenly bodies (Genesis 1:16) ..." and "... in the closing summation of the account "all that he had made" (1:31) and "all his work which God created" (3:3)"<sup>54</sup> is found.

The word *bara* undoubtedly points to a direct relationship between the Creator and creature – it is not so much the word of command, but rather the *direct creative act of God* from which it derives.<sup>55</sup>

- God not only created the original "**heaven and earth**", but also all present and future material. Examples include "the wind" (Amos 4:13), new generation of life (Ps. 102:18 and 104:30), each human being (Eccl. 12:1; Isa. 44:2, 24; 49:5; Jer. 1:5; etc.), he is the Creator of the "new heavens and the new earth" (Isa. 65:17-18) - he is the "Maker of all things" (Eccl. 11:5; Jer. 10:16; etc.)<sup>56</sup>
- In summary, Van Till says: "Israel, it seems, had no specialized *technical term* for speaking specifically and exclusively of primeval creation or of instantaneous creation or of creation from nothing ..."<sup>57</sup> *Bara'* thus affirms only that God conceived, willed, and effected reality. The verbs used to indicate God's acts of creation do not specify *ex nihilo* or instantaneous creation, or the

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<sup>54</sup> Ibid., p. 209

<sup>55</sup> Gerhard Von Rad, *Genesis – A Commentary*, London, SCM Press Ltd., 1970, p. 54

<sup>56</sup> Ibid., pp. 211 -212

<sup>57</sup> Ibid.

absence of process, or mediating agencies. Wenham is in agreement with Van Till in this respect and says: "First, it should be noted that God, the God of Israel, is always subject of בָּרָא. Second, the text never states what God creates out of. Third, the most frequently named products of creation are man (e.g. Gen 1:27), and unexpected novelties (Gen 1:21), mountains (Amos 4:13), and animals (Ps 104:30)."<sup>58</sup>

It thus seems that the word *bara'* does not automatically entail *creatio ex nihilo* as has thus far more or less been accepted.

- "***The heaven and earth***" (Genesis 1:1b) may also denote *the universe* and Genesis 1 could thus also be translated as "In the beginning God created everything." Bultmann explains this by describing how he understood the early simple Oriental to have lived - "For a human being who lives in the sphere of daily concerns, "heaven and earth" (v. 1) simply mean the whole universe."<sup>59</sup> According to Wenham, it is characteristic of many languages to describe the totality of something in terms of its extremes, e.g. "good and bad", "big and little", etc. "Heaven and earth" thus is also seen as an example of this phenomena. Where commentators insist that the phrase "heaven and earth" denotes the completely ordered cosmos, totality rather than organization is accentuated.<sup>60</sup>
- The issue of ***order-making*** is an important perspective on the purpose of Genesis and Niditch identifies two thematic schemes in this regard: "One involves the passage from an initial state of

<sup>58</sup> Wenham, G.J., op. cit., p. 14

<sup>59</sup> Christoph Bultmann, "Creation at the Beginning of History: Johann Gottfried Herder's Interpretation of Genesis", *Journal for the Study of the Old Testament*, 68, 1995, p. 26

chaos to an ideal cosmos in which all of nature is beautifully arranged and ordered. The other involves the passage from this ideal state to reality, for the first movement from chaos to cosmos stops short of creating those social structures, hierarchies, and definitions which mark real time and the human being's everyday status in the world."<sup>61</sup>

In verse 2 "*the earth was without form and void*", indicating "total chaos". The Hebrew words *tohu* can mean either "nothingness" (e.g. Isa 29:21) or in this case "chaos, disorder", and *bohu*<sup>62</sup> ("emptiness, waste, void"). In this context it shows the "dreadfulness of the situation before the divine word brought order out of chaos."<sup>63</sup> The latter point is also made with the next clause of the relevant sentence, "and darkness was upon the face of the deep", where "darkness" symbolizes everything that is anti-God and "the deep" (*tehom*) is literally translated as "deep water" which can threaten life (man may drown in it - see Exod. 15:8). Verse 2b ("And the Spirit of God moved upon the face of the waters") has caused some disagreement amongst commentators - some believe it signifies primeval chaos and should be translated "a mighty wind swept over the surface of the waters", according to others "the breath of God" is preferable. Von Rad asserts that "Spirit of God" is best translated as "storm of God" where "God" simply signifies the superlative, i.e. "a massive storm raged".<sup>64</sup> The difference seems to centre around the meaning of the Hebrew word *ruach*, which can either mean "wind", "breath" or "spirit", but however

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<sup>60</sup> Wenham, G.J., op. cit., p. 15

<sup>61</sup> Susan Niditch, *Chaos to Cosmos - Studies in Biblical Patterns of Creation*, Atlanta, Scholars Press, 1985, p.6

<sup>62</sup> Many writers prefer to use the word *wabohu*. See e.g. Westermann, op. cit., p. 103; Wenham, G.J., op. cit., p. 16; U. Casutto, *A Commentary on the Book of Genesis*, Part 1, Jerusalem, The Magnes Press, 1972, p. 21. "Without form and void" are, however, translated as *tohu* and *bohu*.

<sup>63</sup> Wenham, G.J., op. cit., p. 16

<sup>64</sup> Von Rad, Gerhard, op. cit., p. 47



these differences are finally settled, commentators generally agree that this clause underlines the element of existing chaos. It also shows without doubt that God was powerfully present and moving mysteriously over the face of the waters.<sup>65</sup> The existence of this “wind” or “storm” is not mentioned separately and thus must earlier have been created by God.<sup>66</sup>

For Wenham (and in fact most modern scholars) creation is thus a matter of organizing pre-existing chaos, the origin of which is left undiscussed, and the “... traditional interpretation of Genesis supposes that God first created chaos and then ordered it.”<sup>67</sup>

The latter situation is also influenced by the apparent dispute with respect to the relationship between Genesis verses 1 and 2-3. The majority of commentators adopt the view that Gen 1:1 is basically a title to what follows. Wenham says in this regard that, according to a literary explanation which is usually advanced, verse 1 is a later addition to an earlier source. Before Genesis reached its final form, it merely spoke of God addressing a dark chaotic world. When the “editor” or “reviser” added verse 1, he neglected to integrate his remarks adequately with the earlier material.<sup>68</sup> (Hudson calls this “the disruption and division of Gen 1,1-2 [which] continues in the rest of the creation story”.<sup>69</sup>)

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<sup>65</sup> Wenham, G.J., p. 17

<sup>66</sup> Casutto, U., op. cit., p. 24

<sup>67</sup> Ibid., p. 13; See e.g. also Westermann, C., op. cit., p. 104 ff

<sup>68</sup> Ibid. Some observers refer to this perceived anomaly as the “Gap Theory”. Perfect creation is then supposed in Gen 1:1, which is followed by a large time gap after the perfect creation in verse 1, when earth/creation is then ruined (presumably by the fall of Satan). The ruined earth is then described by verse 2. This interpretation was also a consequence of the possibility to translate the word “was” in verse 2 (Hebrew *hayah*), as “become” in stead of “to be” (or “was” as is generally accepted). Linguists subsequently pointed out that the order in which the Hebrew words appear, supports the translation of *hayah* as “was”. See C. Vandam, “Is There a Time Gap Between Genesis 1:1 and 1:2?”, Creation II, *INTERNET*, 1998 (<http://www.netrover.com/~azuidhof/creatio2.html>)

<sup>69</sup> Hudson, Don Michael, op. cit., p. 93

On the other hand, the text has to be interpreted synchronically as well (in its total final form), i.e. the first creative act took place in verse 1, verse 2 is a consequence of verse one, and verse 3 is the first creative word. It is, furthermore, questionable if the editor of this part of Genesis did leave obvious contradictions in his work as no evidence exists to support such a possibility. When interpreted synchronically, Gen 1:1-3 thus forms a coherent unit.

Rogerson also suggests that Genesis 1 involves distinguishing, setting boundaries and assigning positions, which leads on to the idea of creation as order. "Light is distinguished from darkness (v. 4), waters above the firmament are distinguished from those below it (v. 7), water is distinguished from dry land (v. 10), and luminaries distinguish day from night (vv. 14-15). The firmament sets a boundary between the upper and lower waters (v. 6), and the luminaries set the limits to days, nights, seasons and years (vv. 14-15). To the earth are assigned trees, plants and living creatures, to the heavens are assigned birds, and to the waters are assigned the sea and water creatures."<sup>70</sup> This view is supportive of the idea that creation is "order-making".

In conclusion Rogerson says that, if creation implies order, that order is not restricted simply to the non-human world alone, but has to include human relationships. If God only guaranteed the stability of the physical universe and was unconcerned about inter-human relationships, then creation would be fundamentally immoral.<sup>71</sup>

- ***"And God said, Let there be light"*** - light is the first of the creator's works. Light manifests most adequately the divine

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<sup>70</sup> Rogerson, J., op. cit., p. 61 - 62

<sup>71</sup> Ibid., p. 63

operation in a world which, without it, is darkness and chaos. “Though it is not itself divine, light is often used metaphorically for life, salvation, the commandments, and the presence of God (Ps 56:14; Isa 9:1; Prov 6:23; Exod 10:23). It is the antithesis, literally and metaphorically, of ... darkness”.<sup>72</sup> This verse thus again alludes to creation as a process of bringing order into the existing chaos. The question of time arises from the creation of the sun only on the fourth day (Gen. 1:14-19). Light is the first of the creator’s works and it presents a problem because of the existence of day and night (Gen. 1:5) before the creation of the sun (and the other “heavenly bodies”)<sup>73</sup>. Similarly, night existed without the moon and the stars.<sup>74</sup> A purely chronological interpretation of this account of creation may thus be difficult.

- “*And God called the light Day*” (verse 5) introduces the aspect of time into perspective. Does “day” constitute a 24-hour period or is one day comparable to a thousand years in God’s sight (Ps 90:4)? Are all days mentioned in Genesis of equal length? According to Blenkinsopp<sup>75</sup> a feature of the creation story in Genesis is that it displays a structural arrangement of seven days of which six days are occupied. This arrangement appears as follows:

Day I.	Verses 3-5	Light Separation of Light and darkness	Day IV. Verses 14-19	Sun, moon, stars Separation of day And night
Day II.	Verses 6-8	Firmament Separation of Lower and upper water	Day V. Verses 20-23	Water and air Creatures

<sup>72</sup> Wenham, G.J., op. cit., p. 18. See also Hudson, Don Michael, op. cit., p. 93

<sup>73</sup> Some commentators (e.g. Westermann) are of the opinion that the creation of light indicates the beginning of all of the work of creation – it puts the basis of the temporal order before the creation of the world of space. See Westermann, C., op. cit., p. 112.

<sup>74</sup> Casutto, U., op. cit., p. 43 - 44

<sup>75</sup> Blenkinsopp, J., op. cit., pp. 61 - 62

Day IIIA. Verses 9-10 Dry land Separation of Water and dry land	Day VIA. Verses 24-28 Land creatures Humans
Day IIIB. Verses 11-13 Vegetation	Day VIB. Verses 29-31 Vegetation as Food
Day VII. Verse 2:1-3 The Sabbath of God	

The structural arrangement of seven days represent the liturgical week, the day beginning in the evening, and the week ending on the Sabbath. It is obvious that the Sabbath is rooted in the created order of things.<sup>76</sup> The blessing of the seventh day is striking as biblical usage generally restricts it (blessing) to animate beings - it is also the first thing in the Bible to be “hallowed”.<sup>77</sup> For Westermann the seven-day pattern represents linear time and the celebration of the holy – “... the seven-day scheme has a meaning of its own, and it is not to be explained by the creation story.”<sup>78</sup> The fact that morning and evening is mentioned, that separate days are mentioned, and that the seventh day is mentioned as the resting day for God, shows that a week of divine activity is described here. This leaves little room for doubt that the author indeed describes seven 24-hour periods.<sup>79</sup> In order to fully explain this assertion, it is necessary to note the following:

- Gen. 1 is characterized by a number of recurrent formulae of which *the number seven* e.g. plays an important role. According to Wenham, there are amongst others a “fulfillment formula, e.g. *And it was so* (7 times; vv 3, 7, 9, 11, 15, 24, 30); ... [an] execution formula or description of

<sup>76</sup> Ibid., p. 62

<sup>77</sup> Wenham, G.J., op. cit., p. 36

<sup>78</sup> Westermann, C., op. cit., p. 90

<sup>79</sup> It seems that most modern scholars indeed agree that reference is made of seven 24-hour periods. See for example Wenham, G. J., op. cit., p. 36; Von Rad, G., op. cit., p. 63; Westermann, C., op. cit., 1984, p. 91;

act, e.g. *And God made* (7 times; vv 4, 7, 12, 16, 21, 25, 27); ... [an] approval formula *God saw that it was good* (7 times; vv 4, 10, 12, 18, 21, 25, 31); ... [the] subsequent divine word, either of naming or blessing (7 times; vv 5 [2 times], 8, 10 [2 times], 22, 28; ... [the] mention of the days (6/7 times; vv 5, 8, 13, 19, 23, 31 [22]. It is also worth noting that although there are ten announcements of the divine words and eight commands actually cited, all the formulae are grouped in sevens.”<sup>80</sup> The seventh day is mentioned thrice “... each time in a sentence of seven Hebrew words ...”<sup>81</sup> Casutto mentions the following examples of the use of the seven:

The terms *light* and *day* each occur seven times; *water* is mentioned seven times; the word *hayya* (“living” or “beasts”) occurs seven times; the expression *it was good* appears seven times; the first verse has seven words (in the Hebrew text); the second verse contains 14 words, etc.<sup>82</sup>

- According to Sterchi<sup>83</sup> it is the pattern in the text of Gen. 1:5-2:3 that the definite article on the first five numbers is absent and present only on the sixth and seventh days. Sterchis’s translated *sequence* of the different days mentioned in Genesis 1:5-2:3 is as follows:<sup>84</sup>

⇒ Gen. 1:5	: <i>yom ehad</i>	: “one day”
⇒ Gen. 1:8	: <i>yom seni</i>	: “a second day”
⇒ Gen. 1:13	: <i>yom selisi</i>	: “a third day”

<sup>80</sup> Wenham, G. J., op. cit., p. 6

<sup>81</sup> Ibid., p. 7

<sup>82</sup> Casutto, U., op. cit., p. 14

<sup>83</sup> David A. Sterchi, “Does Genesis 1 Provide a Chronological Sequence?”, *Journal of the Evangelical Theological Society*, 39/4, December 1996, p. 533 et seq.

<sup>84</sup> Ibid., p. 529 and pp. 531 - 532

- ⇒ Gen. 1:19 : *yom rebii* : “a forth day”
- ⇒ Gen. 1:23 : *yom hamisi* : “a fifth day”
- ⇒ Gen. 1:31 : *yom hassissi* : “The (or a) sixth day”
- ⇒ Gen. 2:2b : *bayyom hassebii* : “The (or a) seventh day”

- This does not imply a ***chronological sequence*** of seven days - it is simply presenting a list of seven days. This list may be chronological, but the syntax of it does not require that it is read as such. The meaning of the article on the sixth day is to emphasize its uniqueness - it is also the only day of which it is declared that it was “very good” (v 31). The last creative act in a list of many acts takes place on this day and it concludes God’s creative acts. It is therefore a special day amongst the other days. The seventh day also has a definite article and “... the uniqueness of day seven is marked by its attributive description, “the seventh” (including the definite article), and also by its structural position in the account (last).”<sup>85</sup> Grammatical justification for the exclusion of chronology is thus presented as to the reason why the author opted for the list alternative to a chronological format.

Van Till in an apparent agreement with Strechi asserts that the days of Genesis are not presented as the first seven days of the story told in Gen. 2:4ff. - these seven days are a completed time and “... the seventh day does not give way to an eighth ... the lack of correlation between the

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<sup>85</sup> Ibid.

chronological sequences of 1:1-2:3 and 2:4ff. [thus] involves no tension.”<sup>86</sup>

Why would the author of the account of the seven days of creation opt for a list of the seven days and not a chronological format? The author may on the one hand have been committed to the truth in reporting the account in the text, but on the other hand may have wanted to remove the confines of chronological syntax by using a literary structure to further reinforce his message.<sup>87</sup>

Furthermore, the inconsistency between the works and the days of creation suggest an earlier revision of the order of creation. The 3<sup>rd</sup> and the 6<sup>th</sup> day each have two created works and the creation of the firmament cuts across two days (the 2<sup>nd</sup> and the 3<sup>rd</sup> days). It seems as if the order of the works could have been different at some time and it is possible that a reconstruction took place at some later stage.

<sup>88</sup> Westermann goes so far as to say: “All attempts to bring the works of creation into a systematic order must be given up. There was never any intention of doing this.”<sup>89</sup>

Ps. 90:4 (“*For a thousand years in thy sight are but as yesterday*”) is sometimes invoked in an effort to explain the questioning of the biblical account of creation. This biblical passage simply cannot be associated with the Genesis account of creation in view of the evidence discussed

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<sup>86</sup> Van Till, Howard J., op. cit., p. 237

<sup>87</sup> Sterchi, David A., op. cit., p. 535. This literary style may seem strange, but is not so peculiar. Sterchi also notes other examples in the Bible where similar abandonments of chronology occur, e.g. the entire book of Jeremiah, the temptation of Christ depicted in Matthew 4 and Luke 4, where the three temptations are not recounted in the same order.

<sup>88</sup> Von Rad, G., op. cit., p. 62

<sup>89</sup> Claus Westermann, C., op. cit., p. 89

above, and the literary nature of Genesis 1 and the chronological sequence thereof should rather be investigated. It "... is perilous to try to correlate scientific theory and biblical revelation by appeal to such texts."<sup>90</sup> There is no indication that the author of the Genesis account of creation intended "his" days to be irregular with some being 24-hour periods, some longer periods, and others eons. "Recognition that Genesis 1:1-2:3 presents a storied rather than a historiographical account of creation reinforces the conviction of many interpreters that the topical selection and arrangement, as well as the sabbatical distribution of the acts of creation, are governed by the demands and logic of the purpose of the presentation in the historical context of the author and the literary context of Genesis."<sup>91</sup>

- The creation of the *firmament* (רָקִיעַ - *raqiya*) on the second day (vv. 6 - 8) is also called "heaven" in v 8. The firmament occupies the space between the earth's surface and the clouds, but the exact nature of the firmament is unclear. The word is derived from רָקַע, meaning to "stamp, spread" - in Ezek. 6:11 (stamp - *raqa*); Isa. 42:5 (stretch out or *natah*), and in Exod. 39:3 (spread by hammering - *raqa*); Job 37:18 (spread out hard as molten mirror - *raqa*). In Ezek. 1:22 and Dan. 12:3 it is described as "the colour of crystal", i.e. shiny. Wenham points out that the aforementioned descriptions of the firmament mostly occur in poetic text and should therefore be viewed figuratively - Genesis 1 is thus not concerned with describing the nature of the firmament, but rather with asserting God's power over the waters. Heaven, furthermore, is not an aspect of God but was itself created by God.<sup>92</sup>

<sup>90</sup> Wenham, G.J., op. cit., p. 19

<sup>91</sup> Van Till, Howard J., op. cit., p. 238

<sup>92</sup> Wenham, G.J., op. cit., p. 20



- In 1:14-19 *the creation of the sun, moon and stars* is described. It soon becomes evident that, apart from being repetitive, this description is done at much greater length than any other part of the creation account, save the creation of man. The most obvious reason for this is the importance of heavenly bodies in Near Eastern thought - in neighboring cultures the sun and the moon were important gods in the pantheon and the stars were often thought to have had a controlling effect on the destiny of man. According to Wenham, the polemic surrounding the way Genesis treats this theme in comparison to Near Eastern thought is as follows:<sup>93</sup>

- \* The sun, moon and stars are created by God and are creatures ... not gods. (Only the sun and the moon were divinities in the Orient.<sup>94</sup>) This entails that they were not always there - unlike the Hittite sun-god they are not from eternity.
- \* The sun and moon are not given their usual Hebrew, but are instead called “the larger” and “the smaller lights”. Giving them their usual Hebrew names (*Shamash/Shemesh* and *Yarih/Yareach* respectively) at this point (as is the case elsewhere in the Bible, e.g. Ps. 74:16; 136:8, 9; Jer. 31:35; Eccl. 1:5; etc.) might suggest an identification with *Shamash* the sun god and *Yarih* the moon god.
- \* The sun and the moon are assigned the roles of lighting the earth and ruling the day and night. “This is quite a lowly function by ancient Near Eastern standards.”<sup>95</sup> Nevertheless, the fact that roles are assigned (i.e. “to govern the day and the night and to separate light from darkness”)

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<sup>93</sup> Ibid., p. 21

<sup>94</sup> Westermann, C., op. cit., p. 127

<sup>95</sup> Wenham, G.J., op. cit., p. 21

indicates that heavenly bodies were considered to be alive and regarded as lords or gods.<sup>96</sup>

- \* The stars which in Near Eastern circles were assigned the role of controlling the destiny of man, are mentioned in Genesis almost as an afterthought and are, like the sun and the moon, not gods but mere creatures. It is also interesting to note that "... all ancient Oriental ... thinking with regard to time was determined by the cyclical course of the stars."<sup>97</sup> It was not the sun and the moon's use that indicated seasons, but the stars. Yet the Genesis account of their creation depicts "lowly creatures" when they are mentioned.

Scientific knowledge makes it difficult to understand the existence of day and night before the creation of the sun, but the ancient Hebrews did not make an absolute connection between daylight and the sun - at dusk and dawn light exists even though the sun is below the horizon.<sup>98</sup> Verse 14 therefore affirms the relationship between the sun and daylight for all time from the fourth day of the creation. Wenham thus says that it must therefore be supposed that light and darkness alternated at God's command during the first three days.<sup>99</sup> This position does not afford an adequate answer to the seemingly illogical sequence of creation and immediately raises a number of questions from the scientific perspective.

It is worth noting that the fourth day of creation is the only one to which no divine word is added after the act of creation. On days 1-3, God names what He had created (vv. 5, 8 and 10) and on days 5 and 6 the creatures are blessed (vv. 22, 28). Wenham says that this

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<sup>96</sup> Westermann, C., op. cit., p. 132

<sup>97</sup> Von Rad, G., op. cit., p.54

<sup>98</sup> Wenham, G.J., op. cit., p. 22

may be "... a deliberate attempt to avoid naming "sun" and "moon" with their connotations of deity."<sup>100</sup> Westermann also notes that it may well be that this passage (Gen. 1:15-16) represents a revision of a previous text in which the sun and the moon were in fact named, and where the names were later removed " ... so as to avoid any possible mythical association ..."<sup>101</sup>

- The creation story is finalized in Gen. 2:1-3. What is important here is the reference to "*the heavens and the earth and all their host*" (2:1). The stars (e.g. Deut. 4:19) and less frequently the angels (e.g. 1 Kings 22:19) are the host of heaven. (This verse also mentions the existence of the "host of earth", which does not occur anywhere else in the Bible. It must therefore refer to everything created on earth.)<sup>102</sup>

It is often asserted that there are *two creation stories* - one in Gen. 1-2:4a and one in Gen. 2:4b-25 and there can be little doubt that duplications between Genesis 1 and 2 exist. Of significance here is that there is no explicit account of the creation of light, darkness, day, night, sun, moon, stars or firmament in Genesis 2. This apparent anomaly is sometimes explained as Gen. 1-2:4a depicting a creation story where the formation and ordering of the universe is highlighted, while Gen. 2:4b-25 is an origins story which presumes the existence of the earth and then describes how it was populated and ordered.<sup>103</sup> For Hudson God is distantly involved in the creative activity in Gen. 1-2:4 speaking realities into existence, while in Gen. 2:4b-25 he is intimately involved in creating humankind.<sup>104</sup>

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<sup>99</sup> Ibid.

<sup>100</sup> Ibid., p. 23

<sup>101</sup> Westermann, C., op. cit., p. 130

<sup>102</sup> Wenham, G.J., op. cit., p. 35

<sup>103</sup> Rogerson, J., op. cit., pp. 63 - 64

<sup>104</sup> Hudson, D. M., op. cit., pp. 93 - 94

## THE ROLE OF MYTH IN THE ANCIENT NEAR EAST<sup>105</sup>

*Genesis as “mythical” literary genre.* Biblical scholars have for a long time known that the Babylonians possessed creation stories which were somewhat similar to the Genesis account of creation, but it was thought that these extra-biblical accounts depended on the biblical account.<sup>106</sup> It, however, was not before George Smith reported to the London Society of Biblical Archeology in 1872, that he had identified a story of a great flood among the mythological texts belonging to the 7<sup>th</sup> century BC “library” of the Assyrian king Ashurbanipal, that the pursuit and study of Genesis in the light of comparative literature from the ancient Near East began.<sup>107</sup> A new context for the interpretation of Genesis emerged and “... these chapters were no longer seen as the beginning of a sacred, inspired book, the Bible. Instead, they were seen as ancient Hebrew narratives similar to other narratives from the ancient world about cosmic and human origins.”<sup>108</sup>

Indications that mythical traditions of the Near East have influenced the “writers” of Genesis are apparent. According to Blenkinsopp, Mesopotamian mythical tradition is evident - it is for instance suggested that “... the cities of the Phoenician littoral ... served as a cultural link between Greece and Israel”, which may have resulted in the acquisition by Israeli scholars of knowledge of such myths.<sup>109</sup>

The borrowing of common Oriental ideas, as Von Rad points out, was

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<sup>105</sup> Rogerson asserts that “... myths are stories about the gods ...”, and for Hess a definition of myths is “...traditional narratives centering on divine beings, but without excluding narratives with only one deity such as Yahweh.” See Rogerson, J., op. cit., p. 63, and Richard S. Hess, “Genesis 1-2 and Recent Studies of Ancient Texts”, *Science and Christian Belief*, Vol 7, No 2, 1995, p. 63 respectively

<sup>106</sup> Rogerson, J., op. cit., p. 13

<sup>107</sup> Hess, R. S., op. cit., p. 141. Some of the texts later discovered were written in Akkadian, the international language of the ancient Near East for two millennia. See Hess, p. 142

<sup>108</sup> Rogerson, J., op. cit., p. 13

<sup>109</sup> See Blenkinsopp, J., op. cit., p. 40 et. seq.

quite common.<sup>110</sup> In another example, Westermann makes the point that the doctrine that the world came out of darkness is found among the Babylonians, Egyptians, Indians, Phoenicians, Greeks and Chinese.<sup>111</sup>

*Examples of possible influences from Ancient Near East texts.*

Examples of such possible influences on the creation story in Genesis include the following:

- The first Babylonian creation account discovered was named *Enuma Elish* (after its opening words). The literature thus discovered dated back to the 7<sup>th</sup> century BC<sup>112</sup>, but later discoveries of other texts date even further back (e.g. the *Ugaritic texts* on the Mediterranean Sea coast of modern Syria, which date from the 14<sup>th</sup> and 13<sup>th</sup> centuries BC).<sup>113</sup> In *Enuma elish* Marduk overcame Tiamat (the primeval saltwater ocean and one of the two primeval gods ancestral to all other gods), and split her into two parts, of which one part was set up as the sky. He then took the measure of Apsu, the ocean below (presumably the other half of Tiamat) and made over it a firmament (canopy) in which he established the celestial bodies, and then formed the mountains on Tiamat's head. Heaven and earth were thus created.<sup>114</sup> The similarity between the Genesis account of creation and that of Enuma Elish is so striking that one can scarcely deny some sort of relationship.<sup>115</sup>
- The reference to the "deep" (*tehom*) in v. 2 was seen by some scholars as referring to Tiamat, from whose corpse the world is

<sup>110</sup> Examples are Ps. 104:5-9; 89:10; 74:12-17; Isa. 51:9; and Ezek. 32:2-8. See Von Rad, G., op cit., p. 48.

<sup>111</sup> Westermann, C., op. cit., p. 104

<sup>112</sup> According to Van Till, this text may possibly even date from the time of Hammurabi - the end of the 18<sup>th</sup> century BC. See Van Till, H. J., op. cit., p. 228

<sup>113</sup> Hess, R. S., op. cit., p. 142

<sup>114</sup> Van Till, Howard J., op. cit., p. 228

created. This view is refuted by arguments based on linguistic analysis which clearly prove that “*tehom*” was not derived from “Tiamat”. “Both Hebrew and Babylonian *Ti’amat* are independently derived from a common Semitic root” which shows “that a direct borrowing is impossible.”<sup>115</sup> It is also pointed out that Gen. 1:2 illustrates God’s power over the seas, whereas the sea was worshipped in Ancient Near East cultures, and that the sea was under God’s control from the beginning.<sup>117</sup>

- A number of parallels between Genesis 1 and *Enuma elish* exist, i.e. the creation of light, the firmament, dry land, luminaries, and the divine rest on the 7<sup>th</sup> day. The overall purpose of *Enuma elish* as well as many other details were, however, completely different from Genesis - *Enuma elish* exalts Marduk and justifies his supremacy in the Babylonian pantheon. His creative skills are second to his overpowering of Tiamat. In Genesis, God’s creation is the central theme. The relative lateness of *Enuma elish* also counts against it being a source of Genesis. Wenham also points out that research revealed that *Enuma elish* does not represent normative Mesopotamian cosmology, and that many so-called parallels between Genesis and *Enuma elish* are in fact commonplaces in many other Near Eastern cosmologies.<sup>118</sup>
- The extensive use of the number 7 in Genesis (and other parts of the Bible). Van Till says in this regard that the number seven played an important role throughout the Ancient Near East, where it commonly served as the primary numerical symbol of fullness, completeness and perfection. Examples from *Ugaritic literature* are the seven-day journey of King Keret to the city of Udm the

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<sup>115</sup> Westermann, C., op. cit., p. 89

<sup>116</sup> Wenham, G. J., op. cit., p. 16

<sup>117</sup> Hess, R. S., op. cit., pp. 143 - 144

<sup>118</sup> Wenham, G. J., op. cit., p. 8

Great, and his seven day siege of that city, the seven days required for completing Baal's royal palace, and King Daniel's seven-day appeal to the gods and his subsequent seven days of feasting. The Mesopotamian Epic of Gilgamesh mentions that it took seven days to build Utnapishtim's "ark" and the flood that followed raged for seven days - it also took seven days to subside.<sup>119</sup>

- The *Atrahasis epic* is a creation account from the 18<sup>th</sup> century BC that preserves older traditions of Mesopotamian mythology than *Enuma elish*. In it is described how the gods created people in order to serve them with food and drink and when they had finished creating these slaves, they rested. The theological differences with the Genesis account are evident: God does not rest because he has someone else to work for him, but because he finished his creative work; people are not created as slaves and to satisfy the needs of God, but as custodians of creation.<sup>120</sup> There are numerous other examples of differences of the relationship between "the mythical gods" and man on the one hand, and between God and man on the other hand.<sup>121</sup>

<sup>119</sup> Ibid., p. 239. Other examples from the Old Testament include the seven days Noah waited in the Ark for the flood to begin (Gen. 7:10), two seven-day periods he waited between his sending forth of the doves after the ark came to rest (Gen. 8:10, 12), the mourning of Jacob lasted seven days (Gen. 50:10), Moses' seven day wait on Mount Sinai for the Lord to come (Exod. 24:16), the seven-day siege of Jericho (Josh. 6), the seven days in which the armies of Ahab and the Arameans faced each other before joining battle (1 Kings 20:29), Job's friends sat down with him for seven days and seven nights (Job 2:13), and the seven-day wedding feast (Judg. 14:12, 17). The seven-day feasts of Passover/Unleavened Bread and Tabernacles are also well known.

<sup>120</sup> Hess, R. S., op. cit., p. 146

<sup>121</sup> Zimmerli mentions the abundance of occurrences in Genesis 1 and 2 of God's concern for man, e.g. God plants the garden of Eden and causes the trees to sprout. The task of the naming of the animals is given to Adam, whilst the giving of names usually is the act of a sovereign (see 2 Kings 23:34 and 24:14). The position of man in the mythical stories certainly does not reflect the god's concern for them. See Walther Zimmerli, *Old Testament Theology in Outline*, Edinburgh, T & T Clark Ltd., 1978.

- The Sabbath as “day of rest” has relevance. The Hebrew word for Sabbath, *sabbat*, resembles the Akkadian *sapattu*, which the Babylonians called “the day of the full moon”<sup>122</sup>. In Mesopotamia the 7<sup>th</sup>, 14<sup>th</sup>, 19<sup>th</sup>, 21<sup>st</sup>, and 28<sup>th</sup> days of each month were considered by some to be unlucky, and the Hebrew Sabbath may thus have been introduced as a deliberate counter to the later lunar-regulated cycle.<sup>123</sup> The Sabbath as one day of rest out of every seven days, remains, however, unique to Israel.
- The two creation stories. Traditionally interpreters divided Gen. 1-2:3 and 2:4-25 into two different sources, explaining that the first part was written/compiled by one source (the P-source) and the second part by another source (J). More recent literary studies of the Bible have suggested an alternative explanation invoking other Ancient Near Eastern creation accounts. Kikawada thus asserts that *Atrahasis*, and *Enki and Ninmah* both relate creation in two parts and like the Genesis account, the first part depicts creation in general terms while the second part is a more descriptive account.<sup>124</sup>

## Discussion

The similarity in the Genesis account of creation and other Near Eastern sources does not mean that the biblical stories themselves are myths. There is no *direct* evidence in Genesis which for example indicates that creation and flood stories known from ancient

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<sup>122</sup> See Hess, *Ibid.*, and Wenham, *op. cit.*, p. 35. The Sabbath is not mentioned in Genesis 1 by name - instead it refers to “the seventh day”. According to Wenham, this is probably so in order to prevent a confusion between “*sapattu*” (Babylonian) and “*sabbat*” (Hebrew).

<sup>123</sup> Wenham, G. J., *op. cit.*, p. 35

<sup>124</sup> I. Kikawada, *The Double Creation of Mankind in Enki and Ninmah, Atrahasis I 1-351, and Genesis 1-2*, Iraq, 1983, pp. 43 - 45, quoted in Hess, R. S., *op. cit.*, p. 146



Mesopotamia are referred to, or if they have been used, what the intentions of such “writers” were in using them.

It is, however, evident from recent studies that the interpretation of the contents of Genesis is definitely influenced by *the assumption* that the “writers” of these stories may well have been in contact with some or all of these extra-biblical traditions.<sup>125</sup> The point is that it is unknown whether the “writers” of Genesis were actually familiar with other creation stories from the ancient world, and any interpretation of these stories which does not take this possibility in account, may result in an incomplete view and interpretation of Genesis.

In an argument flowing from the question whether the “writers” of Genesis actually were familiar with other creation stories from the ancient world, Rogerson makes the additional point that the meaning of the text cannot *ipso facto* be confined to intentionality or motive of the “writer”, but must be connected to and sought in contemporary life. He argues that while some scholars are convinced that the only way to discover the meaning of text is to isolate the sources of which it is believed to be composed and to see how these sources have been used in the final composition, too many uncertainties exist to make absolute findings. An example of such an uncertainty includes whether the compilers of the Genesis account of creation actually were familiar with other creation stories from the ancient world.<sup>126</sup>

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<sup>125</sup> Niditch quotes some striking examples of a wide variety of creation stories from the creation mythology of Scandinavia, China, the Jicarilla Apache of North America, as well as Near Eastern accounts. See Niditch, S., op. cit., pp. 13 - 43.

<sup>126</sup> He illustrates this argument by quoting the following example: According to one text interpretation, the purpose of Genesis 9 was to criticize the building schemes of Solomon. If we assume that this is correct, does it follow that any other interpretation of the story of the tower of Babel is incorrect? It certainly does not, and this example then demonstrates the assertion that interpretations are the work of people who “... have an implicit view of what it means to be a human being”. See Rogerson, J., op. cit., pp. 49 - 50

The idea that the “writers” of Genesis were actually familiar with other creation stories from the ancient world, is quite clear for Wenham, who asserts that the author of Genesis shows that not only was he aware of other cosmologies, but that he wrote not in dependence on them so much as in deliberate rejection of them. He quotes the following five areas which seem to be attacking rival cosmologies:<sup>127</sup>

- I. In some Near Eastern cosmogonies dragons (*tnn*) are rivals whom the Canaanite gods conquer, whereas in Gen. 1:21 “the great sea monsters” are just one kind of the aquatic animals created by God.
- II. These cosmogonies describe the struggle of the gods to separate the upper waters from the lower waters, but in Gen. 1:6-10 the act of separation by simple divine fiat is described.
- III. The worship of the sun, moon and stars was current throughout the ancient orient, but Genesis noticeably refrains from using the normal Hebrew words for sun and moon and instead refers to “the greater” and “the lesser lights”. This is to prevent them from being taken as divine.
- IV. According to Babylonian tradition man was created as an afterthought, and then to relieve the gods of work and provide them with food. In Genesis the creation of man is the ultimate goal of creation and *he* provides *them* with food.
- V. Genesis shows God creating simply through his spoken word, not through magical utterance as is attested in Egypt.

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<sup>127</sup> Wenham, G. J., op. cit., p. 9

For Hess, the Ancient Near East texts discovered and the comparative studies undertaken thus far, have rewarded yielding insights in the interpretation of Genesis, which is summed up as follows:<sup>128</sup>

- Recent literary comparisons with the older creation stories have removed the controversy in respect of the “Tiamat” from Genesis, affirmed God’s control over the sea and have contributed to the better understanding of the significance of the seven days of creation and final “rest” in Genesis 1.
- The Atrahasis Epic as well as other creation accounts have confirmed the distinctive purpose of the biblical Sabbath and helped to explain the two accounts of creation in Gen. 1 and 2.
- Texts from the 13<sup>th</sup> century BC Ugarit have provided help in the interpretation of *tohu wabohu* (formless and empty).

These texts do not encourage the notion that biblical accounts of creation are founded upon Mesopotamian and Ugaritic creation stories. The Genesis account of creation is thus not only firmly set within the linguistic as well as cultural context of the ancient Near East, but the literary creativity of biblical authors is also demonstrated “... providing fresh insights into old truths.”<sup>129</sup>

The numerous studies undertaken thus far seems to have generated consensus among theologians that, though Genesis shares many of the theological presuppositions of the ancient world, it (Genesis) is best read as presenting an alternative world view to those generally

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<sup>128</sup> Hess, R. S., op. cit., pp. 148 -149

<sup>129</sup> Ibid.

accepted in the ancient Near East.<sup>130</sup> “Both agreed that an invisible supernatural world existed; that a God or gods existed; were personal; could think, speak, and communicate with men; indeed control human affairs. Genesis also agreed with oriental theology that man is more than material: he has a spiritual divine dimension. Creation as an act of separation between light and darkness, land and sea, and by the word of God all find parallels in Near Eastern theology.”<sup>131</sup>

## THE PURPOSE OF GENESIS 1 – 2:4A

This study has had the science-religion debate in mind from the onset and it is only natural to want to view the Genesis account of the creation of the universe in this light. But is this what the author(s) of Genesis had in mind when Genesis was compiled? How should one relate to Genesis 1 – 2:4a?

It is clear from the aforementioned evidence that Genesis is primarily about God’s character and purposes for mankind. Genesis can be viewed as a retelling of ancient oriental traditions about the origins of the world with the view to present the nature of God as one, omnipotent, omniscient, good, as opposed to the fallible, capricious weak deities who were popular in the rest of the ancient world. It is further concerned to show that humanity is central in the divine plan - definitely not an afterthought. It also wants to show that man’s predicament is the result of his own disobedience, which is bound to worsen without divine intervention.<sup>132</sup> “It [Genesis] proclaims that the God who has related himself to Israel through redemption and covenant is the Creator of the world and all that is in it, that the world and all that is in it are works of his hands and subject to his rule, and

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<sup>130</sup> See Wenham, G. J., *op. cit.*, p. xlv; Rogerson, J., *op. cit.*, p. 55; Hess, R. S., *op. cit.*, p. 149; Blenkinsop, J., *op. cit.*, p. ix. The literary genre of Genesis thus became known as “mythical”.

<sup>131</sup> Wenham, G.J., *op. cit.*, p. xlviii

that men and women, as beings created “in his image”, are his servants and royal stewards in the visible creation.”<sup>133</sup>

For Zimmerli, “...the primary theme [of Genesis 1] was God’s efficacious word; in Genesis 2, it was his merciful condescension toward man ...”<sup>134</sup>

If the purpose of Genesis is restricted to mainly giving information about the way in which the world and all things began, the value of the book is lost. It shows how God acts towards mankind and what it can do in reply to Him.<sup>135</sup> In the same vein it can be stated that although God initially, before the written word proclaiming God’s revelation to mankind existed, revealed himself only through nature, there was a missing element: “the voice of a guide”.<sup>136</sup> By trying to glean information only on the origin of the universe from Genesis, “the voice of the guide” is restricted in its revealing splendour.

Can, however, the same not be said of efforts to ignore any possibility of studying the origin of the universe from the Genesis account of creation? It seems reasonable to accept that the greater part of the message of Genesis will be lost in the case where a few verses of Genesis become the only object of study, but to suppose that a message does not exist at all for those interested in the origin of the universe, seems unreasonable. The question then is, what does Genesis say about the origin of the universe? Can any scientific knowledge be obtained from the study the origin of the universe from the Genesis account and can this be compared to the scientific account? In order to tackle this issue, one will have to first investigate the origin of the

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<sup>132</sup> Ibid., p. liii

<sup>133</sup> Van Till, H. J., op. cit., p. 222

<sup>134</sup> Zimmerli, W., op. cit., p. 39

<sup>135</sup> Hargreaves, J., op. cit., p. 1

<sup>136</sup> Bultmann, C., op. cit., p. 28

universe from the scientific point of view so that the feasibility of such a comparison can be made.

## SUMMARY

In interpreting Genesis, a choice had to be made according to which a *fundamentalist approach*, a *critical realistic approach*, or a *reader oriented approach* could be adopted. The *fundamentalist approach* does not allow for the possibility of errors in the Bible and resists the making use of modern scientific methods in such an endeavour. The fundamentalist approach's strong hostility towards modern theology and towards the use of methods, results and implications of a modern critical study of the Bible, thus precludes the use of this approach.

The *critical realistic approach* in its search for realism fixes itself to the past in such a manner that the past becomes a theological strait-jacket and is thus inherently conservative. It will allow creative interaction between science and religion only *as long as fundamental belief systems about God are left unchallenged*. This approach also had to be discarded especially insofar as it cannot allow creative interaction between religion and science because it does not allow the challenging of fundamental belief systems about God. Alternative belief systems about God presented e.g. by the Process Theology, can thus not be accommodated.

By making use of modern methods (*associated with the reader oriented approach*) to interpret Genesis, it could be shown that:

- The Hebrew word used to describe God's creative act (*bara'*) is always associated with the creative activity of God, but the concept of *creatio ex nihilo* is not always associated with the word *bara'*.

- The “order-making” is central to God’s creative activity.
- If the Genesis account of creation is interpreted literally, it clashes with scientific evidence with respect to how the universe came into being (e.g. the sun was created on the 4<sup>th</sup> day, after evenings and mornings for three days are mentioned).
- The Genesis account of creation contains a list of creation acts of God and this list does not follow a consequential pattern. A purely chronological interpretation of this account of creation is thus impossible.
- Although Ps. 90:4 (*“For a thousand years in thy sight are but as yesterday”*) is sometimes invoked in an effort to explain the questioning of the biblical account of creation, this biblical passage simply cannot be associated with the Genesis account of creation in view of the evidence that the days mentioned in the Genesis account of creation consist of 24-hour periods.
- There are two creation stories - one in Gen. 1-2:4a and one in Gen. 2:4b-25 and there can be little doubt that duplications between Genesis 1 and 2 exist. This apparent anomaly is explained as Gen. 1-2:4a depicting a creation story where the formation and ordering of the universe is highlighted, while Gen. 2:4b-25 is an origins story which presumes the existence of the earth and then describes how it was populated and ordered.
- Indications that mythical traditions of the Near East have influenced the “writers” of Genesis are apparent. Examples include the fact that a number of parallels between Genesis 1 and *Enuma elish* exist, i.e. the creation of light, the firmament, dry land, luminaries, and the divine rest on the 7<sup>th</sup> day, the *Atrahasis epic* is a creation account from the 18<sup>th</sup> century BC which also describes

how the gods created people, and the *Atrahasis*, and *Enki* and *Ninmah* both relate creation in two parts and like the Genesis account.

- The idea that the “writers” of Genesis were actually familiar with other creation stories from the ancient world, is quite clear, but the author of Genesis shows that he not only was aware of other cosmologies, but that he wrote not in dependence on them so much as in deliberate rejection of them. It was also shown that the ancient Near East texts discovered and the comparative studies undertaken thus far, have rewarded yielding insights in the interpretation of Genesis.

### **DISCREPANCIES BETWEEN BIBLICAL AND EXTRA-BIBLICAL DATA ON CREATION**

The discrepancies between the biblical account and extra-biblical data can be summarised as follows:<sup>137</sup>

- The Genesis 1 and 2 account of creation describes creation as having taken place over a *period of six days*. Biblical evidence (e.g. the designation of the days as day 1, day 2, etc.) suggests that 24-hour periods are described. Science has established that earth is 4.5 billion years old and that some of the items mentioned in the Genesis account appear at intervals extending over a vast period of time.
- The *separation of light from darkness* as well as the mentioning of the “evening and morning” of each day, precedes the creation of the sun on the fourth day.

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<sup>137</sup> Michael R. Johnson, *Genesis, Geology and Catastrophism - A Critique of Creationist Science and Biblical Literalism*, Exeter, The Paternoster Press, 1988, p. 16 ff



- *The firmament* separating the waters from above, from the waters from below occupies a full day, thus underlining the importance thereof. Such an entity does not exist in Earth's atmosphere.
- *Seed- and fruit-bearing plants* are created before the sun, moon and stars and all other living things. Palaeontological evidence indicates that such advanced plants first appeared long after the first primitive plants and animals.
- *The sun, moon and stars* are set in the firmament (below the waters that are above the firmament). This implies a geocentric cosmology and it is incompatible with the known structure of the universe.
- The *creatures of the sea and all birds are described as having been created on the fifth day and thus before animal life*. This contradicts palaeontological evidence. The impression is also given that animal species were created as they are today, while the evidence suggests evolutionary differences over periods of times.
- *Man and animal* were both regarded as vegetarian, while fossil evidence proves that carnivorous animals lived before man.
- *The creation of the "heavens and earth"* is depicted as being finished, while astronomical and geological evidence show continued creative activity (e.g. new stars are condensing from gas clouds in space, new volcanic islands and mountains are forming on Earth, etc.).

## CONCLUSION

In keeping with the view that a reader oriented approach may be the most comprehensive approach to interpreting Scripture, an assessment was made of the Genesis account of creation. A summary of the relevant findings are as follows:

- The universe came into being through the “creative activity” (an act of will) of God (“In the beginning God created the universe”).
- This activity (the creation of the universe) did not result in an instantaneous complete universe. It was a process which resulted in the coming into being of various elements of the universe at various times.
- Taken as a whole, creation also signifies a process of development - the earth, for example, is now no longer “empty” and “without form”. An evolutionary process of some kind is implied.
- Although the initial creative act involved *creatio ex nihilo*, subsequent creation took place from existing matter.
- God is continuously involved with his creations and creation still takes place (e.g. Jer. 51:19).
- An initial act involving *creation ex nihilo*, during which matter, time and space was created, took place. It is impossible to know existence before this point in time.

- Genesis 1-2:3 does not list the creation of earth, water, darkness, *tohu, wabohu* and the deep.
- The author who compiled the account, did so from the perspective of someone who recounted a story long after it happened and in the idiom and with knowledge to which he had been exposed. This implies the following:
  - \* Current myths of the time formed the basis of this story, but a deliberate effort to refute elements which clashed with the purpose of his writing, were demonstrated.
  - \* Before the compilation of Genesis and before any effort was made to compile the Pentateuch in any form, God revealed himself mainly through nature.
- The events described, were not formulated to record a sequence, but rather to list them in order to convey a special message. Genesis thus does not give an historical account of how the universe began.
- The purpose of the intended message was not to describe the creation of the universe, but to present the nature of God as one, omnipotent, omniscient, and good, as opposed to the fallible, capricious, weak deities who were popular in the rest of the ancient world at the time of the “editing” of Genesis. It is further concerned with showing that humanity is central in the divine plan.
- While the reason for the creation of “earth” is given (to serve as abode for the prime of all creatures - mankind), there is no apparent explanation for the creation of celestial phenomena.

This understanding of biblical creation does not deviate from traditionally accepted views of God having created the universe “out of nothing” as there are other references “... which speak of his creating everything by his word and his existence before the world”.<sup>138</sup> It merely illustrates an acceptable argument which enhances the interpretation of scriptural text - the point being that modern scientifically based methods of analysing scripture present a fuller picture of this reality. It furthermore underlines the argument that the purpose of this narrative may never have been intended to give an exact account of *how* the universe came into being, but rather *why*.

The question can be asked whether conflict exists between the doctrines of *creatio ex nihilo* and *creatio continua*. While the two concepts may theologically stand apart, there is no conflict between the doctrines of *creatio ex nihilo* and *creatio continua* in the above sense.

Furthermore, if God reveals himself continuously through nature, does this not affect the Christian view on the authority of the Bible? It must be remembered that the Christian Bible has been in existence for a fraction of the time that “modern” man’s history can be traced. God initially revealed himself to man also (perhaps *mainly* so) through nature. Did God stop revealing himself through nature when the Bible came into existence? Certainly not. When the authority of the Bible was established as the written “word of God” (i.e. revelation to man), God’s revelation through nature continued.

Can Genesis 1 be interpreted literally? It seems in terms of the abovementioned inquiry that a literal interpretation of the Genesis account of creation would be futile. Can any proper comparison be made between the biblical creation story and scientific evidence of how the universe came into being, or should any such effort be restricted to

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<sup>138</sup> Wenham, G.J., op. cit., p. 14. See for instance Ps. 148:5, Prov. 164, Eccl. 3:11,

the mere identification of “creation language” and the theological interpretation of Genesis 1-2:3? In order to address this question, the next chapter will look at the Big Bang Theory.

## CHAPTER 6

... some mocked, and others said "We will hear thee again of this matter".  
Acts 17:32

### EXAMINING THE LOOSE ENDS OF THE SCIENTIFIC MODELS OF THE ORIGIN OF THE UNIVERSE

#### INTRODUCTION

It cannot be denied that science is a dominating force which is helping to shape the outlook of humankind and as such it cannot be ignored by anyone concerned with the plausibility of Christianity (or any other religion for that matter). To ignore any scientific data would certainly contribute to the making of choices which may not include religion at all. "The universe that is steadily being disclosed to [the] various sciences is found to be characterised throughout time and space by an ascending gradient of meaning in richer and higher forms of order."<sup>1</sup> According to Carvin, it is no longer philosophy which set the pace in human culture, but the physical and natural sciences through their constant "revelation" of new knowledge that underlie reality.<sup>2</sup> It is clear, however, that the scientific picture as to the origin of the universe is incomplete.

The purpose of this chapter is to examine the latest findings of the Astronomy and to describe Cosmology from this angle. The following aspects will briefly be covered:

#### Some notes on Astronomy and Cosmology

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<sup>1</sup> W.P. Carven, *Creation and Scientific Explanation*, Edinburgh, Scottish Academic Press, 1988, p. vii

## The Universe

*What do we mean when we refer to “the universe”?*  
*How are astronomical distances calculated?*

*Parallax*

*The intrinsic brightness of stars*

*Stars that pulsate*

*Supernovae*

*Using galaxies themselves as standard candles*

*The Tully-Fisher method (“21-centimetre line width”)*

*The Sunyaev-Zeldovich effect*

*The brightness fluctuation technique*

*How old is the universe?*

## The Big Bang Theory

*Introduction* - Lemaître, "Tired Light", The Steady State (C-Field) Theory, The Plasma Universe Model

*The basic precepts of the Standard Model*

*Physical laws adduced on earth pertain throughout the observable universe*

*The universe is expanding*

*The universe is isotropic and homogeneous*

*General relativity accurately describes the behaviour of gravitation in the universe today*

*The early universe was in a state of high density and high energy*

*The universe is evolving*

## The inflationary hypothesis

## Problems with the Big Bang Model

## Conclusion

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<sup>2</sup> Ibid.

## **SOME NOTES ON ASTRONOMY AND COSMOLOGY**

Cosmology was born when humans first gazed at the night skies and attempted to understand the workings of the universe. Guided only by their eyes and their imaginations, they constructed elaborate myths about the starry sky. Galileo caused a scientific revolution when, in 1609, he turned his considerable intellect and a new invention - the telescope - to the night sky. In a sense, Galileo's observations formed the first roots of what was later to be called the science of "cosmology". The science of cosmology, as all science, is based on observation.<sup>3</sup> "Cosmology is the study of the Universe at large, its beginning, its evolution, and its ultimate fate."<sup>4</sup>

Twentieth-century progress in cosmology has been marked by advances in technology and theory. Edwin Hubble's discovery of the expanding universe, Penzias' and Wilson's observation of cosmic background radiation, the detection of the elementary particles that populated the very early universe - all were made possible by increasingly powerful instruments and flashes of human brilliance.

Technology continues to expand the frontiers of cosmology. The Hubble Space Telescope has revealed gas clouds in the cosmic voids and beautiful images of fledgling galaxies formed when the universe was just one billion years old. It is being employed in efforts to estimate the age of the universe. A number of powerful land-based telescopes, recently built or under construction, will help cosmologists construct a map of the universe.

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<sup>3</sup> John Taylor, *When the Clock Struck Zero*, London, Picador, 1993, p. 101



The Keck Telescope in Hawaii has revealed the elusive brown dwarfs. X-ray detecting satellites - ROSAT (a German satellite sensitive to low-energy or "soft" x-rays) and the soon to be launched Advanced X-ray Astrophysics Facility (AXAF) - provide a wealth of data about galaxy formation. Particle accelerators and detectors continue to yield new information about the fundamental nature of matter. Supercomputers have become so powerful that theories about the evolution of the universe can be tested and realistically compared with observations.<sup>5</sup>

Yet the essential vision of cosmology remains the same - humans seem to be hard-wired with a desire to understand the universe and our place in it. The questions cosmologists ask are so fundamental, it is almost as if they belong to the realm of theology:

When did the universe begin?

What was it like in the beginning?

How did the cosmos evolve?

Will it (and time) have an end? If so, how?

We may never answer these questions to everyone's satisfaction and they may simply be out of reach of cosmologists and theologians alike. But increasingly sophisticated technology promises to bring us closer to the answers.<sup>6</sup>

## THE UNIVERSE

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<sup>4</sup> Michael White and John Gribben, *Stephen Hawking - A Life in Science*, Viking (Penguin Books), London, 1992, p. 21

<sup>5</sup> Ray Jayawardhana, "NASA's Next Space Observatories", *Astronomy*, January 1998, pp. 47 - 49

<sup>6</sup> Board of Trustees, University of Illinois, *INTERNET*, Copyright, (c) 1995: NCSA. Last modified 10/10/95.

*What do we mean when we refer to “the universe”?* The universe is big. Astronomical measurements are of such a nature that it is difficult to imagine. For this reason “ordinary” units are not used because they would make little sense. When we say: “The universe is approximately 15 billion light years in all directions as viewed from earth”, we are not referring to the concept of *time*, but to the *distance* involved. The speed of light is approximately 300 000 kilometers per second - in one second, light can travel seven times around earth. In a year it travels approximately 10 trillion kilometers (one billion = 1,000,000,000 =  $10^9$ , and one trillion = 1,000,000,000,000 =  $10^{12}$ .)<sup>7</sup>

The basic “building block” of the universe is the galaxy. The galaxy to which we belong is called the Milky Way. Its overall diameter is estimated to be approximately 100, 000 light years and the central “bulge” has a thickness of about 20, 000 light years (the Milky Way is a spiral galaxy which is thought to look like two soup plates facing each other, from where the description of it having a central “bulge” comes).<sup>8</sup> It contains between 1 and 3 billion stars.<sup>9</sup> There are only three items which can be seen with the naked eye which do not belong to our galaxy - the Andromeda<sup>10</sup> galaxy (known as M31) and two nebulae (the Large Magellanic Cloud and the Small Magellanic Cloud). If one thus looks at the night sky, practically all that can be seen belong to our galaxy and our galaxy is only one out of an estimated hundred billion ( $10^{11}$ ) galaxies (each with an average of 100 billion stars).<sup>11</sup>

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<sup>7</sup> Carl Sagan, *Cosmos*, Random House, New York, 1980, p. 5

<sup>8</sup> Patrick Moore, *Guide to Stars and Planets*, London, George Philip Ltd., 1995, p. 94.

<sup>9</sup> Gideon Joubert, *Die Groot Gedagte*, Cape Town, Tafelberg Uitgewers, 1997, p. 34

<sup>10</sup> The Andromeda Galaxy (M31) is incidentally also the most distant object the human eye can see without optical aid, at 2.4 million light-years away. See Brent Archinal, “How Far Can You See?”, *Astronomy*, May 1997, p. 20

<sup>11</sup> Sagan, Carl, op. cit., p. 7

These galaxies come in different shapes and sizes - the biggest galaxy thus far discovered, Abel 2029, stretches over 6 million light years (which is more than sixty times bigger than the Milky Way) and it may contain more than 100, 000, 000, 000, 000 ( $10^{14}$ ) stars.

Galaxies contain solar systems similar to ours, i.e. with planets circulating hot stars similar to our sun. Sagan estimates that there are perhaps  $10^{11} \times 10^{11} = 10^{22}$  planets in the universe, and says: "Why should we, tucked away in some forgotten corner of the Cosmos, be so fortunate [as being the only inhabited planet]? To me, it seems far more likely that the universe is brimming over with life."<sup>12</sup>

A new record for the most distant visually observed object in the universe was recently turned up by the Hubble Space Telescope, when a galaxy of some 13 billion light years away, was spotted.<sup>13</sup> This does not mean that we can see the entire universe - our efforts to observe is restricted to the *observable* universe. Some of the elements of the universe lie so far away that their light cannot reach us yet. In addition, most galaxies are moving away from each other (and thus also from the Milky Way - our galaxy) and the further away they are, the faster they recede. Some galaxies may thus be receding faster than the speed of light, because of which their light will never reach us. (According to the Specific Theory of Relativity, nothing with mass can move faster than the speed of light, but because space is expanding at the same time, such movement is relative to "the same" space and therefore possible.)<sup>14</sup> According to Ferris: "If the ... universe were [to be compared to] the surface of the earth, the observable part would be smaller than a proton."<sup>15</sup>

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<sup>12</sup> Ibid.

<sup>13</sup> *Astronomy*, November 1997, p. 28

<sup>14</sup> James B. Kaler, "Ask Astro", *Astronomy*, July 1997, p. 92

<sup>15</sup> The "observability" of the universe also depends on whether the *inflationary hypothesis* is true. Had there in fact been an inflationary period shortly after the Big Bang, the actual size of the universe would be "astronomically" larger than the

A close look at the immense measurements such as the aforementioned (as well as our apparent inability to *falsify* and therefore also to completely *verify* any of these theoretical models) has a profound influence when philosophical contemplations are attempted.

***How distances are determined.***<sup>16</sup> The classic technique of determining distances involves the so-called *cosmological distance ladder*, a set of overlapping distance-measuring techniques. The distances for nearby Cepheid variables and other bright stars in our galaxy is e.g. obtained, similar stars in other galaxies are identified, after which whole galaxies are used to probe still farther into space, and so on.<sup>17</sup> Reliance on each of these “standard candles” is, however, subject to error and the errors mount up, so that the ladder eventually becomes precarious indeed. Galaxies evolve over time so that when observing galaxies at large distances which, because of the time it takes their light to reach us, means observing them in the distant past, one is embarking on the risky business of comparing galaxies as they are today with similar systems as they were long ago. Galaxies also evolve at different rates, depending on their environments - none of these effects are fully understood.<sup>18</sup> Fortunately the cosmological distance ladder, though rickety, has some overlapping rungs, so to some extent measuring systems can be checked against one another.

The main components of the distance ladder are as follows:

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observable universe. This hypothesis (the *inflationary hypothesis*), attractive as it may seem intuitively, has in no way scientifically been verified yet. See Timothy Ferris, *The Whole Shebang - A State-of-the-Universe (s) Report*, London, Weidenfield and Nicholson, 1997, p. 78

<sup>16</sup> The purpose of including this somewhat detailed discussion, is to show that, despite the availability of modern knowledge and techniques, science sometimes still has to rely on “guestimates”.

<sup>17</sup> Ibid., p. 53

<sup>18</sup> Ibid.

- **Parallax.** “Close” astronomical distances are measured primarily by means of parallax, which is simply triangulation.<sup>19</sup> The position of a nearby star against very distant stars changes as the Earth orbits the sun. Because of the change in perspective, a triangle can now be constructed for which you have the sizes of all three angles and the length of one side (the side of the Earth’s movement around the sun).<sup>20</sup> The distance between the Earth’s starting point and the star can thus be computed. Parallax is thus the first step on a distance ladder.

Parallax, furthermore, has a little ladder of its own. The initial step involves measuring the distances of other planets. This was first accomplished for the planet Mars in 1672, by observers who made parallax observations simultaneously from Paris and Cayenne, in French Guiana. Nowadays astronomers can check the distances of nearby planets by bouncing radar signals off them and clocking the time it takes the radar echoes to return.<sup>21</sup> Thanks to Johannes Kepler’s discovery of the laws of planetary motion, if you know the radius of one planet’s orbit you can derive all the others from their orbital periods. So, having measured the radius of the orbit of Mars, astronomers determined the radius of Earth’s orbit. This provided a much longer baseline - by observing a neighbouring star at intervals six months apart, when Earth is at opposite points in its orbit, astronomers could measure slight changes in its apparent position against distant stars in the background. The size of this slim angle yielded the approximate distance of the nearby

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<sup>19</sup> For distances beyond about 30 parsecs (about 98 light years) the angle between the star and the Earth becomes too small for reliable measurements. See Peter Mack, *Night Skies*, Cape Town, C. Struik Publishers, 1987, p. 8

<sup>20</sup> Ibid.

<sup>21</sup> Ferris, T., op. cit., p. 54

star. In this painstaking fashion, the distances to about one hundred stars had been measured by the year 1900.<sup>22</sup>

After many decades of work in astrophysics - the combining of astronomical data with what can be learned theoretically and in laboratories - quite a lot about how stars of various masses and chemical compositions behave have been learnt. Specifically, astrophysicists often have a very good idea of how bright each given kind of star really is, and this makes it possible to add another rung to the ladder.

- Knowing *the intrinsic brightness* of a given star, an astronomer can estimate the distances of all other visible stars of the same type, simply by comparing their estimated actual brightness (absolute magnitude) with their observed brightness (absolute magnitude).<sup>23</sup> If one knows, for instance, the absolute magnitude of the giant white star Sirius (special class A1), then one can say with some confidence that a similar A1 star that looks one percent as bright as Sirius is ten times further away, since brightness decreases by the square of the distance. The distance of Sirius, measured by parallax, is for example 8.6 light-years from Earth, so the distance of the second star is 86 light-years.
- A higher rung is provided by *stars that pulsate*.<sup>24</sup> Such stars change in brightness as they pulsate. Their rate of change is an index of their absolute magnitude, so by charting variations in their apparent magnitude one can determine how bright they really are.

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<sup>22</sup> Ibid.

<sup>23</sup> Ibid., p. 55

<sup>24</sup> Edwin Hubble developed this method as a new way of measuring the distance to a galaxy. See Eric J. Lerner, *The Big Bang Never Happened*, London, Simon & Schuster, 1992, p. 132

Nearby, this can be accomplished by observing *RR Lyrae stars* (named after a prototypical example in the northern constellation Lyra, the Lyre). Beyond that, one resorts to the mighty *Cepheids*.<sup>25</sup>

Cepheid variables are young giant stars that have entered into an unstable stage of their development. The specifics of why they pulsate provide an example of the elegance one can find in something as simple as a star. As a Cepheid contracts, it gets hotter. Heat flowing into the outer portions of the star (its “atmosphere”) energises atoms of singly ionized helium. (“Singly ionized” means that these atoms are missing one of the electrons they would normally have.<sup>26</sup>) The added energy knocks another electron off the helium atoms, making them doubly ionized. Doubly ionized atoms tend to absorb light. As a result, the atmosphere of the star becomes opaque. An opaque atmosphere retains heat, like a blanket and therefore it grows hotter. As it gets hotter it expands. As it expands it cools, naturally enough, since it now is spreading all its energy over a greater area. As helium atoms cool, they return to their singly ionized state. The atmosphere, transparent again, begins to collapse, and the cycle begins anew. Each cycle typically takes a few weeks.

The beauty of this process from a cosmological point of view is that the rate at which Cepheids pulsate, when combined with a measurement of their colour, yields their absolute magnitudes.<sup>27</sup> Bigger Cepheids pulsate more slowly than smaller Cepheids - just as big gongs produce deeper tones than small gongs - and the bigger the star, the brighter it shines. Astronomers can thereby infer the distance of any Cepheid for which they have measured a cycle or two of variability. (Polaris, the north star, 466 light-years

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<sup>25</sup> Ibid.

<sup>26</sup> Ibid.

away, is the nearest Cepheid to Earth.) Cepheids are bright enough to be detected in galaxies as much as 15 million light-years away using ground-based telescopes, and up to roughly 60 million light-years using the Hubble Space Telescope.<sup>28</sup>

The results of research in connection with Cepheids have startled cosmologists who had accepted the traditional calculation of the age of the universe to be roughly 18 billion years. All else being equal, a rapidly expanding universe must be younger than a slowly expanding one. If the results of a specific research project (the so-called "Hubble Team")<sup>29</sup> was correct, the universe is only about 8 billion years old. This is younger than what the astrophysicists believe to be the age of the oldest stars in the Milky Way - certain globular clusters are thought to be about 14 billion years.

- The stars most readily observed across vast distances are the exploding stars called *supernovae*. Supernovae are mind-boggling powerful - a supernova can liberate more energy in one minute than is released by all the normal stars in the observable universe during the same amount of time.<sup>30</sup> Only a fraction of this energy - as little as one one-hundredth of one percent, in some cases - is emitted as visible light, but that is enough for the supernova to outshine the entire galaxy it inhabits.

There are two types of supernovae, designated Type I and Type II.<sup>31</sup> The Type I supernovae are thought to arise in binary systems. The supernova candidate is a dwarf star whose orbit carries it close

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<sup>27</sup> Ibid.

<sup>28</sup> Ferris points out that the nearest Cepheids are too far from Earth for their distances to be measured by parallax, because of which indirect methods are used, which in turn leads to an element of uncertainty as to the intrinsic brightness of Cepheids. See Ferris, T., op. cit., p. 318

<sup>29</sup> Ibid., p. 56

<sup>30</sup> Ibid., p. 57

<sup>31</sup> See Ferris, T., op. cit., pp. 57 et. seq.



enough to its larger and less dense companion star so that it can, by virtue of its gravitational force, strip gas from the atmosphere of the companion. As time passes, the dwarf keeps gaining weight in this fashion, until eventually its mass surpasses the Chandrasekhar limit (named for the Indian astrophysicist Subrahmanyan Chandrasekhar, who discovered the phenomenon theoretically). At this point, equal to 1.44 times the mass of the sun, the dwarf weighs so much that it collapses even further. Dwarfs are already so dense that normal atoms cannot survive in them. Their protons, neutrons, and electrons, crushed together cheek to jowl, are kept from merging further by quantum mechanical forces acting principally among the electrons. (This state, called *degenerate matter*, is extremely dense by terrestrial standards - a spoonful of dwarf-star matter set down on Earth would weigh as much as a Rolls Royce limousine.) Yet once a binary dwarf star exceeds the Chandrasekhar limit and collapses further, the weight of the matter bearing down on the core smashes its imposing degeneracy structure, and there ensues a titanic nuclear explosion that vaporises the star. The advantage of Type I - specifically the subgroup called Type Ia - supernovae to cosmologists is that they all have similar magnitudes. *This makes them useful as standard candles.* Moreover, they are the brightest form of visible light, making them conspicuous to astronomers searching the skies. Preliminary measurements of Type Ia - supernovae yield an age for the cosmos comfortably greater than that of the older stars.

While Type I supernovae are dwarfs, Type II supernovae are giants. They collapse not because they have gained mass, but because they have run out of nuclear fuel at the core. As they run out of fuel they become unstable - there is no longer enough radiative pressure pushing outward to balance the inward pull of gravity and then they deflate. Since giant stars burn furiously and consequently die young, Type II supernovae are usually found in

the arms of spiral galaxies, where the stars originated and from which location they have not had time to venture very far. Type II's are seldom found in elliptical galaxies, where few new stars form, while Type I's may turn up anywhere there are binary stars, which is to say in all sorts of galaxies. Type II's are more powerful than Type I supernovae, but they look dimmer - a full magnitude, meaning 2.5 times, dimmer-because they release 99 percent of their energy not as light but in the form of neutrinos. (Astrophysicists, with their customary flair for irony, refer to this process, which takes place at temperatures in excess of 100 billion degrees, as neutrino "refrigeration.")<sup>32</sup> The emerging science of intergalactic neutrino astronomy was baptized in 1987, when neutrinos from a supernova in the Large Magellanic Cloud, a satellite galaxy that orbits the Milky Way at a distance of 165,000 light-years from Earth, were recorded at underground neutrino detectors in Japan and Ohio. Neutrino astronomy has great potential, since neutrinos are plentiful and interact only weakly with matter, meaning that they bring news of events that transpired deep inside the star and not, as is the case with light, only in the star's outer atmosphere.

Type II supernovae can be detected fully a third of the way across the observable universe. But they vary quite a lot in their intrinsic brightness, and this detracts from their usefulness as standard candles. This situation may improve as astronomers get to know them better.<sup>33</sup>

To hone the accuracy of supernovae as distance indicators it will be necessary to observe many more of them, and especially to catch them in their early stages, in the days before the cataclysm reaches maximum brightness. However, although supernovae are

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<sup>32</sup> Ibid., p. 58

<sup>33</sup> Ibid.

now routinely observed, no explosions have been observed since the invention of the telescope.<sup>34</sup> For this and other reasons, finding supernovae has become an urgent enterprise. In professional circles, automated telescopes run by computers are employed to observe scores of galaxies nightly. The computers examine the resulting images and alert their human operators whenever they see a point of light that was not there before.<sup>35</sup>

Most galaxies are too far away for any of their individual stars to be detected except when one explodes. So their distances are inferred, not by studying their stars, but by *using galaxies themselves as standard candles*. One way to do this is to identify the brightest galaxy in each major cluster of galaxies. Studies by Allan Sandage and others indicate that there is relatively little disparity in the intrinsic brightness of such galaxies.<sup>36</sup> But astronomers must be especially alert for evolutionary effects. Galaxies in rich clusters are subject to a variety of influences. Close encounters with neighbouring galaxies (which happen more commonly in rich clusters) can set off starburst events, in which tidal perturbations caused by gravitational interaction with an interloper galaxy trigger the birth of billions of stars, many giants among them. "Galactic cannibalism" - the gobbling up of small galaxies by big galaxies typically located near the centre of the cluster - can temporarily (meaning over a period of, for example, a

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<sup>34</sup> Sagan, C., op. cit., p. 237

<sup>35</sup> Supernovae were until very recently thought to have been the most energetic forms of events that exist. On 14 December 1997 a gamma-ray outburst was observed by detectors on NASA's Compton Gamma-Ray Observatory and the Italian/Dutch satellite BeppoSAX. The burst's total energy was later calculated and it was found that it dwarfed that of supernovae - it had the energy of several hundred supernovae. It is not known what could possibly create so much energy. When a spectrum was made, it showed a distance of some 12 billion light years from Earth. Gamma-ray bursts like these are, however, at this point in time too rarely observed to function as candles as yet. See "Stupendous Explosion Challenges Theory", *Astronomy*, August 1998, pp. 18 - 19

few hundred million years) make the brightest galaxy in a cluster much brighter than it normally would be, prompting the unsuspecting astronomer to underestimate its distance.

A newer way of estimating the intrinsic brightness of galaxies is based on the finding, in 1977, by the American astronomers R. Brent Tully and J. Richard Fisher, that the absolute magnitude of a spiral galaxy is related to a quantity known as its *21-centimetre line width*. (Twenty-one centimetres is the wavelength of radio noise emitted by the hydrogen atoms that make up most of the interstellar matter in spiral galaxies.) This spectral line is blurred - widened - by Doppler shifting, to a degree directly related to the speed at which the galaxy is rotating. The rotation speed, in turn, is related to the galaxy's brightness. Since radio spectra at this wavelength can be obtained for very faint sources, the *Tully-Fisher method* may prove to be usable in estimating the distances of galaxies out to 300 million light-years or more.<sup>37</sup>

- Recently a few techniques have emerged that measure distances more directly - that is, by skipping over many of the distance-ladder rungs. To date they have produced only approximate results, but they show great promise. One such direct method is *gravitational lensing*.<sup>38</sup> Matter distorts space surrounding it. (What is called "gravitational force" is simply the result of objects and light beams pursuing the shortest available path through curved space.) Quasars - the bright spots in the centre of galaxies - were more common in the violent days when the universe was young. Consequently, most quasars, since they belong to the past, are found at great distances. As the light from a quasar travels toward us across billions of light-years of space, it may pass to

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<sup>36</sup> Ferris, T., op. cit., p. 60; See also Frederic Golden, "Astronomy's Feisty Old Man", *Astronomy*, December 1997, pp. 55 - 59

<sup>37</sup> Ibid.

either side of an intervening cluster of galaxies. The warped space surrounding the cluster can act as a lens, with the result that we see two images of what is (or was) actually one quasar. Unless the cluster is located precisely on a line between earth and the quasar, the light passing around the one side of the lens will have travelled farther than that on the other side. Many quasars vary in brightness, sputtering over periods of as little as a month. When a variable quasar is lensed, the difference in travelled time for the light composing its two images can be measured by observing the images for some time and locating the same incidents of variability in both of them. The difference in arrival time of the same event then reveals how much longer one light beam travelled than the other. Imagine that you are in a sound studio in New York, and that you are recording a live symphony concert being transmitted from Paris, simultaneously over two channels. One radio is receiving the signal via a single satellite over the Atlantic. The other is coming in via a longer route, using satellites above Asia, the Pacific, and North America. The second signal therefore arrives a bit later than the first. Once the broadcast is over, you locate a single passage in the music and measure how much time elapsed between the time it was received by the first radio and the time it was received by the other one. Knowing that the signals travel at the velocity of light (and here we ignore delays introduced by the satellite transponders) you calculate how much longer was the path through space taken by the second satellite linkup.

If the intervening cluster of galaxies is mapped correctly (one has to make an educated guess as to its centre of gravity), simple triangulation then yields the distance of the cluster.

Another direct approach employs what is known as *the Sunyaev-Zeldovich effect*, after the two Russian astrophysicists who

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<sup>38</sup> See Ferris, T., op. cit., pp. 61 et. seq.

pioneered its use.<sup>39</sup> This consists of measuring the intensity of the cosmic microwave background (CMB) through certain clusters of galaxies that emit x-ray radiation. The intergalactic gas in such clusters is relatively warm (which is why it emits X rays) so the CMB photons are heated up when they pass through the cluster. The result is a hot spot in the background radiation. More distant clusters are denser and hotter, and so make hotter spots in the CMB. Hence the temperature yields the distance. The effect is subtle - the hot spot is only a fraction of a percent hotter than the overall background - but it has been observed, by drawing on an arsenal of observational tools.

Finally there is an ingenious method called the *brightness fluctuation technique*.<sup>40</sup> A telescope is pointed at the central bulge of a spiral galaxy, or the central part of an elliptical galaxy, and the amount of unevenness in its surface brightness from point to point is measured. Since nearby galaxies are more nearly resolved into stars, they will show more unevenness than will distant galaxies, in which the stars merge into a smooth, unresolved blob of light. If, for instance, a narrow-field telescope were pointed at a galaxy so close to us that the field of view contained only one star, we would have the maximum possible surface brightness fluctuation - all black but for one point of light. The same telescope, trained on a more distant galaxy, might capture a hundred stars (less fluctuation) while for a still more distant galaxy the figure would be a thousand stars (even less fluctuation), and so forth. So brightness fluctuation correlates with galaxy distance, everything else being equal. With the Hubble Space Telescope, this emerging technique should be applicable to galaxies at distances of up to half a billion light-years or so.<sup>41</sup>

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<sup>39</sup> Ibid., p. 62

<sup>40</sup> Ibid.

<sup>41</sup> Ibid., p. 63

The above described distance ladder thus produces values that differ considerably, with one set of results giving an old universe age of about 15 billion years, and the other a young universe age of about 10 billion years.

***How old is the universe?*** As could be seen from the above discussion, astronomers/cosmologists estimate that the Big Bang occurred between 10 and 20 billion years ago. To put this in perspective, the Solar System is thought to be 4.5 billion years old and humans have existed as a species for a few million years. Astronomers estimate the age of the universe in two ways: (a) by looking for the oldest stars; and (b) by measuring the rate of expansion of the universe and extrapolating back to the Big Bang.<sup>42</sup>

The universe is thus generally considered to be roughly 15 billion years old, which fits in with what most astrophysicists estimate to be the ages of the oldest existing stars (about 14 billion years).<sup>43</sup>

As seen above, some recent observations, however, yield a smaller age for the universe. When astronomers estimate the age of the universe by studying globular clusters (a dense collection of roughly up to a million stars), it shows that stellar densities near the centre of the globular cluster are enormous. If we (for example) lived near the center of a globular cluster, then there would be several hundred thousand stars closer to us than Alpha Centauri, our nearest stellar neighbour (which is some 4.3 light years away).

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<sup>42</sup> Peebles, P.J.E., Schramm, D.N., Turner, E.L. and R.G. Kron, "The Evolution of the Universe", *Scientific American*, 271, 1994, pp. 29 - 33

<sup>43</sup> Ferris, T., op. cit., p. 15. Most observers quote an age of the universe of between 15 and 20 billion years. This is because none of the existing methods currently used to date the Cosmos, can give an exact figure as far as the rate of expansion of the

The life cycle of a star depends upon its mass. High mass stars are much brighter than low mass stars, thus they rapidly burn through their supply of hydrogen fuel. A star like the Sun has enough fuel in its core to burn at its current brightness for approximately 9 billion years. A star that is twice as massive as the Sun will burn through its fuel supply in only 800 million years. A 10 solar mass star, a star that is 10 times more massive than the Sun, burns nearly a thousand times brighter and has only a 20 million year fuel supply. Conversely, a star that is half as massive as the Sun burns slowly enough for its fuel to last more than 20 billion years.

Since all of the stars in a globular cluster formed at roughly the same time, they can serve as cosmic clocks. If a globular cluster is more than 10 million years old, then all of its hydrogen burning stars will be less massive than 10 solar masses. This implies that no individual hydrogen burning star will be more than 1000 times brighter than the Sun. If a globular cluster is more than 2 billion years old, then there will be no hydrogen-burning star more massive than 2 solar masses.

The oldest globular clusters contain only stars less massive than 0.7 solar masses. These low mass stars are much dimmer than the Sun. This observation suggests that the oldest globular clusters are between 11 and 18 billion years old. The uncertainty in this estimate is due to the difficulty in determining the exact distance to a globular cluster (hence, an uncertainty in the brightness (and mass) of the stars in the cluster). Another source of uncertainty in this estimate lies in our ignorance of some of the finer details of stellar evolution.<sup>44</sup>

The validity of the Big Bang Theory is questioned by some because of the age issue. The adherents to one school of thought claim that the

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universe is concerned. See Joshua Roth, Dating the Cosmos - A Progress Report, *Sky and Telescope*, October 1997.



age of the universe cannot be higher than 10 billion years.<sup>45</sup> This means that estimates which give an age of only 10 billion years indicate that the universe is younger than the oldest stars, which is absurd.

## THE BIG BANG THEORY

**Introduction.** Einstein first formulated his concept of a finite universe in 1917 (two years after developing the General Theory of Relativity), but astronomers already were observing the *redshift*<sup>46</sup> effect when taking spectra of stars in nearby galaxies, indicating that most galaxies were moving away from each other and from Earth. In 1924 a German astronomer, Carl Wirtz, noted a correlation - "... the fainter the galaxy the higher its redshift, thus the faster it is receding."<sup>47</sup> Assuming that the fainter galaxies were farther away, it followed that their velocities increased with distance. Hubble and his assistant Milton Humason soon began to examine these findings and their findings seemed to confirm the relation between redshift and distance.<sup>48</sup> Georges-Henri Lemaître then synthesized Wirtz's purely mathematical result with Hubble's tentative observations and concluded that the universe must

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<sup>44</sup> Board of Trustees, University of Illinois, *INTERNET*, Copyright, (c) 1995: NCSA. Last modified 10/10/95.

<sup>45</sup> The latest *Hubble Constant* ( $H_0$ ) which gives an age of the Universe of about 15 billion years, are challenged by some astronomers (e.g. the French astronomer Gérard de Vaucouleurs) on the basis that the distances to some of these "candle objects" are in dispute. See Frederic Golden, "Astronomy's Feisty Old Man", *Astronomy*, December 1997, p. 59

<sup>46</sup> Lerner, Eric., J., op. cit., p. 131. Redshift is the displacement of the spectral lines in light coming from the stars of distant galaxies, thought to be produced by the expansion of cosmic space. This operation is done with a *spectrograph*, which records the distribution of input of energy (e.g. light) by frequency. See Ferris, T., op. cit., p. 365 and 366

<sup>47</sup> Lerner, Eric., J., op. cit., p. 132

<sup>48</sup> The *Hubble Law* was thus born - the farther away a galaxy is, the larger the redshift displayed in its spectrum. The *Hubble Constant* denotes the rate at which the universe is expanding, and is denoted as "H-nought" ( $H_0$ ) - meaning that for every 3.26 million

be expanding.<sup>49</sup> Alexander Friedman discovered that if the general theory of relativity was correct, the universe must either be expanding or contracting and Einstein ultimately had to concede : “The universe of relativity was a dynamic universe”.<sup>50</sup>

It would be incomplete not to mention that some scientists believe in other explanations for the existence of redshift. The *Tired Light* hypothesis is the concept that light loses energy as it travels vast distances, creating a redshift-distance relation that is not due to cosmic expansion.<sup>51</sup> The *Steady State Theory* maintains that matter is constantly created by means of a “C-Field” that also drives cosmic expansion.<sup>52</sup> Both these models ran into trouble especially when the cosmic microwave background was discovered in the sixties, which suggested that there had been a big bang at some point in the past. The *Plasma Model* proposes that parts of the universe are expanding while other parts are contracting in an ongoing process that occurs when matter and antimatter collide.<sup>53</sup>

***The basic precepts of the Standard Model.*** “Cosmology today is mostly conducted within the broad framework of the standard cosmological model, known as the “big bang” theory.”<sup>54</sup> This model (the *standard* or *big bang* model) comprises an arena within which

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light years one looks out into space, one finds galaxies receding 50 kilometers per second faster. See Ferris, T., op. cit., pp. 45, 48

<sup>49</sup> Ibid.

<sup>50</sup> Ferris, T., op. cit., p. 43

<sup>51</sup> “Tired Light” was first suggested by Fritz Zwicky - see *Proceedings : National Academy of Sciences* (U.S.) 15, 1929, p. 773, quoted by Ferris - Ferris, T., op. cit., p. 319

<sup>52</sup> Fred Hoyle, *Home is Where the Wind Blows: Chapters from a Cosmologists Life*, California, University Science Books, 1994, pp. 401 et. seq. ; See also Rufus Young, “The Steady State Galaxy Theory As An Alternative To The Big Bang Theory”, Rufus's Galaxy Web Page, *INTERNET*, Copyright R. Rufus Young 1996, Last revised December 1996

<sup>53</sup> Lerner, Eric., J., op. cit., pp. 214 et. seq.

<sup>54</sup> Ferris, T., op. cit., p. 13

many other theories and experimental programs compete. The basic precepts include the following:<sup>55</sup>

- ♦ *Physical laws adduced on earth pertain throughout the observable universe.* Stars situated billions of light years away from us produce spectra which indicate that they are made of atoms identical to those on Earth. There are phenomena such as *plasma jets, black holes*, etc. which produce physics which can not be reproduced on Earth.
  
- ♦ *The universe is expanding.* Einstein's general relativity theory predicted a dynamic universe, i.e. either expanding or contracting, which he later (in 1920) adapted based on the findings of Friedman, to say: "... one can say ... that the theory demands an expansion of space".<sup>56</sup> Evidence for this was first found when Hubble and Humason began measuring the spectra of distant galaxies and found that they were "red-shifted" and that the more distant the galaxy was, the more "red-shifted" its spectral lines were.<sup>57</sup> The question was whether Earth was in a special position because it seemed that most of the galaxies were receding away from us, but it is more likely that the universe itself is expanding - the receding galaxies are thus also "red shifted" in relation to each other. What is the exact expansion rate? Although this rate is not yet known, the majority of current evidence suggest an age for the

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<sup>55</sup> Ibid., pp. 14 ff.

<sup>56</sup> Robert W. Lawson, *Relativity - The Special and General Theory - A Popular Exposition by Albert Einstein* (authorized translation), London, Routledge, 1994, p. 133

<sup>57</sup> Sagan explains this phenomenon as follows: The light from a galaxy is the sum total of the light emitted by the billions of stars within it. As the light leaves these stars, certain frequencies or colours are absorbed by the atoms in the stars' outermost layers. The resulting lines permit us to tell that stars millions of light years away contain the same chemical elements as our Sun and the nearby stars. In terms of the Dopler effect, were receding from us. See Sagan, C., op. cit., p. 254

universe of roughly 15 billion years.<sup>58</sup> The question is whether the universe will expand forever, or will it eventually halt and re-collapse into a “big crunch”? It all depends on the density of matter in the universe because gravity slows down the expansion. An international team of astronomers have, however, recently (January 1998) found that the Universe does not seem to be slowing down, which can mean one of two things: “Either there is not much matter in the universe to slow down the expansion, or there is a lot of matter but gravity is countered by a cosmological constant.”<sup>59</sup>

- ♦ *The universe is isotropic and homogeneous.*<sup>60</sup> If a big enough sample of perhaps a billion light years is taken on a side of the universe, the same mixture of galaxies and space would be acquired, no matter where the sample is taken. It was discovered in the 1980’s that galaxies are organized into giant bubbles measuring some 300 million light years in diameter and it is currently unknown whether even higher levels of hierarchies exist. Should the latter prove to be the case, it will call into question the present assumption that the universe is homogeneous.<sup>61</sup>
- ♦ *General relativity accurately describes the behaviour of gravitation in the universe today.* Gravitation is described as the influence that matter possessing mass, has on each other.<sup>62</sup> Thus, the more accurately cosmic matter density can be estimated, the

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<sup>58</sup> Ferris, T., op. cit., p. 15

<sup>59</sup> Ray Jayawardhana, “Is the Universe Slowing Down?”, *Astronomy*, January 1998

<sup>60</sup> *Isotropic* means that it looks much the same in every direction, and *homogeneous* mean that, while matter is collected locally into planets, stars and galaxies, and while galaxies are in turn clustered, on very large scales their distribution is smooth. See Ferris, T., op. cit., pp. 15 and 360. Lerner, opposing the Big Bang Theory, claims that the discovery of ever bigger clumps of matter in the universe is immanent. See Lerner, E. J., op. cit., p. 15

<sup>61</sup> Ferris, T., op cit., p. 15

<sup>62</sup> Ibid.

more accurately the eventual fate of the universe can be predicted. Matter density is scientifically described by *omega*. If *omega* is greater than 1 (meaning the universe is relatively dense), the cumulative gravitational force of all the galaxies will eventually halt the expansion of the universe and it will collapse. If *omega* equals 1 (a state known as *critical density*), the universe will continue expanding, but at an ever-slowing rate. If *omega* is less than 1, the universe will continue to expand forever. Present data, albeit inconclusive, suggests that critical density in fact exists. This puzzles scientists, because it may indicate that cosmic matter density may not have come about by chance.<sup>63</sup>

♦ *The early universe was in a state of high density and high energy.*

Einstein's general theory of relativity, taken on its own, predicted that space-time began at the big bang and would come to an end either at the big crunch, or inside a massive black hole.<sup>64</sup> (This depends on *omega* - see above.) Hubble's discovery of the expansion of the universe led theorists to speculate that, if cosmic matter density is decreasing, then there must have been a time when everything in the universe was like the centre of a star and perhaps even hotter and denser than that.<sup>65</sup> Based on the well advanced work on nuclear physics as well as George Gamov's idea that elements were forged in the fires of the big bang, predictions of the existence of a cosmic microwave background (CMB) radiation were made in 1948 (George Gamow coined the phrase "Big Bang" to describe this "explosive creation").<sup>66</sup> It was now, at

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<sup>63</sup> Ibid., p. 16

<sup>64</sup> Stephen W. Hawking, *A Brief History of Time - From the Big Bang to Black Holes*, London, Bantam Press, 1988, p. 115

<sup>65</sup> Ferris, T., op. cit., p. 109

<sup>66</sup> Gamov and his colleagues even roughly calculated the temperature this left-over radiation would have and they came up with 5 K (minus 268 degrees Celsius). The COBE (Cosmic Background Explorer) satellite later confirmed a mean temperature of 2,73 degrees K - the CMB was thus also isotropic. See White, Michael and Gribben,

least theoretically, also be possible to explain how the various elements existing in the universe, came into being (i.e. initially some elements were formed in the big bang, and subsequently other elements were formed in the nuclear processes taking place in stars). The existence of the CMB was soon forgotten because the big bang theory was not generally accepted and a microwave radio receiver had not yet been developed during the 1950's.<sup>67</sup> Then in 1965 two physicists, Arno Penzias and Robert Wilson, picked up this cosmic background radiation on their radio-telescope. The existence of the background radiation showed that there really had been a big bang, and the fact that its exact temperature could be measured, made it possible to retrace the various stages to the point where a temperature of the Big Bang itself could be calculated. Knowing the temperatures at each different stage made it possible to calculate how nuclei were synthesized, which indicated how the different elements were formed.<sup>68</sup> This led to the prediction, amongst various other aspects, of another important precondition for the acceptance of the Big Bang theory: Cosmic Nucleosynthesis (Helium Abundance).

- ♦ ***Helium Abundance.*** About 25% of the Universe (by mass) is helium. Stars could not have produced this much helium over the age of the Universe. Because of that, the following thesis is much more accepted among scientists: High density and temperatures at early stages were just right for making helium from hydrogen, roughly 3 minutes after the Big Bang, similar to conditions in cores of stars. Models of the early Universe predict that 25% of the hydrogen should have fused to become helium at that time. Conditions did not, however, allow the production of elements

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John, op. cit., p. 110; and Gideon Joubert, *Die Groot Gedagte*, Tafelberg-Uitgewers, Kaapstad, 1997, p. 237

<sup>67</sup> Ibid., p. 33

heavier than helium. One second after the Big Bang, the temperature of the universe was roughly 10 billion degrees and was filled with a sea of neutrons, protons, electrons, anti-electrons (positrons), photons and neutrinos. As the universe cooled, the neutrons either decayed into protons and electrons or combined with other neutrons to make deuterium. During the first three minutes of the universe, most of the deuterium combined to make helium. Small amounts of lithium were also produced at that time. The predicted abundances of deuterium, helium and lithium depend on the density of ordinary matter in the early universe. If the density of the ordinary matter is roughly 3% of the critical density, then the theory correctly predicts the massive amounts of these elements. “And this is just what we do find: The universe at large is 25% helium and 73% hydrogen.”<sup>69</sup>

- ◆ *The universe is evolving.* The light elements (hydrogen, helium and lithium), as seen above, were made in the early universe while the heavier elements were made later in stars. This clearly indicates a pattern of evolutionary development and as Ferris puts it: “Cosmology is an ongoing story”<sup>70</sup>.

## THE INFLATIONARY HYPOTHESIS

According to this hypothesis, the early universe may have undergone a spasm of exponential expansion - during the initial period of the Big Bang, it repeatedly doubled its radius over equal intervals of time (this event is called *inflation*).<sup>71</sup> Alan Guth, who is considered to be the “father” of the inflationary hypothesis, explained that the early

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<sup>68</sup> Stephen Hawking (ed.), *Stephen Hawking's A Brief History of Time - A Reader's Companion*, Bantam Press, London, 1992, pp. 73, 112 - 113

<sup>69</sup> Ferris, T., op. cit., p. 35

<sup>70</sup> Ibid., p. 17

<sup>71</sup> Timothy Ferris, “Inflating the Cosmos”, *Astronomy*, July 1997, p. 40

universe expanded at an increasing rate, rather than a decreasing rate which it does today.<sup>72</sup> An inflationary event would solve the following mysteries:

- \* The *Flatness* Problem, which refers to the universe's "eerie" closeness to critical density. In the classic Big Bang model, it is inexplicable why  $\omega$  is approximately 1. Ferris says in this regard: "To make cosmic geometry come out that way would have required extraordinary fine-tuning of the initial conditions: The primordial value of  $\omega$  had to be set to one within one part in  $10^{60}$ . God might have been up to it, but why should he have gone to the trouble?"<sup>73</sup>
- \* The *Horizon* Problem, which relates to the puzzling fact that matter is distributed evenly over the universe's entire expanse. The shape of space is perceived to be flat instead of being curved. Ferris explains this in the following example: If one watches ships navigate away from one, one can judge the extent of the horizon by noting where they disappear. In the classical model of the Big Bang, objects should also disappear "over the horizon", but they do not. An inflationary model thus explains that the observable universe is by far smaller than the actual universe, because of which the horizon appears to be flat.<sup>74</sup>
- \* The Problem of the *Homogeneity* of the Universe (matter is distributed evenly on a large scale) and the Problem of the *Isotropy* of the Universe (matter is distributed in comparable ways in all directions). In the standard Big Bang model, matter distributed on

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<sup>72</sup> Stephen W. Hawking (1988), p. 127

<sup>73</sup> Ibid., p. 41

<sup>74</sup> Ibid.



opposite sides of the observable universe could never have been in physical contact, given the velocity of light and the age of the universe.

## PROBLEMS WITH THE BIG BANG MODEL

Various points of view in respect of the Big Bang theory exist within the scientific community. According to Nutting, the following problems are noted:<sup>75</sup>

- \* The first problem recognized by the scientific community is what caused or started the Big Bang?
  
- \* A second problem recognized by the scientific community is called the horizontal problem. Because of the "extremely high" expansion velocity, the early universe did not have time to equalize its density to the degree necessary to form the even distribution of matter which is evident today. It is believed by the scientific community that an expansion rate equal to or less than the speed of light is necessary to allow any process which would allow the mass distribution to become uniform. This problem is explained by the inflationary hypothesis - see above.
  
- \* Another problem is that the affect the ever increasing velocities of individual objects at ever increasing distance from us is not taken into account. Those objects near us have strong gravitational interaction with us but little relative velocity. Those objects far from us have small gravitational interaction but high relative

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<sup>75</sup> Gene Nutting, "A New Big Bang", *INTERNET*, December 1997

velocity. These issues are even more significant if relatively is considered.

- \* A practical problem is the age of the universe. The age of the universe is dependent on the density of the universe. Scientists today are trying hard to find other forms of matter besides the visible forms/matter we see from stars. They believe that there could be 10 times as much matter as we can identify today in the form of "Dark Matter" and other exotic types. Because we have a poor handle on the density of the universe we have a poor handle on the age of the universe.<sup>76</sup>
- \* Another practical open question is what is the future of the universe? Will it expand forever? Will it slow down and stop? Will it slow down, stop, reverse, one day collapse and bounce back as a new universe? These issues are dependent on the Critical Density noted earlier and because we can account for only a small part of all the matter that may exist, we don't know the universe's destiny to any degree of certainty.

Ferris adds to the abovementioned problem areas by pointing out that difficulties exist as to how, in a generally homogeneous universe, primordial fluctuations produced the vast structures represented by superclusters of galaxies. Related to this issue is the "riddle" of what constitutes "dark matter" - nonluminous material that evidently holds the clusters together.<sup>77</sup>

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<sup>76</sup> George H. Jacoby, "The Universe in Crisis", *Nature* 371, 27 Oct. 1994, p. 741; John Travis, "Hubble War Moves to High Ground", *Science* 266, 28 Oct. 1994, p. 539

<sup>77</sup> Ferris, T., (*The Whole Shebang*), op. cit., p. 39

According to Simon White, the following problems exist in respect of the Big Bang theory:

- \* The observed density of the universe is only a few percent of that predicted by current big bang theory
- \* The Big Bang has great difficulty accounting for the formation of galaxies and larger structures.

Both of these problems have been "solved" by postulating huge amounts of mysterious "missing matter", esoteric forms of matter that are virtually invisible. Recent observations, however, raise serious doubts as to whether such matter, in the required huge amounts, really exists.<sup>78</sup>

There are further problems which include:

- \* A number of seemingly very distant galaxies, whose light is postulated to have been emitted very shortly after the big bang and which therefore should appear to be very young, are estimated to be billions of years old - much too old to fit in with the big bang model.<sup>79</sup>

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<sup>78</sup> Simon D .M. White, et. al., "The Baryon Content of Galaxy Clusters: A Challenge to Orthodox Cosmology", *Nature* 366, 2 Dec. 1993, p. 429

<sup>79</sup> See for example Jeff Hecht, "Double Whammy Rocks Cosmology", *New Scientist*, 141, 5 Feb, 1994, p. 16; Ral Jayawardhana, "Red Galaxies Hint at an Old Universe", *Science* 264, 13 may, 1994

Even Stephan Hawking has some unanswered questions about the Big Bang. These include:<sup>80</sup>

- \* Why was the early universe so hot?
- \* Why did the universe start out with so nearly the critical rate of expansion that separates models that recollapse from those that go on expanding forever so that it is still expanding at nearly the critical rate (even after 15 billion years)? If the rate of expansion after the Big Bang had been smaller by even one part in a hundred thousand million million, the universe would have recollapsed before it reached its present size.
- \* Despite the fact that the universe is homogeneous and isotropic on a large scale, it contains local irregularities such as stars and galaxies which are thought to have developed from small differences in the density of the early universe. What was the origin of these density fluctuations?
- \* Science has uncovered a set of laws which tell us how the universe will develop in time if its state at any point is known. “These laws may have been decreed by God, but it appears that he has since left the universe to evolve according to them and does not now intervene in it. But how did he choose the initial state or configuration of the universe? What were the “boundary conditions” at the beginning of time?”<sup>81</sup>

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<sup>80</sup> Stephen W. Hawking (1988), pp. 121 -122

<sup>81</sup> Ibid., p. 122; Hawking denies the existence of God (see footnote 6 in Chapter 5). The quoted reference to a *deistic* God is also a concept that has been rejected by most modern scholars. One cannot resist to speculate that his present reference to God

The Big Bang theory thus describes the universe as expanding, and the existence of the CMB seems to indicate that there was a time when everything in the universe was compacted together in a massively dense state, when an explosion took place (leaving the CMB “signature” behind and causing the expansion of the universe). According to Hawking, this state of infinite density is called the big bang singularity “... [and] ... it would be the beginning of the universe.”<sup>82</sup> However, *Planck time* and *Planck length* ( $10^{-43}$  of a second and  $10^{-35}$  of a meter respectively), which are the scientifically accepted meaningful cut-off points (i.e.  $10^{-43}$  is the smallest interval of time that has meaning and  $10^{-35}$  similarly is the smallest period that has meaning)<sup>83</sup>, come into play at a singularity. Furthermore, “All the known laws of science would break down at a singularity.”<sup>84</sup> If general relativity is correct, science would thus be unable to predict how the universe began.

## WAS THERE A BEGINNING?

The question is thus whether a singularity did in fact exist. Even among supporters of big bang cosmology there is no consensus as to what happened near the supposed singularity, within the first fraction of a second.<sup>85</sup> At this early phase the theory degenerates into almost complete speculation.

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from an angle that represents a fundamentalistic point of view, may have been a veiled, though deliberate, attempt to draw sympathy for his views about God.

<sup>82</sup> Hawking, S. (ed.), op. cit., p. 82

<sup>83</sup>  $10^{-35}$  of a meter is smaller than the nucleus of an atom and it is impossible to measure any length shorter than this and there can be no measurement of periods shorter than  $10^{-43}$  of a second - see White, M. and Gribbin, J., op. cit., p. 179

<sup>84</sup> Hawking, S. (ed.), op. cit., p. 82

<sup>85</sup> John Byl, “Cosmology and the Biblical God”, *Contra Mundum* No. 15 Summer/Fall 1995, *INTERNET*

One major problem is that near the singularity the pressure and temperature become so great that conventional physics no longer applies. Current theories of matter are no longer valid here. Various new theories of particle physics have been proposed, but these are all highly conjectural and unverifiable.

Even closer to the singularity the density becomes so huge that the equations of general relativity must take quantum effects into account. General relativity must then be replaced by a theory of quantum gravity. Nobody has yet been able to develop a workable model for quantum gravity. Thus what happens at such early times is anyone's guess. The only thing that is clear is that there is no rigorous proof that the singularity must necessarily be reached.<sup>86</sup>

Furthermore, how can we be sure that the present expansion was not preceded by a contraction? Various big bang models have been constructed that avoid a beginning in time. Cosmologist George Gamow suggested that the big bang expansion was preceded by a corresponding contraction: before the Big Bang was the Big Crunch. In his view the universe has existed from eternity, collapsing from a state of infinite rarefaction until it arrived at the big bang singularity, when the density became immensely great. Since then it has been expanding and the density is steadily diminishing again.<sup>87</sup>

Various other eternal models have been constructed. For example, it has been proposed that the present universe emerged spontaneously from a pre-existent vacuum. This model is based on quantum mechanics, in particular on the uncertainty relation.<sup>88</sup> According to this

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<sup>86</sup> Ibid.

<sup>87</sup> George Gamow, "Modern Cosmology", *Scientific American* 190, 1954, pp. 55-63

<sup>88</sup> Heisenberg's uncertainty principle means that one can never make a precise determination of all the properties of an object like an electron: all one can do is to assign probabilities (determined in a very accurate way from the equations of quantum

principle, particles can be spontaneously generated in a vacuum by random fluctuations of energy. The smaller the energy of the particles, the longer the particles can exist before disappearing again into the void.<sup>89</sup> Taking the total energy of the universe as zero (it is argued that the positive energy of matter is exactly cancelled by the negative energy of gravity), the universe can last indefinitely long, a colossal free lunch. The universe is seen as an infinite vacuum, boiling with energy fluctuations. Our present universe is just one of the large fluctuations to emerge from the vacuum and in time it will again dissolve back into the vacuum. Other cosmologists have presented scenarios in which our present universe was created out of a "mother" universe, and so on from past eternity.<sup>90</sup>

## CONCLUSION

The Big Bang model that attempts to explain the origin and structure of the universe incorporates the talents of many individuals through the course of more than 150 years of study. Many times facing opposition similar to that of Galileo and Copernicus, these cosmologists used a *deductive* approach in solving the greatest question in the history of science. The findings and observations of these eminent scholars forced them to draw the conclusions they arrived at. Most predictions that quantum physics and the theories of relativity have made regarding the origin and the state of the universe have either been observed and confirmed and/or not proven to be false. That is in essence the reason cosmologists have arrived at this cosmology, fully confident that science and technology can look back in time some 15 billion years and see the birth of our universe.

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mechanics), to the likelihood that e.g. the electron is in a certain place at a certain time. See White, M. and Gribbin, J., op. cit., p. 37

<sup>89</sup> Joubert, G., op. cit., p. 211

<sup>90</sup> A.D. Linde, "Particle physics and inflationary cosmology", *Physics Today* 40 (1987, No. 9), p. 61-68; M.A. Markov, "Some problems of modern theory of

It remains abundantly clear that the whole truth is as elusive as ever. As was noted by implication in the discussion of how distances are calculated, it is virtually impossible to get 100% accurate distances and the farther away these objects are, the more difficult it is to be accurate. Many other difficulties exist: The Hubble constant is constantly being challenged and despite more-or-less conclusive scientific evidence to the effect that the universe experienced a massive explosion in its initial stages of coming into being, many phenomena remain unsolved and unanswered.

It can also be concluded that, although many cosmologists do believe that the physical universe has a finite past, other evidence suggests at least the possibility that a singularity may not have taken place. It rests upon a particular interpretation of the known physical laws, to the exclusion of various alternatives that seem no less plausible. In short, even within big bang cosmology an eternal universe cannot be definitely ruled out.

Scientific evidence of exactly how the universe began is thus, as was indicated by an evaluation of the biblical account (Chapter 5), somewhat inconclusive. Some answers seem closer to being answered when evaluating the scientific evidence though. It may, however, be fair to assume that the scientific descriptions of the universe cannot answer the philosophical question: Why is there something (a universe) at all, and why does it take this particular form at all?

In the next chapter, attention will in particular be given to this aspect, namely why is there something instead of nothing, and why in this



particular format. An overview of the present state of the science-religion debate will be given, which will be followed by a conclusion in respect of this study.

## CHAPTER 7

*Even a tiny drop of water glimmers with hidden divinity.  
Atharva 4.16.3*

### AN EVALUATION OF BIBLICAL CREATION AND COSMOLOGICAL THEORIES OF THE ORIGIN OF THE UNIVERSE

#### INTRODUCTION

The issues pertaining to the science-religion debate as far as the origin of the universe is concerned were described in Chapters 5 and 6. A somewhat vague picture as to what biblical creation as depicted by Genesis 1 and 2 entails on the one hand, and as to what the existing scientific picture entails on the other hand, has arisen.

It is fairly obvious that the biblical account of creation cannot effectively be used as a scientific, or even as an historical account of creation, because a literal interpretation of the Genesis account of creation would be futile. It was pointed out that the Genesis account of creation was indeed aimed at establishing facts about God's activities as Creator, about ordering the initial chaos, and of God's planned continued involvement in his creation.

It seems that two distinct lines of thought in this regard were also established: Those who are adamant that "intellectual honesty" should prevail and that any notion of the biblical chronicle of the birth of the universe and of living things is false and must be abandoned,<sup>1</sup> and

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<sup>1</sup> Eugene Y. C. Ho, "Is a Liberal Interpretation of the Creation Story Compatible with Science?", Internet Infidels, *INTERNET*, 1997

those who demonstrate a willingness to debate the relationship between science and religion.

It was also concluded that, although many cosmologists do believe that the physical universe has a finite past, other evidence at least suggests the possibility that a singularity may not have taken place - in short, even within big bang cosmology an eternal universe cannot definitely be ruled out.<sup>2</sup>

Similarities between the Genesis account of creation and the scientific are probably to be found only in the fact that the Big Bang implies a finite universe (which implies a possible beginning), and in the principles of *creatio ex nihilo* (and *creatio continua*). There are, however, a number of theological implications of creation, which also influence the science religion-debate (e.g. the question: Why is there something like the universe and why specifically this one?).

The aim of this chapter is to identify the different ways of looking at the reality of how the universe came into being, to discuss those issues which are presumed to be common to both accounts (the scientific as well as the biblical accounts) as a possible way forward in the science-religion debate, and to discuss the theological implications thereof. The following aspects will be discussed:

### **Possible grounds for collusion between theology and science**

#### **Approaches**

##### ***Johnson's three different approaches***

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<sup>2</sup> The question of an eternal universe is for all practical purposes ruled out by what is known as "Olbers' Paradox", in terms of which it is calculated that the entire night sky would have been as brilliant as the surface of a star, had the universe been eternal.

*The Concordist Approach*

*The Literalist Approach*

*The Functionalist Approach*

***Blocher's views***

*Concordist approach*

*Anti-scientist approach*

*Fideistic approach*

***Peters' "blind alleys"***

*Scientism*

*Ecclesiastical Authoritarianism*

*Scientific Creationism*

*The Two-Language Theory*

***Other "Alleys"***

*Ethical Overlap*

*New Age Spirituality*

***Hypothetical Consonance***

**Uniting Themes**

***General Aspects***

***Faith and Reason***

**The Current Debate**

***The transformation from a 19<sup>th</sup> century scientific world view to the (modern) 20<sup>th</sup> century world view***

*Absolute space, time, object and determinism*

*The universe is in a process of change and evolution*

*The connection between the cosmos and mankind*

***Faith and Reason***

***Recent astrophysical features vis-à-vis design, chance and necessity***

*Design - The Anthropic Principle*

*Chance - The Many Worlds Theories*

*Necessity - A Theory of Everything*

**The Theological Implications**

***Intelligibility and Contingency***

*Contingent Existence*

*Contingent Boundary Conditions*

*Contingent Laws*

*Contingent Events*

***Creatio ex Nihilo and Creatio Continua***

*The Contingency of Existence*

*The Contingency of Boundary Conditions*

*The Contingency of Laws*  
*The Contingency of Events*

**How does the New Cosmology affect the Position of  
 Mankind?**

*The Immensity of Space and Time*  
*Interdependence*  
*Life on Other Planets*  
*Chance and Purpose*

**Conclusion**

**POSSIBLE GROUNDS FOR COLLUSION BETWEEN  
 THEOLOGY AND SCIENCE**

The question now is: Can there still be any grounds for collusion between theology and science on these issues in view of the fact that the Genesis account does not bear witness to the describing of the process of creation as such? Peters, furthermore, asks the questions: "Is the natural world just that, natural? Or is it more than natural? Can we speak of it as a creation, as the product of divine intention? If the natural world is the province of the scientist, how can the theologian justify describing it as the domain of God's activity?"<sup>3</sup> There are a number of approaches to these problems, which will briefly be dealt with.

***Approaches***

Johnson distinguishes three different approaches in respect of the relationship between scientific knowledge and the Genesis account of

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<sup>3</sup> Ted Peters (ed.), *Cosmos As Creation - Theology and Science in Consonance*, Abingdon Press, Nashville, 1989, p. 11

creation.<sup>4</sup> The *Concordist Approach* according to which modern scientific knowledge regarding the history of the earth and man are regarded to be correct, as well as that it is possible to harmonize such findings with the Genesis account of creation. The Bible is thus seen as containing inerrant factual information in this regard. The *Literalist Approach* is based on the assumption that Genesis should be interpreted in a literal manner, which clearly establishes open confrontation with science. The *Functionalist Approach* accepts that scientific knowledge on creation is basically correct, but also that serious differences exist between the scientific account and that of Genesis. It recognises that the Bible is not a scientific and historical record of reality. "The scientists' description of origins and of the nature of physical reality are seen to be complementary to the biblical truths concerning God's activity as Creator and Sustainer of the universe."<sup>5</sup>

Similarly, **Blocher's views** are summarised in the distinguishing of three principal ways of picturing the possible relationship between science and religion, namely the *concordist*, *anti-scientist* and *fideistic approaches*.<sup>6</sup> The *concordist approach* seeks to point out harmony between science and the Bible - "In their interpretation of the Bible, they strive to bring out points of agreement with accepted scientific theories."<sup>7</sup> *Anti-scientism*, or *creationism*, comes in many forms - the strong elements insist upon a literal interpretation of Genesis. They protest against the elevation of science to a religion. Scientific opinions are "ill-founded" and biblical revelation is always accepted as the "truth". *Fideism* "... separates the realm of faith from that where the geologists, paleontologists and others are pursuing the research",

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<sup>4</sup> Michael R. Johnson, op. cit., p. 11

<sup>5</sup> Ibid., p. 13

<sup>6</sup> Henri Blocher, (translated by David G. Preston), *In the Beginning - The Opening Chapters of Genesis*, Inter-Varsity Press, Leicester, 1984, p. 20

<sup>7</sup> Ibid.

and where there can basically be no rapprochement between science and religion.<sup>8</sup>

Which avenue should thus be taken ... or should it indeed even be considered that some form of harmony may exist? There can be no doubt that both religion as well as science have assertions to make as to the origins and the future of the universe, but Van Till correctly asks the question: "Why does the warfare metaphor persist?"<sup>9</sup> as far as the relationship between religion and science is concerned. Ted Peters proposes a number of "*blind alleys*" from which to steer clear to prevent the existence for such a negative metaphor. Peters proposes the following:<sup>10</sup>

- **Scientism** (sometimes called "naturalism" or "secular humanism"). According to scientism, science provides all the knowledge we need to know and religion cannot provide knowledge of reality. In the words of Bertrand Russel: "What science cannot tell us, mankind cannot know."<sup>11</sup> According to this view, there can be no rapprochement between science and religion.
- **Ecclesiastical Authoritarianism**, which assumes that if there is a conflict between faith and reason, reason must be wrong. The highest truth is revelation and the assumption is that science and religion share the same domain - thus if there is a contradiction, one must be right and the other wrong. Immediate problems are encountered by science, which must be able to function freely and

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<sup>8</sup> Ibid., p. 21

<sup>9</sup> Howard J. van Till *et al*, *Portraits of Creation - Biblical and Scientific Perspectives on the World's Formation*, Michigan, William B. Eerdmans Publishing Company, 1990, p. 227; Ted Peters also refers to a newspaper article published in 1995, which was entitled "A Passionate New Battle over Religion and Science", which still uses the military metaphor - see Ted Peters, "Theology and Science: Where are we?", *Zygon*, Vol. 31, No. 2, June 1996, pp. 323

<sup>10</sup> Peters, Ted (1989), *op. cit.*, pp. 14 -17

<sup>11</sup> Ibid., p. 14



with academic autonomy if it is to advance. Thus: "Without academic freedom we cannot have genuine science, and without genuine science rapprochement is a sham."<sup>12</sup> An "all or nothing" approach like ecclesiastical authoritarianism can for obvious reasons not serve any effort towards rapprochement.

- *Scientific Creationism.* Scientific creationism developed out of fundamentalism and both have a strong belief in the literal truth of the Bible. The difference arises where the authority of the Bible is concerned - the fundamentalists stand firmly on the authority of the Bible, while creationists believe that biblical truth and scientific truth belong to the same domain. Where conflict arises, it is due to conflicts within scientific theories. It fails to recognise the historical distance between the authors of the Bible and modern thought - ancient language was dominated by myth, symbol and nuance and pointed to transcendent mysteries, while modern thought is based on the principles of univocity, mathematical precision and the elimination of mystery. Hermeneutical principles have changed from biblical times to the modern world.

Scientific creationism can be considered to have a negative impact on religion because it invariably forces individuals to make a choice between biblical truth and what science teaches. The best example of this state of affairs comes from the polemic surrounding the teaching of evolution in American schools. In 1968, Susan Epperson, a high school teacher in Little Rock (Arkansas - USA), challenged legislation in her state arguing that a law preventing her from teaching evolution was an infringement on her exercise of free speech.<sup>13</sup> The point here is not to argue in favour of evolutionism, but to indicate that supporters of creationism forced

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<sup>12</sup> Ibid., p. 15

<sup>13</sup> Arnold and Hulda Grobman, "A Battle for People's Minds: Creationism and Evolution", *The American Biology Teacher*, Vol. 51, No. 6, pp. 337 - 341

American schools to teach creationism's point of view which ultimately forced individuals to make a choice between religion and science in this regard, which is why an ongoing "battle" exists between adherents to scientific creationism and opponents thereof.<sup>14</sup>

- The *Two-Language Theory* (see Chapter 1, page 20 - *The Language-Game Theory*). Perhaps the best known contemporary proponent of the two-language theory, is Langdon Gilkey who testified in the abovementioned court case at Little Rock in 1981.<sup>15</sup> Many scholars are arguing that scientific theory and religious faith represent two separate and distinct domains of knowing. According to Peters, "Science deals only with objective or public knowing of ... origins, whereas religion deals with existential or personal knowing of ... origins. Science asks, *How*, while religion asks, *Why*?<sup>16</sup>

The two-languages theory prevents rapprochement and separates religion and science from the outset. It assumes that there is no connection between religious beliefs about God's acts of creation and the observable creation as a result. It forbids cross-disciplinary conversation and any possible point of consonance between science and religion is purely a coincidence.

### ***Other Alleys***

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<sup>14</sup> Dr. R. Morden, "Report on Creationism", University of Wisconsin, published on the *INTERNET*, June 1998 (<http://staff.uwsuper.edu/homepage/rmorden/welcome.htm>); see also Richard Young, "Why Creation "Science" Must Be Kept Out of the Classroom", *INTERNET*, June 1998; Robert E. Snow, "A Critique of the Creation Science Movement", in Van Till *et al*, op. cit., pp. 166 - 202

<sup>15</sup> Peters, Ted (1989), op. cit., p. 16

<sup>16</sup> Ibid.

There are in addition two other *alleys*, which Peters later added to his views, and which need to be mentioned:<sup>17</sup>

- *Ethical Overlap*<sup>18</sup> - this category refers to the need by theologians to speak out against negative results in terms of e.g. human suffering, caused by scientific developments and the ethical problems caused by the environmental crisis. Examples of such influences that need to be addressed include the depletion of natural forests, uncontrolled industrial and agricultural production, the population explosion, air, soil and water pollution, the widening split between the rich and the poor, etc. Theologians often use the destruction of creation as ammunition, but Peters also points out that redeeming is also to be found in eschatological form (i.e. new creation), which can and should be allowed to redress the wrongs of the past.<sup>19</sup>
- *New Age Spirituality*. The key to New Age thinking is holism and three sets of ideas form the basis: (i) Discoveries made by 20<sup>th</sup> century physics (especially the quantum theory) (ii) Acknowledgement of the role of human imagination in the process of obtaining knowledge, and (iii) Recognition of the role of ethics in efforts to preserve our planet. New Age Spirituality argues that ordered reality as it is observed is not the fundamental reality - there is a realm of undivided wholeness behind it all. Peters says that this amounts to a combination of Hindu mysticism with physical theory. Criticism against New Age Spirituality is that it endorses “metareligious naturalism”, which Christian theism is uncomfortable with.<sup>20</sup>

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<sup>17</sup> Peters, Ted (1996), op. cit., pp. 323 - 343

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

Peters thus proposes the idea of *hypothetical consonance*.<sup>21</sup> This (consonance) means that areas are identified where there is a correspondence between what science says about the cosmos and what theologians understand to be God's creation. "Hypothetical" in this sense means that it is understood that both science as well as religion speaks (hypothetically) about the same reality. We may thus be asking whether it is indeed reasonable to accept that both scientists as well as theologians may wonder and seek answers to the questions of a possible divine role in bringing the cosmos into being. Theologians need to ask "... what possible implications new scientific discoveries and theories might have for our understanding of God's relationship to the world. *How can we understand our cosmos as God's creation?* Or, to put it in the form of a challenge, How can theologians at this point in time continue to speak intelligibly of creation without taking modern natural science into account?"<sup>22</sup>

## UNITING THEMES

### *General Aspects*

Sufficient grounds exist for asserting that there are certain themes on which science and religion share certain views, and which describe the same reality. Should these themes be distinguished and separated, or should they only be distinguished? Can there be an absolute separation between metaphysics and physics? This clearly cannot be done as religion has to do with everything "... precisely because all realms are created by God and continue to depend on him."<sup>23</sup> So, what contributions can be made and under what conditions?

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<sup>21</sup> See Peters, Ted (1989) p. 11; and Peters, Ted, (1996), pp. 323 - 343

<sup>22</sup> Ted Peters (1989), op. cit., p. 12

<sup>23</sup> Blocher, H., op. cit., p. 24

Carvin says that the first function of religion is *salvation* and not *explanation*.<sup>24</sup> At the same time it is believed that the believer cannot dodge the task of harmonizing the interpretation of e.g. Genesis with his extra-biblical knowledge - faith is built upon facts and where there is a contradiction between scientific facts and biblical teaching, faith might stand to lose. An important part of faith is the affirmation of God as "Creator of heaven and earth".

### ***Faith and Reason***

The dilemma is, however, knowing that truth is open-ended (Popper) - "... science is necessarily incomplete and provisional" and "piecemeal social engineering [is] the only means of social change in conformity with what can be known".<sup>25</sup> Theologians should thus be aware of the fact that the views of the scientist cannot be accepted or rejected too hastily. The meaning of biblical text must be his (the theologian's) first concern and the interpretation of scientific knowledge should be guided by circumspect.<sup>26</sup>

Theological and scientific reasoning is guided by two insights (according to Peters<sup>27</sup>), namely (i) Scientific reasoning depends in part on an element of faith, and (ii) Theological reasoning should be presented in a hypothetical mode so that it is subject to testing. A potential dispute immediately rises: Is theology a form of realism which refers to a reality beyond theologians (i.e. God), or do religious assertions merely give expression to faith? Gilkey says in this regard: "The activity of knowing points beyond itself to a ground of ultimacy which its own forms of discourse cannot usefully thematize, and for

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<sup>24</sup> Carvin, W.P., *Creation and Scientific Explanation*, Scottish Academic Press, Edinburgh, 1988, p. 4

<sup>25</sup> W.L. Reese, *Dictionary of Philosophy and Religion - Eastern and Western Thought*, Humanities Press, New Jersey, 1980, p. 449

<sup>26</sup> Blocher, H., op. cit., p. 24

<sup>27</sup> Peters, Ted, (1996), pp. 323 - 343

which religious symbolization is alone adequate.”<sup>28</sup> The scientist, at the same time, believes that the universe is intelligible and that truth is worth pursuing. For Gilkey, “This is not faith in the religious sense ... but it is a commitment in the sense that it is a personal act of acceptance and affirmation of an ultimate in one’s life.”<sup>29</sup> The scientist acknowledges the “faith” dimension to science. Davies says: “Sooner or later we all have to accept something as given, whether it is God, or logic, or a set of laws, or some other function of existence ... [which] will always lie beyond the scope of empirical science.”<sup>30</sup>

But does theology, like science, seek to explain? If so, then (according to Clayton) “Theology cannot avoid an appeal to broader canons of rational argumentation and explanatory adequacy”.<sup>31</sup> Van Huysteen advocates “critical-theological realism” where justification is based on progressive argumentation through theological theory, and not by ecclesiastical authority. Human speech is relative, contextual and metaphoric and these attributes influence science as well as theology. But although truth is open-ended, progress can be made towards truth through constructive thought, the building of metaphors and models, aimed at growing insight. “Theology, given both the ultimate religious commitment of the theologian and the metaphoric nature of our religious language, is scientifically committed to a realist point of view ... Our theological theories do indeed refer to a Reality beyond and greater than ours.”<sup>32</sup>

### The Current Debate

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<sup>28</sup> Langdon Gilkey, *Religion and the Scientific Future*, San Francisco, Harper, 1970, p. 41

<sup>29</sup> Ibid., p. 50

<sup>30</sup> Davies, Paul, *The Mind of God*, New York, Simon & Shuster, 1992, p. 15

<sup>31</sup> Clayton, Philip, *Explanations from Physics to Theology*, New Haven, Yale University Press, 1989, p. 13

<sup>32</sup> Wenzel Van Huysteen, *Theology and the Justification of Faith*, Grand Rapids, Eerdmans, 1989, pp. 162 -163

The Big Bang requires that at some time in the past the universe was suddenly created.<sup>33</sup> Stephen Hawking concludes that the fact that galaxies are generally moving farther away from each other and that there once was a big bang, finally brought the question of the beginning of the universe into the realm of science.<sup>34</sup> (It must be remembered that the latter conclusion does not entail the recognition of the existence of God – it merely “reluctantly” accedes the notion that scientific evidence seems to prove that there was a beginning. Stephen Hawking remains, however, a proponent of the idea that a singularity may not have occurred.)

The following table gives a picture of the evolution of the universe from the Big Bang.<sup>35</sup>

TIME	TEMP.	TRANSITION	ERA
15 Billion years		(today)	
12 Billion years		Microscopic life	Life
10 Billion years		Planets formed	Planets
1 Billion years		Galaxies formed (also heavier elements)	Stars
5,000,000 years	2000	Atoms formed	Atoms

<sup>33</sup> Professor John Taylor, *When the Clock struck Zero - Science's Ultimate Limits*, Picador, London, 1993, p. 103; Hefner writes in this regard: “What is at stake in the falsification of theological theories is not whether they can prove the existence of God, but rather whether, with the help of auxiliary hypotheses, they lead to interpretations of the world and of our experience in the world that are empirically credible and fruitful - that is, productive of new insights and research.” - see Philip Hefner, *The Human Factor*, Minneapolis, Fortress Press, 1993, p. 201

<sup>34</sup> Stephen Hawking, *A Brief History of Time: From the Big Bang to Black Holes*, New York, Bantam, 1988, p. 8 - 9. Hawking was later asked whether he believes that there is a God who created the universe and guides His creation, to which he replied: “No”. See Michael White and John Gribben, *Stephen Hawking - A Life in Science*, Viking (Penguin Books), London, 1992, p. 3.

<sup>35</sup> Peters, Ted (ed.) (1989), p. 118

<i>3 minutes</i>	$10^9$	Nuclei formed (hydrogen, helium)	Nuclei (plasma)
$10^{-4}$ seconds	$10^{12}$	Quarks to protons and neutrons	Protons, neutrons
$10^{-10}$ seconds	$10^{15}$	Weak and electromagnetic forces separate	Quarks
$10^{-35}$	$10^{28}$	Strong nuclear forces separates	Electro - weak
$10^{-43}$	$10^{32}$	Gravitational force separates	Grand Unified Theory
(0)		Infinite Singularity)	Supersymmetry

The question can rightly be asked if the Big Bang was the only aspect of cosmology which has a bearing on the contemporary science-religion debate. Arthur Peacocke highlights the following additional aspects of scientific information in this regard, which have influenced *the transformation from a 19<sup>th</sup> century scientific world view to the (modern) 20<sup>th</sup> century world view*:<sup>36</sup>

- *Absolute space, time, object and determinism* of the 19<sup>th</sup> century caused a view of an unmysterious, mechanically determined world which was simple in structure at the atomic level, and which was unchanging (statistically). This changed drastically with the advent of Einstein's General and Special Theories of Relativity.
- Along with Hubble's confirmation of an expanding universe came the realisation that *the universe is in a process of change and evolution*. This is certainly true of Earth as well (e.g. volcanic action which causes new islands to appear) and it was later also



discovered to be true of the satellites of other planets (e.g. the volcanic action on Jupiter's moon Io<sup>37</sup>).

- A new awareness that there is an inextricable *connection between the grand sweep of the cosmos and mankind*. New scientific information suggests that "... if, for example, the interaction constant governing the forces between protons were only slightly different, then all the protons in the universe would have turned into inert helium at the early stages of the expansion of the universe. As it happened, they did not. Had they done so, no stars and no life would have emerged ... [and] this expresses in a new way the old assertion that the universe in which we exist is contingent".<sup>38</sup> The human presence in the universe is, furthermore, remarkably and intimately related to events in the galaxies - every atom of iron in our blood would e.g. not have been there had it not been produced in some galactic activity billions of years ago.

Ian Barbour distinguishes some interesting questions in respect of *recent astrophysical features vis-a-vis design, chance and necessity* to account for the value of the parameters favourable to the emergence of life. He proposes the following:<sup>39</sup>

- **Design - The Anthropic Principle.** The traditional "argument from design" claimed that life forms as well as physical conditions favourable for life must be the product of intelligent design because it is inconceivable that they could have been the result of chance. The counter argument is simply that judgments cannot be made because there is only one universe from which judgments can be made - probability assessments need multiple comparable

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<sup>36</sup> Arthur R Peacocke, "Theology and Science Today", in Peters, T., op. cit., pp. 30 - 33

<sup>37</sup> Richard Talcot, "Jumping Jupiter", *Astronomy*, June 1998, pp. 40 - 45

<sup>38</sup> Peacocke, A.R., op. cit., p. 31

examples. With the advent of new theories on the possible existence of multiple universes, the argument from design has been revived. "A striking feature of the new cosmological theories is that even a small change in the physical constants would have resulted in an uninhabitable universe."<sup>40</sup> Examples of these fine-tuned conditions are as follows:<sup>41</sup>

- \* *The Expansion Rate* - If the expansion rate had been less by even one part in a thousand billion, the universe would have collapsed again before temperatures had fallen below 10,000 degrees C. Had it been greater than one part in a thousand billion, stars and planets would not have been able to form because the expansion rate would have been too fast.
- \* *The Formation of the Elements* - There would have been only hydrogen in the universe, had the strong nuclear force been weaker. Had it been stronger, all the hydrogen would have been converted into helium. Stable stars as well as e.g. water would not have formed.
- \* *The Particle/Antiparticle Ratio* - In the early universe there were 1 billion and 1 protons for every billion anti-protons which annihilated each other to produce radiation and which left one proton over. Had there been more or less "survivors", the kind of material currently in existence in the universe would have been impossible.

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<sup>39</sup> Ian G. Barbour, "Creation and Cosmology", in Peters, T., op. cit., pp. 129 - 136

<sup>40</sup> Ibid., p. 130

<sup>41</sup> See also e.g. Dr. Hugh Ross, "Astronomical Evidences for the God of the Bible : Design and the Anthropic Principle", *INTERNET*, Copyright "Reasons to Believe", 1992 - HTM Version - attached as Annexure A

There are numerous other examples of such fine-tuning and reflections such as these led certain cosmologists (Dicke and Carter) to formulate the following anthropic principle: "What we can expect to observe must be restricted by the conditions necessary for our presence as observers".<sup>42</sup> It is interesting to note that even non-believers such as Stephen Hawking find such fine-tuning worthwhile to connect with religion: "It would be very difficult to explain why the universe should have begun in just this way, except as the act of a God who intended to create beings like us."<sup>43</sup>

- **Chance - The Many Worlds Theories.** Apparent design could also be explained in terms of the remarkable coincidences as far as the many worlds theories are concerned. According to the latter theory billions of worlds could exist with differing constants - in this way that which is highly improbable in one world might be probable in another set of worlds. These worlds may occur in the following ways:

- \* *An Oscillating Universe* - Wheeler and others have suggested that the universe oscillates between "big bangs" and "big crunches" during which the universe is completely "melted down", a new (hot) start is made, a process of cooling off ensues, and a new universe is developed every time. The constants may vary at random during these fluctuations and a particular "right" combination will eventually come up by chance. (Present indications are that oscillating theories are not favoured above the Standard Model of a big bang).

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<sup>42</sup> Barbour, Ian G., op. cit., p. 131

<sup>43</sup> Hawking, Stephen W. (1988), p. 127

- \* *Multiple Isolated Domains* - A single big bang may have caused multiple domains to come into existence simultaneously. These different universes might be existing parallel to our universe like bubbles which, because of their velocity of separation, prevents communication with our world. They may have different constants or even laws and ours may be the only one in which life could be present.
  
- \* *Many-worlds Quantum Theory* - Some quantum theorists propose the existence of a myriad different worlds which form every time there is an alternative quantum potentiality. Each of these worlds will split again to form myriads of other worlds every time they in their turn develop alternative quantum potentialities. Although this alternative is difficult to envisage and is inherently unverifiable since there could be no communication between all these worlds, it is at least philosophically possible, according to Barbour.<sup>44</sup>
  
- \* *Quantum Vacuum Fluctuations* - According to this principle, particles can be spontaneously generated in a vacuum by random fluctuations of energy (see Chapter 6 p. 233). The smaller the energy of the particles, the longer the particles can exist before disappearing again into the void.<sup>45</sup> Taking the total energy of the universe as zero (it is argued that the positive energy of matter is exactly cancelled by the negative energy of gravity), the universe can last indefinitely long, a colossal free lunch. The universe is seen as an infinite vacuum, boiling with energy fluctuations. Our present universe is just one of the large fluctuations to

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<sup>44</sup> Barbour, Ian G., op. cit., p. 133

<sup>45</sup> Gideon Joubert, *Die Groot Gedagte*, Cape Town, Tafelberg Uitgewers, 1997, p.

emerge from the vacuum and in time it will again dissolve back into the vacuum. Other cosmologists have presented scenarios in which our present universe was created out of a "mother" universe, and so on from past eternity.<sup>46</sup>

According to Barbour all the abovementioned theories "... would allow us to explain the combination of constants favorable to life as a chance occurrence among a set of worlds most of which would be lifeless."<sup>47</sup> In terms of the process theology, one could interpret the multi-world hypotheses theistically - evolution and chance is considered to be the way in which God creates. This may, however, require an enormous allowance for the role of chance which in itself would possibly be beyond any basis for probabilities (whether one accepts or rejects the notion that time or space could never be a problem for God).

It is especially the *vacuum fluctuation theory* which has notable implications for the theological principle of *creatio ex nihilo* and according to Barbour, it is sometimes "... viewed as the secular version of *ex nihilo*."<sup>48</sup> A number of uncertainties do, however, exist, e.g. the fact that quantum vacuum fluctuations have been produced in laboratory conditions where space and time obviously already existed. In addition, one would have to account for the gigantic quantum fluctuation which must have existed at the beginning, had this option been the one through which the universe came into being.

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<sup>46</sup> A.D. Linde, "Particle physics and inflationary cosmology", *Physics Today* 40 (1987, No. 9), p. 61-68; M.A. Markov, "Some problems of modern theory of gravitation". In: *The Past and Future of the Universe*, Moscow, Nauka, 1989, pp. 11 - 23

<sup>47</sup> Barbour, Ian G., op. cit., p. 133

<sup>48</sup> Ibid., p. 134

- *Necessity - A Theory of Everything.* A *Grand Unified Theory* (GUT) may offer the prospect of bringing the so-called strong and weak nuclear forces as well as the electromagnetic force into a single theory. This theory would enable us to understand the period before  $10^{-43}$  "...when the known laws of science would break down at a singularity."<sup>49</sup> At  $10^{-43}$ , temperatures were so high that the fourth force, gravity, would have been united with the other three forces. The hope is that the development of a *Supersymmetry* or *Supergravity* theory would provide for a quantum gravity theory and because it would unite all the basic physical forces, it is also referred to as the *Theory of Everything* (TOE).<sup>50</sup> Of such a theory, Hawking claims that we would know why we and the universe exist and that we would then know the mind of God, which implies the non-existence of God (because to know the mind of God would be to be like him).<sup>51</sup> Such a theory would have nothing to say about life, or in Hawking's own words: "Even if there is only one possible unified theory, it is just a set of rules and equations. What is it that breathes fire into the equations and makes a universe for them to describe?"<sup>52</sup> Would such a theory not describe in perfect terms a universe where the rules and laws all contribute to its perfectness? Doesn't such an orderly universe even more display a grander universe of chance? Would there - and *can there* - ultimately be only one set of assertions that would predict all events from one basic principle? A mathematical model cannot give answers to these questions.

It seems in the final instance that necessity and chance do not explain the world.

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<sup>49</sup> Stephen Hawking (ed.), *Stephen Hawking's A Brief History of Time - A Reader's Companion*, Bantam Press, London, 1992, p. 82

<sup>50</sup> Barbour, Ian G., op. cit., p. 135

<sup>51</sup> Hawking, Stephen W. (1988), p. 175

## THE THEOLOGICAL IMPLICATIONS

*Intelligibility and Contingency* - Can the universe be contingent and intelligible? Historically it was accepted that the biblical doctrine of creation contributed to the rise of experimental science - it combined the idea of rationality with contingency.<sup>53</sup> The world can only be understood by observing it - if God is rational, the universe should be orderly. God is also free and the universe did thus not have to have the particular order it has. God alone is necessary and the cosmos must therefore be contingent as it (the cosmos) might not have been in the first place. Being created, it means that it can be observed separate from God. Einstein saw contingency as a threat to rationality: "A conviction akin to religious feeling, of the rationality or intelligibility of the world lies behind all scientific work of a high order."<sup>54</sup> Barbour makes the following distinction:<sup>55</sup>

- *Contingent Existence.* The details of scientific cosmologies are irrelevant to the contingency of the existence of the universe - the question is: Why is there anything at all? The latter question lies totally beyond the domain of the scientist, according to Van Till *et al.*<sup>56</sup> Moreover, if the universe had been created by God from nothing, it could never be seen as emanating from him. The Christian doctrine of *creatio ex nihilo* proclaims that the cosmos is wholly other than God, yet completely dependent on God for its existence and maintenance.

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<sup>52</sup> Ibid., 174

<sup>53</sup> Barbour, Ian G., op. cit., p. 137

<sup>54</sup> Albert Einstein, *Ideas and Opinions*, London, Souvenir Press, 1973, p. 262.

Einstein, like Hawking, is often quoted in a religious sense. Helen Dukas and Banesh Hoffman, however, quote Einstein as having said: "I do not believe in a personal God and I have never denied this but have expressed it clearly". See Helen Dukas and Banesh Hoffman, (eds.), *Albert Einstein - The Human Side*, Princeton, Princeton University Press, 1979, p. 43

<sup>55</sup> Barbour, Ian G., op. cit., p. 139

<sup>56</sup> Van Till, Howard J. *et al*, op. cit., pp. 112 - 113

- *Contingent Boundary Conditions.* If there was a beginning, it cannot be described by science because the laws of physics do not apply under the conditions science tells us existed at  $T=0$  (the beginning or the big bang). Even if there was no beginning because time is infinite, one would still end up having to describe a set of conditions no matter how far back it happened. Events are always described on the basis of existing laws at the time as well as the prevailing conditions - not in terms of laws alone.
- *Contingent Laws.* Many of the laws of cosmology appear to be arbitrary and the specific fine-tuned constants that made life possible seem to be coincidental. Some of these laws form necessary constituencies of more fundamental theories. If a TOE is found it will in itself be contingent. "Moreover, there are laws applicable to higher emergent levels of life and mind that are not derivable from the laws of physics."<sup>57</sup>
- *Contingent Events.* The uncertainty principle in quantum physics reflects indeterminacy in the world and not simply the limitation of existing knowledge. Similar contingency is also prevalent in other ways, e.g. freedom in human choices, random mutations in evolution, etc. The question is thus whether we can explain the universe simply by means of scientific laws and whether historicity does not play an evenly important role - quantum physics prevailed during the initial stages of the coming into being of the universe (in other words, indeterminacy prevailed), which makes the process irreversible. Moreover, is the balance between law and chance knowable as far as cosmology is concerned?

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<sup>57</sup> Barbour, Ian G., op. cit., p. 140



*Creatio ex Nihilo and Creatio Continua.* It was pointed out earlier in this study (Chapter 1) that the existence of God cannot be proved - he has to be believed in. Similarly, the Anthropic Principle does not give conclusive proof of the existence of God - only evidence. The Doctrine of Creation is neither effectively proved by the Big Bang Theory (see Chapter 6). The belief in God rests upon the redemption of Israel (through the covenant and the person of Jesus Christ). The Judeo-Christian belief in God and the creation as an extension of his beliefs thus seems to have little influence on scientific cosmology and *vice versa*. It remains, however, the task of the believer to seek coherence and consonance. Barbour suggests the following examples of consonance:<sup>58</sup>

- *The Contingency of Existence.* The contingency of existence is compatible with the religious meaning of *creatio ex nihilo*. An absolute beginning is not vital from the point of both theology or science, although present indications are that it is likely that a Big Bang took place (and therefore that an absolute beginning took place). (One cannot, however, completely rule out the possibility of an oscillating universe or infinite time.) Genesis also alludes to the ordering of existing chaos. But it is the sheer existence of the universe (*why is there something*) that is the central issue for theology and the historical details are not that important in this respect. *Ex nihilo* in a theological sense thus alludes to the "... transcendence, power, freedom, and purposefulness of God and to express our dependence on God ... as well as the eternal aspect of God as beyond time *and related equally to every point in time.*"<sup>59</sup> (Italics mine.) Theology must, moreover, be careful not to make the same mistake of yesteryear, namely to over-emphasize God's transcendence and power - the idea of omnipotence and predestiny - and in the process neglect other scriptural themes.

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<sup>58</sup> Ibid., p. 141

- *The Contingency of Boundary Conditions.* *Ex nihilo* is compatible with the assertion that conditions for an absolute beginning cannot be replicated in the laboratory and is thus inaccessible to science. It is also compatible with the possibility that there was no absolute beginning. In both these examples, dependence on God is evident (though not proved) - contingent boundary conditions or infinite time have to be dealt with in science as givens. Though, in neither case it could be argued that the particular universe was necessary.
- *The Contingency of Laws.* The contingency of laws can be identified with *creatio continua* - creation involves both law as well as chance (through quantum mechanics) and traditionally it was associated with the establishment of order. Scientific facts in broad terms can be related to, but the detail of speculative theories should at this stage not be discussed. Again, order is not an absolute necessity for life and it can only be understood by observing it.<sup>60</sup>
- *The Contingency of Events.* It is abundantly clear that the universe is not static and the contingency of events also corresponds to *creatio continua*. Nature in all its forms can be viewed historically and astrophysics plays its role here in addition to biological evolution and other fields of science. "Time is irreversible and genuine novelty appears in cosmic history."<sup>61</sup> From the theological point of view, God's immanence and ongoing participation in the universe is expressed in *creatio continua*. The process theology's contribution in this regard is worth noting (see Chapter 4 for a full discussion) - God is the source of both order as well as novelty and the contingency of events takes place through the indeterminacy of

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<sup>59</sup> Ibid., p. 143

<sup>60</sup> Ibid.

<sup>61</sup> Ibid.

physics as well as the freedom of individuals. God affects creation, but is also affected by creation (because of his dipolar nature).

Gilkey sums up the theological meaning of *creatio ex nihilo* by saying that (i) God is the transcendent source of all existence; (ii) that creaturely existence is dependent, contingent and transient, and yet possesses a reality and a value of its own fulfillment, and (iii) that the divine act of creation is to be understood not in terms of structure but in terms of its divine purpose, as a free act of a loving will.<sup>62</sup>

### **HOW DOES THE NEW COSMOLOGY AFFECT THE POSITION OF MANKIND?**

The purpose of the biblical story of creation was not to describe historical events, but rather to place human experience within a larger framework. "Creation stories manifest the essential structure of reality and our place in it. They provide archetypes of authentic human life in accord with a universal order."<sup>63</sup> But how do the new cosmological findings affect life and can they be reconciled with the Bible?

- *The Immensity of Space and Time*. Cynics describe man's position in the cosmos in a variety of ways, but one cannot help to be awestruck by the immensity of the universe *vis-a-vis* the apparent insignificance of man. But, as Teilhard de Chardin points out, we should not measure significance by size or duration alone, but rather by complexity and consciousness.<sup>64</sup> "There are a thousand billion synapses in a human brain; the number of possible ways of connecting them is greater than the number of atoms in the

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<sup>62</sup> Langdon Gilkey, *Maker of Heaven and Earth*, New York, Doubleday, 1959, p. 73

<sup>63</sup> Barbour, Ian G., op. cit., p. 146

<sup>64</sup> Pierre Teilhard de Chardin, *The Phenomenon of Man*, New York, Harper & Brothers, 1959, pp. 226 - 228

universe.”<sup>65</sup> It is, moreover, the human being who is reaching out to understand the universe.

- *Interdependence.* It was noted earlier that the human presence in the universe is remarkably and intimately related to events in the galaxies - every atom of iron in our blood would e.g. not have been there had it not been produced in some galactic activity billions of years ago. Although mankind is the highest known form of life, it remains part of a much wider process in space and time. The biology, ecology and cosmology join together in an interdependency of all things. This situation undercuts the claims of anthropocentrists, but it does not deviate from the significance of life.
- *Life on Other Planets.* Sagan’s estimate of the number of planets (perhaps  $10^{11} \times 10^{11} = 10^{22}$ ) in the universe mentioned in Chapter 6, and his comment: “Why should we, tucked away in some forgotten corner of the Cosmos, be so fortunate [as being the only inhabited planet]? To me, it seems far more likely that the universe is brimming over with life.”<sup>66</sup>, is indicative of the wide acceptance of the possibility of life on other planets. This issue has many angles and can be debated from various angles (See Annexure B for material pertaining to this subject). The possibility of more advanced civilizations (although it may not necessarily be more advanced) serves as a further warning against anthropocentrism. There may also be religious resistance to such an idea based on the revelation of God through Christ. According to Barbour, “... the Eternal Word ... was not confined to its self-expression in Christ”<sup>67</sup>, which means that God may reveal himself through any means he chooses and that any other life form may be included in

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<sup>65</sup> Barbour, Ian G., op. cit., p. 147

<sup>66</sup> Ibid.

<sup>67</sup> Ibid., p. 148

such a plan. After all, the “Eternal Word” is currently busy with creation throughout the cosmos and why should he then not also reveal himself?

- *Chance and Purpose.* The real question here is whether God is in absolute control and this has traditionally been the issue that theism did not want to accept - God has to be in total control because if he was not, he would not be God. Thus chance and theism seemed to be incompatible and to assign total control to God could not be accepted by science as this overrules scientific freedom. Does God then control all the events that appear to us to be chance (such as quantum uncertainties, evolutionary mutations, accidents in human history, etc.)? If so, then determinism will be retained at a level where science cannot detect it. Theologically, it also means that God is to blame for everything that goes wrong in the universe, e.g. pain and suffering (as he controls everything).

Another view is that genuine chance is not incompatible with theism. Design can be seen to be the order of the day even where probabilities come into play and natural law as well as chance may be instruments in the hands of God - there can be purpose without predestination. “In the face of all such contingencies [like catastrophes, illness, death, the actions of other people which have a negative impact on our lives, etc.], the gospel does not promise immunity from suffering or loss, but rather the courage to affirm life in spite of them and the confidence that God’s love is with us in the midst of them.”<sup>68</sup>

## CONCLUSION

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<sup>68</sup> Ibid., p. 149

The question of whether there was a beginning or not was investigated and found to contain a number of implications for both science as well as religion. If the Standard Model (i.e. the Big Bang theory), which is currently the model with the greatest support amongst scientists, is accepted to be the explanation of the existence of the universe, it has to be refined to include the dynamic nature of the process involved. There is sufficient evidence to suggest that the Big Bang initiated a process which is continuing even today.

Should any of the other (not so) plausible theories (the many worlds theories) be brought into play, theism finds that the initial cause may be forced to take a step backwards one step, but it remains compatible with scientific suppositions in terms of the question: Why is there anything at all?

It is evident that the concept of *creation ex nihilo* is a metaphysical concept that offers a biblically based, theistic answer to the question: Why did the universe come into being? The Big bang theory offers no such explanation and restricts itself to the describing of the early development of the cosmos. Although the Big Bang theory is called upon to verify one theological aspect, namely that there was a beginning, "... it wholly lacks the *theological substance* of an adequate concept of *creation ex nihilo*."<sup>69</sup> A Big Bang beginning and *creation ex nihilo* can thus not be equated and they do not give answers to the same question. *Ex nihilo* thus means that God is the transcendent source of all existence, that creaturely existence is dependent, contingent and transient, and yet possesses a reality and a value of its own fulfillment, and that the divine act of creation is to be understood not in terms of structure but in terms of its divine purpose, as a free act of a loving will.

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<sup>69</sup> Van Till *et al*, op. cit., p. 114

Why is there coherence, causality and continuity which science displays, or put in theological terms: Why is there something and *this particular something* at all?

Coherent and continuous cosmic history are indicative of the character of actual cosmic history which in effect displays causality. This causality does not prove the existence of God, but it provides evidence for the existence of a supreme Being.<sup>70</sup> Dynamic change is continuously taking place according to intelligible patterns and it was noted that these changes are also cumulative and give cosmic history a directional character.

The latter amounts to the acceptance of some form of the Anthropic Principle, which is countered by opponents by the asking of two questions: *Are we alone in the universe?* and *Does our existence tell us anything about the universe?*<sup>71</sup> The theological counter-arguments state that finding intelligent life elsewhere would not constitute a breach of the biblical principle of redemption, and our existence points to a fine-tuning which is unassailing: The evidence suggests that our presence on Earth, with a particular chemical makeup and requiring a particular chemical, physical and biological environment, is dependent on the presence of the entire physical universe and the evolution of the cosmic history. This cosmic history is therefore not merely of scientific interest.

What is nature telling us? "Is the natural world just that, natural. Or is it more than natural?"<sup>72</sup> If we study nature with the intention of wondering about the magnificent mysteries around us, we will end up

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<sup>70</sup> The difference between "providing evidence" and "proof" can best be explained with reference to legal proceedings in a court of law: The legal council may e.g. provide evidence to support a legal point of view, but such evidence may or may not prove a *prima facie* call for legal action.

<sup>71</sup> Timothy Ferris, *The Whole Shebang - A State-of-the-Universe(s) Report*, London, Weidenfield & Nicholson, 1997, p. 292

where we started, namely with an imagination full of puzzles. If we study nature for her beauty, we will see beauty. If we study nature to see her violence, we will see her violence. Peters says further in this regard: "Nature, we have been assuming for a century or so now, does not seem to take the initiative to disclose her ultimate foundation or even her existential meaning. What natural revelation reveals is simply nature, not God. If we want to know more, we will have to ask more questions. And we will have to go beyond our natural relationship with nature to find the answers."<sup>73</sup>

Faith says nothing about the age or nature of things and science says nothing about the ultimate origin of things - therefore they can live in peace together.

Why is there something and this something at all ... remain the ultimate unanswered questions.

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<sup>72</sup> Peters, Ted (ed.) (1989), p. 11

<sup>73</sup> Peters, Ted (1996), p. cit., pp. 323 - 343



## CHAPTER 8

*Only one thing is certain, namely that nothing is certain.  
Rene Descartes*

### GENERAL CONCLUSION

#### INTRODUCTION

This study was undertaken with the general goal of describing the science-religion debate with reference to one of the most fundamental issues - *the origin of the universe* - in this debate. The origin of the universe is the point of focus for both science as well as religion, but whilst theology is in a position to present the Judean-Christian world view in what can be termed as a coherent and plausible fashion, it does so from the *a priori* point of departure which claims the existence of a Supreme Being to whom the actual being of the universe is ascribed. Science, on the other hand, purports to describe creation in its entirety (the *what*), but is struggling to give a plausible account of the issue of *why* everything came into being. The *origin of the universe* is thus of vital significance from the point of view of theology as it answers the questions as to not only the *what* (beginning of time and space), but also the *why* (which cannot be answered by science).

The terrain that was covered thus had to include the philosophical angle in which the existence of a Supreme Being could be debated. The *ontological*, *cosmological*, and *teleological* arguments as “proof” for the existence of God was debated in **Chapter 1**. Other arguments - *theism and probability*, the *moral argument*, and the *argument from special events and experiences* - were also called to testify. It was noted that the ontological argument exists on the basis of the *a priori* acceptance of the existence of God and could therefore not be accepted by those not believing in God. The cosmological argument excludes

the possibility of a universe where an infinite number of things can happen and the necessary “first cause” (God) is thus not necessary. (This argument does not prove the existence of God, but it also does not *disprove* his existence.) The teleological argument (argument from design) was found to be reasonable, despite the impact of Darwinism and natural evolution. The other arguments (theism and probability, the moral argument and the argument from special events and experiences) are all to some extent derivatives of the already mentioned arguments, each contributing from an *a priori* point of departure. It was thus generally concluded that, although the existence of God cannot be proved, sufficient *evidence* suggests the existence of a supreme Being, and that it cannot be proved that he does *not* exist.

*Religious Language* concerns mainly two aspects, namely the special meanings of descriptive terms when they are applied to God, and the other aspect is concerned with the basic function of religious language. The question here is not so much the issue of descriptive terms when describing God, but rather whether religious language is considered to be cognitive. Are religious sentences intended to be construed cognitively, or can their logical character, regardless of intention, be either true or false? Whilst a growing number of theorists are beginning to treat religious language as non-cognitive, there are also some who argue that religious language is meaningful because some religious statements are neither true nor false because some of them are not assertions, but *bliks* (which are unverifiable and unfalsifiable). Nothing can count against bliks, but at the same time some religious statements are true by virtue of their meanings. Finally, it is indicated that there are certain similarities between religious beliefs and ordinary, unproblematic factual beliefs. Religious language can thus be adequate, coherent and effective.

In *Chapter 2* an historical account of the general development of the relationship between science and religion was given. It was noted that

three periods or phases in the debate between theology and science are identified. During the first phase the general use of scriptural texts and statements *against* the new scientific doctrine is apparent. The intermediate period is marked by the frequently putting against science of some great doctrine in theology. (Examples in astronomy include the insistence that the scientific doctrine of the earth revolving about the sun is contrary to the theological doctrine of the incarnation, and in geology it was urged that the scientific doctrine that fossils represent animals which died before Adam, contradicts the theological doctrine of Adam's fall and the statement that "death entered the world by sin.") The third period is marked by attempts at compromise and efforts to reconcile scriptural statements with ascertained fact. The result of the initial one-sided pressure on scientific discoveries in which physical science could hardly grow, was the establishment of an atmosphere in which all seeking truth (as truth in nature) were regarded as futile from the general belief that the end of the world was at hand, that the last judgment was approaching, and that all existing physical nature was soon to be destroyed. Hence the greatest thinkers in the Church generally poured contempt upon all investigators into a science of nature and insisted that everything except the saving of souls was a waste of time. For twelve centuries the physical sciences were thus discouraged or challenged by the dominant church orthodoxy. At the same time it was demonstrated that the positive role played by the Christian faith in the development of the natural sciences cannot be disputed and the science of the Middle Ages e.g. differed from that of the 17<sup>th</sup> century when *mathematical reasoning* and experimental observation was combined. Immanuel Kant gave prominence to the *interpretation* of knowledge. He argued that religion formed the basis of man's practical life as well as inner experience, thus presenting reconciliation of science and religion. It was thus concluded that indications are that there is an effort now between both theology as well as the natural sciences to move closer where scientists agree that they can no longer operate completely free from criticism from

theology - there is also for example a growing acceptance and even a willingness to conduct certain pure scientific research in close cooperation with theologians. It was, moreover, noted that changes have also occurred in theology. There is e.g. a growing acceptance of man's position as biological organism. In addition, there is a growing awareness of the fallibility of Scriptural dogmatism because it was written by fallible people who are influenced by culture - we are now explained by our culture, whilst in the past our specific identity was attributed to the working of God's providence. It was the proposals of the *Liberal* and *Process* theology which perhaps introduced an avenue of plausible cooperation between science and religion.

**Chapter 3** overviews the concept of *world views*. The existence of world views which can be labeled *scientific* and *Judeo-Christian*, and the *development of world views in the West*, is treated. It is concluded that it cannot be asserted that only one world view (e.g. a scientific- or a Judeo-Christian world view) exists, but that there is a set of pluralism of multi-faceted and dynamic contributions which forms world views. It is pointed out that a unified world view may distort some aspect of truth as it may be over emphasized to the detriment of other aspects of world views.

In **Chapter 4** the *Liberal and Process Theology* is expounded as contributing factors in the reduction of the "warfare" metaphor in the science-religion debate. It is noted that the *Liberal Theology* came as a reaction against dogmatic emphasis, and that it also accepts the methods of modern historical studies of Scripture. The freedom of thought, from interference and from human declarations, together with a sense of responsibility, of openness and modesty, is what it stands for. The Liberal Theology questions the inerrancy of the Bible and does not accept that God reveals himself only through the Bible (but also through e.g. the insights of man, through nature, etc.). The *Process Theology* comprises the thesis of dynamism, development and

improvement - it emphasizes becoming, organism, experience and creativity. While the *Liberal Theology* opened up religion allowing a flirtation with fundamental questions which in retrospect probably played an important role in the “easing” of the relationship between science and religion, the *Process Theology* allows for the reinterpretation of God’s role in the universe. God’s power is no more absolute (as the fundamentalist would have it) because he shares his power with mankind (he has the *most* power, but not all power), his nature is no longer coercive - his persuasive love-beauty describes his power more accurately. God is constantly involved in *ongoing creation*.

The contribution of the *Liberal Theology* is summarized as having helped to transform orthodox dogmatism to attitudes similar to those of scientists being appropriate to theology, the acknowledgment that science involves presuppositions and moral commitments not unlike those in religion, the critical interpretation of human experience (and Scripture), and the refinement of revelation. The *Process Theology* underlines the *immanence* of God rather than his *transcendence*. God’s activity in the world is based not on omnipotence and predestiny, but on the sharing of power with co-creators through free cooperation.

It is concluded that the *Process Theology* makes effective cooperation between science and religion possible.

The question whether the Bible may be used in the science-religion debate is tested in **Chapter 5**. The purpose of this chapter was to analyze what the Bible (Genesis 1 and 2) says about the origin of the universe and a special effort is made to restrict this analysis to biblical text instead of constantly involving theoretical explanations based on how such texts may be interpreted e.g. from the point of view of scientific discoveries. The intention was to highlight one element of the creation, namely the universe as astronomical focus of God’s ongoing

involvement in the creation. The various approaches to the interpretation of Scripture are referred to and the point is made that the *fundamentalist approach* to the use of the Bible is considered not to present a reasonable way to the interpretation of the Bible. The *reader oriented approach* to the use of the Bible is therefor preferred as a means of investigating biblical references to creation as it is considered to present an adequate, coherent and effective means of such an endeavour.

The general aim of this chapter is to evaluate the purpose and meaning of biblical creation and to highlight the use of so-called “creation language” in the Bible, but not to use the Bible as “evidence” for the existing scientific theory of the origin of the universe (the Big Bang Theory).

An analysis of the words “In the beginning”, “created” (*bara*), “heaven and earth”, “the earth was without form and void”, “And God said let there be light”, “And God called the light day”, the concept of *creatio ex nihilo*, the issue of “order-making”, etc. is made. Reference to Ancient Near East myths are made and aspects such as “the role of the number seven”, the sequence of creation events and days, the “firmament”, the creation of the sun, the moon and the stars, “the heavens and the earth and all their host”, the two creation stories, are called upon.

The role of the Genesis account of creation cannot be complete without reference to the purpose of the book. Genesis can be viewed as a retelling of ancient oriental traditions about the origins of the world with the view to present the nature of God as one, omnipotent, omniscient, good, as opposed to the fallible, capricious weak deities who were popular in the rest of the ancient world. This puts the theme of “Discrepancies between the Biblical and extra-biblical data on Creation” into perspective.

It is concluded that God created the universe but that this act of creation did not result in an instantaneous complete universe, creation signifies a process of development, the initial creative act involved *creatio ex nihilo*, subsequent creation took place from existing matter, God is continuously involved with his creations and creation still takes place, the events described, were not formulated to record a sequence, the purpose of the intended message was not to describe the creation of the universe, but to present the nature of God as one, omnipotent, omniscient, and good, as opposed to the fallible, capricious, weak deities who were popular in the rest of the ancient world at the time of the “editing” of Genesis. It is also noted that while the reason for the creation of “earth” is given (to serve as abode for the prime of all creatures - mankind), there is no apparent explanation for the creation of celestial phenomena. (The latter issue has a direct bearing on the science-religion debate as, according to the *Anthropocentric Principle*, celestial phenomena exist for man’s sake.)

It is finally worth noting that a literal interpretation of the Genesis account of creation would be futile.

The purpose of **Chapter 6** is to record an overview of the latest findings of the Astronomy and to describe Cosmology from this angle. A description of the vastness of *the universe* is given and *the way distances are calculated* is briefly dealt with, as well as the question: *How old is the universe?*, receives attention. The Big Bang Theory is discussed in which the basic *precepts of the Standard Model* of the Big Bang Theory is expounded on. The *Inflationary Hypothesis* is included, which fits in with a section on *Problems with the Big Bang*. It becomes clear that Cosmology is in no way an exact science even at this stage.

The question is then asked whether a singularity did in fact exist. One major problem is that near the singularity the pressure and temperature become so great that conventional physics no longer applies. Current theories of matter are no longer valid here. Reference is also made to the so-called *multi-worlds theories*, according to which quantum mechanics dictate the possible existence of many worlds similar to ours.

It is concluded that it remains abundantly clear that the whole truth is as elusive as ever. As is noted by implication in the discussion of how distances are calculated, it is virtually impossible to get 100% accurate distances and the farther away these objects are, the more difficult it becomes to be accurate. Many other difficulties exist: The Hubble constant is constantly being challenged and despite more-or-less conclusive scientific evidence to the effect that the universe experienced a massive explosion in its initial stages of coming into being, many phenomena remain unsolved and unanswered. It was also concluded that, although many cosmologists do believe that the physical universe has a finite past, other evidence suggests at least the possibility that a singularity may not have taken place. It rests upon a particular interpretation of the known physical laws, to the exclusion of various alternatives that seem no less plausible. In short, even within big bang cosmology an eternal universe cannot definitely be ruled out.

Scientific evidence of exactly how the universe began is thus, as was indicated by an evaluation of the biblical account (Chapter 5), somewhat inconclusive.

In *Chapter 7* an evaluation of biblical creation and cosmological theories of the universe is given. It is noted that similarities between the Genesis account of creation and the scientific are probably to be found only in the fact that the Big Bang implies a finite universe



(which implies a possible beginning), and in the principles of *creatio ex nihilo* (and *creatio continua*). There are, however, a number of theological implications of creation, which also influence the science religion-debate (e.g. the question: Why is there something like the universe and why specifically this one?).

Can there still be any grounds for collusion between theology and science on these issues in view of the fact that the Genesis account does not bear witness to the describing of the process of creation as such? An effort to answer this question refers to the different approaches which can be taken, and some “blind alleys” are illuminated, including *Scientism* (science provides all the knowledge we need to know and religion cannot provide knowledge of reality), *Ecclesiastical Authoritarianism* (assumes that if there is a conflict between faith and reason, reason must be wrong), *Scientific Creationism* (considered to have a negative impact on religion because it invariably forces individuals to make a choice between biblical truth and what science teaches), and *The Two-Language Theory* (scientific theory and religious faith represent two separate and distinct domains of knowing). None of the aforementioned approaches is conducive to effective consonance between science and religion. Other “alleys” include *Ethical Overlap* (refers to the need by theologians to speak out against negative results in terms of e.g. human suffering) and *New Age Spirituality* (the key to New Age thinking being holism - it endorses “metareligious naturalism”, which Christian theism is uncomfortable with). The idea of *hypothetical consonance* (meaning that areas are identified where there is a correspondence between what science says about the cosmos and what theologians understand to be God’s creation) is the approach which is accepted.

When discussing *uniting themes*, it is agreed that the first function of religion is *salvation* and not *explanation*. “Critical-theological realism” where justification is based on progressive argumentation through

theological theory, and not by ecclesiastical authority, is the accepted method. The question can rightly be asked if the Big Bang was the only aspect of cosmology which has a bearing on the contemporary science-religion debate. Some questions in respect of *recent astrophysical features vis-a-vis design, chance and necessity* to account for the value of the parameters favourable to the emergence of life are distinguished, which include *Design - The Anthropic Principle*, *Chance - The Many Worlds Theories*, and *Necessity - A Theory of Everything*. It is concluded in this section that necessity and chance do not explain the world.

On the *Theological Implications* a number of questions are asked: *Intelligibility and Contingency* - Can the universe be contingent and intelligible? While contingency was originally perceived to be a threat to intelligibility, the quantum theory shows that the world can only be understood by observing it. *Creatio ex Nihilo and Creatio Continua* - the Doctrine of Creation is not effectively proved by the Big Bang Theory (the Judeo-Christian belief in God and the creation as an extension of his beliefs thus seem to have little influence on scientific cosmology and *vice versa*. It remains, however, the task of the believer to seek coherence and consonance.) The theological meaning of *creatio ex nihilo* is that (i) God is the transcendent source of all existence; (ii) that creaturely existence is dependent, contingent and transient, and yet possesses a reality and a value of its own fulfillment, and (iii) that the divine act of creation is to be understood not in terms of structure but in terms of its divine purpose, as a free act of a loving will.

How does the new cosmology affect the position of mankind? *The Immensity of Space and Time* - we should not measure significance by size or duration alone, but rather by complexity and consciousness. *Interdependence* - it was noted that the human presence in the universe is remarkably and intimately related to events in the galaxies - every atom of iron in our blood would e.g. not have been there had it

not been produced in some galactic activity billions of years ago. *Life on Other Planets* - The possibility of more advanced civilizations (although it may not necessarily be more advanced) does not impact negatively on the Eternal Word - it is not confined to its self-expression in Christ, which means that God may reveal himself through any means he chooses and that any other life form may be included in such a plan. *Chance and Purpose* - the real question here is whether God is in absolute control and this has traditionally been the issue that theism did not want to accept - God has to be in total control because if not, he would not be God. Genuine chance is not incompatible with theism and there can be no purpose without predestination.

It is concluded that there is sufficient evidence to suggest that the Big Bang initiated a process which is continuing even today. Should any of the other theories (the many worlds theories) be brought into play, theism finds that the initial cause may be forced to take a step backwards, but it remains compatible with scientific suppositions in terms of the question: Why is there anything at all? It is evident that the concept of *creation ex nihilo* is a metaphysical concept that offers a biblically based, theistic answer to the question: Why did the universe come into being?

Why is there coherence, causality and continuity which science displays, or put in theological terms: Why is there something and *this particular something* at all? These are the main questions that remain unanswered.

## THE WAY FORWARD

*Tentative guidelines for the way forward.* One question remains, namely how should we proceed from this point onwards? Given the transitional phase in which South Africa finds itself at present which has a special effect on religion in that religious practices are now part

of the expression of individual freedom to a far greater extent than before, how will this affect the Christian faith in particular? The openness of society means that not only is there a greater freedom of individual expression of religion, but there is also a growing awareness about other religions. This growing awareness moreover entails a greater allowance for the free interpretation of scientific developments, which in its turn may influence school curricula. Traditional orthodox theology has thusfar e. g. taken a stand against the theory of evolution and it is foreseen that the debate on issues such as these will escalate. How should the Christian theologian enter into this immanent debate with regard to scientific knowledge? The following tentative guidelines are proposed:

- ❖ The authenticity of the Christian faith cannot be held ransom to particular scientific models. There is one God who is the Creator of all things. Subscribing to a specific scientific theory on creation is an individualistic discourse, but Christian doctrine cannot uphold e.g. the Big Bang theory to the exclusion of all other possibilities – it is not the purpose of God’s revelation to be bound in a spatio-temporal situation. The issue is not whether the church accepts e.g. the theory of evolution, but how the church absorbs this theory into a comprehensive world view which does not necessarily exclude it.
- ❖ God reveals himself not only through Scripture. It is the Christian’s obligation to receive revelation in any way possible. Nature cannot speak for itself, but God reveals himself also through his activities within nature. The role of science in this regard is to *inter alia* describe nature, which must then be related to religion by the theologian.
- ❖ The “warfare” metaphor describing the relationship between science and religion needs not be accepted as such. The role science can play to enhance religion is to be fully exploited –

science should neither be ignored nor be dictated by, so that theology and science can operate on a par. Christian faith "... and sound scholarship are not at war with one another ... is neither dependent upon ignorance nor threatened by knowledge about the world ...".<sup>1</sup>

- ❖ Scripture as God's revelation to mankind, is not infallible. Scripture is at least in part the result of the handiwork of the interpretation of fallible man. There can also be little doubt that God did not stop this process of revelation once the Bible came into being – God is revealing himself on an ongoing basis. We are called upon to constantly investigate - not to question God's revelation, but our interpretation thereof in the light of new knowledge around "old facts" and new circumstances. In arriving at new conclusions, we accept that God's revelation to mankind is ongoing and that any change of opinion is not merely for the sake of change, but for the sake of keeping abreast of new revelation.
- ❖ Admitting the fallibility of Scripture, it should be accepted that continuous study of especially difficult areas of Scripture need to be promoted. This attests to the scholarly studying of the Bible as well as nature as an ongoing revelation by God. It is acknowledged that nature is not God, neither does nature prove the existence of God, but that nature provides us with evidence which cannot be ignored.
- ❖ The potential role of process theology to narrow the gap between science and religion should be emphasized. Such an effort will perhaps more fully account for a deity who is closely involved with the affairs of the world on the one hand, as well as the freedom,

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<sup>1</sup> Howard J. Van Till, *et al*, *Portraits of Creation - Biblical and Scientific Perspectives on the World's Formation*, Michigan, William B. Eerdmans Publishing Company, 1990, p. 275

creativity and change in nature on the other hand. The relationship between permanence and change could well be researched in order to establish whether there is some sort of unchanging essence in the world and what the nature of such an “unchanging essence” is. Traditional orthodox theology tends to restrict God’s actions in this world to supernatural acts, while process theology offers a comprehensive and plausible description of the actions of a mighty, all-loving God. The ensuing orthodox view of the “God of the Gaps” leaves a pitiful picture of God which makes scientific knowledge and open inquiry the enemies of God and faith in general. It is process theology’s position that God is present in all reality and while goals and methods may differ, the ultimate goal is to understand reality – thus there ought not to be a conflict of interests. Ultimately, God’s actions in this world are not restricted to the supernatural field and idealistic dreams - according to process theology, God’s actions become known through Scriptural revelation as well as through scientific investigation.

- ❖ As far as could be ascertained no similar study has been undertaken about the “biblical end of times” from the points of view of religion or science. It is conceivable that the science-religion debate could include this highly controversial (at least from the scientific point of view) topic.

***Rationality and the Study of Religion.*** This study would be incomplete without reference to the issue of the rationality of religion. Is religion founded upon ancient myths and mysticism and intangibles only and therefore irrational, or can it be seen as rational? Given the general findings thus far, it seems prudent to ask at this stage whether sufficient cause to confirm that religion can indeed be considered to be rational, was given in the above study. This is especially so when the notion persists from some quarters that there is a common conviction “... that religion as known and practiced was in conflict with human

reason”.<sup>2</sup> The existence of the current distance between religion and science is partly the result of such claims and if closer cooperation is to be expected, the existing hampering conditions need to be addressed. What scientific significance can thus be attached to knowledge gained from Scripture?

Logical positivists feel, whether religion is rational depends on its ability to present itself as a theoretical enterprise capable of producing testable and replicable results within the corpus of knowledge, for only then can Ludwig Feuerbach’s view that religion is nothing but human projection<sup>3</sup>, be refuted. Some arguments against religion being rational are based on the assertion that religion is dominated by values and that values may have a detrimental effect on the pursuit of knowledge. Jensen, however, points out that “... rationality is a systematic property of social and cultural life ... [and] we can also acknowledge that rationality is an integral aspect of religion, including religious values.”<sup>4</sup> It also seems fair to accept that human beings are able to explore their own imaginative constructs rationally, of which religion forms an integral part. Religion’s general rationality, moreover, is indisputable in terms of the vast amount of academic study of religion being undertaken.

In the final instance then, it is the view of the author that religion is rational and should be able to hold its own amongst other sciences.

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<sup>2</sup> The position of religion has not been helped by the historical posturing of religious scholars who are continuing to see the study of religion as their sole “responsibility” or domain, which has marginalized the study of religion to some extent. There has also been a tendency to steer clear of any form of critical study of religion with the point of departure that religion should not be studied if you are critical about it. See Jeppe S. Jensen & Luther H. Martin (eds.), *Rationality and the Study of Religion*, Aarhus University Press, Aarhus, 1997, p. 9

<sup>3</sup> Ibid.

<sup>4</sup> Jeppe Sinding Jensen, “Rationality and the Study of Religion”, in Jensen, J.S., op. cit., p. 15

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