

THE BIG BANG, PHILOSOPHY and GOD

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Nettleberry / Çitlembik Publications

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Library of Congress Cataloging-in-Publication Data

Taslaman, Caner

The Big Bang, Philosophy and God/Caner Taslaman; trans: Ender Gürol
İstanbul:Nettleberry Publications,2006.

224 p.

References

ISBN 9944-424-03-X

1.Big bang theory.- 2.God.-3.Religion and science

I.Title.II.Gürol, Ender

LC:QB991.B54 2006

DC:523.1/8

Cover design: Devrim Gülşen

Layout: Özge Beken

Translated by Ender Gürol

Edited by Nancy Öztürk

Printed by Seçil Ofset

In the USA:

Nettleberry, LLC

44030 123rd St.

Eden, South Dakota 57232

www.nettleberry.com

In Turkey: Çitlembik Publications

Şeyh Bender Sokak 18/5

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80050 İstanbul

www.citlembik.com.tr

*For my mother,
Meliha TASLAMAN*

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PREFACE

Is the Big Bang theory acceptable? What are the philosophical and religious consequences of the Big Bang theory? Can the existence of God be demonstrated through scientific data and logical reasoning? Are the universe, the laws of science, universal phenomena, living beings and we ourselves the products of sheer coincidence or are we the result of willed creation? The answers we reach will have decisive effects on what we must believe and whether life has meaning or not. The beliefs we hold and our concept of life influence formative aspects of our lifestyle such as ethics.

Our opinion of the universe is consequential. Our view of it shapes the view we have of ourselves, which is but a fragment of it. The Big Bang theory has increased our knowledge of the origin and constitution of the universe and has contributed to a better understanding of it. The Big Bang model has demonstrated that the universe started to evolve from a single point in an extremely dense and hot state and that it continuously expanded, cooling down as it expanded and losing much of its density; it was due to this that all the evolutionary stages of the universe took place, resulting in the formation of all the phenomena upon the earth, from sub-atomic particles to stars. Throughout the book, I usually use the expression "The Big Bang theory" to refer to the entire process.

The Big Bang's reverberations have certainly had a far-reaching impact on philosophy and religion. In the course of the last few centuries, massive barriers have sprung up between science on the one hand and philosophies and religions on the other. Most scientists have focused on the discovery of the origin of the universe and on its makeup, generally ignoring the consequences of this scientific data upon philosophy and theology. On the other hand, most philosophers have held themselves aloof from an occupation that called for a close observation of scientific data and have remained stuck in the new trends that reduced philosophy to the enlightenment of linguistic concerns, following in the footsteps of positivistic linguistic philosophy. Theologians, on the other hand, have remained detached from scientific research and have found themselves at

home in a setting confined by a barrier that separates the sciences from philosophy and religion.

Truth is one; it cannot be diversified: sciences, philosophies and religions cannot have different truths. We see that the barriers between these disciplines have been erected to protect each one within its respective domains. Yet, there can exist inaccurate science as well as misleading philosophy and religion. This has led to the failure to make wholesome deductions from scientific data, to overstuffing philosophies with barren skeptical approaches and to the introduction of innumerable superstitions into religions.

To avoid all irrelevancies, I have made a point of adopting a collective approach embracing philosophy, science and religion. In the first two chapters of the book I give a brief account of the human condition in terms of the philosophies and history of astronomy, hoping that the readers may evaluate the Big Bang theory within the framework of an historical perspective. The succeeding chapters deal with the evidence for the Big Bang theory, the scientific objections raised to it, and the reactions to these objections. In the course of these three chapters (3-5), the scientific data of the Big Bang is given larger space. In the subsequent four chapters I discuss the history of philosophy and religions in the light of the Big Bang theory. Referring to the discussions and controversies about the existence of God and the eternity of the universe, I demonstrate how the Big Bang theory both corroborates and contradicts these issues and I have the Big Bang theory judge the age-old controversies. In the last section, I address the question of whether the Big Bang and the phenomena in the universe support argument from design.

There are many who helped me write this book; they have discussed the issues, recommended sources and read my text. To all these, and to my dear Feryal and my revered professors Bekir Karlığa, İlyas Çelebi, Necip Taylan and especially to Kasım Turhan, I extend heartfelt thanks. I am also grateful to Ender Gürol for his translation and Nancy Öztürk for editing this work. My gratitude extends to you, my esteemed reader, as well. Please do not hesitate to forward your comments, criticism and suggestions to me (www.bigbang.ws).

I
THE PICTURE
PRIOR TO
THE BIG BANG THEORY

CHAPTER 1

PHILOSOPHIES AND RELIGIONS BEFORE THE BIG BANG THEORY

In order to better grasp the philosophical consequences of the Big Bang theory we should touch on the ideas that flourished before its emergence. In this way we will better understand which of these ideas the theory validated and which it called into question. We intend to let the Big Bang theory judge the history of philosophy in the coming pages. For the moment, however, we shall give a brief outline of what had gone before.

Two interrelated crucial questions in the history of philosophy had to do with the existence of God and whether the universe and matter had always existed or had been created. These two fundamental philosophical issues are the groundwork of the present book; the philosophies that preceded the Big Bang theory will be examined according to the answers provided by the history of philosophy.

DENIAL OF GOD AND ACCEPTANCE OF THE ETERNITY OF MATTER

According to this view on which the materialistic philosophy is based, matter is real and nothing exists outside of it. Matter is not created; therefore, it cannot be destroyed. It is self-existing and the *prima materia* of the universe. According to materialism God does not exist, and belief in religion based on the existence of God is *ipso facto* absurd.

Other philosophies have also contended that matter has an eternal existence. For instance, Buddhism (established in the 5th century BC) asserts that everything owes its existence to matter, which follows mechanical laws without any intervention on the part of a deity. Certain branches of Buddhism may profess belief in a deity/deities, but as no mention is made of a deity in any basic sacred texts, and since the universe is believed to have existed from eternity, Buddhism may be approached as one of the atheistic religions (or philosophies) that regard matter as eternal.

Most of the Indian philosophies (whose beginnings extend back to the 20th century BC) accept the universe to have existed from eternity, and try to explain it without reference to God. Taoism (which flourished in China in the 6th century BC) postulates that everything came about by itself and that the universe has an eternal existence. We shall, in the coming pages, refer to these religions and philosophies of the Far East and weigh the consequences that the Big Bang may engender for them.

Democritus (460-370 BC), an ancient Greek philosopher, and Epicurus (341-270 BC), who adopted from him the general outline of his philosophy, are considered to be the ancestors of contemporary materialists. These philosophers also believed that

the universe had no beginning and no end; that it had existed eternally and would continue to exist forever without any intervention by God. However, it was Lucretius (99-55 BC) who, for the first time, most clearly declared that God did not exist and that the universe was not created. He is acknowledged by some to be the father of materialism.

D'Alembert, Turgot, Condorcet and Baron d'Holbach all figure in the history of materialism. However, the best known and most influential proponents of materialistic philosophy were Karl Marx (1818-1883) and Friedrich Engels (1820-1895). Seventy years after the death of Marx, the Marxists, whose actions accorded with their philosophies, succeeded in attracting one third of the world's population to their side. We can easily say that there has never been a philosopher who exerted as great an influence as Marx in such a short time. Readers of the materialist philosophers will observe that for the said thinkers, the fundamental question of philosophy is posited as follows:

1. Either matter and the universe are eternal and God does not exist; or
2. God is eternal and is the Creator of everything including matter and the universe.

They opted for the first alternative. The prominent proponents of the materialistic philosophy venerated science, and vehemently militated against agnosticism. A scientific evaluation of the views of these philosophers (who were themselves infatuated with science) within the framework of the Big Bang theory will be interesting. The arbitration of the kind of science they sanctioned was to lead to philosophical consequences. We shall see how the Big Bang theory will pass judgment on their credo.

THE VIEW THAT BOTH MATTER AND GOD HAVE ETERNAL EXISTENCE

There are two alternatives espoused by materialistic thinkers: either both matter and the universe are eternal without beginning or end, and God does not exist; or, God is eternal and is the Creator of everything including matter and the universe. Yet, the fact that Plato (427-347 BC) and Aristotle (384-322 BC), two of the most prominent philosophers in the history of philosophy, are of the opinion that both matter and God are eternal and have a perennial existence, deserves a special chapter.

The idea of the eternity of the universe is more explicit in Aristotle. According to him, the stars burn with an endless fuel and are timeless. Given the fact that Plato says that everything originated from a primeval chaos, one may be inclined to think that his view is somewhat nearer to the idea of creation out of nothingness; however, the majority of Plato's commentators contend that Plato believed in the eternity of matter. Although Plato and Aristotle were the foremost proponents of this view, other philosophers like Avicenna and Farabi - at whom Ghazzali leveled criticism - were also influenced by their philosophies.

Despite the fact that Plato and Aristotle are considered to be pre-Christians saints by the Christian world, their main difference from the monotheistic religions was in relation to the eternity of matter. What the Big Bang has to say in this respect will shed light on this crucial historic controversy. Who had the right on his side? Plato and Aristotle? Or the monotheistic religions? We shall see how the Big Bang will settle this controversy.

VIEWS OF THE AGNOSTICS

We have seen above that there were two basic views about the existence of God and the eternity of matter, while a third alternative was the view held by Plato and Aristotle. Although one cannot say that there is a fourth one, there is still another approach to the question, namely the body of opinion professed by agnostics. Agnosticism maintains that one cannot possibly know which of the foregoing alternatives is the right one. Beyond this, it offers nothing as an alternative. We can classify agnostics in three categories:

1. Agnostic-Atheists: These philosophers claim that one cannot possibly know whether God exists or not; it therefore follows that atheism is the only conclusion that can be drawn.

2. Agnostic-Fideists: The proponents of this attitude posit that intelligence can neither prove nor disprove God's existence; however, they make room for faith and belief in God. Kant, the most famous agnostic in history, may be classified among this type.

3. Agnostics who remain agnostics: They choose not to speculate. Their starting is their end point. They accept neither a belief in God nor in atheism.

Agnosticism affirms that we cannot know if God exists or not. The fact of whether matter existed from eternity or was created remains likewise a moot point. The origin of agnosticism dates back to the ancient Greeks, as far back as the Sophists. Protagoras (485-420 BC) and Gorgias (circa 5th century BC), the best known among them, claimed that definite and absolute knowledge was an impossibility.

On the other hand, the word 'agnosticism' is associated in the mind with two important names, David Hume (1711-1776) and Immanuel Kant (1724-1804), who, influenced by the former, was to earn an even greater renown. Both confessed that we are not in a position to know whether God exists or not, or whether matter is eternal or not. We shall address this issue later, using the Big Bang theory to judge agnosticism.

The Big Bang theory postulates that we may learn about how the universe began, and purports that this knowledge may be gained-and proven-by observations and empirical data. The Big Bang theory invalidates many agnostic claims that such knowledge is unattainable and inexplicable.

BELIEF IN BOTH GOD AND THE CREATION OF MATTER

The main advocates of this attitude - in fact, the only champions of it - are the monotheistic religions. Monotheistic religions maintain that matter and the universe were created ex nihilo and that God exists. Despite the divergences between Judaism, Christianity and Islam, all of them concur on a crucial point: the eternal existence of God and the creation of the universe. These religions arrive at this conclusion based upon their holy books. The viewpoint of materialistic atheism is challenged by the contention of monotheistic religions regarding the creation of matter out of nothing and the contention that matter had a beginning in time. This is the fundamental creed that sets apart the monotheistic religions from all the other views expressed so far.

In monotheistic religions, the omnipotence and sublimity of God are His essential characteristics. All constructions that are likely to run counter to God's sublimity and omnipotence are

refuted. Any viewpoints attributing failure to God are refuted. Matter considered not created and self-existing becomes independent from God's power and omnipotence; therefore, the idea advocating that matter was eternal and was not created is a postulate that the monotheistic religions vehemently condemn.

I would like to draw attention to five points on which the monotheistic religions particularly dwell. These five points - as will be seen later in detail - are of special interest in terms of the data provided by the Big Bang theory. All these five arguments were put forward and advocated by the monotheistic religions in human history. The validity of these arguments will be discussed in the light of the Big Bang theory. These arguments are as follows:

1. The universe was created; therefore, it is not eternal. It had a beginning in time.
2. Time is also created.
3. The creation of the universe followed a progressive evolutionary process.
4. The universe is designed.
5. The universe will come to an end.

CHAPTER 2

HISTORY OF ASTRONOMY UP UNTIL THE BIG BANG THEORY

We intend to make a brief survey of the history of astronomy. It is our aim to remind our readers of the scientific process prior to the development of the Big Bang model; the place of the theory in historical perspective will thus be clearer.

DEVELOPMENTS ACHIEVED BY FORMER CIVILIZATIONS

Data easily accessible to a ten-year-old child today were enigmas for ancient people, and most often constituted the core of their mythologies and legends.

We know that the Sumerians acquired certain technical knowledge and made use of it, and that the Babylonians, who succeeded them, achieved considerable progress in mathematics and astronomy. The latter even contrived a useful calendar as a result of long and acute observations. They maintained that the sun entered through one gate of the heavens and exited from the other. The Babylonians were interested not only in astronomy, but also in

astrology. They constantly watched the stars, attempting to read signs for the future.

In ancient Egypt, important developments took place both in mathematics and astronomy. Successful achievements in mathematics and astronomy were also observed in the Chinese and Indian civilizations. The immediate concern of these efforts was to find solutions to daily problems, rather than being scientific in the proper sense of the term.

These civilizations watched the movements of heavenly bodies, trying to read the future basing on their regular interrelationships; this, they believed, enabled them to benefit in the field of agriculture and prophesy the events likely to take place in the future through astrological findings. To the best of our knowledge, they failed to pry into the whys and wherefores of the results of their observations and to evaluate them on theoretical bases. This prevented them from marking any progress in astronomy in the sense of the scientific concepts of today. However, we must also add that recent discoveries have revealed that their progress had been more astounding than what has been conveyed to us in historical records, and formed the basis of the scientific achievements in Ancient Greece.

THE GEOCENTRIC UNIVERSE OF ARISTOTLE AND PTOLEMY

Aristotle believed that the earth was the center of the universe and that the sun and the moon revolved around it. According to him the *prima materia* of the stars was different from the material of which the world was made. The fire of the stars was inextinguishable. These materials had eternal existence. The earth, on the other hand, was not so perfect and was defective.

Ptolemy (85-165), benefiting from the heritage of Aristotle as well as of the views of Eudox and Hipparchus, postulated a geocentric model. He maintained that the five satellites discovered up until then, namely Mercury, Venus, Mars, Jupiter and Saturn, together with the moon and the sun, revolved around the earth. The stars occupied the outermost circle. The universe was described in terms of concentric circles and spheres.

THE GOLDEN AGE OF SCIENCE IN THE WORLD OF ISLAM

The period extending from the eighth to the thirteenth century was the summit of scientific achievement for Muslim civilization. While the majority of historians refer to the same period as the "Dark Ages" of the Christian civilization, the attribute used by historians corresponding to the era in question was the "Golden Age" for the world of Islam.

The Muslim world made use of Greek, Indian and Persian legacies. The works of these civilizations were translated into Arabic, while the Arabs themselves were also the authors of many scientific works based on their original discoveries. An observatory in the sense of the modern acceptance was established for the first time in 1259 in Meraga. Nasraddin Tusi found defects in the Ptolemaic model of the universe, while other scholars like Harazmi, Bitruji and Biruni made valuable contributions to astronomy.

The scientific lore of the Muslims was transmitted to the western world through translations from the Arabic. According to a great number of historians, the process of technological advances in the West from the Renaissance onward owes much to this erudition of the world of Islam. The western world came into contact with Ancient Greece, with Plato, Aristotle and Ptolemy through these translations.

THE CHURCH AND THE PROCESS INITIATED BY COPERNICUS

More than 1500 years after it emerged, the Ptolemaic system was widely accepted as the basis of astronomy by a large circle of believers, particularly by the Christian world. Given the fact that the Catholic Church was considered to be God's representative on earth, any opposition to this creed meant opposition to God Himself. Thus the model of the universe of Aristotle and Ptolemy gained incredibly wide acceptance, more in fact than even its initiators would have dreamt possible. These early philosophers were sanctified, while their ideas became dogmas!

It was Copernicus (1473-1543) who initiated the process that rejected this system. He postulated and proved that if the geocentric system were supplanted by the heliocentric system, universal phenomena would be better explained. This idea was rejected, not only by the Catholic Church, but by Luther and Calvin as well. They just could not imagine any system other than the geocentric one.

Had the new postulate been proven, then the Church and the persons canonized by it would be involved in error. This first serious objection refuting the age-old conception of the Church became one of the heralds of secularism. Had the absolute authority of the Church not been questioned, secularization would never have taken place. The views of Aristotle espoused and sanctified by the Church were said to have a scientific foundation. The Church thus had exclusive authority over the curricula of schools. The control of curricula by the Church caused the western world to acquiesce to the erroneous data of Aristotle's physics that it had sanctified as if revealed by God. The detriment caused by this became the groundwork of secularism.

TYCHO BRAHE AND KEPLER

It was Tycho Brahe (1546-1601) who made the most astute observations prior to the invention of the telescope. Brahe, under the auspices of the Danish king, drew a detailed map of the sky. In the West, Brahe's observations of great bearing met with Kepler's (1571-1630) theoretical approach. Kepler, who was a very good mathematician, turned to good account Brahe's observations and corrected the deficiencies in the Copernican system. Copernicus believed that the sun was in the center, and the earth and other planets moved in perfectly circular orbits around it. Kepler, on the other hand, demonstrated that the planets did not move uniformly in circles, but in ellipses with the sun in focus. Kepler corrected the Copernican system, while confirming his heliocentric system.

Kepler's mathematical laws heralded the future vital role of mathematics. These laws were not mere drab and abstract knowledge. The calculations related to travel in space, to the revolution of the earth around the sun, and to the distance to the farthest stars could not have been achieved were it not for this mathematical approach.

GIANT STRIDES OF GALILEO

Kepler was the first person to apply the physical laws of the earth to celestial bodies. He was also the first scientist to claim that astronomy was a branch of physics, and is accredited today as the first astrophysicist. It was Galileo (1564-1642)-the discoverer of the laws of motion-who contributed to the soaring of science to great heights. He used the telescope that led to his astronomical discoveries to put an end to Ptolemaic physics. This time the church was not as lenient as it had been with Copernicus and Kepler; Galileo was tried by the Inquisition for heresy.

This event is referred to as the most illustrative example of the controversy between religion and science. Yet, all those people who refuted the Ptolemaic system were devout people, faithful adherents of the church. Their unshakeable belief in God is apparent in many of their statements. None of them ever thought of attacking the church. However, the results they obtained through their scientific research could not help clashing with the heads of the Church. These scientists maintained that the results they had achieved did not conflict with God's existence and omnipotence. Mathematics was the language in which God had written the universe, said Galileo. He believed that the universe was one of the books of God and that there could be no inconsistency between any of them.

The Church was to later acknowledge its unfair treatment of Galileo. This meant the acknowledgment of the fact that God's will had been supplemented by the will of the Church. Galileo had shaken the traditional Aristotelian conception to its foundations. Quantitatively oriented physics superseded Aristotle's qualitatively oriented physics. He argued that nature had to be interpreted by recourse to mathematical certainty and impartiality.

ARISTOTLE AND HORSE'S TEETH

Aristotelian logic had yielded its place to mathematics, and the sanctification of Aristotelianism by the church had thus run its course. The principles of Aristotelian physics had become a controversial issue and physics became an object of re-assessment, and was re-evaluated on mathematical and experimental bases. According to legend, in the Middle Ages someone asked the number of a horse's teeth; the addressee was said to have consulted Aristotle's opinion on the matter.

According to the new method, phenomena were observed carefully and mathematical laws were constructed through experiments and analyses. These laws permitted scientists to elucidate many secrets of nature and to make generalizations for future phenomena. The system that Copernicus, Kepler and Galileo advanced made clear the great benefit that one could draw from mathematics and the fact that cosmology should be approached not only theoretically, but through experiments and observations as well.

René Descartes (1596-1650) conceived a reconstruction of the entire body of knowledge into a unified system of certain truth based on mathematics. He had considerable understanding of spatial phenomena based on mathematics. Galileo's physics was to constitute the foundations of the classical physics; while Descartes's mathematical view of the universe would be seminal.

THE GREATEST GIANT NEWTON

The heliocentric system developed by Copernicus and Kepler, coupled with Galileo's observations and physics, contributed to a better understanding of the universe. There were, however, mysteries still to be cleared up: What kept the planets in their orbits? What prevented those on the earth's underside from falling? It was Newton's (1642-1726) lot to shed light on these mysteries.

For many, Newton was the most important figure in the history of science; his only rival was to be Einstein. The fall of an apple induced the train of thought that led to the law of gravitation, according to which the moon was attracted by the earth. It was thanks to this law that the celestial bodies and the people on the earth's underside did not fall out of place. The laws of motion

maintained that the planets moved in their orbits. Newton reached these laws through mathematical equations. The magnitude of the gravitation was proportional to the masses of the two objects and was inversely proportional to the square of the distance between them.

Newton's law of motions demonstrated that nothing in nature is static. The Ptolemaic system was henceforth set aside. The Church finally accepted that the earth was one of the planets revolving around the sun. Newton defined the law of gravity as the law that God created to have sway over the universe. His law of motions proved that physical laws were applicable all over the universe. Aristotle's view of stars and the earth was thus repudiated.

Thanks to Newton, mankind had access for the first time to a detailed and systematic cosmology. But cosmogony, the branch of science concerned with the origin and development of the universe as a whole, was still missing. Basing their assertions on Newton's laws, Kant (1724-1804) and Laplace (1749-1827) were later to describe the formation of planets out of clouds of gas. The studies of Kant and Laplace may be defined as the first attempts at building up a cosmogony in terms of science.

They maintained that the stars and the planets were the outcome of the condensation of gas and dust under the action of mutual gravitational forces. A purely scientific cosmology and cosmogony including every detail from subatomic particles, atoms and clouds of gas to the formation of stars would be the work of the Big Bang model that awaited the advent of Einstein, Hubble and Lemaitre.

II
THE BIG BANG THEORY
AND
SCIENCE

CHAPTER 3

EVIDENCE OF THE BIG BANG

In this chapter we aim to illustrate the process of the development of the Big Bang theory over the course of history and to present its main evidence.

1. THEORETICAL EVIDENCE

MISSING LINK IN NEWTON'S CONCEPT OF UNIVERSE

Newton imagined an infinite universe ruled by gravitational force. He thought that kinds of matter that attracted each other in a finite and stationary universe would eventually adhere to each other to form a single whole. But one could observe no such composition in the universe. He tried to sidestep the issue by stating that matter was scattered in an infinite universe. But this did not constitute an explanation of the problem: if every object was attracting every other object, how had the stars kept their distances from one another for ages? The idea of an infinite universe was not the solution. The gravitational force between the stars would draw them closer to each other in a given portion of

space. If they got close enough, they would adhere to each other; but if they moved away from each other somewhat, they would go even further away from each other, since they would be released from the gravitational force. Thus, the notion of the indefinite expansion of the universe did not do away with the problems that the gravitational force would generate; assuming that the universe was infinite, everything would collapse sooner or later into a single whole. But this did not fit in with the age-old universe presented to the view of man.

Newton's idea of an infinite universe created difficulties in establishing the beginning of creation. On the other hand, the idea of creation by an omnipotent God of an infinite universe had come to be accepted by a considerable number of theologians. Scientists and philosophers who succeeded Newton were under the influence of Newtonian physics and espoused the idea that the universe was infinite. This assumption continued until the formulation of the Big Bang theory.

CORRECTION BROUGHT TO NEWTONIAN PHYSICS

Einstein also came under the influence of Newtonian physics. It was in 1916 that Einstein put forward the model of a static universe. Soon after, however, he realized that such a static universe was eventually destined to collapse into a single mass under gravitational force. His introduction into his equations of the "cosmological constant" to fit his model of a stationary universe in his theory was not based on any logical reason, observation or theoretical necessity. Einstein postulated this cosmological force of repulsion to cancel out the attractive force of gravity. The only reason for Einstein's positing the "cosmological constant" was his confirmed belief in Newton's infinite static universe, as he was resolute that any contrary view could not find justification. Later,

Einstein was to acknowledge that this biased opinion about a static universe and "cosmological constant" had been the greatest blunder of his life.

In 1922, Alexander Friedmann, Russian meteorologist and mathematician, noticed something that Einstein had ignored and refused to acknowledge in the beginning: the fact that the universe might be expanding. Friedmann worked with the relativity equations of Einstein and found that the expansion of the universe was the necessary consequence of these equations; the universe was not static so, then, it was dynamic; this model of the universe provided the missing link for the Newtonian system. It became clear that the laws of gravitation did not contradict the picture that the universe presented. The dynamism of the expansion prevented the galaxies from collapsing into a single whole.

This discovery, based on Einstein's equations, agreed with the Einsteinian physics. The paradox that Newtonian gravitational laws had been facing was thus solved by Einstein's formulas, and it was understood that there was no need for a "cosmological constant."

LEMAITRE'S SOLUTION

Independently from Friedmann, Georges Lemaître, Belgian astrophysicist, developed the notion of a 'primeval atom' that had exploded, establishing thus the Big Bang theory that marked the beginning of the expanding universe. Like Friedmann, Lemaître had also studied Einstein's formulas, and it was these formulas that inevitably led Lemaître to conclude that the universe was expanding.

An expanding universe counterbalanced gravitational force, which prevented the matter scattered in space from condensing

into one single mass. The expanding universe continually grew in size and was never the same as a moment earlier. This connoted, at the same time, the fact that the universe that preceded the expansion was smaller in size. This meant that originally the universe had been a single mass. The said results, which formulated the Big Bang theory, were the consequence of Einstein's formulas. Lemaître was the most prominent specialist in the observatory of the Vatican. The theory he propounded found a ready home in the Catholic Church, which never failed to support him. The Catholic Church was the first among the religious circles that acknowledged the paramount importance of the Big Bang theory (1920s), and in 1951 the Church officially recognized that the theory was in perfect accord with religion.

EINSTEIN'S FORMULAS

Einstein's formulas explained the gravitational force in a clearer light than did Newton's. For instance, the failure of Newtonian formulas to exactly explain the orbit of the planet Mercury was later explained precisely by Einstein's formulas.

According to Einstein, the mass of objects influences space by causing it to be curved. Space is not an absolute void; it is dependent on masses by which it is influenced. This phenomenon, one that seems at first difficult to comprehend, may be illustrated as follows: imagine a bi-dimensional sheet representing space. Let two persons stretch it from either end. Let us place an apple on it. The sheet will automatically lose its tautness and becomes distorted especially near the apple. If we replace the apple with a heavy rock, the distortion will be so great that it will become almost impossible to go on holding the sheet. We can deduce from this the fact that as mass grows, the distortion is larger.

According to Einstein's explanation of gravity we are

revolving around the sun, since it is the sun that causes the greater distortion in near space. Had the universe been static, matter (stars, planets, etc.) would have collapsed at the bottom of the greatest pit of time and space. Newton's physics demonstrated the mutual attraction between celestial bodies, while Einstein's physics produced the mathematics that explained the manner in which celestial bodies exerted influence over time and space.

INTERLINKING OF MATTER, SPACE AND TIME

Matter, space and time were interlinked by Einstein's formulas, but prior to the 1920s it was the concepts of "absolute space" and "absolute time" that dominated. It was believed that space and time stemmed from infinity and perpetuated their infinity and were not affected by the motion and gravitational force of celestial bodies. Einstein's relativity theory demonstrated the error in conceiving of space and time as separate and absolute entities; whereupon there emerged the space-time concept. The space-time affected the motion of celestial bodies, and they were affected by all the phenomena in the universe. These phenomena cannot be comprehended without the space-time concept, and according to the "relativity theory" one cannot refer to a space and time outside the confines of the universe.

Einstein's formulas led us to the conclusion that the universe expanded. Now, were one to reverse the process and conclude that space dwindles into nothingness, the concept of time would necessarily also cease to exist. It ensues from this that the Big Bang was not only the origin of matter, but also of time. This fact was further corroborated by the theoretical demonstrations based on the mathematical equations of Roger Penrose and Stephen Hawking.

The theory of relativity paved the way for an important mental revolution by the fact that time is not absolute, that it changes along with the speed and gravitational force. The Newtonian concept of absolute time, the antinomies that Kant's philosophy had posited on the postulate of absolute time, lost their value in the wake of Einstein's revolution.

Experiments conducted afterward justified Einstein's claims. Two precision atom clocks were set at exactly the same time: one was kept on the earth's surface and the other boarded a plane that left London for China. These clocks set by John Laverty were of such perfection that the admissible error involved was 1 second per 300,000 years. As the plane flew at high altitudes, it was not affected by gravity as much as an object on the surface of the earth. As the gravitational force influenced time, it was expected that the clocks would mark different times. The difference anticipated was insignificant and, therefore, could only be established by a precision instrument. The difference in question proved to be $1/55,000,000,000$ of a second. This was an empirical evidence of the correctness of Einstein's relativity of time. Such a phenomenon could not even have been fancied before, since the former conception conceived of time as absolute and unaffected by gravitational force. Additional experiments were to confirm Einstein's theory.

Einstein's discovery introduced momentous change into the minds of many. Reversal of the progressive expansion of the universe to the beginning of time ended with the extinction of space. Time, coexistent with space, had a common origin according to the relativity. The concept of absolute time that Einstein's formulas had invalidated lost its eternal character. Time became a relative concept that had a beginning. This, however, did not mean, as some had imagined, that time was merely a product of the mind

and that it had no existence in the world outside. Quite the reverse was the case, given the fact that this approach linked space, time and matter together and explained it in mathematical terms; time was as real as the existence of matter in the outside world. The scientific demonstration of the fact that not only matter but time also had a beginning and that both had a common origin was the achievement of the Big Bang theory.

SOLUTION OF OLBERS'S PARADOX AND THE GRAVITATIONAL POTENTIAL PARADOX

The Big Bang theory owed its origin to theoretical considerations, without observational evidence. This same theory also resolved Olbers's Paradox, a subject that had been hotly debated for years. This paradox, expressed by Heinrich Olbers in 1826, asked the following question: "Why is the sky dark at night?" In an infinitely large and unchanging universe, uniformly populated with stars and galaxies, the sky should be dazzlingly bright. Olbers suggested a solution for this paradox: he thought that the enormous amount of dust in the universe must be absorbing the greater portion of the light emitted by the stars, causing the sky to darken.

It was discovered afterward that even this dust would get hot because of the radiation it had absorbed and would radiate with the same intensity. The paradox came to be solved following the Big Bang's postulation that the universe must have had a beginning and that it was expanding. So, the fact that the night sky is dark indicates that the universe cannot have an infinite number of evenly distributed stars over an infinite period of time.

Johann Friedrich Zöllner's (1871) paradox about gravitation was also invalidated by the expanding universe model

(the gravitational potential paradox). Zöllner maintained that if we imagined the stars in an infinite and static universe evenly scattered in space, as Newton had assumed, there should have been infinite gravitational potential at every point of the universe. Such a postulate was hardly compatible with common sense and observations; in this way the Big Bang model that postulated an expanding, dynamic and finite universe also resolved this paradox.

HAWKING'S WONDER

Hawking wondered at the fact that nobody (not even Newton) had ever posited that the universe was expanding, before the twentieth century. He commented: *"We know it is impossible to have an infinite static model of the universe in which gravity is always attractive. It is an interesting reflection on the general climate of thought that before the twentieth century no one suggested that the universe was expanding or contracting. It was generally accepted that either the universe had existed forever in an unchanging state, or that it had been created at a finite time in the past more or less as we observe it today." In a different context he had the following to say: "The discovery that the universe is expanding was one of the greatest intellectual revolutions of the twentieth century. With hindsight, it is easy to wonder why no one had thought of it before. Newton and others should have realized that a static universe would soon start to contract under the influence of gravity. But suppose instead the universe expanding."*

The fact that the universe could not be static was inherent in Newton's law of gravity. Yet, Hawking was puzzled at the fact that the expansion of the universe had not been conceived by Newton and his successors. Hawking thought this mystery should have been solved long before the 1920s.

In the beginning, the Big Bang was based solely on "theoretical evidence." Observations were to be made later, as the

theoretical considerations found their justifications. Plato thought that the universe had been constructed according to mathematical principles laid down by God. Einstein said that unless we turn to good account the observations we make on a theoretical basis, phenomena will not be comprehensible, given the fact that theories are explained by mathematical principles; the mathematical approach joins the point of intersection towards which Plato and Einstein converge.

1. The said theoretical evidence solved the paradoxes related to Newton's law of gravity.
2. They were based on Einstein's formulas (these formulas are supported by experiments).
3. They established the fact that time had a beginning simultaneously with matter.
4. They solved Olbers's paradox.
5. They also solved the gravitational potential paradox.

In this way, paradoxes in the cosmology of the universe were solved, the laws of gravity became comprehensible and mathematical formulas of the theory of relativity found their application. The beginning of the universe was thus seriously explained in scientific terms for the first time.

2.EVIDENCE OF THE EXPANSION

MENTAL REVOLUTION BASED ON THE TELESCOPE

The "theoretical evidence," which was the first piece of evidence of the Big Bang, was based on Einstein's formulas; this evidence posited that the universe could not be in a steady-state and that it was in the process of expansion. When this evidence was introduced for the first time, experimental data were not available;

all that existed were theoretical principles based on mathematics. Spurred by scientific developments, and especially by the invention of the telescope, the observation of the celestial bodies had created a new enthusiasm. The marked developments in the telescope provided new knowledge of the celestial sphere. By adding mirrors to the telescope, Newton succeeded in obtaining images that were more highly magnified than those available to Galileo. Stars were seen more readily, inviting scientists to discover the mysteries of the universe and the stars.

In 1920, the most sophisticated of telescopes was at Mount Wilson in California, USA; Edwin Hubble (1889-1953) obtained permission to use it in research that would lead to revolutions in our thought. These revolutions would be led by new knowledge based on observations.

HUBBLE'S OBSERVATIONS AND THE DOPPLER EFFECT

Observations made by the Hubble telescope demonstrated for the first time that the number of galaxies in the universe greatly exceeded one hundred million. His statements gave rise to speculation that the time had come for this man to retire.

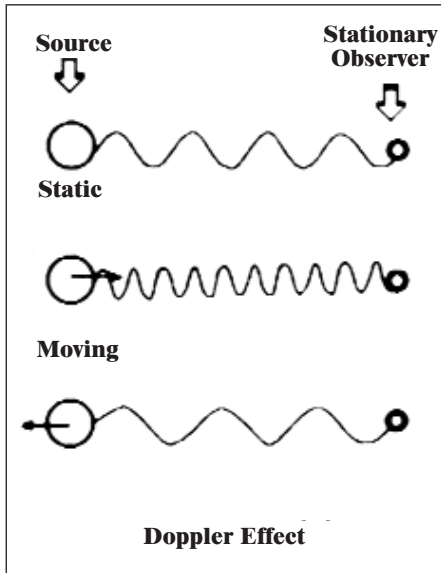
Hubble, disregarding the controversy he was provoking, continued his research. In 1929 he noticed that the external galaxies appeared to be receding from the Milky Way and that the further away they were, the faster they receded. Hubble obtained the same results in all the galaxies he observed. This discovery of Hubble's was to lead the way to a conceptual revolution of great scope. At first, the importance of this unexpected discovery was not fully realized. The best illustration of Hubble's universe was made by using an inflating balloon. Mark a speck on the surface of a balloon and put dots around it haphazardly. As the balloon keeps

inflating you'll see that the dots will recede away from each other. The universe was expanding as such.

Hubble discovered the expansion by the Doppler effect. The Doppler effect is the change in wavelength observed when the distance between a source of waves and the observer is changing. The wavelength increases as the source or the observer move apart from other and decreases as they move closer to other. The changing pitch of the siren of a passing motor vehicle is an example of the Doppler effect on sound waves. In this respect, there is no difference between sound and light, as both propagate in waves.

As the wavelength of the light source drawing near decreases, it shifts to the blue color in the light spectrum. The wavelength of the receding light source increases and shifts toward red. Hubble examined the light coming from the stars using the Doppler effect and noticed that the light always shifted to red; this meant that all the stars were receding along with the galaxies. The

anticipation was the shifting toward blue of the light coming from the stars of some galaxies, while toward red of the light coming from other stars.



Observations that succeeded those of Hubble, Milton Humeson's and others', confirmed this result. In 1948 the biggest telescope of the world was established at Mount Palomar and the observations carried out by this telescope confirmed the results as well.

LEMAITRE AND BOXER HUBBLE

Edwin Hubble's initial aspiration was to be a boxer. One wonders how many adversaries he would have knocked out had he done so! But one thing is certain; his observations knocked out a great number of scientists who believed the universe to be static and stationary. The concept of a steady-state universe, confuted by theoretical evidences, was, in a sense, knocked down by Hubble.

All observations carried out up until today have confirmed Hubble's findings. At first, atheists, who foresaw the philosophical consequences of Hubble's discoveries, took issue with them and refused to accept the concept of an expanding universe. This was a concept that atheistic scientists, convinced of an unchanging, eternal and boundless universe, were to have difficulties accepting. When Hubble exposed the findings of his observations for the first time, he was derided and the results he had obtained were made light of.

However, the new discovery caused a scientist by the name of Lemaître to sparkle with excitement. As we have already seen above, Lemaître and Friedmann had, independently from each other, theoretically posited the necessity of an expanding universe by mathematical formulas. Lemaître was not content with a theoretical approach; he also made use of Hubble's observational data and ended by explaining that the Big Bang theory was substantiated by both theoretical and observational evidence. Theoretical calculations matched eventually with the results achieved by the telescope.

At first Hubble himself did not realize the scope of influence that the knowledge he had acquired would be exerting on the physics and the philosophy of the 20th and 21st centuries. It seems that Lemaître was the first person to understand its importance.

ENCOUNTER OF LEMAITRE, EINSTEIN AND HUBBLE

As I have already pointed out, even Einstein was at pains at first to confirm the truth of this theory, despite the fact that it was the product of his own formulas, for, he, like Newton, maintained that the universe was static and stationary. Lemaître, Einstein and Hubble met one day at the California Institute of Technology. Lemaître gave a detailed account of the Big Bang theory. He said that the universe owed its beginning to a "primeval atom," which, as a consequence of disintegration, had broken into parts that eventually became galaxies that expand according to the standard equations of general relativity. He meant thereby that the universe was created on a day that had no yesterday. He had made all the calculations needed for the purpose; he combined the data of Hubble, who was among the audience, with Einstein's formulas. Lemaître was surprised to see Einstein rise and declare this explanation to be the brightest and the most convincing he had heard thus far.

The meeting at the California Institute of Technology was a breakthrough. Lemaître, the father of the Big Bang theory; Einstein, who had a share in the production of the "theoretical evidence" through the application of the mathematics of the theory of relativity; and Hubble, who had contributed to the demonstration of the theory by his "observational evidence," had come together and confirmed the truth of the Big Bang theory.

HUBBLE'S LAW

The findings of Hubble and Vesto M. Slipher and Milton Humason, who collaborated with him at the Mount Wilson observatory, have another important aspect: the Hubble Law, the result of his observations. In 1929, he announced his famous law:

the more distant a galaxy, the greater, in direct proportion, is its velocity of recession.

This law permitted scientists to measure the speed at which galaxies moved away from each other, and to spot the place that a particular galaxy would be occupying at the end of a definite time. We can estimate the position of a galaxy after a billion years. The same reasoning may also be reversed. If we go backward instead of proceeding ahead we end up at the beginning of creation. By this formula it is possible to calculate the age of the universe. The moment at which the universe was created can thus be defined.

The age of the universe can be established by using Hubble's constant. The exact calculation of Hubble's constant involves difficulties; that is why the construction of the exact time at which the universe was created has been a controversial issue.

Scientists have used different methods to calculate the age of the universe. Nevertheless, the results they have achieved vary between 10 to 25 billion years; none of the various calculation methods have gone beyond these limits. Research conducted after the 1990s indicated that the age should be around 15 billion of years.

NO MOMENT OF THE UNIVERSE IS EQUAL TO ANOTHER MOMENT

The expansion of the universe, which had, at the beginning, been posited as "theoretical evidence" deduced from mathematical calculations, was substantiated by observations that eventually led to the reckoning of the age of the universe and its establishment within a time bracket. The question now was not, therefore, whether or not the universe had a beginning, but how to exactly calculate its age.

The most recent observations have added new evidence to the expansion of the universe. According to the Big Bang model, the universe expanded rapidly from a highly dense primordial state that resulted in a significant decrease in density and temperatures. When you look at the galaxies in the farthest corners of the sky, please bear in mind that you are, in fact, watching the past of the universe. As the light of the farthest galaxies is traveling from an extremely long distance, what we observe in fact is the state of galaxies billions of years ago. Our observation of this fact proves that this state of galaxies presents a denser aspect of the universe. The universe that was denser billions of years ago attained its present density after continuous expansion. This is another confirmation of the Big Bang theory.

Continuous expansion of the universe is a discovery that has revolutionized astronomy and deeply affected man. Such an earth-shattering discovery has but few precedents in the history of science. A similar breakthrough was perhaps the substitution of the geocentric system with the heliocentric system. I maintain that the revolution in thought processes that this would lead to was of an even greater scope. (However, its far-reaching significance may as yet not be as conspicuous as the Copernican revolution.)

The continuously-expanding universe reminds one of Heraclitus (540-480 BC), who said, "*You cannot step into the same river twice.*" The expanding universe is changing every moment, and every moment we are in a universe of differing dimensions. No split second is the same as the one that preceded it. No two moments of the universe are equal. This revolutionary change is being evidenced by observations that take us much further than Heraclitus's statement. The expansion and continuous alteration generate other far more reaching consequences related to the origin and the end of the universe.

3.COSMIC BACKGROUND RADIATION

DISAPPOINTMENT GENERATED BY THE OVERTHROW OF THE CONCEPT OF AN ETERNAL UNIVERSE

The Big Bang theory was launched at a time when Marxist atheism was gaining ascendancy and positivism was espoused by a great many scientists as the only valid philosophical system. A universe that had no beginning in time was gladly maintained by positivists and atheists as it shoved aside God. Sir Arthur Eddington declared that the idea that the universe had a beginning was "philosophically repugnant." The antagonism toward the Big Bang theory originated from ideological concerns and atheistic psychology rather than scientific interest.

In a radio broadcast, Fred Hoyle, who himself advocated the Steady State model, referred sarcastically to the new findings with the expression "Big Bang." The expression later gained acceptance.

WHERE IS THE FOSSIL OF THIS EXPLOSION?

During the time in which the Big Bang theory was being formulated, demonstration was made of the formations of elements in the course of the life process of stars. The contribution of Fred Hoyle and his team on this subject had been very significant. The Big Bang theory explains the origin of hydrogen, an element which was not produced by stars, but contributed to their formation. The Big Bang compensates for the gaps that existed in Hoyle's suppositions and gave a perfect account of the formation of elements. According to the subatomic theory, in order to be obtained, hydrogen requires a medium of immense heat. The Big Bang model posits the necessity of the existence of such a medium of immense heat at the origin of the universe.

Hoyle maintained that the solution of this problem could not be found in the Big Bang theory and he continued to insist on his antagonism. If the Big Bang had produced an immense heat at the beginning, he said, the explosion should have left a fossil behind.

As a consequence of the sarcastic approach of Fred Hoyle, not only the term "Big Bang," but the term "fossil" was also coined. When "cosmic background radiation" was discovered, many scientists termed it "fossil radiation." In fact, Hoyle's objections played the role of a boomerang, as they ended up validating, rather than invalidating the Big Bang theory, thus putting an end to his espoused Steady-State model.

GAMOW'S THEORETICAL CALCULATIONS

It was Gamow who first postulated the existence of the cosmic background radiation based on mathematical calculations. Gamow and Alpher proposed on 1 April 1948, the "alpha, beta, gamma" theory that suggests the possibility of explaining the abundance of chemical elements as the result of thermonuclear processes in the early stages of a hot, evolving universe. These ideas were developed and became part of the Big Bang model of the universe. They predicted that, as the universe expanded, the cooling of the Big Bang would yield a faint background radiation with the current temperature of about 5 Kelvin.

An article by George Gamow and colleagues narrated the way the atoms interacted at the beginning of the Big Bang in the light of recent findings of nuclear physics, exposing the fact that the value of heat emitted during these reactions could be measured in terms of billions of degrees. They pointed out that the radiation, involving an immense energy, filled the universe and claimed that

even today a remnant of this high-energy thermal radiation was still there in space. In brief, Gamow postulated the necessity of the existence of the "fossil" at which Hoyle had poked fun.

All radiations that succeeded the Big Bang would have definite points of origin from which they emanated. But the most significant characteristic of the radiation caused by the Big Bang was its spread throughout the universe.

FOSSIL RADIATION FOUND

In the 1960s, Robert Dicke and colleagues deduced that a Big Bang origin of the universe should have left an observable remnant of microwave radiation, detectable all around us. The origin of the universe was intensely hot and replete with hot electrons, protons and photons of high energy. As the universe expanded this radiation was to cool down, enabling us to observe it in the microwave zone of the electromagnetic spectrum. It is said that the astronomers from Princeton were not aware of the fact that Gamow had a similar concept. It is an established fact, however, that Gamow and colleagues were aware of the existence of this radiation, although they failed to propose its experimental demonstration.

Robert Dicke and colleagues were the first to use special instruments to try to find the cosmic microwave background radiation. Dicke, Roll and Wilkinson constructed the microwave radiation detector that Dicke had designed in 1965. However, the discovery, which they believed would secure them the Nobel Prize, was to fall to the lot of others, namely, to two engineers: Arno Penzias and Robert Wilson, employed at the Bell Telephone Laboratories in New Jersey. Penzias discovered "cosmic microwave background radiation" while investigating an unexpected excess.

The interference caused by this phenomenon thwarted their research. When they failed to dispose of this interference they called up Dicke and his friends at Princeton, as they knew that they were specialized in radiations in space. Dicke and colleagues, having heard of the findings of Penzias and Wilson, realized that the latter had discovered the radiation that they themselves had been looking for. Thus, the fossil, at which Hoyle had poked fun, was discovered by Penzias and Wilson, who were awarded the Nobel Prize, while Dicke and his friends missed the chance. There have been many scientists who acknowledged this discovery as "compelling evidence." The defense of the Steady-State model became impossible following the discovery of the "cosmic microwave background radiation." The radiation in question could be observed in every direction of the universe. The temperature of the radiation was -270° (3 Kelvin). This value was quite near the temperature -268° (5 Kelvin) that Gamow and colleagues had calculated. Alpher and Herman said: *"Everyone agrees that 1965 was an important year in the historical development of cosmology; indeed, some take it as the birth year of modern cosmology."*

4- EVIDENCE OF COSMIC MICROWAVE BACKGROUND RADIATION

SLIGHT FLUCTUATIONS IN THE RADIATION

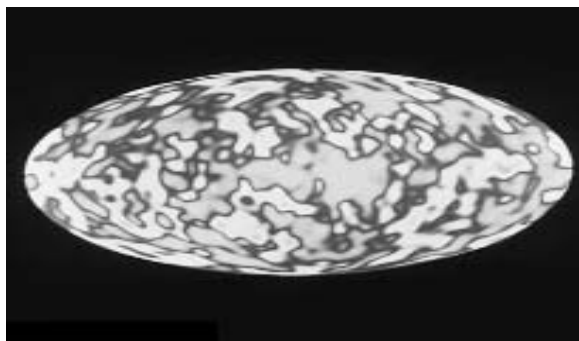
The discovery of cosmic background radiation was a significant evidence of the Big Bang. Further research conducted on this radiation was to supply new evidence in corroboration of the Big Bang model. Following the observations of Penzias and Wilson, Roll and Wilkinson from Princeton University built precise instruments to carry out the experiment. This was the first of a number of experiments that were to validate the findings of Penzias and Wilson.

After the discovery of cosmic microwave background, scientist began searching for fluctuations of the radiation, as they were necessary for the formation of the universe. Had matter dispersed in every direction homogenously following the Big Bang, the formation of galaxies, stars and the earth would not have been possible. For the said formation, fields of varying densities were necessary. The minutest of divergences in temperature during the initial development of the universe starting from a single point would give ample evidence to attest to this. Spots comparatively hotter would have had greater energy, whose contents of particles would be more numerous than in the cooler portion. This process would give the way to the formulation of the galaxies.

FLUCTUATIONS DISCOVERED

The detector that Penzias and Wilson used could not possibly detect the fluctuations anticipated in the cosmic microwave background. To obtain precise measurements, it was first necessary to eliminate the sources of interferences in the earth's atmosphere. Instruments of great size had to be lifted into the sky in helium balloons. A plan was constructed whereby U2 aircraft would search for "cosmic microwave background." To carry the precious detector, a cockpit with a specially designed compartment was constructed, for even the windowpanes of the aircraft might impair an instrument of precision. It became clear that the motion of the aircraft and the time that would allow measurements was limited. The aircraft could not remain suspended in the air like a balloon; it had to draw the same trajectory over and over again which would drain up its fuel before the completion of the measurement. The only realistic solution was to use a satellite. The anticipated venture was realized in November of the year 1989 by the installation of an instrument on the Cosmic Background Explorer satellite (COBE) by John

Mather. The instrument developed by Mather succeeded in sensitively measuring the temperature of the cosmic microwave background, which corresponded to a temperature of 2.725 Kelvin. COBE stayed in space for three years; the data it provided were more than sufficient, as they proved not only the existence of the cosmic background radiation, but also its emanation from every direction of space. Infinitesimal fluctuations were also detected.



Investigations into cosmic background radiation also detected the temperature fluctuations that would form the galaxies in the first periods.

The picture drawn by computers based on data provided by COBE also indicated the fluctuations in the former map of the world. To differentiate between the hotter and cooler portions, pink and blue colors were added to the picture.

The data that COBE had found in the universe were re-examined and meticulously studied; the results were satisfactory. Fluctuations did exist in the cosmic microwave background and this would permit the formation of galaxies. The Big Bang model had won another victory.

George Smoot hit the headlines all over the world when his data processor produced the pink and blue image of the fossil radiation in the universe. A cosmological observation like this had never been witnessed before. Next to the picture was Stephen Hawking's comment on this discovery: *"This is the greatest discovery of the century, and perhaps of all times."*

The project leader of the COBE satellite, George Smoot, declared that this discovery was an evidence of the fact that the

universe had had a beginning and added that it was as if one was looking at God.

SATELLITE AND COMPUTER-BACKED DATA

The satellite, a marvel of engineering, and the computer, a miracle of electronics, joined hands with the fine calculations of mathematics to promote the Big Bang. The picture of the universe was now clearer than ever.

The discovery of the fluctuations required for the formation of galaxies was something that not even those who had posited their indispensability had been expecting. The alpha-beta-gamma thesis that had put forth for the first time the necessary existence of the cosmic microwave background radiation had occupied its privileged place in history. In 1978 Penzias and Wilson were awarded the Nobel Prize for their discovery of 1965. The COBE satellite launched into space at the cost of millions of dollars in order to measure the cosmic background radiation had thus measured the "fossil radiation" and the fluctuations in it with great precision. The discovery of the cosmic background radiation and its study were of paramount importance for the Big Bang theory. The cosmic microwave background had other evidence in store for us.

TEMPERATURE OF THE FORMER COSMIC MICROWAVE BACKGROUND RADIATION

As we have already noted, one of the most significant data provided by the Big Bang model was the fact that the origin of the universe was extremely hot and dense and that these had decreased as the universe expanded. The temperature of the cosmic background radiations is continuously falling, and, at present, it is equal to 2.7 Kelvin. When we look at the light coming from the

galaxies far in space, we must remember that we are actually looking far into the past. The light coming from the remote galaxies is coming from a distance of billions of years. It may well be that the galaxy we are observing at the moment does not actually exist, and that we are seeing the light that had departed on its journey billions of years ago. In brief, we are looking far into the past.

In the past the universe was, according to the Big Bang theory, much denser and hotter. Were we to measure the temperature of the cosmic microwave background in one of the farthest galaxies (galaxies of the past), we should be able to find a much higher temperature. In the spring of 1994, researchers were able to succeed in doing this. The temperature of the cosmic microwave background radiation was 7.4 Kelvin, which today is but 2.7 Kelvin.

This observation was made thanks to the Keck telescope, the biggest optical instrument of the time. In 1996, the same team of astronomers succeeded in measuring the temperature of a more remote galaxy; the value they found slightly exceeded 8 Kelvin. The scanning of even more remote zones by another group of astronomers led to the discovery of a temperature of 10 Kelvin. All these data confirmed the Big Bang; the farther we went, the higher the temperature encountered. The study of the history of the cosmic background radiation proved to be an additional evidence of the Big Bang.

COMBINING THEORY AND OBSERVATION

So the mathematical theory was coupled by observations as regards the cosmic background radiation: We may summarize this process in the following manner:

1. On a theoretical basis: Gamow and Princeton researchers postulated that there is a remnant radiation from the

primeval fireball which spread over the entire universe, and made a calculation of its temperature.

On an observational basis: This radiation, the existence of which was initially detected by Penzias and Wilson and afterward came to be confirmed by COBE observations, was diffused throughout the entire universe and the calculations made by Gamow and Princeton researchers were very near to the temperature of this radiation.

2. On a theoretical basis: It was postulated that fluctuations must have been at the initial temperature of the universe for the formatting of galaxies.

On an observational basis: In 1992 COBE detected the temperature fluctuations at the initiatory phases of the universe.

3. On a theoretical basis: Given the fact that the past of the universe involved higher temperatures, so should the temperature have been of the past cosmic microwave background radiation.

On an observational basis: In 1994 the study of light coming from remote galaxies confirmed that the cosmic microwave background radiation was higher in the past, as was expected. The subsequent observations confirmed this.

5. EVIDENCE FROM THE QUANTITY OF ELEMENTS

AMOUNT OF HYDROGEN

The proportions of the elements in space are established by the “Fraunhofer lines” discovered by Fraunhofer. These lines were the fingerprints, so to speak, of the elements. It is possible to detect the nature of the elements in the light source by analyzing this fingerprint. It has been observed that the composition of the sun and the stars are one and the same. Their basic elements are hydrogen and helium. The sun was part of a subgroup of galaxies

of stars. The universe was a medium subject to the gravity which stars and satellites made of the same primary material used.

Fraunhofer's lines proved that 73% of the universe is made up of hydrogen and 25% of helium. This was corroborative evidence of the Big Bang. Subatomic research necessitated a medium-intensely hot environment for the production of the hydrogen atom. The first detailed estimate was put forth in 1948 by the work of Gamow and colleagues.

As Gamow suggested, the rapid cooling of the universe from an intensely hot state explained the cooperative production of elements of protons and neutrons and the 73% proportion of hydrogen in the universe. Hydrogen cannot form in the processes taking place inside the stars; the Big Bang cleared the way for the formation of the hydrogen atom and its amount.

EVIDENCE IN THE AMOUNT OF HELIUM

The Big Bang has taught us that helium formed at the very beginning of the universe. At its beginning, the universe was a very hot mixture of protons, neutrons and electrons. As this composition cooled down, nuclear reactions began to occur. Neutrons and protons combined in pairs that joined to form the nucleus of the element helium. Theoretical calculations showed that twenty-five percent of the composition of the universe was made up of helium. Helium can also be produced by the reactions taking place in the stars; however these reactions cannot by themselves account for this amount of helium.

All the observations carried out thus far have confirmed this. For instance, in 1999 American and Ukrainian astronomers used the Multiple Mirror and Keck telescopes to obtain a 24.52%

proportion of helium. The Big Bang theory was thus proved once again by these astronomers who had determined this proportion based on their observations of the oldest galaxies. Later, in 2000, the results reached by Canadian astronomers were very close. These studies demonstrated that helium had existed from the very early stages of the universe.

EVIDENCE SCATTERED THROUGHOUT THE UNIVERSE

The Big Bang originated from a single point in the universe and all the matter in the universe originated in a cataclysmic explosion. The Big Bang model suggests that, at its origin, the universe was exceedingly small and hot and that its temperature fell as it expanded. The Big Bang model also provided an explanation for the amount of hydrogen and helium in the universe. We have seen that one of the significant characteristics of cosmic microwave background was its diffusion throughout space. The same result must have been reached with regard to the 73% ratio of hydrogen and 25% of helium. Considering that the elements in question scattered in all directions, the same ratio should prevail throughout the expanding universe.

The results tally with the data the Big Bang theory anticipated and have been demonstrated by the observations made. Hydrogen and helium are the dominating elements in every spot of the universe. Approximately three fourths of the universe consists of hydrogen and one fourth of helium.

EVIDENCE PROVIDED BY DEUTERIUM AND LITHIUM

All the deuterium (one of the three isotopes of hydrogen, the nucleus containing one proton and one neutron) and lithium were formed immediately after the explosion. Processes going on

inside the stars cannot form these elements; as a matter of fact, stellar burning gobbles up those elements rather than producing more of these atoms. The Big Bang model explains the *raison d'être* of deuterium and lithium.

Observations made with the Keck and Hubble telescopes conform exactly to the amounts of deuterium and lithium as suggested by the Big Bang model. Studies of Vanoni Flam, Coc and Casse published in 2000 and research conducted previously confirm this.

Calculations related to the amount of deuterium and lithium in the universe prior to 1994 were made in stars relatively near the earth. After 1994, the masses of gas at a distance of 12 billion light years from our planet (that is billions of years before) were examined. Deuterium and lithium were also present in these. The fact that these elements existed from the first minutes after the Big Bang once more prove the validity of the Big Bang theory.

We can summarize the results as follow:

1. About three-fourths of the universe consists of hydrogen atoms as suggested by the Big Bang theory.
2. About one-fourth of the universe consists of helium atoms as suggested by the Big Bang theory.
3. The ratios are prevalent throughout the universe as suggested by the Big Bang theory.
4. The maximum intense heat required for the formation of the hydrogen atom is provided by the Big Bang.
5. Helium may form inside the stars, but the 25% helium in the universe can only be explained by the Big Bang.
6. The stars gobble up the elements like deuterium and lithium; these elements owe their formation only to the Big Bang.
7. The recent discoveries that succeeded in observing distant (the

most ancient) galaxies and gas clouds and establishing the amounts of hydrogen, helium, deuterium and lithium prove the primordial existence of these elements just as suggested by the Big Bang model.

6. EVIDENCE FROM THE SUB-ATOMIC WORLD TO STARS' PROGRESSIVE DEVELOPMENT

ACCELERATORS OF BILLIONS OF DOLLARS

To gain a better access to the sub-atomic world, accelerator tunnels were constructed to simulate the hot mediums and to increase the velocity of sub-atomic particles. These experimental mediums in which the prominent physicists of the world carry out their research projects are marvels of technology constructed at a very great cost. The most powerful of these are CERN in Geneva, Switzerland, Fermilab in Chicago, USA, and SLAC in San Francisco, USA. The experiments conducted in these tunnels tally with the Big Bang model.

The Big Bang theory postulates that at the beginning, only energy existed; this was followed by the formation of all the sub-atomic particles as the initial heat gradually cooled down; this, in turn, was succeeded by the production of gas clouds and periodically of stars. All the stages of formation of the sub-atomic world and stars are explained in terms of the reduction in heat, and in condensation and expansion. The discovery of matter and antimatter, electrons and positrons (that is, the anti-matter of the electron), protons and anti-protons, quarks and anti-quarks and their destruction of each other are explained within the framework of the Big Bang theory. In brief, all the stages of the sub-atomic world, the present sub-atomic state of our universe, are explained in terms of the Big Bang model and the accelerator tunnels mentioned a while ago confirm the model.

THE FIRST THREE MINUTES

About one second after the first explosion, the temperature at every spot in the universe has been computed to have been around ten billion degrees. These results have been obtained by sophisticated mathematical calculations. Persons who are not particularly interested in physics and mathematics seem at a loss to understand the boldness people display in speaking of the first second of the Big Bang. However, the acclaimed books about the subatomic world explain these phenomena in terms of split seconds. Steven Weinberg, the author of *The First Three Minutes* (perhaps the most celebrated among its kind) said that we were ready to behold the cosmic phenomenon of the initial evolution of the universe. He said that as the phenomenon at the first seconds of the universe took place at a more rapid rate, it might not be advantageous to represent the sequence of shots in equidistant time intervals like in an ordinary filmstrip. He suggested arranging the speed in parallel with the cooling process of the heat and taking a shot whenever there is a reduction at the rate of $1/3$. Weinberg illustrated these stages with six frames. I will try to give a brief account of these six frames in order to illustrate the daring with which the Big Bang model's mathematical results have accredited us:

First Frame: The temperature of the universe marked 100 billion Kelvin. The universe was a chaotic structure made of matter and radiation. In this chaotic milieu, every particle was in collision with each other at great speeds. In the first frame, the number of nucleic particles was not so great. There was only one proton or neutron for approximately every billion photons or electron or neutrinos. It is advisable to remember that the time corresponding to the shot was about one percent of a second.

Second Frame: The temperature of the universe fell to 30 billion Kelvin. Just 0.11 seconds had elapsed. The limited number

of nuclear particles had not yet integrated to form the nuclei. The ratio of nucleic particles was subjected to a shifting of 38% of neutrons and 62% of protons.

Third Frame: The temperature fell to 10 billion Kelvin. 1.09 seconds had elapsed since the first frame. The universe was still too hot to allow the integration of neutrons to form the nuclei of atoms. The shifting in the balance of protons and neutrons was 24% neutrons and 76% protons.

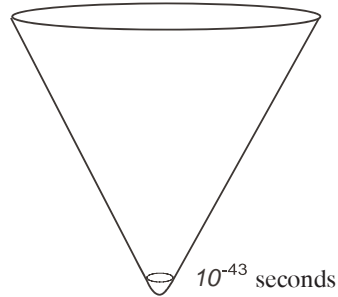
Fourth Frame: The temperature was now 3 billion Kelvin. The time that had elapsed since the first frame was 13.82 seconds. Neutrons were being transformed into protons, though at a slower pace: the balance was now 17% neutrons and 83% protons. The universe was cool enough now to allow the formation of nuclei like helium, but the process had not begun as yet.

Fifth Frame: The temperature was 1 billion Kelvin now. A short time after the fifth frame a striking thing occurred. The temperature dropped to a degree at which the nuclei of deuterium (an isotope of the hydrogen element) did not break down. Nevertheless, the number of the nuclei heavier than helium was not considerable. The time elapsed since the first frame was 3 minutes and 46 seconds (Weinberg apologizes for the slight mistake in the title of the book, since the addition of the fraction of 46 seconds to the title might not sound so catchy).

Sixth Frame: The point targeted in the fifth frame was reached and the basic elements had already formed. However, in anticipation of the subsequent phenomena, Weinberg ventured another frame. The temperature was 300 million K, this time. 34 minutes 40 seconds had elapsed since the first frame. The nucleic particles had integrated. But the temperature was still too high to allow stable atoms.

PLANCK TIME

We try to understand the phenomena that occurred within the first seconds of the universe explained by the Big Bang model, thanks to the infinitesimal calculation and experiments conducted by particle accelerators. However, it is not possible to say anything about the fraction of time equal to 10^{-43} . This fraction of time is called Planck time; as physical laws like the law of gravity are not applicable to this fraction of time, it cannot be defined. Nothing can be said about the 10^{32} K degrees, the temperature of the Planck time.



The Big Bang model has elucidated many things, enabling us to describe in such detail the formation of the universe from sub-atomic world to galaxies within the framework of the expansion of the universe following the decrease of temperature and density succeeding the Planck time. The point at issue now is the extremely small fraction of a second.

The world of science had been deprived of thousands of years from cosmogony, the scientific study of the origin and development of the universe. All the particles from quarks to the formation of gluons, from protons, neutrons and electrons to neutrinos, fit into the Big Bang model of the universe. The antiparticles, their interactions and the evolution to this day conform perfectly to the Big Bang model.

EVOLUTION OF STARS

The Big Bang model's account of the formation of the subatomic world and stars through an evolutionary process is

confirmed by experiments and observations. Astronomers divide the stars into three categories: namely, first population of stars, second population of stars and third population of stars. The first population of stars was the first to appear (some make a reverse classification of stars according to their discoveries). The first population of stars is called the "super-giant stars," as they came about at a period when the elements of the universe were denser. Their lifetime was short as all their elements were dispersed by a big explosion. Theoreticians conclude that few, if any, of these stars may be observed.

The second population of stars has been described as follows within the framework of the evolutionary process of the Big Bang model.

- a) These form the largest population of stars.
- b) They are denser in particular regions (like the regions where young stars are formed).
- c) They should come in both big and small sizes in all mass categories.

These three postulates conform to the recent observations of astronomers. The third population of stars, a category that also includes our sun, was formed from the scattered dust of the second population of stars.

A great many elements, ranging from the carbon and calcium in our bodies to gold and iron, are the products of the second population of stars. This also explains the reason why living beings were created 15 billion years after the creation of the universe. As a matter of fact, an atom like the carbon atom, an element essential for the earth, was the product of the second population of stars.

The evolution of stars has been confirmed by observations, which, in turn, were additional pieces of evidence that sustained the Big Bang theory. The Big Bang model explains the universe by an evolution from the sub-atomic world to the populations of stars; this is a dynamic account of the universe, contrary to the views held for millennia that had sustained the static models of the universe. Observation and experimentation combine to give voice to mathematical calculations, enabling access to the mystery of the universe never before witnessed in such a way in the history of science.

CHAPTER 4

INDIRECT EVIDENCE IN SUPPORT OF THE BIG BANG

The indirect body of evidence supports the postulate that the universe had a beginning; in other words that it has not had eternal existence. The most basic philosophical consequence of the Big Bang theory is its postulation of the fact that the universe did have an origin. Every piece of evidence that suggests that the universe had a beginning indirectly corroborates the Big Bang theory. Of the said evidence, I am going to address in the first three items those that are related to physics. In the last item of this chapter I will briefly outline how the theory that advocated that the universe had an origin had its counterpart in philosophy.

1. EVIDENCE FROM ENTROPY

THE LAW OF ENTROPY

Entropy is a measure of the unavailable energy in a closed thermodynamic system that is also considered to be a measure of the system's disorder. The concept of entropy follows from the application of the second law of thermodynamics. This law posits that the end of the universe is drawing near and that this process is

irreversible according to the laws of physics. The fact is that heat flows irreversibly in one direction. Let us suppose that we leave a pail full of hot water in a room: the thermal energy in the mass of water will spread about the room never to return again to its source. The flow of energy in a closed system travels one way and continues until a point of balance is attained called 'thermodynamic equilibrium,' where the entropy is at its peak.

The existence of this irreversible process proves that the universe, like human beings, is subjected to the irreversible aging process. Both our sun and the other stars are subject to this oneway thermodynamic law. The sun increases the entropy by the continuous transfer of heat to space. Yet, this heat does not return to the sun. The law of thermodynamics postulates that the entropy is continuously increasing and the process is definitely in one direction.

PHILOSOPHICAL CONSEQUENCES OF THE LAW OF ENTROPY

A great many people conceive the data relative to entropy merely in terms of physics. But the law of entropy enables us to arrive at very significant philosophical consequences.

1-The flow of heat in the universe follows one single direction; this is irreversible (the second law of thermodynamics).

2-Under these circumstances, a day will come when a thermodynamic equilibrium will be established and we shall experience the "heat death." This means the universe has an end.

3-Had the universe existed from eternity, the universe would, in the course of time that has elapsed, have reached the state of thermodynamic equilibrium and experienced the "heat death ." A mortal universe cannot exist from eternity.

4-Given the fact that the universe does not exist from eternity, it follows that the universe had an origin. The universe in its initiatory state ($t=0$) is heading from a state of low entropy to a state of high entropy. The continuous increase in entropy suggests that in the origin the universe enjoyed low entropy.

ENTROPY, PESSIMISM AND HOPE

Some philosophers at first dwelt on that portion of the law of entropy that postulated that the universe does not have a perpetual existence, ignoring the fact that it had had a beginning. Bertrand Russell spoke of his pessimism in the face of his expectations of the total annihilation of whatever existed: *"All the labors of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast death of the solar system...the whole temple of man's achievement must inevitably be buried beneath the debris of a universe in ruins..."* Paul Davies is puzzled at the fact that scientists and philosophers focus on the prospective annihilation of the universe toward which entropy seems to be heading, ignoring the fact that it had a beginning: *"Something that runs down at a finite rate obviously cannot have existed from eternity. In other words, the universe must have come into existence a finite time ago. It is remarkable that this profound conclusion was not properly grasped by the scientists of the nineteenth century."*

The law of entropy is not entirely pessimistic. The factor that will enable man to overcome his pessimism is not the eternal existence of the universe when he is no more, but his own eternal life. There is no denying that man is weak in that respect. The power to secure himself an eternal existence is what he can hope for. The law of entropy that postulates that the universe had a beginning makes indispensable the belief in the existence of a Power outside the confines of the universe sustaining the argument of monotheistic religions that advocates that the universe had had a beginning. Those who surmise that matter is eternal and that the

universe they believed to have had perpetual existence is drawing to an end will, of necessity, be despondent. But for those who feel confident that the universe had had a beginning and will come to an end and believe in the existence of God and in the truth of this message conveyed by monotheistic religions and in the almighty God, the law of entropy should not lead them to pessimism.

MEETING OF ENTROPY AND THE BIG BANG

The idea that the universe had a beginning and will have an end was suggested by the Big Bang model. The laws of thermodynamics (entropy) had been devised before; the results they reached are converging, as we see. Conclusively, the laws of thermodynamics, the astronomical observations and the formulas of the theory of relativity are mutually corroborative.

The law governing entropy, in another aspect, can also be taken for a direct evidence of the Big Bang theory. Entropy is very high in the universe, which can be accounted for only by the intense heat generated by a primordial explosion. (Entropy is measurable by the ratio of the smallest particle of light, photons, to baryons, protons and neutrons).

Despite the fact that the supernova explosion is one of the most entropic events, it is not to be compared to the entropy existing in the universe. No formation in the universe we know can account for the high quantity of entropy existing in the universe. Yet, this high entropy is compatible with the Big Bang model.

2.EVIDENCE CONCEALED IN THE EXTINCTION OF LIGHT

ERROR OF THE CONCEPT OF A STATIC UNIVERSE

The star-studded universe gives us the impression of a static and immutable universe model. Aristotle was convinced that the

stars were eternal and postulated that they had an inexhaustible fuel. A person looking at the sky with the naked eye at night may believe that the universe is steady, and fail to perceive the dynamism and the continuous process of evolution and destruction.

Prior to the insight into the structure of stars, materialist thinkers contended that stars had an eternal existence and that they would continue to exist forever. At present we know that the stars have a definite lifetime, that all of them (including the sun) owe their existence to their conversion of hydrogen into helium and that once their fuel is exhausted they will come to an end. Thereafter, it was believed that the newly formed stars replaced the stars that disappeared and that this process would go on till eternity. We know today, however, that this also is not true. A day will come when the stars and light will be no more.

A disappearing star is replaced now by a newly formed star. This process will continue so long as there is enough raw material. The source of this raw material is the explosions and eruptions in supernovas and other stars, just like the primordial process at the beginning of creation. These gases, condensed by the force exerted by gravitation, collapse and give rise to the formation of stars. After having spent their lifetimes, they are transformed into black holes, neutron stars, white drafts and red giants. The raw material required for the formation of stars is becoming exhausted. Once this raw material is drained, no stars will form any longer. The universe will grow dark as the stars fade out (unless a prior cataclysm ending the universe does not intervene).

PHILOSOPHICAL DEDUCTIONS FROM THE EXTINCTION OF LIGHT

According to scientific data, this process will last billions of years. Such an immense space of time may not interest the multitude, although it has much significance in philosophical terms. Let me summarize:

1-Light will vanish in the universe

2-As no life is possible without light, life upon earth cannot be eternal.

3-Considering that light in the universe is expected to end one day, light as such cannot have existed from eternity, so it must have had a beginning.

With the postulate that light (or the stars) will be extinguished after a space of time, the idea of an eternal universe is shown to be without foundation. This result is compatible with the law of entropy and the Big Bang theory.

Since the idea of the eternal existence of stars has fallen into disuse, the point at issue now is to calculate the ages of stars as precisely as possible. It is computed that the second population of stars, which are the most numerous, formed 1.5 - 5 billion years after the beginning of creation. If one adds the age of the second population of stars to this number, we can learn the age of the universe.

Computations made based on these measurements give the approximate age of the universe as 15 billion years. This result is very near the result obtained using the Hubble Constant. Stars and the light they emit belie the eternal universe model while they confirm the postulate that it had a beginning and an end.

3.EVIDENCE FROM THE AGE OF RADIOACTIVE ELEMENTS

HALF-LIFETIME OF RADIOACTIVE ELEMENTS

Radioactive elements are no mystery for the high school student of our day. Radioactivity was discovered in 1896 by the French scientist Henry Becquerel. Radioactivity is the spontaneous

disintegration of the nuclei of certain atoms accompanied by the emission of particles or rays. It is the release of energy by rare, heavy elements when their nuclei decay into lighter nuclei. In such disintegration not all the radioactive atoms break simultaneously apart. The effect of the radioactive matter decreases in time, because its number of atoms continuously diminishes as time goes by. The time it takes for a given portion of atoms in a radioactive substance to decompose is always the same. Therefore, the time that elapses for the decay of half of the atoms in the radioactive substances is used in calculations. This time is referred to as the "half-life" of the radioactive element and the said space of time differs according to the radioactive substance in question. The following are the half-lives of certain radioactive elements:

Radioactive Isotope	Half life
Thorium 232	13.900.000.000 years
Uranium 238	4.500.000.000 years
Uranium 235	700.000.000 years
Neptunium 237	2.250.000 years
Carbon 14	5.700 years
Radium 226	1.600 years
Radon 222	3.8 days

Let us take as an example the Uranium 235 mentioned in the above list. Existing in a given quantity, Uranium 235 will be reduced to half in the course of 700 million years. The same will take place in another 700 years and will be reduced to the half of the previous quantity. This process will be repeated every 700 years. By this method one can mathematically calculate the quantity of Uranium 235 at a given date in the past. US chemist Willard Frank Libby was awarded the 1960 Nobel Prize for

chemistry for his development of the radiocarbon dating technique, which has extensive applications in geology. The importance of the radioactive elements became still more marked in the world of science.

Modern observation techniques allow us to deduce the age of chemical elements from the available radioactive elements and from the calculation of the quantity of the radioactive elements formed at the end of their half-lives. In 1997, English and American astrophysicists Margaret and Geoffrey Burbidge, William Fowler and Fred Hoyle demonstrated that the elements having higher atomic weights were formed through the processes in supernovas. Their research and the work undertaken subsequently indicate that elements such as Thorium 232, Uranium 238 and Uranium 235 are the remnants of the first supernovas. The existing quantity of these elements and the mathematical data we have acquired relative to half-lives allow us to calculate the age of the first supernovas.

AGE OF THE UNIVERSE ON BASIS OF RADIOACTIVE ELEMENTS

Based on the proportions of Thorium 232, Uranium 238 and Uranium 235, European physicists Thielemann, Metzinger and Klapdor stated in 1983 that the formation of the first supernovas must have taken place in the time interval of 16.8 - 22.8 billion years. Afterward, in 1987, William Fowler tried to correct these calculations and posited that Thielemann's calculations should be reduced to 3-9 billion years. Later Thielemann and two collaborators, Cowan and Truran, made a new calculation according to which the interval should be 12.4-14.7 billion years. This was followed by the postulate of US physicist Donald Clayton, who, having used eight different methods, computed the date of the first supernovas as somewhere between 12 - 20 billions years.

The first supernovas came about at the beginning of the creation, when matter was very dense. Therefore the approximate dates obtained from radioactive elements about the formation of the first supernovas give the approximate age of the universe. Calculations made using this technique based on the age of stars or on the Hubble constant point to the same time interval. The results of these calculations do not widely differ from one another. Certain difficulties make it impossible to make a precise calculation, yet assessments indicate that the age of the universe must be somewhere around 15 billion years. Despite the varying parameters the results reached do not widely differ. Use of the characteristics of the radioactive elements was among the calculation methods. The point at issue is no longer whether the universe is eternal or not, but the determination of the exact date when the universe was created.

4. PHILOSOPHICAL EVIDENCE ATTESTING THAT THE UNIVERSE HAD A BEGINNING

PHILOSOPHICAL ARGUMENTS IN FAVOR OF THE ORIGIN OF THE UNIVERSE

At a time when astronomical and physical developments had not yet taken place, when nothing was known about the cosmic microwave background radiation, when man had not yet observed the expansion of the universe and when he was still unaware of entropy and radioactive elements, rational approaches to the idea that the universe had had a beginning were already being adopted by such philosophers as Saadia of the Judaistic creed, Bonaventure representing Christianity and Kindi standing for Islam. I will try to address this subject only briefly, for it is a subject about which volumes might be written. In following these trends of ideas it was argued that the universe and the time and motion in the universe could not be eternal. It was stressed that there should be a Cause

behind the creation, a Cause outside the confines of the universe. The cogent arguments put forth can be summarized as follows:

- 1-Whatever begins to exist has a cause.
- 2-The universe has a beginning
- 3-Therefore the universe has a Cause for its existence.

The second point is the critical argument. Objections were especially raised to this point. The basic evidence provided by the Big Bang theory has been the scientific substantiation of this point. However, even in the absence of scientific proofs, one may have recourse to philosophical reasoning. Motion and time in the universe cannot be eternal; the beginning of time is also the beginning of the universe. Time in the universe is a measure of the motion in the universe; what is in motion is the universe itself. A universe where there is no motion is unimaginable. Given the fact that there is a beginning of time, it follows that this beginning is also the beginning of the motion in the universe and of the universe itself. This beginning entails a Cause outside the confines of the universe.

ACTUAL INFINITY AND IMAGINARY INFINITY

The study of the concept of infinity is vital for our cause. It is important that we clarify the meaning of the word "infinity" if we are to dispel confusion. The sets of numbers formulated by a mathematician like Cantor are "imaginary infinities" that have no corresponding parts in the universe. "Actual infinity" must differentiate from "imaginary infinity." A great many people including such mathematicians as Zeno of Elea, Russell, Frege and Hawking could not help being faced with paradoxes just because they failed to make this differentiation. Mathematical paradoxes are the consequences of the failure to differentiate between "the real" and "the fictitious." Yet, these paradoxes do have an important task, as they announce to their addressees in the

following manner: "You are engaged in dealing not with the mathematics of the really existent but dallying with imaginary mathematics!" Mathematics based on infinite sets of numbers can be indulged in, no doubt, as Cantor has attempted. But this has no counterpart in the universe.

ZENO'S TORTOISE AND HARE

If we may be permitted to make a slight digression, it is my intention to briefly note the manner by which paradoxes in the history of philosophy can be solved. According to Zeno of Elea, the hare can never catch up with the tortoise. For when the hare has reached the point "X" where the tortoise had been, the tortoise will have reached the point "Y" and when the hare will be at point "Y" the tortoise will be at point "Z" and this will go on infinitely, thus the hare will never be able to catch up with the tortoise. By having recourse to such paradoxes Zeno of Elea tried to demonstrate that there could be no motion or change in the universe. But the fact is that the mathematical pattern he has contrived is in no way related to the motion in the universe. To begin with, when the hare catches up with the tortoise, it does not stop to watch the tortoise proceed. The simple mathematical formula that is the distance covered is equal to speed multiplied by time.

There are certain established distances in the universe like 10 km and 100 meters. But while dividing this length by a number, attributing infinity to the denominator is an imaginary application. In the first place, "infinity" is not a number; it merely connotes the continuous increasing. On the other hand, there is no real integer in the universe divided by "infinity;" to try to divide the integer in this way is but a figment of the imagination. All that one can deduce from the expression 'to divide an object by infinity,' would be the division of an object into ever bigger numbers. If we assume "infinity" to be an actual number, outside its meaning as

"continuous increasing," we cannot help but create an absurdity that does not exist in the real world. When Zeno claimed that an arrow would not be able to strike the target towards which it was heading, he divided the distance between the point of origin of the arrow and the target by infinity and claimed that, given the fact that this distance was infinite, it could never be crossed. The fact is that the division by infinity was purely imaginary and the target did not obey it. Hares will likewise catch up with and surpass the tortoise. To state that the hare stops when it catches up with the tortoise and make these stops infinitely is contrary to the actuality existing in the universe.

Another well-known paradox in mathematics is Russell's Paradox". In this paradox a definition of set is given; it includes the same sorts of entities but it is not a member of its own. For instance, the set of dogs includes in it all the dogs existing in the universe, but "the set of dogs" is not a member of this set. All sets satisfy this characteristic, but not in the case of "the set of all sets." This set must include not only other members but also "the set of all sets." But then "the set of all sets" will be its own member, which is against the definition given of a set. Frege was thrown into a panic when he heard Russell's set-theoretic paradox related to an important chapter of mathematics. Had they modified the "imaginary definition" of their own naive invention, which does not actually exist in the universe, the paradox would have been solved. As can be seen in these examples, some mathematicians confuse their intellectual fictions with reality, approximating the figments of their imaginations to Platonic ideas.

INFINITY AS CONTINUITY

People tend to confuse the reality of the universe and their fictive projections of the universe, especially when they consider the concept of infinity. There have been mathematicians who have

imagined "infinity" to be an actual number. Actually there is no such number as "infinity;" infinity suggests that we can proceed on and on without stopping. Let us take, for instance, the natural series of 0,1,2,3,4. When we say that this set of numbers extends to infinity, we are not suggesting that it has a definite target ahead; all that we state is the fact that the set proceeds on by addition of 1 every time. This is why none of these sets of numbers reaches "infinity," they just go on and on; if we assume that this set of numbers stops somewhere, it will be contradicting the definition of the concept of "infinity."

We ought now to differentiate the assertions of those who claim that the time in the universe was infinite in the past and will be so in the future. Those who conceive the past and the future of the universe to be like Cantor's set of numbers will be disposed to readily accept this expression. Those who contend that the universe proceeds on to infinity will have said that time in the universe continues perpetually. In this respect for progression toward the future there have been theoreticians who used the expression of "potential infinity." This definition changes nothing in terms of the result we have given. Yet, I do not favor using this definition, for the idea of "potential" may associate in the mind the possibility that something can develop or become actual. A process that is oriented toward infinity never comes to a standstill, as per the definition of infinity. It will never attain infinity; as a matter of fact, we cannot speak of a point representing infinity for "infinity" is not a target to be reached. It simply means a perpetual progress. Therefore the contenders who suggest that the future time of the universe is the "actual infinite" are in error. No matter where we stop in the perpetual progress, that place is not infinity.

Thus, those who maintain that the past of the universe is infinite contend that infinity has come to its term and that the age of the universe is "actual infinite." In this sense, the definition of

"infinity" means an accomplishment, an attainment outside perpetuity. This is quite different from what is meant by the infinitude of future time; this important point has been ignored by many.

CAN ONE GO BEYOND INFINITY

The notion of "passed infinity" is incompatible with the definition of infinity. Those who use the concept of "infinity" in an imaginary sense have failed to take cognizance of this. Let me summarize it:

1-Infinity means that which proceeds on and on perpetually and is never completed.

2-It is suggested that the time past is infinite.

3-In order that we may exist at this point we must have gone past the infinity (in accordance with item 2 above).

4-However, considering that infinity cannot be passed (in accordance with item 1 above) and our existence cannot be denied, time past in the universe cannot be infinite.

5-It follows that time reigning in the universe had a beginning.

If the misuse of the concept of infinite is corrected, the fact that the universe had a beginning will be evident. Let me stress once more the fact that what is wrong is not the association of imaginary elements existing in the universe with mathematics, but the correlation between "imaginary" and "reality" in the universe. I am of the opinion that paradoxes of mathematics will contribute significantly to the corrections of these errors. "So long as

mathematics is the mathematics of the phenomena (reality in the universe) it cannot entail any paradoxes," may be adopted as a motto.

If no error is made in the ontological status of mathematics (regarding whether mathematical concepts are imaginary or actual), no paradoxes will come about. In point of fact, in the advancement of sciences the correct application of mathematical formulas has an incontestable part. The mathematics that has remained on an imaginary level and fallen short of having a field of application to the reality in the universe has had no part to play in the progress achieved in scientific fields. Such mathematics has not gone further than being a mental jugglery and a source that has produced nothing else but paradoxes.

Mathematicians cannot do without imaginary considerations, but they must beware of mixing up what is imaginary with the reality of the universe. For instance, Pamela Huby, in her study of Cantor's infinite sets, states that they have no message to convey about "actual infinite." In addition, Abraham Robinson has announced that the said set of numbers has no counterpart in reality. Yet, it appears that not everybody has been successful in differentiating between "imaginary" and "the reality of the universe." William Lane Craig gives a detailed account of this and makes the following summary that tries to demonstrate that the universe could not have existed from eternity:

1-An actual infinite cannot exist.

2-An infinite temporal regress of events is an actual infinite.

3-Therefore an infinite temporal regress of events cannot exist.

HILBERT'S HOTEL

When we project the Cantorian patterns related to the concept of “infinity” to the real world, we are faced with contradictions. We appreciate Cantor's work; however, we must realize that in this universe there is no “actual infinite.” In this connection we can repeat the well-known puzzle of German mathematician Hilbert (1862-1943). Let us take up the case of Hilbert's hotel. Let us assume that the “actual infinite” of rooms in the hotel are occupied and an “actual infinite” numbers of guests are soliciting accommodation, whereupon, we shift the person in room number 1, into room 2, 2 to 4, 3 to 6, 4 to 8 (let us bear in mind that the set of odd numbers goes to the infinite 1, 3, 5, 7, 9...) In this way, all the odd-numbered rooms become free. Thus, the infinite number of guests will occupy the infinite number of rooms with odd numbers. In the meantime the number of hotel rooms remains the same; the rate of the hotel's occupation is still infinite, as it has always been! On the other hand, considering that every guest corresponds to a natural number, a new guest that appears cannot be accommodated. The reason is that one can add nothing to the infinite. Moreover, even though we erect a new hotel next to the existing one and accommodate guests therein, we can still not claim that there has been an increase in the number of guests (For infinite + any number = infinite).

The examination of the concept of infinite shows that a set consisting of successive additions does not lead to the “actual infinite.” Every moment in time follows the previous one and time advances in one direction solely. Given the fact that every moment is added to the preceding one, no “actual infinite” can exist in time. William Lane Craig summarizes this as follows:

1-The temporal series of events is a collection formed by successive addition.

2-A collection formed by successive addition cannot be an actual infinite.

3-Therefore the temporal series of events cannot be an actual infinite.

This reasoning leads us to the fact that time, and, consequently, the universe had a beginning.

MY SUGGESTION FOR A SOLUTION OF KANT'S ANTINOMIES

While developing the antinomies, mutual contradiction of two principles or inferences resting on premises of equal validity, Kant contends that both statements related to the existence or inexistence of the beginning of the universe are valid or not valid, in other words indeterminable. I believe a distinction must be made between something that is "absurd" (impossible) and a phenomenon that is "inconceivable." According to this train of thought, on the basis of evidence we have produced so far we may term as absurd (*reductio ad absurdum*) the contention that the universe has existed since eternity. But the assertion that the universe was created from nothing cannot be reduced to absurdity. The only question that comes to mind would be: "How was it created?" This cannot constitute a reason for its refutation and falsification. Kant's antinomies can be solved in this manner. It is certain that one of the two antinomies expressed is correct. What is postulated by antinomies is their mutual negation. However, if one can prove that one of the alternatives is absurd, the correctness of the other proposition becomes evident. To this end one must try to demonstrate that one of the alternatives is absurd. This will reveal the correctness of the other one.

To state that 2 is bigger than 3 is absurd (impossible). On the other hand, for a lay person, the working of an aircraft engine

is “inconceivable.” “Absurd” is the expression of something impossible, unrealizable, while the second alternative denotes something that is unknown, but can well be possible.

Kant was in error in giving equal values to mutually contradicting propositions. G. J. Whitrow refuted the antithesis of Kant about the eternal existence of the universe, saying that the time concept prior to the beginning of the universe is wrong. As a matter of fact, the formulas of the theory of relativity linked time to space, demonstrating that where the universe did not exist, time would not. However Kant, who based his antinomies on Newton's “absolute time” independent from the universe, committed the error that Whitrow detected.

My aim in the present chapter has been to briefly show in philosophical terms the necessity for a beginning of the universe. This is why I have focused on the fact that the past of the universe could not go backward to the infinite. Philosophical evidences are in harmony with the evidences of the Big Bang theory, thermodynamics and the theory of relativity.

CHAPTER 5

EXAMINATION OF SCIENTIFIC MODELS ALTERNATIVE TO THE BIG BANG

The Big Bang theory holds that the universe had a beginning, that in the beginning the primordial universe was extremely dense and the prevailing heat was extremely intense, that the density and the heat gradually fell and have been falling ever since and that in the course of this process, all universal phenomena from sub-atomic particles to galaxies have taken place. There are also cosmological controversies outside the confines of these basic common traits. The questions whether the growth of the universe is occurring at a constant speed or whether it has undergone a sudden inflationary process at a given time, the exact values of the Hubble's constant corresponding to the speed at which the universe is expanding, the extent to which the string theories are successful in elucidating the gravitational force may all be enumerated among these controversies. I am not going to go into the details of these controversies, as they remain outside the scope of our objective. The fact that the universe is expanding at a constant speed or that it expands inflationary at certain periods, that the Hubble's constant is inferior or superior to what is anticipated are not so important in terms of the results addressed

in the present book. In the present chapter I intend to take up, in particular, the models that counter the postulate that the universe had a beginning and that attempted to prove their causes in scientific terms, and examine them on the basis of scientific data. Although the primary and secondary evidences of the Big Bang theory invalidate all these models, it will be advisable to analyze them because of their significance.

1.THE STEADY-STATE MODEL

COMPATIBILITY BETWEEN THE EXPANSION OF THE UNIVERSE AND MATERIALISM

The studies of William MacMillan in the 1918s and of James Jeans in the 1920s were a source of inspiration for those who postulated the Steady-State model. However, the Steady-State model was formulated in the 1940s by the work of Hermann Bondi, Thomas Gold and Fred Hoyle. During the said years no scientist could take a stand against Hubble's observations of the expansion of the universe. Atheists, who had adopted the view that matter and the universe had an eternal existence and that the universe was static, had difficulty in acknowledging Hubble's findings. An expanding universe could not help but change. What was changing could not have had eternal existence, and if it did not have an eternal existence it ought to have had a beginning. They did not think it worthwhile to ruminate upon it.

In opposition to the observational and theoretical evidence for the expansion of the universe, the materialists who had posited matter as the only element of the universe were reluctant to acknowledge the transformation that the universe was undergoing. The Steady-State model was the outcome of such a frame of mind and its objective was to prove that there was constancy, despite the expansion.

Fred Hoyle was the most prominent figure among this group. It was he who coined the expression "Big Bang" to poke fun at the theory. Hoyle's discomfort with the philosophical consequences of the Big Bang theory is no mystery. He contended that the Big Bang necessitated a beginning, and the idea of the beginning of the universe would connote the existence of God, which he found objectionable.

The Steady-State model was thus the outcome of atheistic concerns without any scientific foundation. The fact that it was supported by a prominent physicist proved an exacting test for the Big Bang theory. There were many other scientists who exerted efforts challenging the theory at all costs. But a theory that drew its power from its truth should be able to put on a brave front.

THE IDEA OF PERPETUAL CREATION TO EVADE ACKNOWLEDGING THE BEGINNING

As the Big Bang theory has posited, the density of matter decreases as the universe expands. Had the universe had an eternal existence, no star or satellite would have come about because of the decreasing amount of matter. To solve this problem Hoyle came up with an unexpected assertion. The problem of reduction that resulted as a consequence of expansion could be settled by a perpetual production of matter.

Those who may not be familiar with Hoyle and with what lies behind his ideas may think that he arrived at such an assertion to substantiate God's process of continuous creation. One of the essential principles of physics is the conservation of matter and energy. The foregoing assertion does not conform to this principle. Yet, there is no other way to acknowledge the constancy of the expanding universe and its perennial existence. Hoyle's claim of "the ongoing creation from nothing" was certainly asserted most reluctantly, but the dilemma of the expanding universe led him to defend this postulate.

In maintaining his assertion, Hoyle did not have any observational and experimental data at his disposal. As a matter of fact, no-one has put forward any evidence so far. Hoyle tried to clothe his metaphysical assertion with the garb of physics. But he failed to detect the origin of the new matter or the new energy. In calculations made it was stated that every ten billion years, two hydrogen atoms had to be created in every meter square of the universe. The amount is insignificant, but how and where these atoms will originate remains a riddle.

QUANTITY OF CREATED MATTER

The dilemma of the “Steady-State model” is discussed in almost all the articles that aim to invalidate Hoyle's contention. There is, however, another dilemma to which I would like to draw attention. Had it been the case of the creation of such matter, the question would be the manner in which the required amount would be created. If the quantity of matter created is less compared to the speed of expansion of the universe, the space would be the size of an area in which the distances between atoms would be equal to the distance between galaxies. If the created matter were superior to what was required, every spot of the space would be as dense as a star nucleus. Under the circumstances, the Steady-State model fails to explain how it is that “matter is continuously created out of nothing,” and the maintenance of the constancy of the steady-state is another dilemma. Physical processes deprived of consciousness cannot possibly be expected to bring about a regular and continuous creative process as if they had consciousness in order to preserve the steady-state. The defenders of the Steady-State model are also at a loss to explain this.

According to the celebrated physicists Alpher and Herman, there were two reasons for the interest shown in the Steady-State model in the 1950s and 1960s. The first was the miscalculation of the defenders of the Big Bang theory, as they had computed the

age of the universe to be younger than it actually was due to the fact that they had failed to exactly calculate the rate of expansion of the universe and the density of matter in the universe. This had generated a lack of conformity with the calculated age of stars. This problem was solved later thanks to sophisticated telescopes and new advancements in science. The second reason was the fact that the Big Bang theory necessitated a beginning, which entailed unacceptable consequences. This problem could never be solved since it was not a scientific issue but a psychological one. For example, Arthur Eddington said: *“Philosophically, the notion of a beginning of the present order of Nature is repugnant to me...I should like to find a genuine loophole.”*

MECHANISM OF EXPANSION

The Steady-State model displayed an expanding but unchanging universe. What was the mechanism that expanded the universe? How was it that all the galaxies kept expanding like an inflating balloon as if they had been launched from a single center? Those who postulated the Steady-State model had never been able to explain this. The Big Bang theory gave a perfectly clear account of the working of this mechanism.

Consider an expansion continuing from eternity in the case of the Steady-State model. A universe of this model would be eternal both in terms of time and volume. Thus we will be confronted with a number of paradoxes. Take Olbers's paradox, for instance, according to which in an infinitely large, unchanging universe uniformly populated with stars and galaxies, the sky would be dazzlingly bright in the night. The absorption of light by the dust clouds in between would not change anything, for, after a while, the dust would eventually heat up and start to glow with the same intensity as the radiation it absorbed. Yet, we observe that the night is dark and our observations belie the universe of the steady-state model full of immensely vast galaxies.

HOYLE'S CONTRIBUTION TO THE BIG BANG THEORY

Hoyle and colleagues demonstrated the fact that hydrogen atoms clustering by gravitational force transformed into celestial bodies. In the massive spheres growing like snowballs the inward-oriented pressure of attraction continued increasing. As this pressure built up, the hydrogen atoms interlaced, forming the next heavy atom, helium. The generated energy balanced the power of attraction within the stars and created an explosive pressure. This process contributed to their lives of billions of years. Man eventually realized that the stars did not have an inexhaustible store of fuel, as Aristotle had postulated. The fuel produced by the conversion of hydrogen into helium was capable of lengthening the time life of a star to billions of years.

Hoyle and colleagues demonstrated that elements formed during the process that went on within the stars. Now, the question was the manner of the formation of hydrogen. The formation of hydrogen required a medium-intense heat as the subatomic theory dictated. The Big Bang theory states that the origin of the universe was an extremely dense and hot medium. This medium for which Hoyle had asked the contenders of the theory to find its fossil, which was eventually discovered in 1965, puts the Steady-State partisans in a difficult position.

Much new evidence that invalidated the Steady-State model was introduced in the 1990s. It was demonstrated that the density of matter reduced as the universe cooled off and that a day would come when the stars and the light would fade out. The additional evidence provided about the same time by the COBE satellite related to the cosmic background radiation and undermined the Steady-State model that had already lost much of its former importance. The measurement of the cosmic background radiation of distant bodies, which took place in the 1990s, was another piece

of evidence that invalidated the Steady-State model. When we look far into the distances populated by celestial bodies, we observe in fact the past of the universe, for the speed of light, even though it is a very high speed, is, after all, limited. The establishment of the mere fact that the past of the universe was much hotter is adequate in itself to discredit the Steady-State model. Ivan King said: "*The Steady-State theory has now been laid to rest, as a result of clear-cut observations of how things have changed with time.*"

The Big Bang theory demonstrates that the universe was the outcome of a gradual process of development. The formation of elements within the stars is but a part of this process. The contributions of Hoyle and colleagues on this issue and their objections conducive to the discovery of new evidences are of paramount importance. Therefore Hoyle and colleagues are quoted along with Lemaître, Friedmann, Hubble and Gamow among those who contributed to a detailed exposition of the Big Bang theory.

SUMMARY OF EVIDENCE INVALIDATING THE STEADY-STATE MODEL

The Steady-State model was the postulation that withstood longest the Big Bang theory. Therefore, the past of the Big Bang theory also includes the story of the Steady-State model. It is also of interest to note that this model held out against the fact that the universe had an origin and that it underwent changes despite the fact that it had had to acknowledge its expansion. This model, proposed as a defense of the eternal universe of materialism, was advocated by renowned scientists and became the most assertive argument of materialists. We can summarize some of the evidences that invalidate this model:

1-The Steady-State model states that matter is created out

of nothing by a continuous physical process, although this is in fact incompatible with observations and laws of physics.

2-If, as suggested by the Steady-State model, matter was created out of nothing continuously, this creation *ex nihilo* should have realized a given ratio. Such balance, said to come about in conformity with the laws of physics solely, cannot be demonstrated.

3-At every formation of matter from energy an equal amount of antimatter is formed. If matter were created through the perpetual conversion of energy into matter, the amount of anti-matter should have been equal to matter. This is contrary to the actual universe observed. (The heat produced by the Big Bang may account for the greater amount of matter as compared to anti-matter.)

4-The Steady-State model cannot account for a mechanism to throw light on the expansion of the universe (as in the case of the Big Bang).

5-The Steady-State model cannot account for the great rate of entropy in the universe.

6-The cosmic background radiation invalidates the Steady-State model.

7-The data obtained about the farthest stars and the fact that the cosmic background radiation in the past of the universe is calculated to be at a higher temperature than the present cosmic background radiation invalidates the Steady-State model, while demonstrating the correctness of the Big Bang theory.

8-The lack of red shifting after a certain given point in the universe invalidates the infinitely immense universe proposed by the Steady-State model.

9-By the infinite universe image of the Steady-State model, the Steady-State model leads to the formation of the Olbers's paradox.

10-According to the Steady-State model, spontaneously generated matter must have a given proportion of helium with respect to hydrogen. The formation of this ratio in the actual model is not clear, while the proposition based on the Big Bang is perfect in this respect.

11-The presence of light elements like deuterium and lithium in the universe cannot be accounted for in the Steady-State model. (The Big Bang theory has an admissible clarification on this issue.)

12-We are receiving the light emitted in the past of galaxies and quasars. The variations they display in terms of characteristics and diffusion from regions nearer to our galaxy have rendered the Steady-State model illogical.

13-As Hugh Ross has said, the absence of very old galaxies around our galaxy invalidates the assertion of the Steady-State model about the immeasurably old age of the universe, while the absence of very young galaxies around our galaxies invalidates the continuous creation idea of the Steady-State model.

14-The fact that the gas clouds in the universe will not allow the formation of stars endlessly has discredited the idea of a constant, static model of the universe.

2.THE OSCILLATING UNIVERSE MODEL

PHILOSOPHICAL CONCERNS

The Steady-State model was considered to be the most challenging antagonist of the Big Bang theory. However, the findings of observational astronomy discredited the Steady-State

model, as the evidence derived from the Big Bang became more and more conclusive. Those discomfited by the idea that the universe had a beginning this time introduced the Oscillating Universe model. However, this new model was not the outcome of scientific findings but a consequence of philosophical concerns. Famous physicist John Gribbin said: *"The biggest problem with the Big Bang theory of the origin of the Universe is philosophical -perhaps even theological - what was there before bang? This problem alone was sufficient to give a great initial impetus to the Steady-State theory; but with that theory now sadly in conflict with observation, the best way round this initial difficulty is provided by a model in which the universe expands from a singularity, collapses back again, and repeats the cycle indefinitely."*

The proposal of an Oscillating Universe model without any circumstantial evidence or theoretical justification was the fact that Big Bang was conducive to the idea of a Cause and a Power outside the universe. However, this demonstrated the correctitude of the evidence supporting the Big Bang theory, while even those who dodged the corollary of such a proposal tried to avoid the issue that necessitated a beginning by repetition of this model.

THERE IS NO PHYSICAL MECHANISM TO BRING BACK THE UNIVERSE

The science of physics teaches us that the universe, space and time owe their origin to the Big Bang; this expansion is expected to come to a close by the Big Chill or the Big Crunch, the final collapse of the universe. The concept of the Big Crunch or the Big Chill is still a matter of debate. To know which is going to take place we need to exactly calculate the following values:

- 1-Density of matter in the universe.
- 2-Age of the universe.
- 3-Rate of expansion of the universe.

A calculation of the "density of matter" is crucial to establishing what exactly is going to occur. This issue is the most problematical. The reason is the impossibility of making an exact calculation of the black holes (as they emit no light) and the exotic substances, like neutrinos. The amount of matter likely to cause the closing back of the universe is expressed by a critical value called Omega. Calculations made so far have shown that the density of matter in the universe is inferior to the critical value. This may vary though if we discover more exotic matter or black holes (or other matter having gravitational force) than anticipated. If matter has a density lower than the critical value, the universe will, by continuously expanding, experience a "cold death." This scenario will not allow the universe to oscillate, thus invalidating the Oscillating Universe model.

My personal opinion is that, of the two alternatives above, the Big Crunch better fits the picture. When plants, animals and human beings created from elements whose essence is clay, die, they return to their quiddity. We can observe the same recurrence in stars formed of dust. The Big Crunch better fits the scenario. Throughout this book, we have tried to draw conclusions based on scientific evidence. As regards the present subject, I have tried to determine which of the two possible options looks more likely to be correct, by focusing on the actual picture of the universe. Just to remind you, this is a matter of conjecture only, and not a scientific fact. In reaching this conclusion I have been attracted by the option that appears to be simpler, more appropriate and orderly. The contract of the universe will end in a singularity in the absence of a physical force likely to withstand the gravity to pull the matter outward. In fact, the collapse of the universe will change nothing. The Oscillating Universe model is against all the known principles of physics. There is no physical law that would allow the universe to "bounce back," as Prof. Tinsley from Yale University has suggested.

SINGULARITY MEANS TIME COMING TO A STANDSTILL

Roger Penrose was the first person who demonstrated that the black hole was a singularity and that at the center of a black hole particles of matter can not pass by each other. Penrose, in the research he conducted in conjunction with Hawking, proved that the universe and time owed their origin to a singularity. Previously, those who had adopted the Oscillating Universe model had contended that the universe during its period of contraction would not be resolved to a singularity and that matter might pass each other by, contributing to a bounce-back of the universe. Penrose and Hawking's mathematical demonstration has proved the impossibility of this. Their studies have shown that time came to a standstill in this singularity. In brief, the collapsing of the universe and coalescence at a point means the end of the concept of time; however, the intention of the concept of the Oscillating Universe was to show that time continued without interruption, which meant that the universe could not have had a beginning.

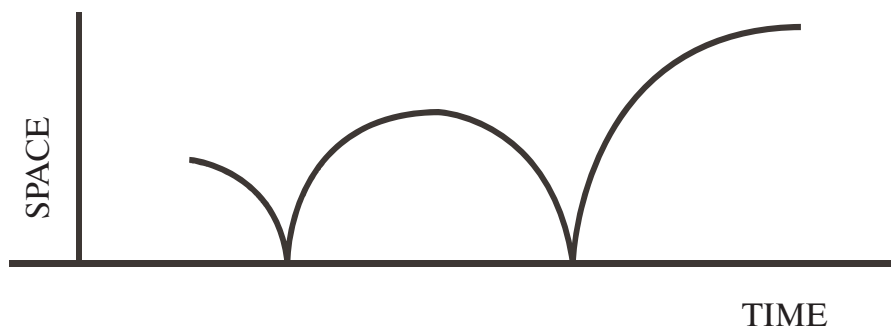
Prior to Einstein's theory of relativity, it was believed that celestial objects were subject to gravity in space depending on time, and that galaxies moved, despite the fact that space and time were not affected thereby. The biggest change in mindset to which the theory of relativity paves the way was to show that space and time do not vary interdependently and that the concept should be styled as "space-time." In such a case "singularity," in other words the moment of collapse of the universe, would connote the annihilation of time. There is no longer a force to cause the universe to bounce back, nor is there "time" in which the sequence of phenomenon may be perpetuated.

To the inquiry about the time that preceded the Big Bang, the answer provided is, "There was no space-time prior to the Big

Bang;” while to the question as to which portion of space the Big Bang occurred within, the answer is, “It was the Big Bang that made space as there was no space prior to the Big Bang.”

NO ESCAPE FROM ENTROPY

As we have already noted, the second law of thermodynamics states that entropy in the universe is on the increase. According to this, a thermodynamic equilibrium will eventually be established and motion will come to an end. Increase in entropy means a decrease in the energy required to set off mechanical work. The bouncing of a ball will gradually lose its energy until it remains motionless in the



Even the Oscillating Universe model is subject to entropy. Even if it were not subject to it, the speed of expansion of the universe would go on increasing and the universe would no longer be capable of closing.

end. The Oscillating Universe model tried to substantiate the infinite perpetuity of the universe and time. Such continuity necessitates physical interdependence of every state of the universe. But there is no escape from entropy even though the universe was in a position to oscillate. It will still run short of the mechanical energy it requires. Entropy, which is one of the basic laws of physics, posits that the

universe has an end, regardless of all contingencies, and that what has an end must have a beginning.

The data of observational astronomy have also discredited this model. This model cannot explain the homogenous distribution of matter in the universe. In the course of the collapse of the universe many black holes will come about and these black holes will close after having swallowed the matter. This will cause a heterogeneous spread of matter. The closing of the universe involves many more black holes as compared to the exact symmetry of the initial phase of the universe. This, in its turn, will prevent the continuity of the symmetry, homogeneity and oscillation.

Radiation, the remnant of the Big Bang, lingers in the universe, while the light emitted by the stars augments their intensity. According to this, if the universe begins closing, it will begin to do so with a radiation higher than the level of radiation energy immediately after the primal explosion. In other words, the universe will be hotter at every point where the universe will have re-attained its old size; this will occur through the transfer of energy from matter to radiation. This will cause the universe to collapse at a faster rate.

Had it been possible in terms of physics to reverse a cosmic contraction, the expansion would have occurred more rapidly than the universe's initial expansion. This means an expansion of such speed that it will not allow any contraction. The Russian physicists Igor Novikov and Yakob Zel'dovich demonstrated that the symmetrical cycles of the Oscillating Universe model could not be defended and that such a model does not avoid facing the idea of a beginning.

REGULATOR OF THE CRITICAL SPEED OF THE UNIVERSE

There is one problem of great consequence for those who contend that the oscillating model operates merely physically, without any contribution by a Power outside the universe. Had the Big Bang explosion been more intense, matter would have spread at a greater speed in the universe, rendering the formation of stars and galaxies impossible. Had the explosion been less intense, matter under the influence of gravity would have immediately collapsed, again rendering the formation of celestial bodies impossible. In the Oscillating Universe model the symmetry in expansions was necessary. Otherwise matter would be scattered, never to come together any more. Entropy suggests that this end could not be avoided even if the Oscillating Universe model were the case.

Let us ignore entropy for a while. The Big Bang explosion should have been at an optimum intensity so that no collapse might occur and permission be given for the formation of the celestial bodies out of the matter scattered. The probability, without an intelligent Designer, of the attainment of the optimum intensity would not even have the chance of a pencil standing on its tip when it falls after having been thrown in the air. This probability cannot be the result of a trial and error experiment, for any error would have missed the matter, while in another aspect it would have led to a singularity. Under the circumstances, the partisans of the Oscillating Universe model have no other alternative but to acknowledge the coincidental achievement of this phenomenon, as well as the attainment of the same result at every recurrence.

SUMMARY OF EVIDENCE INVALIDATING THE OSCILLATING MODEL

There have been people who used the oscillating model for the scientific expression of the Indian belief in reincarnation. According to this belief, the universe has existed from eternity and the souls experience a cyclic birth and rebirth in the universe. The belief in reincarnation connotes an eternal universe. Yet, not even one single bit of evidence exists to justify the Oscillating Universe model. Moreover, scientific evidences have also invalidated this model. We can summarize some of the scientific data that invalidate it:

1- Reversing a cosmic contraction is against the laws of physics, like gravity.

2- Studies on the formulas of the theory of relativity have demonstrated that the Big Bang marked the origin of space and time.

3- The homogenous structure of matter in the universe is not compatible with the Oscillating Universe model.

4- The second law of thermodynamics (entropy) has invalidated the eternal oscillating model of the universe quite independently from all data.

5- The fact that if the closed universe were capable of reopening, every reopening should be endowed with a speed greater than the previous one. This very fact would mean that all matter would be so scattered that it would never come together again. It follows from all these that if the universe cannot have existed from eternity it must have a beginning.

6- The Oscillating Universe model would necessitate the

expansion's having a "very critical speed." Unless a Designer is conceived, this critical speed cannot be accounted for.

7- The Oscillating Universe model would also require the continuous conservation of this "very critical speed." This would mean that the pencil would continue to fall on its tip at every kick.

3. STEPHEN HAWKING AND IMAGINARY TIME

SINGULARITY THEOREMS OF HAWKING AND PENROSE

Stephen Hawking and Roger Penrose, as a result of their collaboration based on Einstein's formulas, have demonstrated that both the universe and time owe their origin to a single origin. They advocate that a time concept prior to the Big Bang would be senseless. Hawking suggests that Kant was in error because he had formulated his antinomies based on Newton's "absolute time." He praised Augustine for his proposition that time had come into existence simultaneously with the universe, at a period when data about time's relativity were not available. Hawking never claimed this work with Penrose to be without validity but rather always professed its truth. In his book entitled ***A Brief History of Time*** he stated: "*Roger Penrose and I showed that Einstein's general theory of relativity implied that the universe must have a beginning and, possibly, an end.*"

How is it then that Stephen Hawking also suggested that the universe had no beginning? Can a person who, together with Penrose, states that they had theoretically proved that the universe had a beginning, later recant by saying that it had no beginning? Considering that in all his work, even in the most recent ones, he boldly asserts and confirms all his statements and never refutes them, how can one account for the contradiction?

considering the extremely dwindled size of the universe, recourse will be made to the uncertainty principle of the quantum theory (quantum theory of gravity). However, in this position, according to which the size of the universe contracts, there is neither rhyme nor reason, nor cogent evidence, to assert that quantum state would apply to the case. It is not logical to draw a parallel between the states in which all the density of the universe is squeezed into one single point and the quantum formulas are applicable to the atom.

THE WISH TO REMAIN BOUND BY THE LAWS OF PHYSICS ONLY

By introducing the concept of "imaginary time" in the formulas, Hawking, tries to evade the issue of the origin of time and universe; while he does not forego the data of his work with Penrose as they apply to "real time." Hawking, in his *A Brief History of Time* says, *"In real time, the universe has a beginning and an end at singularities that form a boundary to space- time and at which the laws of science break down. But in imaginary time, there are no singularities or boundaries."*

We can summarize the subject as follows:

1-Provided that time is taken for "real time," Hawking acknowledges that time must have a beginning.

2-When time is taken for "imaginary time," Hawking says that we may not be qualified to claim that the universe had a temporal beginning.

Hawking likens the historical beginning of the universe in imaginary time to the South Pole. According to him, there is no sense in asking what was there prior to the beginning. Such an

imaginary time cannot be defined, just like the spots to the south of the South Pole.

Hawking does not deny God, as an atheist would, but he tries to conceive of a universal design that could be explained without having recourse to God's existence. Without such a reference point, he imagines he can explain everything within the laws of physics.

Hawking stresses: *"I would like to emphasize that this idea that time and space should be finite without boundary is just a proposal: it cannot be deduced from some other principle."* He openly announces that his approach that postulates that time is limited like the South Pole but without a beginning is devoid of all scientific observations and data. This proposition of his stems from his reluctance to see the laws of physics interrupted with a beginning.

REALITY OF IMAGINARY TIME

While suggesting the existence of an "imaginary time," Hawking moves into that of philosophy from his specialization in physics. The fact is that this concept is not a concept based on scientific observation and experiment. Someone like me who contends that there can be no separation in knowledge, considering that all branches of knowledge, whether philosophy or physics, should unite in attaining reality, will not be adverse to seeing a physicist philosophize, just as in the case of a philosopher who dabbles in the solution of problems of physics. The question is not Hawking's philosophizing, but, rather, the soundness of his philosophy. Here the concept of "imaginary time" becomes a point of controversy in terms of physics and philosophy. In philosophical jargon, "What is the ontological reality of imaginary time?"

Hawking commits the same error as Zeno and Russell when he confuses reality and fiction. Those whose interest is limited to the figures in front of them without considering the counterpart in reality of their imaginary mathematics generate paradoxes and blunders. Those who revert to mathematical formulas to explain the mystery of the universe must take an interest in the correlative in reality of their mathematics. Physics is a science that makes use of mathematics as an instrument. Mathematics on an imaginary plane without any correlative in actuality has no physical validity.

I will try to illustrate the difference between "mathematics of reality" and "imaginary mathematics." Let us assume that three persons have three separate apple trees. Two of these may, under certain circumstances, without having an exact idea of the number



of apples on the latter's tree, announce that "the total number of apples on all the three apple trees is over 100." These two may have counted the apples on their respective trees and obtained the results 70 and 80 respectively. A person like Hawking, who conceives mathematics purely on a fictional basis, will state that we can never know for certain whether the total number of apples of the three trees is greater than 100 as we know nothing about the number of apples on the third tree. If we assert and say:

Can one apple tree produce (-60) apples ?

"How so? There are already 150 apples on the two apple trees," he may retort: "What if there are -60 apples on the third one? Then we would have the following equation: $80+70+(-60) = 90$." So saying, he would have a broad smile on his countenance, as he is sure to have checkmated his opponent!

The example of the apple tree illustrates the difference between us and those, like Hawking, who conceive of mathematics as mere formulas, with no correlation in reality. Hawking frequently states that the correlation in reality of mathematical formulas does not interest him. For instance, in his ***The Universe in a Nutshell*** he states: *"From the viewpoint of positivist philosophy, however, one cannot determine what is real. All one can do is find which mathematical models describe the universe we live in...So what is real and what is imaginary? Is the distinction just in our minds?"*

Let alone the fact that "imaginary time" has no correlative in reality, it is also contrary to reality. The definition that Hawking makes of "imaginary time" in ***A Brief History of Time*** proves this. He says: *"If one can go forward in imaginary time, one ought to be able to turn round and go backward. This means that there can be no important difference between the forward and backward directions of imaginary time."* We all know that time proceeds in one direction and it is irreversible. No one may be asked to give an answer other than: "This is against the definition and reality of time" to the question put to someone who killed his grandfather going back with a time machine: "What will happen now?" Hawking, like the person who solved the puzzle by writing down "-60" apples has confused imaginary time in terms of mathematical formulas with time being imaginary in reality.

Confusing universal reality with fictional mathematics is an error committed by many mathematicians whose link with reality has been very weak. This error made by Hawking while tackling the issue of time shows that his philosophical speculations were not as successful as his work in physics. The reason that lies behind this failure is his striving to reflect faithfully the fiction in his imagination for the sake of positivism, instead of trying to conceive of reality.

AN ERROR ACKNOWLEDGED BY HAWKING

Hawking acknowledges to have committed a grave error in his analogy of North and South Poles. In *A Brief History of Time* he describes his error in the following words: "*At first, I believed that disorder would decrease when the universe recollapsed. This was because I thought that the universe had to return to a smooth and ordered state when it became small again. This would mean that the contracting phase would be like the time reverse of the expanding phase. People in the contracting phase would live their lives backward: they would die before they were born and get younger as the universe contracted...I was misled partly by the analogy with the surface of the earth. If one took the beginning of the universe to correspond to the North Pole, then the end of the universe should be similar to the beginning, just as the South Pole is similar to the North. However, the North and the South Poles correspond to the beginning and end of the universe in imaginary time...I realize that I had made a mistake: the new boundary condition implied that disorder would in fact continue to increase during the contraction. The thermodynamic and psychological arrows of time would not reverse when the universe begins to re-contract or inside black holes.*"

Time operates one way. The most important concepts of time are "before" and "after." "After" always succeeds "before." The

causes of "after" are always in "before." Let us imagine that we are watching a film backward: in this film, there can be no logical reasoning. When we watch the film in reverse we shift the position of cause and effect, yet we cannot shift the chain of succession of "before" and "after." What we could do was doing away with the logical sequence of "before" and "after;" but we could not do away with the concepts of "before" and "after." Everybody witnesses the one-way operation of time that is based on the concepts of "before" and "after."

Although it makes no alteration in our issue, I should like to stress Hawking's idea, according to which the 'thermodynamic arrow' and man's psychological arrow are equated, which is not true. It is true, on the other hand, that time follows a unidirectional path, as well as the fact that entropy increases as it advances. Total entropy is always on the increase in the universe; you can turn on the air-conditioner in a room, and if you took its machine outside the room, you would lower the entropy in that room. But, no matter what you do, the total entropy will go on increasing. On the other hand, no matter what you do, you cannot change the concept of time in the mind of a man; we cannot play with his psychological arrow; we cannot shift the position of the "before" and the "after" of a man, even for a second, no matter what we do.

Time flows unidirectionally for every man and at every spot in the universe. Advancing time is not unidirectional in terms of "total time," but the 'thermodynamic arrow' advances with "total entropy." On the other hand, there can be no absolute superposition between man's perception of time and the law of entropy. Man perceives the universe, unaware of the law of entropy; so long as the entropy decreases in the system there is no reason why man's perception of time will change. This fact proves

that the psychological arrow and the thermodynamic arrow are different, and this is the point where Hawking falls into error. The error is in the identification of the unidirectional flow of entropy with the unidirectional flow of time. In other words, he mistook parallelism for identity.

HAWKING AND SCIENCE FICTION

We can see the errors Hawking committed from his own acknowledgments. One of the reasons for this may have been his interest in science fiction. He intends in his books to create an atmosphere of science fiction to attract his readers. His idea - which he recanted later - about man, who dies to live afterward and eventually to be born, thrilled his mind as well as those of his readers. Among those who took an interest in Hawking's ideas and who even looked for opinions to realize his projects was the famous science-fiction film director Steven Spielberg, and these two men expressed mutual praise when they met.

The approaches of Hawking regarding time have no place in the real world; in ontological terms, this concept of time is devoid of all consideration. Cavalleri said that a value based on observation must be expressed by a real number, since otherwise it will constitute the subject of imaginary science or science-fiction. Hawking said that theories of physics are but mathematical models; whether they meet with reality or otherwise is of no consequence. This mentality led Hawking to formulate his "imaginary time" concept in which, just like in a science-fiction film, he could move forward or backward. How right was Cavalleri who declared that those who do not use real numbers are dabbling in science fiction!

Another criticism leveled at Hawking is his equating the time concept with spatial dimensions, in passing from real time over to imaginary time as we move backward to the beginning of the universe. The principle is to be in between in spatial dimensions; for instance between straight lines X and Y there may be a point A, but the essential thing for time is "to be before" and "to be after." For instance: event B is before event C, while event C is before event D. In Hawking, time is considered in the same category with spatial dimensions of space, and its special ontological status is ignored.

One of Hawking's greatest difficulties lies in relating "imaginary time" to "real time." In imaginary time, how does one pass from the quantum state to real time? Hawking's uneasiness as far as imaginary time and real time are concerned may be seen in his book *A Brief History of Time*: "So it is meaningless to ask: Which is real, 'real' or 'imaginary' time?" Hawking's imaginary time concept has no validity in philosophical or physical terms or from the point of view of common sense. He failed to demonstrate how we were supposed to pass from this concept of his invention over to real time.

HAWKING AND POSITIVISM

In the beginning of the universe, that is, in Planck time, all laws of physics are stopped. An undefinedness, an unimaginability reigns. Avicenna says that non-existence is nothing, therefore unimaginable. The initial state of the universe fits Avicenna's definition of "non-existence" well. The mathematical formulas related to the beginning of the universe point to infinite density. But nothing in the universe can have an infinite density; this supports the postulate that the beginning of the universe was equivalent to nothingness. It is interesting that scientific formulas

and mathematical calculations indicate that the laws of physics will not be applicable to the origin of the universe. The fact that in the beginning of the universe there is no earlier space-time point indicates that the beginning is tantamount to nothingness. Definitions of a concrete entity wherein space and time do not exist are not possible.

It appears that Stephen Hawking saw this end; he is reluctant to see the inapplicability of the laws of physics. Hawking worked out his own positivism and imposed it on the universe through his invention of "imaginary time." Hawking may be considered as a theologian of positivistic religion. He interprets the moment at which the laws of physics fall into abeyance as recantation; not wanting to cease being a positivist, he clings to his concept of "imaginary time." Yet, as Hawking leaves the physical domain and passes over to philosophical ground, he becomes clumsy. Innumerable readers, who fail to follow his speculations, believe that his scientific approaches are correct and fail to assess the plight of his philosophy. On the other hand, many philosophers, who think it a merit to remain aloof from scientific data, have failed to see Hawking's blunder about "imaginary time" and the reason behind it. It is evident that this concept is in contradiction with philosophy, physics and common sense. Neither this concept, nor Hawking's positivism, can be attributed to the universe.

4.OCCAM'S RAZOR

USE OF OCCAM'S RAZOR

William of Occam (1285-1347) was a celebrated philosopher. The aim of Occam's principle is to avoid useless speculations. Its essence is, "do not multiply entities beyond what is needed," meaning that a theory should not propose the existence of

anything more than that needed for its explanations and that the simplest of competing theories be preferred to the more complex. This principle has been widely accepted both by modern science and by philosophers. We should learn how to differentiate between "the entities that exist in our minds and tongues" on the one hand, and "the entities that exist in reality;" this spares us useless and fruitless speculations. The razor in question is used for cutting off what is not necessary.

In theoretical physics there are many speculations deserving of being excised by Occam's razor:

1-Those assertions that are utterly groundless.

2-The assertions that fail to explain a single phenomenon in the universe and fall short of contributing anything to our knowledge.

3-The assertions that are but stuff for science fiction films and waste our time by stirring up useless controversies.

INFINITE UNIVERSES AND VACUUM FLUCTUATIONS MODEL

Mathematical models that do not contribute to our understanding of reality in the universe must be excised by Occam's razor. The mathematical model is of value so long as it contributes to our understanding of the universe. Otherwise, it is bound to remain a fiction. The models of the universe that try to explain it by endless universes would easily fall victim to William of Occam. None of these models are based on any evidence, nor do they contribute in the least to our understanding of any of the universal

phenomena. (Universes outside the confines of our own universe may well exist. To make a statement like: "There can be no universe outside our own," would mean that God could not create a universe outside the present one. Yet, to state that there can be no universe outside our own would be as speculative as to state there are indeed universes outside our own.) Most of the models of infinite universes are but products of efforts that try to explain the universal phenomena by pure coincidence. These models, to which we must turn a deaf ear according to William of Occam, we shall address all the same in the coming chapters and demonstrate that even though these models were to prove realistic, we could not deny the design of the universe in which we live.

According to the Vacuum Fluctuation model, our universe and many other universes were a result of quantum fluctuations. According to this model, the super space that gave birth to all the universes is like an ocean of soap bubbles and every universe is but a bubble of the super space. Our own universe is just one of the endless bubbles. Christopher Isham has pointed out the theoretical weaknesses of this model. If we go backward infinitely, as this model suggests, the said bubble-universes will scatter, and as they will expand, they cannot avoid coming into collision with each other. This is against all observations so far made.

The Chaotic Inflationary model of Andrei Linde contends that inflated universes are divided into tiny universes, which, in turn inflate to be further divided into tiny universes. He contends that this process goes on and on without interruption. In 1994, Arvind Borde and Alexander Vilenkin demonstrated that this model that keeps inflating from eternity onward could not have been perfect geodetically and that it could not escape the initial singularity. This model, like all other "infinite universes" models, is

devoid of all justification. Yet, for Occam's Razor to operate, there is no sense in looking for counter-evidence; the fact that the Vacuum Fluctuation and the Chaotic Inflationary models are devoid of any evidence and that they try to explain the single universe with infinite universes is sufficient reason for their elimination.

THE POWER OF THE BIG BANG

The endless universe models cannot escape the second law of thermodynamics. The conclusion one can draw from this law is the fact that entropy keeps increasing until it brings all the systems into a thermodynamic balance and that on that account there is a beginning of all physical systems. Moreover, given the philosophical evidences we have already examined, the fact that one cannot surpass the infinite invalidates all these models.

None of the models examined so far have had the evidences that the Big Bang has. They do not have even a single piece of evidence. As we went over the primary evidence of the Big Bang, we examined the observational and theoretical evidence that confirm the Big Bang. The study of the stellar exploration, the analyses of radioactive elements, the thermodynamic laws and philosophical reasoning have further corroborated the theory.

Once the expansion of the universe has become clear, no rational explanation for the attribute of eternity can be provided. As we shall be seeing in the next chapter, the materialists who claim that the universe existed from eternity have advocated throughout history the immutable structure of universe, of matter, even of the stars. This materialistic creed prior to the discovery of the Big Bang and the findings of modern physics showed how the

expectations should have been, had the universe been eternal.

To try to combine the new findings and the data of the Big Bang with materialistic interpretations is a psychological indication of a wish to evade the conclusions advocated by monotheistic religions. Materialism badly needs this eternal immutability; on the other hand, however, it is also a clear fact that the Big Bang has evidenced the continuous evolution that has been going on since the beginning.

III

THE BIG BANG JUDGES THE HISTORY OF PHILOSOPHY

In the next four chapters of this book I shall be judging the history of philosophy based on the conclusions of the Big Bang theory; I shall also evaluate the consequences of the Big Bang in terms of religion. Atheism existed in ancient historical times and it still exists today; skepticism existed before and it also exists now; monotheism existed before as it exists today. What have been the arguments of atheists throughout the past ages? What have the monotheists upheld up until now? What do the data of the Big Bang, the most important theory of astronomy, prove, either in favor of or against these creeds? The Big Bang theory has assumed the charge of judging the age-old controversial issue. This assessment also bears upon today's approaches to the subject.

Most of the scientists of the present century have been indifferent toward the philosophical and religious consequences of scientific data. On the other hand, some philosophers and theologians, without taking the least interest in scientific knowledge, have considered philosophy, religion and science to be fields having nothing in common. In the meantime, some scientists have displayed unsuccessful philosophical approaches inversely proportionate to scientific achievements. In the next four chapters I will try to demonstrate the philosophical and religious consequences of the Big Bang. Last but not least, an independent chapter will deal with the "argument from design." My objective is to demonstrate that science, philosophy and theology are inextricably blended, although they have different methods, that for a healthy and sound mind, no controversy can exist between them and that they cannot cover contradictory realities.

CHAPTER 6

VIEW THAT DENIES GOD'S EXISTENCE AND ACCEPTS THE ETERNAL EXISTENCE OF MATTER IN THE LIGHT OF THE BIG BANG

WHAT WOULD A MATERIALIST EMULATING HAMLET SAY?

The view that denies God's existence is the view of atheists. According to them, matter is not created; it cannot be destroyed; it is self-existent; it is the only substance, and nothing else exists. An ideologist of materialistic philosophy in the role of Hamlet would have said: "Whether matter is eternal or not, that is the question." Whatever exists, according to materialists, exists thanks to matter and its material. They postulate that a God who has created matter, a universe that depends on Him, and who is exterior to it cannot exist. Given the fact that this material universe has not been created and cannot be destroyed, it had neither beginning nor end. This has been maintained by atheists throughout history.

Today, there are those who argue that materialism conforms to the data of science. To examine this it is advisable that we

explore the basic arguments of materialists over the course of history, for these ideas, propounded at a period when scientific evidences were still inexistent, purported to indicate what should be now if the materialist view were true. A controversy that has been going on for millennia will be appraised and a conclusion will be reached in the light of the Big Bang. Two questions needing answers are:

1-What did they say?

2-What happened?

INDIAN PHILOSOPHY AND BUDDHISM

We note that a significant number of the Indian philosophies accept the idea that the universe has existed from eternity. Therefore, a major part of the partisans of Indian philosophies may be examined in the same category, i.e. as materialists who do not believe in God. A poet of the Jainistic creed sings his concept of eternal universe as follows.

No single being had the skill to make this world

For how can an immaterial god create that which is material?

How could God have made the world without any raw material?

If you say he made this first, and then the world, you are faced with an endless regression.

If you declare that this raw material arose naturally you fall into another fallacy,

For the whole universe might thus have been its own creator, and have arisen equally naturally.

If God created the world by an act of his own will, without any raw material,

Then it is just his will and nothing else and who will believe this silly stuff?

If he is ever perfect and complete, how could the will to create have arisen in him?

Taoism believes that the universe is self-generated and is eternal. However, there are Taoist commentaries that advocate contrary beliefs as well. In Taoism (in many of the Far Eastern religions, for that matter) we do not come across the explicit expressions we see, for example, in Marxism and monotheistic religions.

In Buddhism, it is believed that everything is made of matter, in conformity with mechanical laws without divine intervention. Certain branches of Buddhism may acknowledge the existence of God or gods; but as in the basic writings of Buddhism there is no mention of a God or gods, it may fit in the category of atheistic religions that accept matter as eternal.

DEMOCRITUS, EPICURUS AND LUCRETIUS

In the Far East, there have been partisans of points of view similar to those in materialistic thinking. Yet, for most of the books on the subject, the origin of materialism goes back to Ancient Greece. The first name mentioned is Democritus. According to him matter is made up of eternal atoms. His atomic system assumes an infinite multitude of everlasting atoms, from whose random combinations spring an infinite number of successive world-orders in which there is law but not design. He is considered the ancestor of our present day materialists. Once matter is taken to be everlasting and everything is reduced to matter, there is no need for a Divine Being, providing thus a basis for atheistic consideration. The idea of eternal matter had been insinuated previously, as in Anaximander and Heraclitus, although not explicitly stressed as in Democritus.

Epicurus was a faithful follower of Democritus. He also thought that there was an eternal world-order according to which births and deaths succeeded one other. The most influential materialist in history, Karl Marx, wrote a doctoral thesis entitled, *Philosophies of Nature in Democritus and Epicurus*.

Lucretius, Roman poet and philosopher, who is somewhat nearer to the materialists of today, advocated not only the eternal existence of matter, but, like the materialist atheists of our day, openly avowed that God did not exist.

*Our principle then will be
 Nothing can be created out of nothing with divine power.
 The mortals are taken by fright
 As they fail to find a perceptible cause
 Of phenomenon upon earth or in the sky
 It's easy to explain them by reverting to God's will
 Once we understand that nothing can come out of nothing
 We shall better see our way*

...

*All objects are made of
 Atoms and their combinations.
 For nothing can destroy them
 The fact they represent the absolute end will protect them everlastingly.*

MARXISM

Turgot, d'Alembert, and Condorcet were the prominent representatives of materialism, but Karl Marx and Friedrich Engels were the most celebrated founders of materialist philosophy. Marxist theoreticians contend that the most important issue of philosophy is the question as to whether the universe and matter are eternal; this is the most important characteristic that separates the materialists from other philosophies in their defense of the eternity of the universe.

According to Marx and Engels the main issue is the question as to whether nature is essential substance or not and that this question is the primary difference between materialism and idealism. On the other hand, George Politzer, the prominent exponent of materialism said that the basic question of philosophy (no matter how one puts it) is whether matter (nature) is eternal and eternally essential and soul (consciousness) but a derivation, or soul (consciousness) is eternal and essential and matter (nature) but a derivation.

Karl Marx and Friedrich Engels, whose influence has been great in the spread of atheism the world over, and their followers like Lenin and Mao, who put their theories into practice, have defended the eternal existence of matter. This principle is the sine qua non of their system. Avoidance of all sorts of idealism and being atheist form the basic tenets of communistic materialism. The attitudes of the communist materialists and other atheistic materialists are identical. The eternal existence of matter is the common incontestable denominator of all materialists. The following distinction can be made based on the common writings of materialist philosophers:

1-Either God precedes the universe and the universe is the work of God and materialistic philosophies are in error.

2-Or, matter is eternal and there is no God. Matter may explain everything and monotheistic religions are in error.

DIFFERENCE BETWEEN SUN WORSHIPPERS AND MATERIALISTS

We have seen the consequences of scientific discoveries in philosophical and religious terms. Let us take as an example a

religion whose followers worship the sun. Once the structure of the sun becomes enlightened by science, we are led to believe that the sun had a beginning and will have an end and the deification of the sun will be considered to have been erroneous in the light of scientific discoveries. Likewise, the Big Bang theory postulates that the universe had a beginning and it will come to an end. This fact repudiates materialistic philosophies. Sun worshippers may stick to their age-old beliefs despite scientific discoveries; as a matter of fact, there are still such intransigent people, even though their number is few. The persistence of materialism in spite of the Big Bang theory may be compared to the worshippers of the sun after the scientific structure of the sun came to light. It would be appropriate to style such a materialistic approach "unscientific materialism" or "fideistic materialism" rather than "scientific materialism."

An Indian who rejects the authority of science and intelligence may perpetuate his eternal universe belief within the endless cycles of this philosophy (or religion). But the same thing does not hold true for a Marxist-atheist who has sanctified science and always adopted an antagonistic approach toward religion and skeptical philosophies. For instance, Engels criticizes Kant based on the achievements of science. He said that we did not have sufficient knowledge of natural objects in Kant's age; and that though we might surmise that there was a *Dasein* (existence) enveloped in mysteries, those things considered inconceivable came within men's reach to be analyzed and even reproduced; he said that we cannot possibly say that we do not know anything about what we have produced and that in the first half of the 19th century organic matter was yet a mystery, but today we know how to compose them using their chemical elements without recourse to organic processes.

CHANGE THROUGH SCIENTIFIC DEVELOPMENT

Materialism, with its sanctification of science, assumes that the changes occurring in science must restructure philosophy. Lenin, quoting Engels, tells us that materialism should change its aspect at every new discovery that opens a new era in the natural sciences. The Marxist-materialists have stressed the importance they give to science, emphasizing their scientific backgrounds with such attributes as "scientific socialism" and "scientific materialism."

The materialists of the 19th and the following centuries used the achievements of science to oppose the idealism of Berkeley and skepticism of Kant. Engels used the advancements in chemical science to undermine Kant's skeptical approach to *Dasein*, in the same way that the Big Bang theory can now use advancements in science to pass judgment on materialistic philosophy. The theoreticians of materialistic philosophy discussed whether matter or God had existed eternally. But now developments in astrophysics are judging and countering materialism. This does not represent a superficial revision of knowledge, but rather the complete abrogation of materialism.

ABOLITION OF MATERIALISTIC ETHICS

Having lost the support on which they were founded, the philosophies that assume matter to have an eternal existence now must undergo complete changes in their systems. In the case of ethics, for instance, the ethics that grew out of systems that profess the perpetuity of matter must now be subjected to close scrutiny, since these systems assume matter to be the only essential element, postulate the inexistence of God and, consequently, construct their belief sets on these foundations. Since these foundations have collapsed, their ethics will, of necessity, collapse as well.

Not every philosophical or religious system that acknowledges the eternal attributes of matter defends a definite set of ethical rules; as a matter of fact, there are wide divergences in the ethical make-up of their systems. The hedonistic ethics of Epicurus, who held that pleasure is the chief good, the ethics of Buddhism that preaches spiritual purity and freedom from passions, and the ethics of militancy of Marxist ideologies cannot be considered identical. But all these divergent ethical approaches share the idea that matter is eternal and that there is no God. Once matter is considered eternal, the "human being" or "mankind" occupies the center of the concept of ethics, for it is he who is endowed with the consciousness that matter lacks. Buddhism's advocacy of salvation through the abrogation of passion and Epicurus's hedonistic approach were both human-centered.

Man's limited power does not allow him to cope with death, a grim reality facing mortals. Materialistic philosophies fail to rationally account for the renunciation of egoistic impulses by the man who considers life as a process of brief duration ending in death. It is true that certain classes of people who profess belief in materialistic philosophies are of exemplary character. This is not contrary to what has been suggested. What is meant here does not preclude a materialist's being of impeccable morals, but the fact that the materialistic philosophy's ethics cannot be rationally grounded. In creeds where God is acknowledged to be the Creator of the universe, ethics is God-centered since God's superiority, will and omnipotence are the basic postulates. By conceiving of the existence of God, man will be in a position to cope with the mystery of death and have rational grounds for expunging any egotistic impulses. We see that the Big Bang theory also has consequences in terms of "philosophy of ethics." Forming a belief in the existence of God and understanding that matter is not the essential and unique substance will lead us to the conclusion that ethical concerns will come to the fore by positioning God in the center.

ARGUMENT FROM DESIGN

Bertrand Russell said during a conversation, "*The universe is just there, and that's all.*" By this remark he meant that the eternal universe was the explanation of everything. Nevertheless, the Big Bang demonstrated that the universe was not the explanation of everything, that it required an Agent outside of its confines and that all materialistic philosophies postulated in the course of thousands of years have been in error.

Atheists like Lucretius, Marx or Russell contended that the universe had an eternal existence and that it was not designed. This is the natural consequence of their philosophy, for those denying God's existence are obliged to accept that the universe is the outcome of the concatenation of coincidences.

Yet, the phenomena occurring during the process of the Big Bang demonstrate that the universe is the product of a conscious Power. Had the Big Bang explosion been of greater or lesser intensity, the universe would not have formed, while all the critical values subsequent to it, from the ratio of matter and antimatter to the arrangement of entropy in the origin of the universe, point to a design behind it. All the critical values in matter owe their existence to the properties immanent in it. This is a sign that matter was a product of creation and all the process in the universe is the outcome of a design.

END OF THE UNIVERSE AND SUMMARY

We have seen that the universe is expanding. Under the circumstances, one of two scenarios is to occur. Either the universe will go on expanding, its end resolved in the Big Chill as a

consequence of the "cold death" or, when the expansion reaches a certain point, the gravitational force will start the shrinking process, the collapse referred to as the Big Crunch. In case of such a collapse, given the fact that the universe is no longer, time also will be obliterated and universal time will come to an end. Those who have discussed the philosophical consequences of the Big Bang have pointed to the origin of the universe, but have only superficially touched upon the apocalyptic issue.

Before science demonstrated the fact that the universe had a beginning and will have an end, atheists insisted that the universe was eternal. In the face of their own end in death, at least some of these atheists sought some limited consolation in the idea of an eternal existence of the universe. While passing judgment on the history of philosophy, the Big Bang also undermines this atheistic argument.

To summarize, the Big Bang theory invalidates all materialistic philosophies in five important points. Those who have built up their system of creeds, behaviors and morals within the framework of these philosophies should subject them to a revision. The five points in question are:

1-The universe is not eternal. The materialistic philosophies that postulate the universe and matter as the only substance have been invalidated.

2-The formulas of the theory of relativity have linked the universe and time; thus, the demonstration that the universe had a beginning is also a demonstration of the beginning of time. The materialist thinkers who perceive of time as an eternal and independently-existing entity are in error.

3-Processes that followed the Big Bang prove that there is a design in the universe. The materialist philosophy that denies the intervention of a conscious Creator has lost its validity.

4-Materialism imagined a universe and matter, steady and incorruptible and not subject to erosion by time. The actual evolutionary processes in the universe have proved that the reverse was true. The expansion, entropy, the conclusion reached about the prospective extinction of stars and light show that the only thing that never changes is continuous and uninterrupted change.

5-The universe has an end; it had an origin and will die like all other living things. This basic axiom of materialists has also been disproved.

CHAPTER 7

THE VIEW THAT HOLDS THAT BOTH GOD AND MATTER ARE ETERNAL IN THE LIGHT OF THE BIG BANG

TWO BASIC VIEWPOINTS AND A THIRD

Plato and Aristotle were two prominent historical advocates of the view that both God and matter are eternal. Their followers and devotees also shared their views. However, despite the fact that these celebrated philosophers uphold this view, the idea is not a fundamental one. Ideologists of materialistic philosophy seem to be justified in their arguments. Either God was before (eternal) and created matter; or matter was before (eternal) and there is no God.

The view of materialistic philosophy that considers the universe eternal and denies God and the view of the monotheistic religions that argues God to be eternal and the universe to be His creation were clearer in the minds of the general public than the view that accepted both God and matter to be eternal. The views of Plato and Aristotle and of their disciples on the issue called for interpretation, and some of their commentators interpreted them as monotheists, while others as deists.

PLATO'S IDEAS

Plato says that God created the universe out of "chaos" and gave it shape; the creation of stars was followed by that of the planets and Earth. Plato is nearer to the idea of creation than his disciple Aristotle, who maintained that the stars burn with an inexhaustible fire.

According to Plato, all objects in the universe are but reflections of real entities in the world of "ideas." In the world of "ideas" there is an archetype for every object (pen, table, etc.) and concept (beauty, etc.) that exists upon earth. These entities in the "world of ideas" are absolute. For Plato, objects on earth are created according to these "ideas;" in other words, God acts with reference to them. In Plato's writings, "ideas" have sometimes a supra divine existence and sometimes they are below God and sometimes they are integrated with Him. Plato considers God the absolute good and places Him at the peak of the hierarchy of existence. God's (Demiurge's) integration with "ideas" in certain passages of his work, his placing Him at the peak of the hierarchy of existence appealed to some thinkers, exponents of monotheistic religion, as they saw the "ideas" occupying God's mind as the primordial images of the created things. Plato's statement that "ideas" acquired their characteristics from the "idea of Good" and Plato's identifying God with the "idea of Good" fit in with this conception. Such a commentary draws Plato's philosophy to the account given by monotheistic religions. There are commentators who consider each "idea" as an independent atomized reality independent from God. The discussion of the divergence in the views of commentators is beyond our scope.

A concept that corresponds to the creation of matter ex nihilo does not exist; nevertheless, matter considered to be eternal

has nothing to do with the materialistic conception of matter. Plato's "matter" is shapeless, indefinite, invisible and indefinable. God shapes matter on the pattern of "ideas." Plato's conception of the world as the shadow of the "ideas" has inspired many mystics.

ARISTOTLE'S ETERNAL UNIVERSE PATTERN

Aristotle said that the universe was never in a "chaotic" state, that matter in the universe always had a form and that stars burned with an inexhaustible fuel. According to him, the origin of motion in the universe was God, whom he qualifies as the "Prime Mover." According to him, God is immaterial; He is absolutely perfect and immutable. Aristotle thought that motion had to have a Prime Mover, but failed to notice that matter had to have a beginning.

Certain commentators of Aristotle, referring to the philosopher as a "deist," said that he had considered God to be the Prime Mover, relegating Him to a place outside the universe. Yet, Aristotle not only placed God at the origin of the motion as 'Prime Mover,' but he also referred to Him as "*telos*" of the universe. How can He, toward whom the universe turns, be unrelated to the universe?

Aristotle said that everything has a final cause. This presumed the foreknowledge of all the phenomena designed to take place in the universe. Assuming that the evolutionary processes of the phenomena upon the earth are the stages a statue will be going through before it takes its final shape, the image of its finished form should have been in mind. Who is the owner of the design toward which the universe is directed? God, the source of "the final cause" and being *telos* of the universe cannot possibly be indifferent to the universe. To my mind, some of the modern

commentators try to build up an image of Aristotle that would fit into their positivistic outlook. However, most of Aristotle's postulations are at variance with these views. In his celebrated work entitled *Metaphysics*, Aristotle enumerates the attributes of God and says that the unity prevailing in the universe proves the unity of God. He stresses that God is the Law and the Lawgiver; that He is both Order and the Designer of Order; and that everything is arranged by Him and for Him.

We are not concerned here to find out who among the commentators of Aristotle is justified in his claims; however, ascribing Aristotle the pithy attribute of "deist" I think should be a matter of discussion. Aristotle justifiably leveled criticism at Plato's doctrine of "ideas." He was of the opinion that Plato's imaginary world made up of useless objects served but to generate confusion and failed to shed light on the things and motion in the universe. The criticism is against the consideration of ideas as atomized, abstract, real and independent beings.

According to Aristotle, "the final cause" is the sine qua non of the being upon the earth. The teleological interpretation of the universe is one of the major points shared by Plato and Aristotle.

FARABI AND AVICENNA

Plato and Aristotle shared some of the basic views of monotheistic religions and the fact that their studies encompassed social, political and scientific aspects of the world of phenomena had considerable influence on a great many thinkers of monotheistic religions. Muslim philosophers were the first to seriously consider these Greek Philosophers. Aristotle had decisive influence on Farabi, Avicenna and Averroes, who came into contact with him through translations.

These philosophers tried to integrate the creation out of nothing of Islam with Aristotle's eternal universe. They attempted to make a compromise between the Quran and Aristotle's philosophy. However the act of creation necessitated a beginning and "creation in eternity" thus clashing with the nature of creation that called for a beginning. It was clear that these philosophers were discordant with pure reason. Yet, Ghazzali's contention that they denied the act of creation has no justification. They did not deny the act of Creation, but introduced the idea of eternal universe that is incompatible with the essence of Creation. They considered God the Necessary Being, and the rest, beings dependent on Him. They also said that the attribute of eternity of the universe was not the same as the attribute of eternity of God. Farabi, in his *Al-Jam*, says that to believe in the eternal existence of the universe in this sense is tantamount to denial of God. They consider matter as an object subject to God's will that obeys every order that God gives. What is at issue for them is the clarification of the concept of "eternal." They are nearer to the creation concept of theistic religions rather than the eternal universe concept of Ancient Greece. Nevertheless, the evidence produced by the Big Bang that demonstrates that the universe had a beginning corrects these philosophers and proves the truth of the objections raised against them. The following two points correct the philosophies of Farabi, Avicenna and Averroes:

1-The universe has a beginning. It follows that the universe was created not "in eternity" but at a given point in time.

2-Universe-time also has a beginning; this is the same as the origin of the universe. Thus there is no justification in taking us back to the infinite and deriving from it the concept of "eternal time."

MONOTHEISM AND CREATION *EX NIHILO*

The Christian world came into contact with Plato and Aristotle through translations from the Arabic. Albertus Magnus and Thomas Aquinas were influenced by Aristotle's philosophy. Some Christians refer to them as "Christians before Christ." Aristotle's physics were adopted as the official view of the Church, and the process of sanctification of Aristotle's philosophy began. However, the Church that sanctified him did not sanction his concept of the eternal universe and never gave up its belief in creation *ex nihilo*. Those who, like his counterpart Ghazzali in the world of Islam, embraced Aristotle's logic and philosophy of nature strongly opposed his concept of an eternal universe, while a few philosophers who took sides with him accredited his concept of universe without having to drive apart the act of creation.

The answer to the question as to whether the universe and matter had been created or not will also be the answer to the question as to whether the monotheistic religions or Plato and Aristotle were right. The Big Bang postulates that the universe had an origin, which marked the beginning of time, and has thus substantiated the truthfulness of the monotheistic religions on this issue.

An interesting point is the absence of any dialogue about the creation *ex nihilo* in Ancient Greek. The eternity of matter was taken for granted, as an axiom. The question whether matter was created *ex nihilo* or otherwise had never been on the agenda. Rather, they debated about the elements of which the universe was made, the question as to whether there is finality in the universe and certain models. It is interesting to note that in such a serious atmosphere of philosophical debates this issue had not been raised. Other than those who advocated monotheism, the idea of creation *ex nihilo* did not occur to the human mind. The Big Bang supports the postulate of creation *ex nihilo* by pointing to the origin of matter and time, based on scientific evidences.

SCIENCE IN THE AGE OF PLATO AND ARISTOTLE

In the time of Plato and Aristotle, scientific discoveries were inadequate. When they stated that the sky had an eternal existence, they interpreted it as an object unchanging and one that is not subject to decay. The fact that all celestial objects are of the same material as our earth and that the same atoms are the constituents of space came to be realized thanks to sophisticated telescopes. Even elementary school students know that sublunary space is subject to change and decay, while the idea that superlunary space is unchangeable and incorruptible is erroneous. It is common knowledge now that the celestial bodies are no longer believed to be eternal. During Aristotle's time men labored under the illusion of an immutable universe, and the idea of the eternity of celestial bodies suited this fanciful conception well.

Aristotle's and Ptolemy's earth-centered universe concept was discredited following the discovery of the heliocentric system and the realization that the earth's constitution did not differ from the constitution of other stars and the sun. This new conception shook the Church, which had been advocating the truth of the Aristotelian and Ptolemaic systems. It is interesting to note that the Church, despite the overriding influence of Aristotle, never accepted his "eternal universe" concept. Despite the great number of divergences among the monotheistic religions themselves and in their subdivisions, they all share the view that the material world is transient and created.

This important point is a contention shared by all monotheistic religions. The establishment of truth will also be the establishment of the fact whether monotheistic religions can be relied upon or not. For the demonstration of this hypothesis means the collapse of all the systems challenging the monotheistic religions.

Plato and Aristotle were not fortunate enough to have the scientific data available today at their disposal. The chain of discoveries of Copernicus - Kepler - Galileo - Newton had not yet taken place, nor had they inherited the heritage of an Einstein. They knew nothing of the Doppler effect, or the Fraunhofer lines, and they did not have the infrastructure to enable them to make trustworthy astronomical observations. One can see that no matter how sophisticated a philosophy may be, so long as it is deprived of scientific heritage and instruments of observation, along with products of technology and experimental facilities, it is bound to remain lame and liable to error.

BEGINNING OF TIME AND SUMMARY

We can briefly summarize as follows the corrections brought to the Ancient Greek philosophy by the Big Bang and the science of physics:

1-It has been demonstrated that the universe and matter are not eternal. The view poised by the followers of monotheistic religions that the universe and matter are not eternal has proven to be justified.

2-According to the Aristotelian and Ptolemaic systems, the universe is confined within static boundaries. The fact that the Big Bang theory brought to light an ever-expanding universe has proved that the universe has no static boundaries, as these boundaries are expanding every moment.

3-The Big Bang theory postulates that a time will come when the celestial bodies will vanish; this in fact eventually came to be proved through observations of the stars and astronomical calculations. This has disproved the belief of the Ancient Greeks in

the existence of an inexhaustible fuel consumed by the stars and of the divine character of the superlunary world.

4-The formulas of the theory of relativity have linked the universe with motion and time. The demonstration of the origin of the universe has also demonstrated the beginning of motion and time. This has corrected the Greek misconception that had supposed the universe and time eternal.

5-The Big Bang theory has proven that the universe is not eternal and that a day will come when the universe experiences a Doomsday. This conception of "Doomsday" does not figure in Plato's and Aristotle's philosophies. The Big Bang theory points to this lack in their philosophy and corrects their ideas of a never-ending universe.

CHAPTER 8

AGNOSTICISM IN THE LIGHT OF THE BIG BANG

SCEPTICAL APPROACH TO ALL SORTS OF ARGUMENTS

The agnostic neither advocates that God exists and matter is created, nor espouses the idea that God does not exist and matter has an eternal existence. He merely posits that neither of these assumptions can be proved or falsified. The postulation about the fact that matter cannot be eternal is also an answer to the agnostic approach that affirms that both views are devoid of evidential proof. Let me summarize as follows:

1-Either the view according to which "God does not exist and matter is eternal" is correct; or the view that suggests that "both God and matter are eternal," or that "God exists and matter is created" is correct.

2-Having demonstrated that matter does not have eternal existence, the view that advocates that God does not exist and that matter is eternal has been invalidated (Chapter 6) and the view that maintains that " God and matter have eternal existence" has been proven false. (Chapter 7).

3-It follows that the postulate that suggests that “God exists and that matter is created” is correct.

Those who defend the agnostic attitude will not raise any objection to the first premise. Their objection will be against the second one. They have argued that the views we have refuted could not be refuted. Therefore, the correctness of the conclusions reached in chapters six and seven of this book invalidate the agnostic approach and demonstrate the correctness of the view we have indicated under premises two and three.

AGNOSTICISM IN ANCIENT GREECE

The origin of agnosticism dates back to Ancient Greece, in fact, as far back as the Sophists. Protagoras, the most famous among the agnostics, was of the opinion that nothing certain can be known about anything and that man should do better to deal with himself only. He said that humans were the measure of all, i.e there is no objective truth; the world exists for each person as it appears to that person. Had Protagoras been alive today and seen that you were reading the present book, he would quite probably have said that you should do well not to waste your time and try instead to find ways to make yourself happy. I hope, however, that you turn a deaf ear to him.

One of the possible consequences of the assertion that there can be no correct and reliable knowledge will lead a man to self-centeredness and oblige him to deal with all the events of life, like the difficulties of everyday life and death with what lies in his own power. However, not all agnostics have had the same view of life and moral criteria. Those like Protagoras and Gorgias, who advocated that all criteria were relative and that nothing certain can be known, could not work out the most fundamental moral laws like respect for human life and property. The demonstration of the fact that agnosticism is in error, will, of necessity, bring

changes in the most practical issues of life, such as ethics. Establishment of certain facts in such fundamental issues will also determine the background on which moral values will be based and save the practical side of life from relativism and nihilism. It is not our intention to go into the details of moral philosophy; however, the theoretical character of discussions in this book draws attention to practical ends related to our dealings in daily life, to the manner we shall be handling what, how and why.

DAVID HUME AND SUFFICIENT UNIVERSE

Although the roots and history of agnosticism date back to Ancient Greece, David Hume and Immanuel Kant were also prominent representatives of agnosticism. Hume, in his *Dialogues Concerning Natural Religion*, suggests that an eternal universe may be conceived of, just as we conceive of an eternal God. Hume's approach fits the viewpoint of materialistic philosophers exactly.

While Hume renders the existence of God doubtful, materialistic philosophers claim that God does not exist and that the universe is eternal. Hume casts doubt on the "causality" that the materialists have never denied; he even goes so far as to doubt the existence of matter and the universe which materialism posits as the only eternal basic fact.

According to Hume, the material world may be deemed to be essentially the eternal basic element and God may be ignored; if this probability is also taken into account, God's existence becomes doubtful. He says that the universe may well be the product of coincidental processes rather than the work of a conscious Creator. According to him, we cannot assert that there is finality and an intelligent design in the universe; the whole order of the universe may be immanent only in it. Hume is of the opinion that we have no corroborative evidence for any claim.

KANT'S AGNOSTICISM

Hume's heritage had a great influence on Kant's agnostic views. Kant is claimed to be the most systematic thinker advocating agnosticism. However, unlike many other agnostics, he did not transfer his skeptical approach in metaphysics and cosmology to that of morality. Kant opposed the kind of relativity that denied absolute truths in the field of ethics and advocated a system in which the 'sense of duty,' the existence of God and the Hereafter were incontestable tenets for the actualization of ethics. He is the only philosopher who used ethics to try to demonstrate the existence of God.

Kant, who advocated a faith in God and in the Hereafter for practical reason, was the foremost representative of agnosticism for pure reason. No important philosopher before him let theory be dominated by practice. He produced a philosophy that perfectly fitted fideistic views (the doctrine that the principles of some areas of inquiry cannot be established by reason, but must be accepted by faith). He fought in this way against all the rationalistic evidences of both religion and atheism.

“ABSURD” AND “INCONCEIVABLE”

To demonstrate the impossibility of rational metaphysics, Kant claims that when the mind begins to meditate on metaphysical issues it runs into insoluble contradictions. He calls this antinomy, a contradiction between two laws or beliefs that are reasonable in themselves. The first such antinomy is as follows:

Thesis: The universe has a beginning in time and is confined in space.

Antithesis: The universe does not have a beginning in time and is not confined in space.

For a possible solution of Kant's antinomies I suggest that a differentiation be made between the concept of "absurd" and "inconceivable." If either of these propositions is proved to be absurd, the other one will be correct. If the universe is eternal, then the time past was infinite and the said past time had been crossed over to come to the here and now. This fact contradicts the definition. An infinite set is a set that goes on without ever coming to an end, which means that there is no crossing over the infinite. The error in the proposition that the "infinite" has been surpassed (a *sine qua non* of the eternity of the universe) is perceived by the analytical analysis (analysis of the concept of eternity) of the said proposition. This is similar to the conceiving of the error in the "triangle has four sides" by analytic analysis. The fact that a triangle cannot have four sides is evident by its very definition; the fact that infinite cannot be surpassed is evident from its definition.

An incorrect proposition in analytical terms is a proposition whose absurdity is evident. Therefore, the antithesis of Kant's first antinomy may be reduced to absurdity and refuted. On the other hand, the expression stating that the universe had an origin in the thesis of Kant's antinomy cannot be reduced to absurdity. We can evidently affirm that how the beginning of the universe took place is itself inconceivable; we can state that we are not in a position to know how God gave the start to time. But then, this is in the category of that which is "inconceivable." We do not know how the bee makes the most perfect hexagon in the world. We do not know why and how water molecule freezes at zero degrees. We cannot refute these propositions about things beyond our conception. Yet, no one can possibly refute the existence of either the bee or the water.

Time, by definition, does not require being without a beginning. Using an analytical approach we cannot assert anything to the contrary and cannot reduce the absurdity of the thesis that

time has a beginning. (I believe similar differentia would also be applicable in the solution of Kant's other antinomies).

ABSOLUTE AND RELATIVE TIME

We observe that Kant has arranged his antinomies in terms of "absolute time." The reason is that he was strongly under the influence of Newtonian physics. According to the concept of "absolute time," time flows independently from the universe and the universe has existence within this "absolute time." Yet, according to the "relative time" that Einstein postulated theoretically and supported later by observational data, time is affected by universal variables like speed and gravitation; time-space-matter are inextricably bound together and if any of them is absent the rest also cease to exist.

The Big Bang theory put an end to the insolubility of Kant's antinomy by pointing to the moment of the beginning of the universe. Moreover, by positing the continuously expanding model of universe, it provided a solution to Kant's antinomy as to its infinity in contradistinction with the "infinite universe idea" like the one imagined by Giordano Bruno and the "confined universe" of Aristotle.

The conclusion of William Lane Craig, who worked on the antinomy of Kant we have analyzed, is interesting. Craig says: "*The answer to Kant's conundrum was carefully explained by Ghazzali and enshrined in the Islamic principle of determination. According to that principle, when two different states of affairs are equally possible and one results, this realization of one rather than the other must be the result of the action of a personal agent who freely chooses one rather than the other. Thus, Ghazzali argues that while it is true that no mechanical cause existing from eternity could create the universe in*

time, such a production of a temporal effect from an eternal cause is possible if and only if the cause is a personal agent who wills from eternity to create a temporally finite effect. For while a mechanically operating set of necessary and sufficient conditions would either produce the effect from eternity or not at all, a personal being may freely choose to create at any time wholly apart from any distinguishing conditions of one moment from another. For it is the very function of will to distinguish like from like. Thus, on a Newtonian view of time, a personal being could choose from eternity to create the universe at any moment he pleased. On a relational view of time, he could will timelessly to create and that creation would mark the inception of time. Thus, Kant's antithesis, far from disproving the beginning of the universe, actually provides a dramatic illumination of the nature of the cause of the universe; for if the universe began to exist, and if the universe is caused, then the cause of the universe must be a personal being who freely chooses to create the world."

DESIGN OF SPATIAL AND TEMPORAL INTUITIONS

We shall now digress a bit and dwell on Kant's a priori spatial and temporal intuitions. If we combine this conviction of Kant, a conviction that made him immortal, and the data of the relativity theory, I am of the opinion that we shall acquire important additional evidence for the design of the consciousness (or soul) of man. The agnostic attitude contends that a design or finality can have no foundation in the universe; therefore, it would be interesting to stress the error in an assertion of Kant with a point he himself has put forward.

Kant proves a series of evidences with a view to proving the fact that spatial and temporal intuitions originate not from experience but from reason, a priori. Little children, without having a distinct conception of distance, try to go near things that

seem enticing and move away from things that seem to them to be repulsive. This shows that they have an a priori intuition of whether the thing in question is next to them, in front of them or outside their reach. A child also has an innate intuition of "before" and "after" without prior acquisition of knowledge about the outside world; had this not been the case, he could not have perceived the outside world or all his perceptions would have been in a muddle. We cannot think unless we take space and time into consideration. This impossibility proves that the said intuitive knowledge is already in the mind and does not derive from experience. According to Kant, a realization of the correctness of arithmetical and geometrical truths without recourse to any experiment is evidence of the fact that the spatio-temporal perceptions are innate, a priori conceptions. These truths come within the sphere of space and time.

Kant's conception of man's innate capacity of perception of space and time is correct. This manner of perception, which is innate, is as real as the entities of space and time. Kant merely pointed out the innateness of intuition of space and time in the mind. None of Kant's demonstrations requires the denial of the existence of time and space. Modern physics and common sense posit that these have real existence - although not absolute, but relative - outside man's mind, for, had it not been so, the order observed in perceptions would not have been possible. This harmony between the mind and the universe cannot be accounted for without acknowledging the existence of a Creator who has established a perfect harmony between the mind and the universe. Nor can we surmise the evolution of these categories to have been coincidental, for in the material universe no substance can be detected likely to form spatio-temporal perception in the mind. The substance out of which the universe is made exists in space and time, but the substance shows no evidence showing a potential

susceptible to transformation into a spatio-temporal intuition; moreover, the spatio-temporal intuition cannot come about as a consequence of a haphazard mutation. One cannot imagine one-fourth temporal intuition or half-spatial intuition. Man cannot, in fact, exist without this capacity.

The Big Bang theory described the evolutionary process of the universe outside us up until now and was a blow to agnosticism. The outside world that was henceforth described in mathematical formulas and preconceptions about the universe, sub-atomic particles, planets and satellites proved to be correct. Satellites were launched into space thanks to these formulas and calculations were made of the ages of galaxies. Productions realized from these formulas were placed into the service of mankind. There is certainly no end of things awaiting discovery yet, but the fact that the mind's conception of the universe within this framework is something to wonder at must not pass unnoticed. This perception of the mind is made possible by the harmony reigning between the mind and the universe. This, in turn, is not possible without a Designer of all these things. The simplest knowledge about the universe might have been incomprehensively complicated, or the universe might be a chaotic entity undecipherable like a dream, or again the mind might be deprived of the capacity and a priori intuitions to conceive the universe.

KANT AND ARGUMENTS FOR THE EXISTENCE OF GOD

Kant takes up three arguments for the existence of God's and states that, based on these arguments, God's existence cannot be proved. Kant's first criticism is of the ontological argument. The ontological argument claims that the concept of God is innate in man. It is acknowledged to be an evidence of God's existence. This

evidence was corroborated by Anselm, Avicenna and Descartes, among others, in different arguments. Kant's criticism of this evidence does not come under the present study.

Kant's criticism of the second argument is cosmological. Based on this argument, one can deduce the existence of God as a consequence of the existence of the universe. This argument entails different formulas. It implies the existence of the universe as a fact; the universe is, therefore, a phenomenon necessitating clarification whose reason cannot be considered immanent in it, but can be explained by the existence of a Creator God. According to Kant cosmological evidence states unjustifiably that without Primary Cause there can be no causality. This is similar to the arguments put forth by Kant in his fourth and first antinomies that I rebutted (Kant's objection to the cosmological argument is against Leibniz's formulation).

Muslim philosophers' formulation of the cosmological argument can be summarized as follows:

1. Everything that has a beginning requires a cause.
2. The universe has a beginning.
3. Therefore the universe has a cause.

Kant seems to raise objection to the second proposition. In fact, the second proposition is the critical one. We have demonstrated in philosophical terms the correctness of this second proposition in the fourth chapter. All the evidence related to the Big Bang theory, and other scientific evidence like entropy, corroborates that the said proposition is true. Like Hume, Kant said that if God does not have to have a cause for His being, why not think that the universe should likewise be its own cause? Laws of thermodynamics and other physical and philosophical evidence,

along with the Big Bang, demonstrate that the universe had a beginning, thus discrediting the most important objection to the cosmological argument posited by Hume and Kant.

NECESSARY BEING

I have already pointed out that the cosmological argument may have been assumed differently. The formulation of the evidence based on the differentiation between "Necessary Being" and "contingent beings" by philosophers of Islam is important for our issue. Asserting that the Necessary Being does not exist creates a contradiction in the mind; on the other hand, asserting that the contingent beings whose existence depends on others, do not exist is also possible or can exist is also possible. We cannot explain the contingent beings through the endless chain of causality moving backward; they must end up at the Necessary Being. According to this, in this universe where continuous changes occur, everything that did not exist before but came to be afterward was a possible being before coming to be realized and is a contingent being thereafter. Had their existence been impossible they would never have come into being anyhow. Thus, the contingent beings ought to come to an end at the Necessary Being who has no beginning; the Necessary Being we call God. The Big Bang theory supports this argument of the philosophers of Islam as follows:

1. Every contingent being necessitates a Necessary Being. To imagine the inexistence of what is contingent is not a contradictory statement.

2. Either the universe or God is the Necessary Being.

3. The universe is a contingent being; it cannot be the Necessary Being. The Big Bang theory has demonstrated that the universe had a beginning; therefore it cannot be the Necessary Being.

4. It follows that the universe requires a Necessary Being. Given the fact that the universe is not the Necessary Being; God must be the Necessary Being.

Kant's attitude with respect to the teleological argument is somewhat different, although his agnosticism subsists. He refers to this argument as an argument of which man must think highly, for, according to him, it is the oldest, the dearest argument. While it encourages us to study nature, it draws its power from nature. It proves the way to an increase of our knowledge guided by the concept of mechanic unity. It leads us to the belief in the Creator of the world thanks to consolidated knowledge. Kant's attitude is reverential to this argument. As a matter of fact, in one of his early works, namely "***A General Natural History and Theory of the Heavens,***" he makes statements in conformity with this argument. Acknowledgment of this argument by Kant would be tantamount to his defense of the possibility of a rational metaphysics. Yet Kant could not possibly acknowledge such contradiction. As a matter of fact, he denied the authority of such argument. In the last chapter, I will discuss in detail "the argument from design." This indicates that such a design can be implemented by the intelligent arrangement of inherent characteristics within matter, like the laws of physics. This, in turn, demonstrates that matter is created. This also signifies that these pieces of evidence are the consequence of a design behind all the universal phenomena and that all the processes in the universe are dominated by God, so that all celestial bodies, sub-atomic particles, the earth and living beings are the products of design. Most of this was still unknown in Kant's time. I am curious to know how Kant would have reacted had he come to know of this new body of evidence.

We can summarize briefly the corrections the Big Bang theory introduced to agnostic philosophers:

1. It has become clear that the universe is not eternal and that it had a beginning. The contention of philosophers like Hume and Kant expressed by the statement, "Why shouldn't the universe be the explanation of everything?" has been negated.

2. The formulas of the Big Bang theory and of the theory of relativity have made clear that the beginning of the universe was also the beginning of time. The agnostic attitude that said that we could not know whether space and time had a beginning or not has been found untenable.

3. The Big Bang theory has demonstrated that the universe had expanding boundaries. Thus, the agnostic attitude that professed our ignorance about the boundaries of the universe has been corrected.

4. The data of the Big Bang theory demonstrates that the agnostic objection to the "teleological argument" has been invalidated.

5. The Big Bang theory postulates that the universe would come to an end just as it had had a beginning. The agnostic conception that ignored the possibility of a rational cosmology came to be discredited by the scientific acquisition of knowledge of towering importance, namely of the knowledge indicating that the universe will have an end.

CHAPTER 9

BELIEF IN BOTH GOD AND THE CREATION OF MATTER IN THE LIGHT OF THE BIG BANG

MONOTHEISTIC AND OTHER RELIGIONS

It has been the privilege of monotheistic religions to vindicate God's existence and the fact that matter was created and the universe will come to an end when the time comes. Regardless of divergences of opinion among the various sects and commentaries of Judaism, Christianity and Islam, the monotheistic religions share these basic tenets. In contradistinction with the common assertion of all materialistic philosophies about the eternal existence of matter, the monotheistic religions concurred in the fact that the universe had had a beginning and would come to an end. This assertion is of paramount importance, as it distinguishes the monotheistic religions from all other convictions. The answer to this issue will also demonstrate the reliability of the monotheistic religions.

THE BIBLE AND GENESIS

The initial verse in the Bible says that God created everything:

In the beginning, God created the heavens and the earth.

Genesis 1-1

Biblical commentators like Abravanel say that the Hebrew word “*bereshit*,” the introductory expression, means “in the beginning of time.” This signifies that the creation of time and of the universe was coeval.

In the continuation of this introduction we read that God created the light, the seas, the stars and the living beings. According to this statement, the entire universe is the work of an all-powerful Creator. Every created thing has a definite purpose. In the perpetual presence of God, the universe is an entity having a beginning. The conclusion derived from this hypothesis is that matter and everything made of matter cannot be the essence and purpose of life. God, the creator of everything, is the *telos* of the universe and life's true purpose. The Hebrew expression meaning creation is *bara*. This expression is used throughout the Bible only for the acts of God. Hebrew linguists interpret it as “creating something out of nothing.”

The Gospel according to John reads:

All things were made through Him, and without Him nothing was made that was made.

John 1-3

St Augustine, the foremost theologian of Christianity, says

that philosophers unjustifiably contended that creation in time meant an eternal immobility of the Creator. Their error lies in their conviction that time before the creation was an infinitely long period. There can be no space and time before Creation.

The Creation is described in greatest detail in the Quran. Hundreds of verses speak of the creation of the universe and all the living in it by God. Expressions used are *halaka*, *bedae* and *berae*. Nouns derived from these verbs are *Al-Halik*, *Al-Mubdi*, *Al-Bari*. Here are a few of the verses in question.

He is the Creator of the heavens and the earth. To have anything done, He simply says to it, "Be," and it is.

2 The Cow, 11

He is God, the Creator, the Maker and the Designer: to Him belong the most beautiful names. Whatever is in the heavens and the earth glorifies Him. He is the Almighty, the Wise.

59 The Exodus, 24

BIG BANG'S COROLLARIES AND MONOTHEISTIC RELIGIONS

The fact that the corollaries of the Big Bang theory have supported the arguments of monotheistic religions throughout history will be summarized in five points. There is no religious and philosophical system that has advocated all these points together.

1-THE UNIVERSE IS CREATED AND HAS HAD A BEGINNING

The controversy about whether the universe has existed from eternity or not has yielded its place to the discussion about the exact time of the beginning. All the various methods of calculation point to approximately 15 billion years ago.

The most important breakthrough among the consequences of the Big Bang theory was its demonstration that the universe had a beginning. Throughout history, more or less all atheists have postulated the eternity of the universe as an alternative for God's existence. Hoyle argued against the Big Bang but acknowledged the fact that if it were indeed true, it would have been the answer to the postulation of creation out of nothing. The Big Bang theory as interpreted by Hoyle would lead back to nothing in case of recession in time. Briefly put, even the opponents of the Big Bang theory acknowledged that it would be the answer to creation ex nihilo.

Nothingness means the undefined; if there was nothing in the beginning of the universe, the origin of the universe cannot be defined. Calculations made based on physical laws indicate that in the beginning of the universe, laws of physics were inapplicable. This means the establishment within the framework of physical laws of the moment at which laws of physics lost their applicability and that no one expected that science would lead us to such a conclusion. William Lane Craig said: "*The initial singularity is not an existent. That is to say, the singularity has no positive ontological status: as one traces the cosmic expansion back in time, the singularity represents the point at which the universe ceases to exist. It is not part of the universe, but represents the point at which the time-reversed contracting universe vanishes into non-being. There was no first instant of the universe juxtaposed to the singularity.*" The theory of relativity

links space, time and matter to each other. When the expansion is reversed, the folding up of the entire universe makes matter irrelevant, that is, having no existence.

The age-old argument of atheism is linked to the eternity of the universe. We have observed that once the postulate put forward by the Big Bang theory was acknowledged to be irrefutable, atheistic approaches proved to be forced and unrelated to the atheism advocated throughout history, and were but a consequence of despair for fear of losing the established creed. The Big Bang theory has discredited all the atheistic theses and demonstrated their absurdity. Thus, the argument that God's existence was an inescapable fact has prevailed and the thesis advocated by monotheistic religions has found support. This has also made monotheistic religion reliable.

2-TIME IS ALSO CREATED

Monotheistic religions have always asserted that the universe was created. The controversy whether time was created or not has not been an issue of hot debate between believers and atheists as such. Yet, the fact that time also was created *ex nihilo* has been the general creed in monotheistic religions. The expression "God has always existed" has been interpreted by some people as connoting God's existence in an infinite time, but the prevailing assumption is that God is "timeless," "supra-temporal" and the "Creator of time."

The Big Bang theory and the theory of relativity provide scientific evidence for this widely-shared view of monotheistic religions and inextricably linked space, matter and motion together

and demonstrate that the nonexistence of any one of them also nullifies the others. The Big Bang theory has shown that in its beginning, the universe was in a state in which space folded up and motion came to a standstill and the laws of physics became inapplicable. This, in turn, is the negation of time. In point of fact, the studies of Penrose also include a detailed demonstration of this, based on mathematical formulas.

3-THE CREATION OF THE UNIVERSE FOLLOWED A PROGRESSIVE EVOLUTIONARY PROCESS

A common assertion of the three major monotheistic religions is that the creation process took six days. The Hebrew word for day is “*yowm*” which signifies 24 hours, as well as a “temporal unit.” Many Biblical commentators have argued that this expression of Genesis means a “long temporal unit.” The Quran also says that the creation process lasted six days/six periods and uses the word “*yewm*” which stems from the same root as the Hebrew. Quranic commentators also say that this word signifies a “long temporal unit.” On the other hand, a day made of night and day is a consequence of the fact that the world was created and of the processes operating in the world. In a state wherein the world was not yet in existence, one cannot speak of world's “day,” therefore “*yowm*”/ “*yewm*” must be understood as a “unit of time.”

To sum up, the monotheistic religions do not speak of a spontaneous creation accomplished once and for all. They state that the universe evolved in stages. The Big Bang admirably describes the stages that the universe has gone through. In the beginning of the primary explosion the universe was very dense and hot; along with the process of expansion, the density and heat marked a fall that gave rise to successive stages. The primary explosion was succeeded by the formation of sub-atomic particles out of which atoms took shape to eventually form the various

phases of celestial bodies. All these processes involved stages and the phenomena in each of them varied from one another.

The data produced by the Big Bang fit well the accounts given by monotheistic religions wherein the creation is described to have taken place in stages. The steady model of the universe that had previously been foreseen by Aristotle, who believed that the celestial bodies burned with an inexhaustible fuel, does not fit in the universal design that implies successive stages of development. The data of the Big Bang and modern physics are compatible with monotheistic religions.

Monotheistic religions believe in an all-powerful God who dominates the universe. A model of the universe, as if it were a clock that runs monotonously, may not adequately present active God of monotheistic religions. This model, which entails various stages of development, invalidates the deistic approach that prefers to remain content by placing God at the beginning of the universe, as only the ordainer of physical laws, ignoring His active participation in it. The successive creative processes at each stage of this model are further evidence of a teleological argument.

Many among those who studied the philosophical consequences of the Big Bang have dwelt in detail on the “origin of the universe”- which is the most important consequence - but have not given due emphasis to the issue stated here. This consequence was of special importance, as it pointed to the fact that the data provided by the Big Bang were in perfect accord with the age-old assertions of monotheistic religions.

4- THE UNIVERSE IS DESIGNED

Monotheistic religions imagine God as a Power with consciousness, Omniscient and Omnipotent that freely disposes of

the material universe. The aforementioned epithets are among the most known attributes of God. The design in the universe is referred to in the demonstration of God's existence as argument from design, teleological argument, argument of purpose and order which are endorsed by God's most important attributes. The number of data ranging from our heliocentric system to the subatomic world, from the chemistry to the world of the living, is almost endless. The processes that succeeded the Big Bang are corroborative of these infinite numbers of data. For instance, the intensity of the primary explosion determines the expansion rate of the universe. Had the speed of this expansion been less, all matter would have collapsed under the gravitational force and the universe would not have formed. Had it been greater, the matter of the universe would have scattered around and the consequence would have been the Big Chill; the universe would still be impossible. One observes that the expansion rate of the universe was arranged with an incredible exactitude. The whole scheme of the Big Bang was so designed that the Big Bang was not a haphazard explosion but a teleologically arranged blast, well calculated and implemented.

The initial moment of the creation that involved low entropy made possible the formation of galaxies, celestial bodies and of living beings. Critical values observed at every stage of the evolution of the universe enabled the emergence of life on earth. These critical values have been taken into consideration in the proportion of the particles that came about in the subatomic world and of the antiparticles, in the value of the nuclear force within the atom and electromagnetic force and in the proportion of the rate of protons and electrons. All these were made possible by the design and arrangement prior to the big explosion. On the following pages we will discuss this subject in more detail.

5- THE UNIVERSE WILL COME TO AN END

Another important point that distinguishes monotheistic religions from all other systems of thinking, religions and philosophies is their statement that there will be an end of universe and the earth. Not enough emphasis has been given to this point in the discussions about the philosophical consequences of the Big Bang. Yet it has great importance, as it shows who is justified in his claims throughout history.

Two epilogues may be envisioned for the expanding universe:

1. Either the universe will go on expanding until it experiences the 'heat death' called the Big Chill.
2. Or gravitational force will prevail and the universe will recede, shrinking till it is resolved into a singularity, called the Big Crunch.

No matter which will come to pass, it is certain that the universe will have an end. For millennia, atheists and others, in their opposition to monotheistic religions, have claimed that the universe will exist forever, and have sought consolation in the eternity of the universe for their transitory life on earth.

In eschatological accounts, the expectation of the end of the world occupies an important place. In this connection, it is worthy of note that reincarnation in Hinduism postulates that the universe existed from eternity and will go on to exist endlessly and that the souls will continue to reincarnate. The model of a universe existing forever has played a significant part in the formation of this conception. The Big Bang's demonstration that the universe had a beginning and an end not only weakened Indian philosophy, but also discredited the belief in reincarnation.

Eschatological accounts of monotheistic religions commence after the end of the universe and life on earth. The corroboration by the Big Bang theory of this assertion of monotheistic religions supports the eschatological accounts of monotheistic religions.

FURTHER CORRECTIONS BY THE BIG BANG THEORY

The Big Bang theory's corrections have not been limited to the atheistic view of the world, as it also introduced amendments to certain creeds: among others, to mystical and philosophical approaches. Some Muslim and Christian mystics and philosophers like Berkeley have claimed that the perception of the universe existed only in the mind, outside of which nothing exists, while the sacred texts of monotheistic religions openly announce that God created the universe and matter. They could not have meant that the creation was limited to the confines of our imagination. The fact that the universe was created “with reality” is clearly expressed in many parts in the Quran:

We created the heavens, the earth, and everything between them only with reality and for an appointed time.

46 The Dunes, 3

The Big Bang theory discredits the materialistic view according to which the universe has existed from eternity and will go on existing for ever and ever. This does not imply that the universe is but a figment of our imagination. Advances in physics have demonstrated that the universe can be expressed in mathematical terms and that it was perfectly designed. To claim that the universe expressed with mathematical formula, about the creation of which we have acquired so much scientific knowledge, is but the work of our imagination, is to contradict science,

common sense and religion. This assertion, having the touch of religion but contradicting it, is a glaring mistake. There have been people who espoused this idea against those who displayed hostility toward religion by using religion. We have seen in the present book that the religion revealed by God cannot clash with science, the knowledge of the universe that God created. Any likelihood of a clash is due either to a misinterpretation of religion or to a misinterpretation of certain discoveries. Science has demonstrated that the universe is subject to the laws of science and can be expressed in mathematical formulas.

There have been mystics and philosophers who make assertions that are hardly compatible with common sense. The concept of *wahdat al-wujud* of which the famous proponent is Muhyiddin Ibn Arabi, often quoted along with Spinoza, is also referred to as pantheism. According to this conception, God is the universe itself; there is no distinction between God and the universe; the Big Bang theory, which reduces the origin of the universe to nothingness, refutes identifying God with the universe. The Big Bang theory necessitates a God who is transcendental, Creator of the universe and time. Identification of the initial singularity with God or a part of Him is impossible.

The Big Bang theory also invalidates "process theology." Advocates of "process theology" postulate that both God and the universe are in a process of development, during which God and the universe affect each other. The fact that the universe had a beginning totally discredits this view. The conception of the singularity in the beginning shows that the universe cannot be of a constitution likely to cause changes in God, and that the evolutionary process occurs unilaterally in the universe. Moreover, the fact that the evolutionary process in the universe will come to an end has demonstrated the fallacy of this argument.

UNITY OF GOD AND THE BIG BANG

The Big Bang produces evidence not only for God's existence, but also for many of His attributes. In our day, we can still observe traces of polytheism. According to polytheism, divinities have respective domains over which they are sovereign. Some worship the sun, some the moon and others have imagined mountains to be the abode of gods, thus lending divine attributes to natural phenomena. One thing they have in common, though: a divided universe in which the respective wills of gods cause it to fall apart.

The Big Bang is the best evidence of the unity of the universe. It has discredited all polytheistic concepts and produced evidence attesting to the unity of God. Some philosophers expressed this by the formula, "One comes out of One." The unity in the universe was recognized even before the discovery of the Big Bang and the laws of modern physics. What the Big Bang theory brought us is the production of evidence based on modern physics in support of the unity, which previously had been the conclusive statement of logical reasoning. The following data of the Big Bang and modern physics point to the unity in the universe and to a Single Will operating in the universe:

1. The origin of the universe was a unity. All matter was comprised within a singularity, which is the evidence of the unity of the universe and of its emergence.

2. Another evidence of the unity is the fact that varying regions of the universe owe their origin to a single point, and the prevalence of the same laws of physics in them provides corroborative evidence. Had the universe been dominated by different wills, this unity could not have been realized. The theory of relativity has made it plain that nothing in the universe is independent, as space and matter and time are inextricably linked together and in continuous reciprocal actions and reactions.

3. Observations of the universe with sophisticated telescopes and the Fraunhofer lines, etc., have taught us that the entire universe has been made of the same raw material (of atoms, and especially of hydrogen and helium atoms).

4. The Big Bang points to the moment of creation of matter in the universe and to the origin with low entropy. The first law of thermodynamics is the law of conservation of matter and energy. According to this law, in the universe, matter and energy cannot get lost, nor can they come into being out of nothing. Matter and energy were created at a single moment with low entropy. Spontaneous creation and conservation of what is created point to a Single Creator. One cannot imagine the concurrence of independent wills in the creative act.

5. Had the Big Bang explosion been of greater speed, matter would have scattered around and the universe would not have formed; had it been of lesser speed, matter would have collapsed. All these critical values indicate that the universe owes its origin to a single Creative Will. The said critical arrangements meant sovereignty over the entire universe, which included density of matter and intensity of explosion.

In the light of modern physics, there is no way to defend the idea of divinities inhabiting the peaks of mountains or powers controlling worldly phenomena and clashing with each other. Yet, although the falsity of the claim about eternity of matter is understood, those who still remain in the grip of materialistic philosophy are in the same category. The only difference is that, of the first category, the number of survivors have become negligible and have no claims for the support of science; while those in the other category, whose number is considerable, declare that they stand fast on scientific evidences and insist on acting according to the dictates of reason!

GOD'S ATTRIBUTES AND THE BIG BANG

The Big Bang demonstrates that there is a Creator, that He is eternal and that He brought the universe and time into being. The Big Bang also produces much additional evidence for the other properties of God, other than His being eternal.

The stars, the planets, the fish, the plants, the cars, the melodies, the smell of flowers, everything was a singularity without form. A comparison between the original singularity and the actual design, the infinite variety that the universe unfolds, points not to a skillful singularity but rather to the One that has created the potentiality immanent in that singularity. It stands to reason that matter was programmed long before its prospective transformations. This, in turn, is a proof of the Creator's omniscience and prescience and of His power to realize this.

The raw material of trillions of stars created the space in which it scattered following the great energy-generating explosion. The control of such an intense energy and matter was an absolute necessity for the explosion and its aftermath. The Creator of the universe spread in the continuously-expanding space the immense matter and energy under His continuous control, proving His omniscience and omnipotence.

What monotheistic religions mean by the expression of God is that of an omnipotent, conscious and omniscient Being. The universe today was potentially present in the Creator's mind before the triggering of the blast. What existed potentially came into being with power as real entities. It is inconceivable that whatever is generated now was not previously in God's omniscience. So, God sees and hears. He is the Shaper of forms, and Artist. He is the Knower, the Almighty. God's sovereignty is so vast that if there had been a slight variation in critical values preceding the creation process, nothing would have come into existence.

THE PROBLEM OF EVIL AND THE BIG BANG

I am not claiming that the Big Bang comes up with a solution for the problem of evil, but it may contribute to it, repudiating the approaches of atheists who try to infer God's inexistence from the existence of evil. Yet, the existence of evil is not a subject related to either God's existence or God's inexistence, but it is related to God's attributes.

We have seen that the universe is not eternal as atheists have conjectured and that the critical design behind the creation points to the existence of God. Evil observed in the universe is not contradictory to God's presence. Contradiction in terms of logic means a set of a proposition and the negation of that proposition. For instance, the proposition "the universe has a beginning" and the proposition "the universe has no beginning" are contradictory terms. Verification of either of them is the negation of the other one. No such interdependence exists between the evil of this world and God's existence. The propositions "Evil exists" and "God exists" are not contradictory. However, observation that evil reigns in this world may lead us to ask such questions as, "How it is that God allows such evils?" or "Why does man perpetrate evil acts;" but it would be irrelevant to question the existence of God in the face of this evil.

We can draw an inference from the existence and the design involved in the universe and declare that God exists. Based on these arguments, a God-centered ontology may be formed in philosophical terms. But to infer that God does not exist based on the existence of evil is not possible. The body of evidence arising from the Big Bang and modern physics enables us to prove that God exists (to formulate a God-centered ontology).

The question of evil may be addressed only within the framework of the overall system of monotheistic religions. For instance, monotheistic religions uphold the existence of an eternal

life Hereafter. This puts a different garb on our view of natural disasters and death in our transitory life on earth. A person who conceives of death not as a complete extinction but as the beginning of a never-ending life does not consider death to be evil.

It is the contention of monotheistic religions that God is compassionate and merciful, that evil and good are but consequences of man's free will and that God will punish some and reward others for their acts. Monotheistic religions maintain that a whole system is designed according to which God judges man according to his will, capable of differentiating good from evil. In this system most evil acts on earth (or acts that seem to be evil) lose their significance in the face of the eternal life of the Hereafter. The retribution for man's iniquities is a consequence of the acts he has perpetrated on earth. Man's free will is the source of all ethical evil.

Various approaches have been put forth to show the reason for evil. One such approach is to evaluate evil as a result of the freedom of choice that man's free will entails. There is also the argument refuting the existence of evil as such, as evil is nothing but the absence of good. According to this conception blindness is nothing; the essential thing is the eye, while blindness is the eye's failure to perform its function. Evil, in this context, is the absence of the eye's capacity of vision. Another approach contends that evil is necessary for the formation of a higher good.

The origin of evil barely touched upon in the present study is outside its essential framework. The Big Bang enables us to tackle the issue by producing a large body of evidence proving God's existence, leaving the question of His existence outside the purview of an inquiry. In order to have access to God's intentions and the outcome of His wisdom, they should have been accomplished. We can better interpret and assess the details of a work of art once it is complete. Not all the ongoing processes upon the earth, including

the human odyssey, have come to a close, so that we are not in a position to conceive all the details of His magnum opus.

ETHICS AND THE BIG BANG

The Big Bang advocates that the universe is the work of an omnipotent Creator. This is very important in ethical terms for everyday life. We cannot live ignoring God's existence. God has created us, we owe him whatever we have. To be conscious that we are His subjects entails the obligation that we lead a life in conformity with His desires. Our moral conduct should place God in the center of our living. So our moral behavior must be God centered. Where the courts of justice and the police force fail to extend their sphere of influence, human moral virtues have a rational ground to prevail. The individual must arrange his ethical behavior according to the norms established with rational ends wherever social imperatives are absent, taking into consideration God's overall presence.

Ethics is important not only in human interrelations but also in politics and economic affairs. We are not concerned here with those who fail to comply with the rational requirement of faith. There is no denying that causing damage to one's kind, committing theft, and political exploitation and indifference to the plight of the poor are also observed in people professing a belief in God. This is the consequence of the individual's failure to comply with the rational requirement of his creeds and of the gap existing between his belief system and his practices. An ideal moral standard is not built up merely by possession of a right idea about good conduct, but also by its practice. The Big Bang put an end to the materialistic way of life and nihilism by invalidating materialistic tendencies. It set up a God centered ethics. However, until individuals harmonize their ontology with their practices, the Big Bang will fall short of realizing the ideal moral conduct.

It is also important to remember that the Big Bang postulated that the entire universe was a singularity before it began expanding. The actual picture of the universe gives the impression that it embraced in its original composition all the stars, plants, animals and all the races of man. This original togetherness may increase our mutual sympathy. On the other hand, the ever-expanding universe creates dynamism in man's spirit. Experiences based on love of one's fellow beings and on dynamism will have important positive psychological and moral consequences.

Conception of the existence of God, the omnipotent Creator of the universe, should erase nihilism from the earth. Man, powerless in the face of death, will feel optimistic, being convinced that life on earth is not the end of all.

MONOTHEISTIC RELIGIONS, MIRACLE AND THE BIG BANG

The Big Bang provides evidence demonstrating that the monotheistic religions are systems truly sent by God in two respects. In the first place, the fact that the universe had a beginning and will have an end was advocated by monotheistic religions, which opposed all other contentions. The Big Bang supported the assertions of the monotheistic religions and provided corroborative evidence for their truth. In the second place, the Big Bang substantiated God's attributes and found rational justification for His revelations. Questions often asked such as, "Where do I come from?" "Where am I going?" "How have I come into being?" prove that man is in need of a religion; as a matter of fact, many atheists acknowledge that man needs a religion and that need has induced him to fabricate it. Atheistic belief that the universe came into existence as a result of pure coincidences suggests that this need is also coincidental and from

this they contend that it follows that religions are pure concoctions. Evidence that demonstrates the existence of God and His attributes indicates that man's need for religion is also the work of God. This is a sign of God's intention to reveal it. It is God who leads man to feel the need for religion. We can show this as such:

1-The Big Bang shows that the universe was created out of nothing and that it is designed.

2-Thus man, being a part of the universe, is created with consciousness.

3-This signifies that man's need for religion was the design of God.

4-The fact that God created man's need for religion indicates that God's revelation of religion is consistent.

We have seen that all three monotheistic religions concur in God's existence, in His omnipotence and share the belief that the universe was created in evolutionary stages and that a day will come when it will vanish. The Big Bang has provided evidence for all these facts and corroborated the reliability of revelation. (Divergences among these religions are the subject of another discussion.) During the course of history, various sects have emerged; human fabrications and divine revelations came to be confused. It is of the utmost importance to differentiate one from the other; however, this is not the subject of our present discussion. All the three religions have their respective characteristics related to the Big Bang theory. Judaism was the first among the three monotheistic religions to assert God's existence, and declared that the universe was created and has a beginning. Christianity was the medium in which the Big Bang theory was discovered and developed. Whatever their respective creeds may have been, Lemaître, Hubble, Gamow, Penzias, Wilson, etc., were brought up

in the Christian tradition. The Quran has a privileged place in that it is the holy book that gives a detailed account of the Creation. Moreover, it also implies the Big Bang's occurrence even before it was discovered. It is, in fact, the only book in the world that described it before the 1900s.

Do not these disbelievers see that the heavens and the earth were an integrated mass, which We then split, and from water we made all living things? Will they not believe even then?

21 The Prophets, 30

With power did We construct heaven. Verily, We are expanding it.

51 The Dispersing, 47

The Quran has revealed that everything in the universe was comprised in a whole and that it splitted and expanded, just as the Big Bang theory has made it clear. Moreover, the Quran also mentions that in the beginning the universe was in a gaseous state (41 Elucidated 11), which conforms to the actual gaseous cloud from which galaxies are created, consisting of hydrogen and helium.

These accounts of the Quran are also an indication of the way the miracle happened. A description of the Big Bang in the Quran at a time when scientific developments and background were lacking and no instrument such as a telescope existed was certainly beyond the genius of any man. Philosophers who said that no miracle would ever come true were proved to be wrong. Thirteen hundred years prior to the scientific demonstration of the Big Bang, such a miracle had come true.

CHAPTER 10

THE ARGUMENT FROM DESIGN

ORDER AND PURPOSE, TELEOLOGY AND GRACE

The splendid universe is something to wonder at, from its galaxies to its planets, from its atmosphere to its winds, from its flowers to its fishes and from its birds to its insects. An age-old method used to prove God's existence is to refer to His creations. Materialist atheism, which advocated that all these arguments were unfounded and that the universe was the product of pure coincidences, found many enthusiasts. Yet, the scientific developments of the last three score of years in particular have caused the movement to retreat.

In the past, it was customary to draw an analogy between the watch and its maker and with the universe and its maker. Thanks to recent developments, this analogy has been superseded by methods based on mathematical expressions. This mathematical approach and newly acquired data contribute to the argument from design advocated throughout history that there is a design in the creation, a design that includes order and purpose, teleology and grace. The study of these arguments under different headings in which the emphasis keeps shifting from the purpose, to the order reigning in the universe, to the harmony foreseen between the

universal design, man and other living beings, makes no difference, for all these approaches point to the fact that the universe was the work of a conscious Power and not the product of a string of coincidences. The fact that differentiated stages in the universe made possible life on earth point to teleology; the perfect function of sub-atomic particles, our bodies, and our heliocentric system point to order; all the critical values that are designed in such a way that living beings would thrive and their needs would satisfy point to grace.

The Big Bang theory has demonstrated that the universe came into being from an immensely dense and hot singularity, that it was expanding continuously and that out of this emerged the entire creation, ranging from the sub-atomic world to the celestial bodies. At different stages of this evolution, critical values were at play and the existence of the universe, the galaxies and the living beings depended on these. The critical values enumerated in the coming pages point to a design behind the evolutionary stages. Thus, God has not a function only as Prime-Mover, but He has designed all stages.

RELATIVITY OF TIME AND GOD'S INTERVENTION

The analogy drawn between the watch and its maker with the universe and God can cause misinterpretations. Once the clock is made, it works regularly without undergoing any change. The Big Bang, on the other hand, demonstrates that the universe is in continuous transformation and not a single moment is exactly equal to another moment.

Leibniz's philosophy emphasized pre-established harmony. On the other hand, there have been people, like Malebranche, who emphasized God's continuous intervention both in the universe and in all the acts of man. One may draw false conclusions from

these and think that in the first case, God does not intervene at every stage of the evolution of the universe, and in the second case, that God was unaware, in the beginning, of all the prospective stages of the evolution of the universe (intervenes not from the start, but at the moment of the evolutionary stage). In fact, Leibniz advocated that God was aware of every stage and made all the interventions in advance. Malebranche, on the other hand, suggested that God was omniscient and that His intervention was a continuous process.

The theory of relativity has contributed to our better understanding of this question. According to this theory time is relative, it is not an absolute concept; the difference between the beginning of the universe and the stage it is in at a given period of time may be insignificant in a different dimension. For instance, in the beginning to say that God had pre-established the Big Bang with a view to creating the prospective world of ours and to say that God had intervened, after ten billions of years after the Big Bang, to create the world do not differ in any way. The theory of relativity has demonstrated that in quite another dimension ten billions of years might be insignificant; thus, the question is settled when billions of years are of no consequence with the concept of relative time.

WHAT PLACE, THEN, FOR A CREATOR?

What is important is to demonstrate that the universe is designed. This is the evidence of God's intervention, sovereignty and omniscience. Infinite amounts of evidence are provided by astronomy, chemistry and biology. Various sciences explain the phenomena within the framework of causality; the very existence of science depends on casual relationship. Our very reasoning faculty also depends on causal relationship. For instance, in order that the readers may have access to the present book, it had to be written

and printed beforehand. The penning of this book and its printing are the cause for its final reading. The effect never comes first. The reader cannot have access to it unless it has been written first.

The reason why I am relating all of this is the following: some contenders, having acknowledged (through causal relationship) that the universe is described by recourse to the laws of science, have asked the question, considering that science explains everything; "*What place, then, for a Creator?*" We must draw attention to the fact that science and causality do not explain whether the universe was created or not, but the way it operates. This is not antagonistic with God's existence. On the contrary, the better the operation of the mechanism is described, the more accessible becomes the order of the universe, and this provides proof for the fact that the universe was designed. The causality and the laws of science are not antagonistic to finality, but an instrument of comprehension. The causality and the finality are inextricably related to each other, contrary to the suppositions of some people. As Averroes had drawn attention to it, the mechanism dependent upon the causality reigning in the universe contributes to the demonstration of God's existence.

The fact that the universe operates within the framework of the laws of science and this is accessible to the human mind is one of the most interesting pieces of evidence of design in the universe. It might well be that the universe is devoid of order or that the order would be so complicated that the individual might contemplate it without understanding anything. The fact that the mind has been endowed with the intuition of causality (as Kant showed) through which it can understand the universe points to the design of mind. Harmonizing the universe with the human mind is a miracle to wonder at. We can summarize the conditions required for the understanding of the outer world under four items:

1. The human mind must be endowed with consciousness and an innate capacity of comprehension. To this end, in the mind must be inherent the a priori intuitions of time, space and causality.

2. If he is to understand the universe, man has to have the capacity of comprehension and memory. For example, the universe will be inaccessible to a person with a poor memory that is incapable of storing more than a few facts.

3. The universe must conform to the causality principal. Phenomena should take place according to the laws prevailing in the universe.

4. The laws in the universe must not be too complicated. Had the simplest phenomenon upon the earth been the result of laws realized through hundreds of thousands of equations, it would have still remained a mystery. In order that the outside world may be comprehensible, the universal laws must be accessible.

Scientific exploits are but a means to get nearer to God, rather than moving away from Him. The problem lies not in the scientific approach, but in the deification of science. The Big Bang has shown that the universe had a beginning and that the laws of physics were not absolute, just like the universe itself. We observe that the laws prevailing in the universe depend on the Power that created the world, and that the universe is based on causality, the laws that are operative and are conserved. The "argument from design" is a sign that shows that the universe is the work of a Designer, conscious and aware of everything.

FORTY EXAMPLES ILLUSTRATIVE OF DESIGN

There is an unbelievable amount of recent data illustrative of universal design that is not accessible to the general public. I will choose only forty among these. The examples I am enumerating below are the sine qua non of life on earth.

1. Had the blast that generated the universe been a bit more intense, all matter would have scattered in space; had it been a bit less intense, all matter would have collapsed. In both cases neither the galaxies, nor the stars, nor our world, nor the living beings would have seen the light of day. The probability of the explosion's forming the galaxies, our world and the living beings on earth would be as infinitesimal as the falling of a pencil thrown in the air on its tip.

2. If there had been a greater quantity of matter at the moment of explosion the universe would have collapsed. If, on the other hand, a lesser quantity of matter had existed at the moment of explosion the blast might have scattered matter apart before it could form the galaxies. It becomes evident, therefore, that the Big Bang is designed in such a way that the intensity, the ratio of matter and their interdependent arrangement have been taken into consideration.

3. The sub-atomic phenomena took place thanks to the extreme heat generated by the Big Bang, thus making possible the process of creation, from the galaxies to the living beings.

4. The original homogenous constitution of the universe was a sine qua non of the formation of galaxies. The slightest reduction in the initial homogeneity would not have allowed the formation of galaxies and would have led to the transformation of all matter into black holes. And we would not have come into the world.

5. Entropy is continuously increasing in the world. This is a sign of the fact that in the origin of the universe the entropy must be at a very low level. The realization of this probability is impossible. Roger Penrose has calculated the probability of a beginning with low entropy and found this probability as 1 to $10^{10^{123}}$.

6. The protons and antiprotons that grew in the wake of the Big Bang would destroy each other. Life required that the number of protons be superior to the number of antiprotons. That is what happened, in fact.

7. Likewise, the neutrons and antineutrons would destroy each other. And life required that the number of neutrons is superior to the number of antineutrons, and that is exactly what took place.

8. Electrons and positrons would destroy each other. Life was possible by a greater number of electrons over positrons, and that is exactly what happened.

9. Quarks and anti-quarks would destroy each other. But life requires a greater number of the quarks than anti-quarks, and that is exactly what happened.

10. Life required not only a greater number of protons, neutrons and electrons over their anti-matters, but also they must have been made in appropriate proportions to each other. This was what life required.

11. In order that life may thrive on earth, the masses of protons, neutrons and electrons must be as they actually are. Had these masses been different, life would not have formed.

12. Despite their widely differing mass, protons and electrons balance each other with electric charges. Had this balance been lacking, no atoms necessary for life would have formed. Had the electrical charge of electrons been a bit different, the stars could not have formed.

13. Had the quantity of neutrinos been less than it is, the formation of galaxies would have been impossible. Had the quantity of neutrinos been somewhat more, the galaxies would have been extremely dense. Both cases would have made life impossible.

14. Strong nuclear force keeps the protons and neutrons together in the nucleus. Had this force been weaker, no atoms other than hydrogen would have formed and life would be an impossibility.

15. Had the weak nuclear force been a bit stronger, too much hydrogen during the Big Bang would have been converted into helium. Had this force been somewhat weaker, the formation of the heavy elements in stars would have been adversely affected and life would become impossible.

16. Had the intensity of electromagnetic force been higher, problems would arise in the formation of chemical bonds. Had it been weaker, the same problem would have existed and the carbon and oxygen atoms of absolute necessity for life would not have been in the required quantity.

17. Had the gravitational force been more powerful, all the celestial bodies would have been transformed into black holes. Had it been less powerful, stars to form the heavy elements would not have formed. Life would be impossible in both cases.

18. The weak nuclear force, the strong nuclear force, the electromagnetic force and the gravitational force had to have been created within the framework of the well-designed critical values and in due proportions to each other. This was an extremely fine balance for the formation of galaxies and stars and of life on earth.

19. For the formation of life, interstellar distances must have been well arranged. For, had they been nearer to each other, the excess of gravitational force would have impaired the orbits of planets. Had they been separated from each other by greater distances the heavy atoms scattered in the universe by supernovas would have disposed over a wider stretch and atoms necessary to make life possible on earth would have fallen short of the mark.

20. Two of the most important atoms vital for life are carbon and oxygen. Of these atoms, had the proportion of carbon to the energy level of the oxygen atom been higher, oxygen necessary for life would not have sufficed. Had the existing proportion been lower, the carbon necessary for life would not have been sufficient.

21. The carbon and oxygen atoms of vital importance for life on earth are not only dependent on each other's levels of energy, but are also dependent on the energy level of the helium atom. Had the energy level of helium been higher, the quantity of carbon and oxygen vital for life on earth would not have been sufficient; had it been lower, the same would have been the consequence.

22. The distances and the frequency of occurrence of the supernova explosions also are vital for life on earth. For instance, had these explosions been nearer, radiation would have exterminated life on earth. Had they been farther, the atoms required for life on earth would not have been enough.

23. Our galaxy ought to be in possession of matter of a definite quantity to make life on earth possible. Had this quantity been more than necessary, the orbit of the sun would have changed. Had it been in less than necessary, the lifetime of a star like our sun would have been shorter. On the other hand, the magnitude, the shape and the distance of our galaxy from other galaxies are also vital for life on earth.

24. Another condition that is vital for life on earth is the size and distance from our earth of the planet Jupiter. Had Jupiter not been at the place it now occupies and been of a different magnitude, the earth would have been exposed to detrimental meteor showers. Moreover, our actual orbit would have changed. Both conditions could impair the ideal state for life.

25. Had the earth been at a farther distance from the sun, we would have been invaded by icebergs, which would not be favorable for life on it. Had we been closer to the sun, the water on earth would have evaporated, making life impossible.

26. Had the gravitation of the earth been stronger, states like excess in the ratio of ammonium and methane would have been an obstacle to life on earth. Had the gravitation been weaker, the atmosphere could have run short of water, and life would again be impossible.

27. The magnetic field around our earth has been critically devised. Had it been stronger, sun rays beneficial for living beings would have been thwarted. Had it been weaker, harmful rays of the sun would make life impossible.

28. The light striking the earth and the light that the earth reflects must be in a certain ratio. Had this ratio been higher, the

earth would have been invaded by icebergs. Had the ratio been lower, the earth heated by greenhouse effect would make life impossible.

29. The crust of the earth is also an important factor for life. Had it been thicker, the oxygen balance would have been disturbed because of oxygen transfer from the atmosphere to the crust of the earth. Had the crust been thinner, we would be witnessing volcanic eruptions from all over the crust of the earth. This, in turn, would not only change the climate but also destroy life on earth.

30. The quantity of oxygen is also critical. Had this quantity been greater, we would have frequent fires upon the earth. Had this value been inferior, breathing would become impossible.

31. The carbon dioxide ratio is ideal for life on earth. Had it been higher, we would have been facing the greenhouse effect. Had it been lower, photosynthesis would have been impossible.

32. The ozone quantity in the atmosphere is also critical. Had it been higher, the surface temperature would have fallen. Had it been lower, not only would the surface temperature rise but also the intensity of the ultraviolet light would increase to threaten life on earth.

33. Atmospheric pressure must be at a critical level. Had it been lower, the quantity of water evaporated would have been higher, which would have given rise to the greenhouse effect, transforming the earth into a desert.

34. In order that the air in the atmosphere is favorable for breathing, it must be at a definite level of pressure, fluidity and density. The slightest change in the density and fluidity would make respiration difficult.

35. The formation of the carbon atom, a vital element of life, within the stars takes place in a medium of extremely critical values. To this end, two helium atoms combine to form the beryllium atom in a very short space of time, i.e. 0.000000000000001 second, to be joined by a third helium atom forming the carbon atom. The slightest difference in the energy level of these atoms would have made impossible the formation of the carbon atom and would thereby have rendered impossible the emergence of the living beings upon the earth.

36. All living beings are the product of the combination of the carbon atom with other chemical elements. Carbon can form the compounds necessary for life within a narrow bracket of heat. The ideal temperature conforms exactly to the earth's temperature. We should bear in mind the wide range of temperature stretching from millions of degrees down to absolute zero: -273.15 degrees Celcius.

37. Weak bonds like the covalent bonds can come about within a definite temperature range. This range is in perfect harmony with the temperature range reigning upon the earth. Had the weak bonds not come about, there would have been no life on earth.

38. The time of the creation of the earth was opportune as well. Had it been created earlier there would not have been enough heavy atoms (like carbon and oxygen) in the world. Had the creation occurred at a later date, there would not have been enough raw materials to form our heliocentric system.

39. One of the other conditions for life on earth is that water should have a definite surface tension. Plants' absorption of water from the soil and their capacity to pump it up to the summit of their stems are possible by this well-designed tension. Had this tension

been somewhat different, there would have been neither vegetation nor other living beings.

40. The reaction capacity of water is another requirement for life. Water presents no shredding properties like acids, nor does it remain inactive like argon. The fluidity value of water and the fact that the solid state of water is exceptionally lighter than its fluid state highly contributes to life on the earth.

The forty cases above indicate that they are designed to enable the unfolding of life on earth. To assert that all this system is the outcome of chance and there is no design behind it is illogical. The scientific data of astronomy, physics and chemistry prove that extremely critical values have been observed. In the field of biology such evidences become even more numerous and every living thing produces further corroborative data.

We can demonstrate, basing our assertions on logical probability, that there is strict observance of critical values in the creation of the universe. In this epistemology, probability occupies the center; it is a mathematical approach. I have selected only forty of a countless number of pieces of evidence pointing to the fact that the universe has been arranged to enable life on earth. I will take up examples of entropy and proteins, and try to show how one may use probability.

INITIAL ENTROPY AND PROBABILITY

We have already seen that according to the second law of thermodynamics entropy keeps increasing in the universe and that this is an irreversible process. Entropy is the objective mathematical criterion of the continuous increase in the degree of disorder. As Penrose has stated, high entropy is natural, but low

entropy signifies order, and calls for an explanation. The existence of the universe with its galaxies, planets and living beings is the result of the low entropy at the beginning. Thus, the origin of the universe calls for an explanation.

The fact that a tiny point represented the beginning cannot account for the low entropy. Penrose, acknowledged to be an expert in these matters, has demonstrated that neither such tiny points as the black holes nor the terminal composition shall be able to escape the high entropy if the universe were one day to experience the Big Crunch. One deduces from this that the low entropy at the beginning of creation was not related in any way to the smallness of the initial point.

It follows that the low entropy at the beginning of the universe brings in an explanation other than the fact that the mass of the universe was extremely small in its origin. The 'thermodynamic arrow' moves in one single direction whether the universe is small or large. I liken this to the shortening of the height of elderly people. Even though the mass of the universe dwindles, its entropy will not mark any fall. Entropy is like time: unidirectional and certain. The probability related to the initial entropy, reached by Penrose, is absolutely impossible: He says: *"This now tells us how precise the Creator's aim must have been, namely to an accuracy of one part in $10^{10^{123}}$ "*

If we were to write down this figure without exponents, the lifetimes of all human beings could not measure up to it. Were we to use all the protons, neutrons and photons in the universe and to put 1 trillion digits on each proton, neutron and photon, we would still be unable to write this number. The Creator has indeed been splitting hairs, so to speak, when He designed this order.

PROTEINS AND PROBABILITY

Probability calculations provide us with objective data of a mathematical nature that let us see whether the alternative of argument from design or the one of coincidence is more credible. In particular, the fact that Hume's criticism of the analogical version of the "argument from design" was generally accepted in philosophy circles has been one of the reasons for the rise to prominence of the probabilistic version of the "argument from design." The structure of proteins makes the application of probability calculations possible. Every living cell is made up of proteins. Proteins are the basic units that run the activities of cells. In the comparison between a cell and a factory, the proteins correspond to the factory's machinery. Proteins are made up of a succession of amino acids. In a living organism, a protein is made up of 20 amino acids. The fact that these 20 amino acids should be placed in a certain order, and that the proteins should have a three-dimensional shape, are absolute requisites for a protein. There is a very great difference between the proteinoids, which are formed by a coincidental succession of amino acids, and the proteins, which have a special function within a cell. Amino acids come in two kinds, left-handed amino acids and right-handed amino acids. While proteinoids, which are a result of a coincidental union of amino acids, are made up of both kinds of amino acids, proteins include only left-handed amino acids. What is more important, proteins have to be set up in a certain order if they are to be able to carry out specific duties. The probability that amino acids will turn into proteins just because they have been subjected to energy is less than the probability that a stack of bricks, which have been blown up in the air with dynamite, will fall back down and form a house.

In living organisms, alongside relatively short proteins like ferredoxin (found in *Clostridium pasteurianum*), which is made up of a succession of 55 amino acids, there are also long proteins like

twitchin (found in caenorhabditin elegans), which is made up of a succession of 6049 amino acids. As an example for our probability calculations, let us consider the medium-sized serum albumin protein, which can be found in the human body and which is made up of 584 amino acids. The probability that the amino acids in this protein would be made up only of the left-handed kind, can be calculated in the following way:

The probability that an amino acid should be of the left-handed kind: $1/2$

The probability that two amino acids should be of the left-handed kind: $1/2 \times 1/2$

The probability that three amino acids should be of the left-handed kind: $1/2 \times 1/2 \times 1/2$

The probability that 584 amino acids should be of the left-handed kind: $1/2^{584}$

In addition to this, all amino acids have to form a peptide bond, which is necessary for tying up with the other amino acids in the protein chain. There are also many other kinds of chemical bonds that can be formed in a natural environment, among amino acids; the probability of a peptide bond forming is roughly equal to the probability of other kinds of bonds forming. Within the serum albumin, made up of 584 amino acids, 583 peptide bonds are required. The probability of these forming is as follows:

The probability that two amino acids should bond with a peptide bond: $1/2$

The probability that three amino acids should bond with peptide bonds: $1/2 \times 1/2$

The probability that four amino acids should bond with peptide bonds: $1/2 \times 1/2 \times 1/2$

The probability that 584 amino acids should bond with peptide bonds: $1/2^{583}$

The probability that the amino acids of a single protein should be all left-handed and that they should be connected with peptide bonds is: $(1/2)^{584} \times (1/2)^{583} = (1/2)^{1167} = (1/10)^{351}$

**CAN ALL THE EXISTING ATOMS AND THE ENTIRE
SPACE-TIME FORM A PROTEIN BY PURE
COINCIDENCE?**

We realize that this probability is a practical impossibility from a mathematical point of view, by means of the following reasoning. If we add the 10^{80} protons and neutrons (total of all protons and neutrons in the universe) to the all photons and electrons in the universe, we obtain a number smaller than 10^{90} . The life span of the universe: 15 billion years \times 365 days \times 24 hours \times 60 minutes \times 60 seconds = 473.040.000.000.000 expresses the time that has elapsed since the creation of the universe. We could say approximately that this number is equal to 10^{18} . If we multiply the two numbers, the number we get is $10^{90} \times 10^{18} = 10^{108}$. This number expresses the number of attempts made, if all the protons, neutrons, electrons and photons in the universe had each made an attempt every single second of the existence of the universe. If we assume that attempts made in a second by each of these are at the highest chemical speed 10^{12} (one trillion), it makes $10^{108} \times 10^{12} = 10^{120}$; but even the probability of two simple events like the formation of a protein with 584 amino acids with only left-handed amino acids and the formation of its peptide bonds is 1 in 10^{351} . This shows us that even if all the protons, neutrons, electrons and

photons in the universe had turned into one of 20 amino acids in living creatures and that even if they had made 10^{12} attempts in each second since the creation of the universe, it would not have been enough even to ensure that the amino acids of a single protein like the serum albumin should be left-handed and that they should be connected with peptide bonds.

This conclusion is indeed very interesting. Following the discoveries of Copernicus, the earth lost its central position in the universe; however, even mobilizing the entire matter in the universe could not ensure the coincidental creation of a single protein, which exists in thousands in living organisms that we can see only by means of a microscope.

It is vitally important that the succession of the amino acids in proteins be in the correct order. We can show the probability calculation for the serum albumin protein in the following way:

The probability that an amino acid should be in the correct position: $1/20$

The probability that two amino acids should be in the correct position: $1/20 \times 1/20$

The probability that three amino acids should be in the correct position: $1/20 \times 1/20 \times 1/20$

The probability that 584 amino acids should be in the correct position: $(1/20)^{584} = (1/10)^{759}$

If we multiply this number with the 1 in 10^{351} , which we have already calculated, we get the probability that a given protein should be made up only of left-handed amino acids and that it

should form peptide bonds and that the succession of amino acids should be in the correct order. This corresponds to a probability of $1 \text{ in } 10^{351} \times 10^{759} = 10^{1110}$, which practically means that it is impossible (Generally in mathematics all probabilities less than 1 in 10^{50} are considered impossible). It could be said that only a certain part of the succession of amino acids in proteins is active and that changes in the amino acids outside this part could be tolerated. This would mean that the actual probability for the succession of amino acids was higher than we calculated, but, on the other hand, if we include the probabilities also of things like the necessity that the protein should happen to be in the correct position within the cell and also that it should exist in the required quantity, then the probabilities decrease.

Those who deny that the causes were created target-oriented have succumbed to mathematics. This calculation of probability was made on the assumption that amino acids are the ones that are used in the living organism, and that after the formation of the protein the functions have been frozen. Supposing that all these stages had been added to the probability what was impossible would be even more impossible. However, the figure mentioned indicates this impossibility for those who are versed in mathematics. This serum albumin protein whose formation cannot be coincidental is being produced in the millions by our body.

According to the "blind coincidental" materialist view, serum albumin is a fortuitous formation. According to the believer, this protein is designed. This probabilistic approach about the formation of the protein can be stretched to cover many things, from the functions in our body to those in other animals and plants, from the phenomena occurring in our world to space.

As all living beings are made of proteins and as even the simplest bacteria has about one thousand proteins; the theory of

probability proves that all living beings are the work of a Designer and an omnipotent Power. All this shows that coincidental happenings are out of the question in the world, and that even the simplest molecule is the work of meticulous design.

ANTHROPIC PRINCIPLE AND CRITICAL VALUES

The recent discoveries in astronomy, physics, chemistry, biochemistry, molecular biology, cell biology and other branches of science have demonstrated that the existence of the human being depends on very critical values, of which we gave forty examples. The existence of a multitude of critical values enabling the creation of man has not failed to attract the attention of scientists. Brandon Carter was the first to explain this situation with the "anthropic principle;" since then it has been used in the fields of philosophy, science and theology. However the "anthropic principle" has been interpreted differently by philosophers and scientists. Some have perceived the relationship between the "argument from design" and the "anthropic principle" and suggested that they are tantamount to each other, while others have suggested that there is nothing to wonder about the conditions that emerged to suit our situation in the universe, adding that had they not emerged we would not have been in a position to observe these things. According to this view, our observation has a selective effect and explains the conditions that enable us to exist.

To suggest that we should not wonder at the formation of the milieu in which humanity would thrive is irrelevant. Data provided by the "anthropic principle" are not limited to the existence of conditions favorable for the emergence of human beings on the earth. They point to much more. According to the "anthropic principle," very critical values have made the emergence of humanity possible.

Arrangement of the ideal milieu based on such critical values permits us to state that the universe and earth were created in perfect order, allowing life on earth. This is a postulate that some may debate, but scientific researches have corroborated this assertion. Let anyone willing to falsify this assertion describe, if he can, better atmospheric conditions and demonstrate, if he can, the existence of a fluid that promotes life better than water and the fact that the initial entropy could have been better!

Let me convey to you a pleasant example to which John Leslie refers in connection with those who misinterpret the "anthropic principle": Suppose you are condemned to be executed and sent to the firing squad and 100 snipers shoot at you at a very close range, but you are not hit. Would you, in such a case say: "Considering I am alive there is nothing to wonder about; had I not been surviving now, I wouldn't be in a position to observe this." Or, would you rather say: "Considering that 100 snipers have shot so many bullets at such a close range and missed their targets, there must be an explanation." The probability of the coincidence for the formation of the critical values required for our emergence on the earth is far less probable than the probability of missing the target by 100 snipers who shot at close range.

ANTHROPIC PRINCIPLE AND INFINITE UNIVERSES

Those who perceived that the consequences of the "anthropic principle" would lead us to the "argument from design" and who were dissatisfied with such a conclusion put forth the "infinite universes" hypothesis. Their objective was to form an infinite grouping and belittle the critical values laid down by the "anthropic principle" by drawing an analogy with infinity. Had the hypothesis of "infinite universes" been demonstrated, that would not have changed the fact that the critical values in the universe

were designed by an omnipotent Power. Richard Swinburne contends that it is lunatic to assume the existence of an infinite number of universes as a way of justifying this existing universe.

Those who tried to evade the issue rather than seek the truth in their attempt at dodging the existence of the Creator have reverted to such fantastic assertions. The hypothesis of the "oscillating universe" we have examined was also a product of the wish to reproduce an infinite number of universes. Even had such universes existed, this could not overshadow the evidence of argument from design. May I remind you once more of the way we should make use of Occam's razor in certain situations?

I want to illustrate the attempt at the infinite universe scenario meant to evade the consequences of the "anthropic principle." Imagine a gambling hall with thousands of roulette tables. I warn you beforehand that all the games played are tricky and tell you beforehand the results of games played at hundred of thousands roulette tables. When the figures I have given you turn out to be correct, you are persuaded that the results of the games are known beforehand and make an account of it to someone. But this someone contends that this is purely coincidental and that if all the people calling at the gambling house were to venture an estimate, there is the likelihood that the estimate of one of them will turn out to be true. When you demonstrate to him that in terms of probability this is impossible, he contends that the number of planets may be infinite and in these planets there might be an infinite number of people in an infinite number of gambling houses who can make such an estimate and that the result in question may have been made by one of them and that I am a liar as I told you that the results of the games played in gambling houses are known beforehand and that my guess had been purely fortuitous. What would your reaction be? Let us assume that you are persuaded

about the existence of the infinite number of gambling houses, would you dare to explain away my correct guess of the results of thousands of roulette games in thousands of tables by chance?

We are in a position to observe one single universe. The Big Bang theory has postulated that this universe has had a beginning and that its expanding boundaries are finite. The critical values in this single universe make plain the fact that the universe had been designed consciously by an intelligent Power. This conclusion would not have changed even if we had acknowledged a groundless scenario that postulated an infinite number of universes as being correct. However, there is no logical reason to accept such a scenario; it is a far-fetched fanciful product of imagination.

**DESIGNS *SINE QUA NON* AND DESIGNS WITHIN THE
FRAMEWORK OF WHICH WE CAN EXIST EVEN
THOUGH THEY DID NOT EXIST**

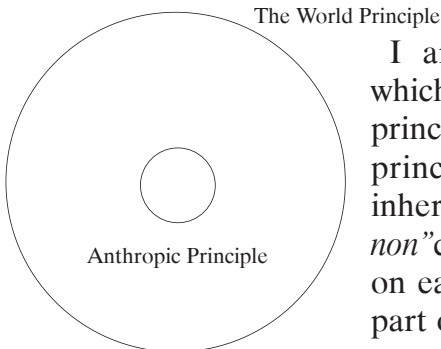
In misinterpreting the “anthropic principle,” a combination is made of man's choice of the required conditions as an observer with the scenario of infinite universes, and it is contended that man must not wonder about the conditions that enabled him to exist, since otherwise, had they not come about, he would not have existed. We illustrated the impossibility of this conclusion by illustrations.

This approach is wrong; however, assuming that it was correct, it would have held true merely for the *sine qua non* conditions that enabled man's existence. The conditions required for man's thriving on earth are the *sine qua non* requirements. For instance, the existence of water and carbon is a *sine qua non* condition for the existence of man. Yet, much of the evidence of argument from design in the world's make-up is not in the category

of “*sine qua non*” conditions. Man may live even if only 1% of the existing plants and animals existed. But the plants and animals and the living beings outside the said 1% bracket still bear evidence of argument from design.

Let us take up the bee, for instance. The existence of the bee is not a *sine qua non* condition for man's survival. We cannot explain, therefore, the bee's existence with man's selective characteristic as an observer. We cannot say: “Had the bee not existed, we would not have been here now; and that is the reason why probabilities related to the bee have come true.” The body of the bee contains a multitude of proteins like serum-albumin, whose probability we calculated earlier. When we take up one of these proteins we can realize that all the atoms of space from the beginning of the universe would fall short of forming a single protein of the bee only.

THE WORLD PRINCIPLE



*The “World Principle”
encompasses a larger area than the
“Anthropic Principle”*

I am advocating a wider concept, which I call “the world principle.” This principle also contains the “anthropic principle.” In this principle is also inherent, in addition to the “*sine qua non*” conditions necessary for man's life on earth, those conditions that are not part of the “*sine qua non*” conditions of man, and the “*sine qua non*” conditions and perfections of all living things. For example, the proteins necessary for the existence of the aforementioned bee are also contained in it. My concept of “the world principle” is this:

The world is an abode for the living. God has selected this place to display His power and art through His creation. Man, as an observer in his capacity of rational being, happens to be one of the reasons for this intention of exposition. Many of the living beings, although they are not *sine qua non* conditions, provide man with edible items like honey, showing thereby God's grace. The existence of so many living creatures alongside man needs an explanation. These cannot be explained by mere observation of the existence of the *sine qua non* conditions. For even in their absence, man could survive.

Phenomena on earth and the living creatures on it, especially plants and animals, are far beyond the immediate needs of man; they point to perfection, to a superior art and power. The "world principle" leads us to a vast field beyond the confines of the *sine qua non* conditions toward which the "anthropic principle" is directed. The following are also embraced by the "world principle:"

1. Other living beings
2. Perfection indices outside the framework of those conditions that do not fall within the category of the conditions *sine qua non* for man's survival (like eyelashes, and having two kidneys).
3. The fact that all that we have enumerated exists on the same planet (the world).

The most important characteristic of the "world principle" is that it answers the objections raised against the selective property of the "anthropic principle." Designs that point toward the views of the "world principle" are no different from those explained under the headings of the design, of grace and the

teleological argument. Nevertheless, the “world principle” supports the “anthropic principle” in a way that closes any loopholes.

Another important aspect of the “world principle” is its requirement that the probability calculations ought to be considered within the confines of the world even though the *sine qua non* conditions that enable man to survive are shoved aside by the misinterpretation of the “anthropic principle;” hundreds of thousands of living things, whose fortuitous formation is not possible according to the probability calculations and from whom man may draw benefit, point to argument from design. We multiplied 10^{90} representing the total number of baryons, photons and electrons by the number of seconds in space-time from the beginning of the Big Bang, 10^{18} , and found 10^{108} . Then we drew an analogy between 1 out of 10^{351} , which represents the probability of the left-handedness of serum albumin's amino acids and the formation of its peptide bonds which is a condition *sine qua non* for the existence of man. If we do the same calculation in terms of the “world principle,” we shall disregard the *sine qua non* conditions of man and instead, as an example, we shall take up one protein of the bee (which does not exist in human beings), a creature created in the immediate vicinity of man upon the earth. (You may take up a protein from another animal or plant but the result will be the same.)

Let us suppose that we redo the calculation we had made for a single protein of the bee within the framework of the “world principle.” As our set would be the world, instead of the universe, the figure 10^{90} would be reduced to the total number of the protons, neutrons, electrons and photons in the world, while our figure representing the age of the universe will diminish to equal the world's age. The question now will be: “Assuming that all the

protons, neutrons, electrons and photons in the world are transformed into amino acids and they strive to form one protein every second from the beginning of the world's existence, can they make it?" The fortuitous formation of a single protein in the course of the total time of the universe will become more impossible.

We have already observed that it is impossible for all the particles in the entire universe to fortuitously make the amino acid bonds of a single protein. My aim is to show that the "world principle" turns our focus within the world, creating a mathematical ground for the argument from design in the world. At a time when some contenders wish to make us believe in the truth of the infinite number of universes scenario, the "world principle" indicates that we can provide evidence of design within the world, disregarding not only the infinite number of universes, if ever, but also the rest of the universe of ours, and that we are in a position to make probability calculations remaining within the confines of the world.

The fact that so many species live side by side calls for an explanation; the countless number of species shows the richness of the "argument from design." It is worthwhile to remember once more that this evidence draws its validity from mathematical certainty.

BACH AND THE COMPUTER WITHIN THE POTENTIALITY OF THE BIG BANG

The explosion that triggered the Big Bang, the density of matter, the arrangement of entropy and heat and all the critical values involved are bodies of evidence proving that the universe was created by a conscious, powerful and superior Being. Thanks to the creation of the conditions and the laws of physics in the

beginning, everything that existed potentially, actualized.

From a work of Bach to a song of Celine Dion, from all the scores ever composed to the musical instruments, from computers to mobile phones, from Turkish *lahmacun* to Italian pizza, from lilacs to ants, everything existed potentially in the initial singularity. The potential of the Big Bang embraced everything that has ever existed in the universe. One of the ways to conceive how the universe had been designed with such consummate art and power is to turn our glance from the moment of creation to its present state. This view would call for common sense and the inspiration of an artist. An individual reviving in his imagination the initial oneness, the soup boiling on the eve of creation, while listening to Bach and contemplating a landscape and sipping his tea may realize that the piece of music he is listening to, the landscape he is

watching and the tea he is drinking were designed before the actualization of all these potentialities and he will comprehend that this was indeed the result of a design. This is one of the major contributions of the Big Bang to the evidence of argument from design. The Big Bang shows how different the original state of the universe is from its actual state



At the moment of the Big Bang everything in the universe existed potentially.

today, while announcing that all the wonders of the world and the work of man had potentially existed at the outset.

Some people cannot perceive the divine in the discoveries of man because of the involvement of the human mind. Celine Dion's songs, the existence of the musical notes and their concatenation were potentially there. The artist and the scientist discover what already exists in potential. In other words, artists and scientists are discoverers of what has been created potentially by God and remained concealed to humanity. The piece of music is the work of the composer and the computer is the discovery of the engineer, yet they actually existed potentially in God's creation. So that all that is designed by man was essentially created by God the Creator-Designer, while scientists and artists are discoverer-designers. It follows that the composition of the composer is as divine as the chirping of birds, the shoe is as divine as man's foot and the mobile phone is as divine as man's ear. Had all things not been potentially immanent in the initial singularity, we would not have been in a position now to observe and benefit from them.

DESIGN OF SCIENTIFIC LAWS

“Why is there anything rather than nothing?” This was an avowal of the fact that the universe calls for an explanation outside the universe. We can add to this: “Why are there scientific laws instead of chaos?”

Scientific efforts are directed at the discovery of scientific laws likely to detect the mystery lying behind what is apparent in the world, which, in turn, are expected to enable man to make plans for the future, thereby securing the welfare and confidence of man. Yet, this does not explain the reason “why” of the existence of the scientific laws. Let us take up, for instance, the scientific

explanation of the gravitational force. Whether we view this phenomenon from Newton's viewpoint or from the viewpoint of Einstein, they give us an account of the manner by which the earth revolves around the sun and the orbits of the planets. A scientific explanation may reveal the time of the sun's eclipse and the manner a satellite should be put into an orbit. Nevertheless, none of these statements is the answer to the question: "Why there are scientific laws, instead of chaos?"

The very existence of scientific laws and their applicability regardless of a specific space and time calls for an explanation. To make this explanation is not the task of science. Science's concern is to discover the laws and not their reason for existence. What makes science tangible is the existence of these laws; had the universe been in a chaotic state there would have been no reason to speak of the gravitational force, of the laws of thermodynamics and motion. In short, there would have been no science, for science cannot be thought of deprived of scientific laws. Had these laws not existed, there would not have been a universe; and even if we suppose that such a universe might be imagined existing, its chaotic state would challenge man's comprehension and be even more difficult to untangle than dreams. Thanks to causality (scientific laws) we can conceive of the universe; causality is the guarantee of intelligence. A person unable to establish a link between cause and effect will be more flummoxed than a newborn baby. (Even the intuition of causality is innate in the mind of the baby, as Kant showed.) The reason our house and objects do not disappear suddenly, the atoms of our body do not mix with those of the seat on which we sit, the fact that we can move ahead at every step, and the very existence and nourishment of our body are all the consequences of the smooth operation of scientific laws. And the fact that our minds are designed to comprehend these laws contributed to our concretization as rational beings.

As Swinburne puts it, if all the coins unearthed in an archaeological site had the same insignia on them, or if all the documents contained in a given room were written in the same handwriting, we would have been looking for an explanation for a common point of origin; thus, the laws of science applicable all over the universe must have a unique source and an explanation, which can account for the existence of God.

We realized that the Big Bang and the beginning of the universe have led us to the conclusion that God exists. We found more evidence for His existence in the critical values observed during the stages of the evolution of the universe and in the display of evidences in the world. Now, we are observing, based on the existence of scientific laws prevailing in the universe, the existence of a design behind all the phenomena, and realizing that unless God's existence is acknowledged, we are not in a position to provide an answer for the question, "Why are there scientific laws instead of chaos?" In other words, the beginning of the universe, the operation of scientific laws and the existing of scientific laws, each points separately to the existence of God.

CONCLUSION OF ELIMINATION OF COINCIDENCES

The careful selection of critical values from the onset of the Big Bang to every successive formation during the evolutionary stages points to the reliability of the "argument from design." All the conditions that prevailed on the eve of the Big Bang, the formation of particles like protons and neutrons, the transformation of these particles into atoms and their conversion into amino acids, which were changed into cells that produced organs like the heart or the brain point to a design. This view of the universe will, of necessity, lead us to rule out all sorts of coincidences. A coincidental view of life would give us a feeling of

an existence (both of ourselves and of the universe) without an aim, which will lead to nihilism in fact. If we come to realize that there is nothing coincidental in the universe, we may be in a position to understand that our very existence has a goal. This goal owes its existence to the Creator of the universe and ourselves. To realize this fact will give rise to important consequences in terms of ethics and give meaning to our life.

If we can get rid of the reasoning based on coincidences, the fact that all the products of humanity were known on the eve of creation will be a plain truth. Take the television, for instance. The primary explosion that produced the sub-atomic particles and the processes that took place afterward in the celestial bodies and the evolutionary stages of the earth have made the production of the TV possible. The laws relative to the carriage by the atmosphere of sounds and vision on electrical laws, etc., had all existed at the moment of the said explosion.

If one concludes that in the cause and effect relationship, the cause is not a fortuitous act, one can derive from this that all effects are but God's doing. The materialistic atheism that considers causality not to be a created process, but the cause's own making, idolizes matter and the causality principles immanent in it. Once the idea of coincidence is ruled out, all the creatures in the universe automatically become the consequence of an Infinite Knowledge and Infinite Power. Assumptions of coincidental formations in the concept of time in which the stages of creation take place have prevented atheists from conceiving of the Creator. Once the concept of coincidence is dealt with, all knowledge is promoted to the Eternal Existence. Those who assert that an object of knowledge is the product of coincidences establish a connection to a process in time. Once coincidences are ruled out, the existent becomes the outcome of the wisdom of the Eternal Being. If we

come to realize that there is no place for coincidences in the universe, we can conceive the fact that every single object, work of art, scientific discovery, the entirety of nature, organic and inorganic, were there in God's mind.

ARGUMENT FROM DESIGN AND ONTOLOGICAL ARGUMENT

The ontological argument was one of the demonstration methods of God's existence and is structurally different from the evidence we have produced in the course of the present book. According to this argument, the God concept is innate in every man, which is acknowledged to be a proof of God's existence. Moreover, the examination of the concepts of "existence" and "perfection" are important in ontological argument. This argument was defended by such figures as Anselm, Avicenna and Descartes, though in different forms.

The ontological argument is examined separately from the cosmological argument that claims that the universe was created *ex nihilo* and from the teleological argument that dwells on the aim, order, grace and design reigning in the universe. I am of the opinion that the ontological argument has an important connection with the teleological argument. This is particularly significant from the point of view of certain formulations of the ontological argument. Let us visualize this by a summary of Descartes' ontological argument.

1. I have in my mind the idea of God, in other words the idea of the Most Perfect Being.
2. A being who lacks any attribute of perfection cannot be God.

3. Existence is an attribute of perfection. The existence of God is an integral part of the concept of God.

4. Therefore God exists.

The first proposition is the critical one. According to Descartes, God has inculcated the evidence of His existence into man's mind just like an artist's stamping his name or brand on his work. One may raise an objection to this proposition, saying that the ideas contained in man's mind are coincidental and that the study of the Perfect Being that leads us to the idea of God is not important.

Some atheists contend that man is in need of a God and religion because he is a weak creature and this is the reason why he has made up God and religion. If man is weak and this weakness of his causes him to contrive a God and religion, this very fact is an indication of the fact some atheists acknowledge that the mental state of man necessitates concepts of God and religion. This may also be conceived as not necessarily innate intuition, but as a fact that the human mind is created in accordance with the idea of God and religion. To formulate such an ontological argument will change nothing. Moreover, this view is not as open to objections as are Descartes' views. A believer takes it as an evidence of God and religion, while an atheist interprets this need as a coincidental occurrence and contends that man has concreted the idea of God and religion.

We see that what separates the believer from the atheist is whether the universe and man were created and designed or happen to be the work of pure coincidences. Even though an atheist may acknowledge that the concept of God does exist in man's mind, he may insist that this innate idea is also coincidental.

But, if it is established that man is the product of design, this contingency will be eliminated.

Descartes thinks that the human mind's containing such an idea cannot be a coincidence and that had God not truly existed, such a concept could not have existed. However, one may revert to the argument from design to refute any likely objections to the ontological argument. Those who have appreciated the "argument from design" may acquire greater confidence in the soundness of innate ideas.

ARGUMENT FROM DESIGN AND CREATION *EX NIHILO*

"Argument from design" points to the fact that God is a Being who shapes everything; a Conscious Being, All-Powerful, free from all restraints and Omniscient. He is the Power that operates at every stage of universe. God's design of the universe contains all these attributes and is a proof of His creative capacity. God realized the design of the universe based on scientific laws using matter that the universe contained. We saw that the cornerstones of matter, the protons, electrons, neutrons, quarks and the strong nuclear force and the electromagnetic force, and the weak nuclear force and the gravitational force were consciously designed. This has the same meaning as the creation of matter. All the laws of physics, chemistry and biochemistry that rule the universe are immanent in matter as a quality thereof.

All these laws are properties of matter; in fact, the fact that all these laws are applicable for definite purposes and contribute to the universal order proves that they have been designed. The designing of the cornerstones and of the forces controlling matter and of the laws of nature immanent in matter indicate that matter

is a product of design, i.e. that it is created. Matter that God made use of in His creation is not an element existing from eternity that will go on existing forever. Like everything else in the universe, matter - of which everything in the universe is made - is also created. Had matter not been a created element, it could not have been in the service of man used for divine means as indicates the "argument from design." As a matter of fact, the data of the "argument from design" is better conceived by taking cognizance of the fact that matter was created to be used for definite ends and served for the realization of God's desire through immanent laws in it.

The argument from design demonstrates independently from the Big Bang that the universe was created. The evidence provided by the Big Bang, the laws of thermodynamics, the philosophical conclusions and the argument from design concur in substantiating the fact that the universe was created out of nothing.

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