SCIENCE AND RELIGION

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Chapter 1

Engagement in Retrospect

An ancient Chinese proverb says that the *yang* - one of the two polar opposites in the cyclic motion of the Tao - having reached its climax retreats in favor of the other, *yin*. If the methodic ideal of purity dominant in the systematic thought reduced the modern pursuit of truth into a one-way-traffic, whereby "every specialist contemplates reality solely through the spectacles of one's own specialization,"[1] the post-modern strategy of the human quest for understanding has retrieved in the opposite direction showing an unprecedented level of systematic interdisciplinary attention. Science and theology are two major components of this new approach. Dispelling the 19th century myth of the warfare between science and religion, they seem to be ready to join their hands today in exploring the real. Theologian Juergen Moltmann observes, "They (science and theology) have become companions in... the search for the new directions which both must work for, if human beings and nature are to survive at all on this earth."[2]

1. From Estrangement to Engagement

An analysis of the historical relationship between science and theology is necessary for the meaningful intersection of both. Because, "knowing the history of the theology-science relationship - the patterns, that endure as well as the unique adaptations to changing circumstances - provides an indispensable perspective for understanding current activity in this interdisciplinary field."[3]

The Medieval World Drama

The Integration of the Aristotelian metaphysics with the Christian theology achieved by St. Thomas Aquinas gave a new form and shape to both science and theology until the 17th century. The recent studies into the nature of the historical interaction between science and religion reject the traditional conception that the middle ages made no substantial contribution to science. Recent studies have brought to light the significant advances made in medicine, technology and physics. There were elements of continuity as well as discontinuity between medieval and early modern science.[4]

The medieval science operated still within the framework of the Aristotelian system. As their primary focus was on the logical relationship among ideas, they had only a secondary interest in the testing of the hypothesis by experiments. Science still remained a branch of philosophy. In the Aristotelian teleological viewpoint, observation and experimentation were not the criteria of truth. The geocentric worldview formed the crux of the medieval cosmology supported by the Christian theology and the Aristotelian system. Supreme significance was attributed to humanity and his place in the creation. They postulated a metaphysical as well as geographical separation between the divine and the world. Every entity from the greatest to the least had its status and purpose in the graded hierarchy of reality – God, planet, angels, man, women, animal and plants.[5] Medieval science also believed in a law-abiding universe although the laws were understood more in a moral sense. The medieval writers had a strong faith in the rationality of the humans. As such they were opposed to skepticism. With the radical trust in the power of the human rationality, they hoped to know the true essence of the world and the world must be totally intelligible to the humans. Barbour observes that in medieval times there was no doubt about the reality

of the external world as has been in the modern philosophy, since Descartes.

In the graded hierarchical order of the organization of the cosmos, the role of the humans deserves special attention. For the medieval thinkers, humans were the centre of the cosmic drama. Nature was almost subservient to the mankind. As the world was designed to serve the wishes of the humans the non-human beings were given only an instrumentalist value. The cosmic drama rotates around God's redemptive act for the salvation of the humanity, the paschal mystery of Christ. The medieval thinking also postulated a dualism within the human as composed of the mortal body and the immortal soul. As free and rational beings our duty and fulfillment lie in conforming at once to reason and to God's will. Everything else must be subjected to critical scrutiny for its significance in our pilgrimage to the divine. Thus humans were placed in radical contrast with the other creatures as regards their ontological status.

The Enlightenment Period

The first significant interaction between science and theology - either on a positive or negative note, begins in the enlightenment period of the 17th and 18th centuries. The collapse of the Aristotelian system and the emergence of the mechanistic worldview were two central developments of the enlightenment period. The compartmentalization of science and theology was largely consequent of this period. Galileo's *Dialogues* and Newton's *Principles of Mathematics* were the two most significant scientific works of this period.

The new scientific method of mathematical observation and scientific experimentation came to prominence in the works of Galileo. The Copernican hypothesis of heliocentrism acquired more acceptances in the scientific world through this method. As a devout catholic, Galileo found no conflict between scientific and religious beliefs. According to him Scripture reveals not scientific facts, but truths that are above reason. His famous dictum was: the Bible teaches us how to go to heaven and not how the heavens go. Galileo justified the Copernican stand with the help of his telescope and experiments. The serious threat to the Aristotelian system was thus posed by Galileo and the Church vigorously defended the authority of Aristotle. Although the Galilean episode is considered as the starting point of the conflict

between science and religion, it cannot be overlooked that Galileo remained a strong believer till his end. According to him, the Book of Nature and the Book of Scripture can never come in conflict with each other. Galileo also attempted a non-literal interpretation of several of the passages of the Bible. While upholding the truth and message of the Scripture, Galileo stood for its soteriological significance and countered the astronomical reading of it. The entire concern of his mathematical system was to justify the Copernican view of heliocentrism.

Galileo also presented a scientific account of the universe as matter in motion quite in tune with the mechanistic worldview. Matter and motion are the two fundamental aspects of every reality. Change no longer meant a transition from potentiality to actuality but rearrangement of particles in time and space.[6] Galileo also distinguished the primary qualities of mass and motion from the secondary qualities of colour, temperature, etc., which were mere subjective reaction of the senses to the objective world. Galileo said: "I can not believe that there exists in the external bodies anything, other than their size, shape and motion which could excite in us our taste and sound. And indeed I should judge that if ears, tongue and nose be taken away, the number, motion and shape of bodies would remain, but not their taste and sound… and I again judge that heat is altogether subjective."[7]

In medieval cosmology, the terrestrial world is a world of change and decay, whereas the celestial world is eternal and changeless. The beings obtain greater perfection as they approach the divine in the celestial world. The new cosmology drastically challenged these assumptions and obliterated the distinction between the corruptible and the incorruptible by applying the uniform natural categories to the whole universe. The unique position of the humans was questioned for the first time. The assumption of the special providence of God towards humans was also modified. However the special status and dignity of the humans thanks to his rationality was still upheld. According to Barbour, in this period human beings were still considered the great exception in world that was increasingly seen as mechanical system of particle in motion. In the Galilean cosmology God, the supreme good was replaced by God the first cause and the earth was demoted from center of the universe to a spinning, minor planet. For Galileo nature once created was assumed to be self-contained and

independent. The middle age theology had permitted the direct and active intervention of God in nature. However the contradiction between the Scripture and science is only apparent and what we need, according to Galileo, is a good interpretation explaining the Book of Scripture in agreement with the experimented truth of science. However, the new cosmology was resisted for its implicit challenges to Scripture and Aristotle and led to the unhappy episode of the persecution of Galileo.[8]

The emergence of the Newtonian mechanics on the scientific scene with its material reductionism and determinism further widened the gap between science and theology. Mechanical philosophy of nature claimed that everything could be explained in terms of matter, motion and force. All phenomena of our experience are nothing but events due to masses in motion under the influence of force. Newton demolished the Aristotelian bifurcation of universe with his new mathematically quantified account of gravitation. Newton gave solid scientific foundations to the works of Galileo. His discovery of the gravitational force was a mathematical revolution in physics. As a believing Christian Newton had no tension between science and religion. He attributed to the presence of God the ordered motions of the material objects. For Newton science was a form of worship. The brilliance of Newton as vivid in his scientific accomplishments is well presented by Timothy Ferris, as he says, "See the great Newton, he who first surveyed the plan by which the universe was made; saw nature's simple yet stupendous laws, and proved the effects, though not explained the cause."[9] Richard West Fall's twenty years of pursuit of Newton resulted in the following confession:

The more I have studied him, the more Newton has receded from me. It has been my privilege at various times to know a number of brilliant men, men whom I acknowledge without hesitation to be my intellectual superiors. I have never, however met one against whom I was unwilling to measure myself, so that it seemed reasonable to say that I was half as able as the person in question or a third or a fourth, but in every case a finite fraction. The end result of my study of Newton has served to convince me that with him there is no measure. He was become for me wholly other, one of the tiny handfuls of supreme genius who have shaped the categories of the human intellect,

a man not finally reducible to the criterion by which we comprehend our fellow being.[10]

On the other hand, the theological preoccupation of this era was the quest for a religious creed that could withstand rational assault. As a result much theology depended heavily on natural philosophy.[11] According to Michael J. Buckley, theologians of this era "were engaged in the paradoxical enterprise of proving a personal God from impersonal nature."[12] An unpleasant outcome of the development of such an apologetic physico-theology was that it tended "to celebrate God the Creator, God the Craftsman, God the Architect, God the Mathematician, at the expense of God the Redeemer."[13] The heavy reliance of theology on argument from design in the 18th century was the example of theology's interaction with the sciences on a wrong footing. The argument from design suffered a severe setback with Hume's posthumous *Dialogues Concerning Natural Religion*. It is in this context that the 18th century free thinker Anthony Collins remarks ironically that, "it would never have occurred to anyone to doubt God's existence if theologians had not tried so hard to prove it."[14]

Nineteenth Century

The 19th century witnessed a very complex interaction between scientific thought and theology. The dramatic expansion of physics with the theories about light, electricity, thermodynamics and the developments in chemistry from atomic theory to periodic table, etc., were the major scientific developments of this period. However, the most noteworthy challenge that theology had to address during the period came from biology with the publication of Darwin's *The Origin of Species*. If Newtonian physics paved the way to a mechanistic worldview, the ground-breaking evolutionary thesis of Darwin conceived of the world as a dynamic and progressive process. Unlike the Newtonian worldview, the evolutionary theory shook the foundations of the arguments from design. Natural selection became the natural explanation to the adaptation of the organic structures. We shall discuss the theory of evolution in detail in the second part of this book.

The evolutionary theory and the immediate theological responses to it led to the popular "warfare" myth between science and theology during the 19th century.[15] Given the baggage of interpretations

associated with the theory of evolution and the plethora of theological responses,[16] one will be inclined to think along with Claude Welch that the warfare myth does not reflect a proper comprehension of the interaction between science and religion during this era. The real relationship between science and theology has been distorted like caricatures, even in the case of the Galilean and Darwinian revolutions. The trend of this period was a massive effort at mediation or synthesis, a uniting of theology and sciences, of religion and culture, and demythologizing within theology, whereby theological assertions take on new kinds of meaning. There have been several religiously consonant interpretations and theological responses to the theory of evolution. Aided by the new exegetical tools and hermeneutical insights, there have been radical changes in the self-understanding of theology.[17] Even Darwin himself is not represented adequately well in the intellectual circles of the debate between theism and atheism in the context of the theory of evolution. Presenting himself as agnostic, Darwin admitted a general providence in the design of the natural laws though he rejected the particular design. In Darwin's own worlds:

In my most extreme fluctuations I have never been an atheist in the sense of denying the existence of God… (There is) the extreme difficulty or rather the impossibility of conceiving this immense and wonderful universe, including man, with his capacity for looking far backwards and far into futurity, as the result of blind chance or necessity. When thus reflecting I feel compelled to look to a First Cause having an intelligent mind in some degree analogues to that of man, as I desire to be called a theist.[18]

Apart from the challenges from biology, the natural sciences of the 19th century have directly impacted the enhancement and reevaluation of the nature of theology and theological methodology. Unlike the enlightenment quest for universal objectivity, the 19th century movement was toward a science of critical history. It is the contention of Welch that a sharper awareness of the role of human subjectivity in epistemology, ethics and religion was part of this awakening. This awareness showed theology that its language is a set of historically and culturally conditioned expressions of the religious self-consciousness:

This is an epochal demythologizing of theology... This has frequently been described as the anthropological turn or, as I prefer to call it, a Socratic turn to the self, away from the objectivism of both the enlightenment and scholasticism toward 'a subjective view of the religious object'; that is, toward a recognition that any significant speech about God has to be talk in which the self is concerned, talk about God as the object of devotion, or of utter dependence, or of passionate concern and fidelity.[19]

Given the complexity of the scientific and theological developments of the 19th century, we could hold that more than the popular myth of the warfare between science and theology, the real trend of this period was a massive effort at mediation or synthesis, a uniting of theology and science, of religion and culture, and at the same time a demythologizing within theology, whereby theological assertions take on new kinds of meaning.[20]

Twentieth Century

Theory of Relativity, Chaos Theory, Quantum Mechanics and the reevaluation of causality, the Cosmological Anthropic Principle, the role of chance in biological systems, etc., are the major scientific developments of this century equally significant theologically as well. As the remainder of this book dwells on the 20th century scientific developments, here we will focus on just one aspect of the contemporary interaction between science and theology, i.e., the cultural aspect. The intricacies of the relationship between science and theology cannot be understood without due consideration of the larger dynamism of the contemporary culture.

According to Wesley J. Wildman, at "the root cause of the problematic character of modern western culture is a profound confusion, a schizophrenic uncertainty, about - how to *be* in the world."[21] The cultural traits of the modern times have its influences on the science-religion relationship as well. As Wildman says, "the interaction between science and religion within the modern West exhibits the same awkward tension that, strains the culture as a whole.... the tension between the religious and critical tendencies of human life with interesting directness, because of the contrast between the *spiritual and critical tendencies of human rationality* immediately evident there."[22]

As science has almost imperialistically dominated the modern culture, Wildman must be right in his observation that the religious quest of the culture also promotes the intersection of science and religion. As we will be discussing later on, the schizophrenic tensions and critical spirit prevailing in the contemporary culture have enabled a critical accommodation of the scientific and religious truths into each other. As Wildman observes: "Religion is less apt these days to tremble at every new instance of a scientific discovery that sits awkwardly with theological ideas. Indeed, theology appears more resilient in the face of secular assertiveness generally... disciplined; creative minds can fruitfully relate religion and science in almost any circumstance. Unchecked pessimism in the science-religion relationship is as inappropriate as unrelieved optimism."[23]

End Notes

1 Bernard D'espagnat, *Reality and the Physicist - Knowledge, Duration and the Quantum World* (Cambridge: Cambridge University Press, 1989), p. 119.

2 Juergen Moltmann, *God in Creation: A New Theology of Creation and the Spirit of God* (San Francisco: Harper and Row, 1985).

3 William Mark Richardson and Wesley J. Wildman, p. 1.

4 See A. Rupert Hall, *The Scientific Revolution: 1500-1800* (London: Longmans Green, 1984), p. 4.

5 Ian G. Barbour, *Religion and Science* (London: SCM Press Ltd., 1998), p. 6.

6 See Barbour, *Religion and Science*, p. 6.

7 Galileo, *The Assayer*, reprinted in A. C. Danto and S. Morgenbesser (eds.), *Philosophy of Science* (New York: Meridian, 1960), p. 30.

8 See Ian G. Barbour, *Issues in Science and Religion* (New Jersey: Prentice Hall Inc., 1966), pp. 31-33.

9 Timothy Ferris, *Coming of Age in the Milky Way* (New York: William Morrow and Co., 1988), p. 14.

10 Cited in Ferris, p. 140.

11 See Richardson and Wildman, p. 4.

12 Michael J. Buckley, *At the Origins of Modern Atheism* (New Haven: Yale University Press, 1987). Cited in John Hedley Brooke, "Science and Theology in the Enlightenment," in W. Mark Richardson and Wesley J. Wildman (eds.), *Religion and Science - History, Method, Dialogue* (New York: Routledge, 1996), pp. 15-16.

13 Brooke, p. 15.

14 Cited in Brooke, p. 15.

15 The warfare attitude between science and religion was advocated by two widely known books of the latter years of the 19thcentury, viz., *The History of the Conflict Between Religion and Science* by William Draper and *A History of the Warfare of Science with Theology in Christendom* by Andrew Dickson White. The former was put on the Vatican's Index in 1876.

16 Liberal Protestant Theology, the post-Schleiermacher tradition in Germany, the late 19th century idealist philosophy of religion in Britain and the beginnings of Liberal Catholicism were the major theological trends that attempted to build bridges between science and theology during this time.

17 See Claude Welch, pp. 30-40.

18 Francis Darwin (ed.), *Life and Letters of Charles Darwin* (New York: D. Appleton, 1887), 1:274, 275.

19 Claude Welch, p. 36. Welch refers to many other 19th century thinkers who emphasized the self's involvement in theological assertions. F. D. Maurice insisted on the partiality of every apprehension of the headship of Christ. Albrecht Ritschl held that religious knowledge consists strictly in "judgments of value." William James' account of the will to believe and Soren Kierkegaard's idea of truth as subjectivity are also referred to in this regard.

20 Welch, p. 37.

21 Wesley J. Wildman, "The Quest for Harmony," in Richardson and Wildman, p. 44.

22 Wildman, "The Quest for Harmony," p. 43.

23 Wildman, "The Quest for Harmony," p. 53.

Chapter 2

Typology of Science - Religion Interaction

The nature of the interaction between science and religion has been extremely complex. Looked at from a historical point of view, it has exhibited diverse and often contradictory tendencies and facets of interaction between the two. The four fold typology of the interaction between science and religion formulated by Barbour is worth analyzing here. Barbour sums up the entire science-religion interaction in terms of conflict, independence, dialogue and integration.[1]

The Conflict Model of Interaction

The conflict nature of the interaction between science and religion is consequent of two extreme mindsets in science and religion, viz., Biblical Literalism and Scientific Materialism. Biblical literalists and scientific materialists are of the opinion that a person cannot be a believer in God and in the Theory of Evolution simultaneously. The contention of the scientific materialists is that the evidence for evolution is totally incompatible with any form of theism. Both science and

religion are locked up in a mortal combat. According to materialism matter holds the ultimate key to the fundamental reality of the universe. Only scientific knowledge can be a true form of knowledge as it alone is based on the empirical data. For want of any experimental verification and evaluation religious knowledge is not a tenable form of knowledge. For the materialists,

Science alone is objective, open minded, universal and progressive. Religious traditions by contrast are said to be subjective, close-minded, parochial, uncritical and resistant to change…. Positivists too asserted that scientific discourse provides the norms for all meaningful language. They claim that only meaningful statements are empirical proposition, verifiable by sense data. Statements in ethics, metaphysics and religion were said to be neither true nor false but meaningless pseudo-statements, expression of emotion or preference devoid of cognitive significance.[2]

Carl Sagan, Jacques Monod, Edward O. Wilson, Daniel Dennet, etc., are some of the major contenders of the materialistic creed in science. For Carl Sagan the universe is eternal, the source of which would remain shrouded in mystery forever. For him the mystical and dogmatic claims threaten the ultimacy of scientific method, which is universally applicable. Having understood the great awe at the beauty, vastness and interrelatedness of the universe, Sagan said that "the nature replaces God as the object of reverence."[3] Under the influence of the scientific developments, the demystification of the universe has been achieved and science finds only mindless matter beneath the surface. While Sagan relied on Astronomy for his philosophical hypothesis, Jaques Monod bases his materialistic claims on biological sciences. Jaques Monod in his *Chance and Necessity* claims, "biology has proved that there is no purpose in nature. Man knows at last that he is alone in the universe's unfeeling immensity, out of which he emerged only by chance. Chance alone is the source of all novelty, all creation, in the biosphere."[4] With a mechanistic view towards the humans and all the living beings, he believes that the human behaviour itself is genetically determined.

Edward Wilson shares the opinions of Monod. He predicts the withering away of religion and the replacement of the same by scientific materialism. "The power of religion will be gone forever, when religion is explained as a product of evolution; it will be replaced by a

philosophy of scientific materialism."[5] Religious practices are merely survival mechanisms useful for group cohesion. He also finds some genetic grounding for morality and the only demonstrable function of morality is to keep the genes intact. Philosopher Daniel Dennet has also written in defense of a strong Neo-Darwinist position. For him, "evolution is the product of a mindless purposeless process" and is against all kinds of design. According to Barbour, all these authors have failed to distinguish between scientific and philosophical questions. The authority of the sciences is used by the scientists in really non-scientific domains. Besides, the pure scientific methodological determinism of the scientists also render their arguments incredible. "The concept of God is not a hypothesis. Belief in God is primarily a commitment to a way of life in response to distinctive kinds of religious experience in communities formed by historical traditions; it is not a substitute of scientific research. Religious beliefs offer a wider framework of meaning in which particular events can be contextualised."[6]

Perhaps, the most credulous attack on scientific materialism in recent times is made by Stephen Barr in his systematic work *Modern Physics and Ancient Faith.*[7] The substantively critical level at which the dialogue between Science and Religion takes place in this book from the viewpoints of the origin, design, human and the mind is a scholarly beauty to the *Modern Physics and Ancient Faith.* It is the major contention of the author that what is at war with religion is not science itself, but the traditional false philosophy termed as scientific materialism. Barr begins with an adequate sketch of the materialist creed itself. It is his concluding finding of the analysis of the materialist creed that the "materialist … is in a strait jacket of his own divising. Nothing is allowed by him to be beyond explanation in terms of matter and the mathematical laws that it obeys."[8]

Having made a most up-to-date discussion of the Big Bang, Barr takes the discussion one step ahead of the usual debates, with the question, "What if the Big Bang wan not the Beginning?" Convincingly, Barr argues that the current trend in the scientific scenario itself is unlike the traditional beliefs that the progress of knowledge has revealed a world that ever more conforms to the expectations of materialists. Barr finds the reconciliation between modern physics and ancient faith regarding the origins that God can be viewed upon

not only as a First Cause but also a continuing cause. Barr attacks the materialistic creed also from the point of the argument from design. The new formulations of the design argument like in science "order comes from order" and "order comes from greater order," etc., are suggestive enough to answer the attack on the argument from design. Barr's re-conceptualization of the laws of nature as "simply patterns which we discovered empirically with world around us, but which could have been otherwise"[9] is a good example of the many sublime elements of original and insightful revisions of the attacks on scientific materialism.

The central materialist claim of the progressive 'dethronement' or marginalization of human by scientific discovery is also critically examined by Barr. Barr has not only got his question perfectly right but also anticipates the hermeneutical bias of the materialists as he asks, "whether it (materialist claim) is justified by a dispassionate examination of the scientific data, or is based on their own philosophical pre-conceptions."[10] Barr's discussion of "What is Man?" from the scientific, philosophical and theological viewpoints sends aching signals to the materialist-ideology. The scientific myth of the mechanical and physical reductionism of humans is shown to be no more scientific with strong and diverse arguments from a variety of sources varying from anthropology and Quantum Physics to the mental sciences. On the religious side of the story of the conflict model of interaction, the literal interpretation of the Scripture is the main champion. The infamous Galileo episode and the outright rejection of the Darwinian Theory of Evolution are resultant of this approach to the Bible.

Independence Model of Interaction

Independence, or contrast according to Haught, is yet another model concerning the relationship between science and religion. It avoids any kind of conflict as well as complementarity between science and religion. Science and religion can be distinguished on the basis of the subject matter, area of inquiry and methodologies. The rationale behind this mutually exclusive compartmentalization of science and religion is an attempt to be faithful to the distinctiveness of each subject. According to Karl Barth, Science and religion are valid in their own defined spheres of inquiry. We must not judge religion by the standard of science nor vice versa, because the question each asks are entirely different and the content of their answers are very distinct. God is the

transcendent, the wholly other, unknowable except as self disclosed.[11] There is a major difference between the nature of the knowledge in science and religion as religious knowledge is not dependent on human discovery but on divine initiative. Barth also postulates a kind of dualism between the Book of Scripture and the book of nature as he says that the sphere of God's action in history is not in nature. Bible especially Genesis could be considered as a symbolic expression of the basic relation of the humanity to the world and to God. In short, in the independence view, theology is a dogmatic and independent science with the laws of its own being developing its distinctive modes of enquiry. Similarly, scientific method and ways of enquiry are entirely different from that of religion. Therefore science and religion cannot conflict and contradict.

The unrelatedness and difference in the functionality of language is yet another way of compartmentalizing science and religion. The 19th century trend of logical positivism had held that any statement which cannot be subjected to the method of empirical verification cannot be called a scientific statement. Verifiability was the criterion of meaning for the logical positivists. Given the nature of the scientific language, science by itself cannot give a philosophy of life or a set of ethical norms. In similar fashion, according to the linguistic analysts, the function of religious language is to recommend a way of life to elicit a set of attitudes. Religious language is intended to evoke the religious experience. Such a way the advocates of the independence model draw a point of demarcation between science and religion on the basis of the role of language in both domains.

The Dialogue Model of Interaction

A more constructive rapprochement between science and religion is represented by dialogue, or contact, according to Haught. "The term 'contact' implies coming together without necessarily fusing. It allows for interaction, dialogue and mutual impact but forbids both conflation and segregation. It insists on preserving differences, but it also relishes relationship. Contact proposes that scientific knowledge can broaden the horizon of religious faith and that the perspective of religious faith can deepen our understanding of the universe."[12] Rather than the differences between the two, the contact model emphasizes the similarities in prepositions, methods and concepts of science and religion.

The question of the boundary question in sciences can provide an opening to the religious issues at stake in the sciences. The issues related to the boundary cannot be accounted for by the scientific method alone in their entirety. In this regard, the fact of the origin and development of the sciences in the Christian West is also attributed to the philosophical and religious issues associated with the sciences especially with regard to the origin and evolution of the universe. While the Greek thought held the order and intelligibility of the world as necessary, the Biblical tradition held it to be contingent and dependent on God. Hence some theologians are inclined to think that these theistic assumptions are implicit presuppositions to the science today. For Thomas Torrance, Science raises fundamental questions that it cannot answer and it shows us order that is both rational and contingent. The combination of contingency and intelligibility prompts us to search for a new and unexpected form of rational order. Meanwhile the theologians hold that God is the creative ground and reason for the contingent but rational order of the universe. "Co-relation with that rationality in God goes far to account for the mysteries and baffling nature the intelligibility inherent in the universe and explains the profound sense of religious awe, it calls forth from us and which, as Einstein insisted, is the mainspring of science."[13]

According to Karl Rahner, another advocate of the Dialogue Model, the methods, and the content of science and theology are independent, but there are important points of contact and co-relations to be explored.[14] For David Tracy, religious questions rise at the horizons or limit-situation of human experience.[15] The recent awareness about the methodological parallels also is promotive of such a dialogue view. Recent studies question the sharp contrast traditionally postulated between the methodologies of science and religion especially in terms of the objectivity of truth.

Science is not objective nor religion as subjective as had been assumed. There are indeed differences of emphasis between fields, but the distinctions are not absolute, scientific data are theory-laden, not theory free. The ways of science and theology do not appear nearly so divergent as either conflict or the contrast position insinuates. Science no longer appears quite so pure and objective as we used to think, nor theology so impure and subjective. Both science and theology

generate imaginative metaphors and theories to interpret certain kinds of data.[16]

The involvement of the observer in the act of experiment as implied by Quantum Physics is considered by certain scholars as reassuring the subjective nuances of science. For John Polkinghorne, "The unifying idea is the personal participation of the knower in all knowledge. In science the sphere of discovery is creative imagination which is a very personal act. All these characteristics could be found in religion. In religion personal involvement is greater, but not the exclusion of rationality and intent."[17] Michael Polanyi envisions a harmony of method over the whole range of knowledge and for him it bridges the gap between reason and faith.[18] Holmes Rolston is of the opinion that religious beliefs and scientific theories interpret and co-relate experience in much similar fashion. Beliefs can be tested by the criteria of consistency and congruence with experience.[19] We will return to the theme of the methodological parallelism between science and religion soon.

The Integration Model of Interaction

Integration is a more substantive kind of interaction between science and religion than the dialogue model. In integration there is a mutual aiding process implied in the path of their progress and therefore a more extensive and systematic kind of partnership between the two. In this view, there are many ways in which religion can help science and positively support the scientific adventure of the discovery. Without interfering with science, religion can pave the way for the generation of the scientific ideas. Hence Haught calls this model as confirmation. There are two aspects to this integration. Firstly, "scientific theories may contribute to the formulation of theological doctrine whose main source lie outside science" and secondly, "both science and religion may contribute jointly to the formation of a systematic synthesis, a coherent and unified worldview."[20]

One way in which the sciences can be at the help of religion is through the enhancement of natural theology. Natural theology starts with the scientific data which is irrespective of cultural and individual differences. Natural theology can very much clarify the assumptions of theology especially its prime hypotheses regarding God's existence presupposing the design argument. The plausibility of a belief in God

can very well be tested and supported by the natural theology. The theology of nature starting from a religious tradition based on a religious experience can also be enhanced by the developments in sciences. Its traditional doctrines are helped to be reformulated in the light of the scientific progress, especially the doctrines of creation, providence, human nature, etc. As Barbour comments:

If religious beliefs are to be in harmony with the scientific knowledge, more extensive adjustments or modifications are called for, than those introduced by the proponents of dialogue thesis. It is said that theologian should draw from broad features of science that are widely accepted, rather than risk adapting to limited or speculative theories that are more likely to be abandoned in the future. Theological doctrine must be consistent with the scientific evidence if they are not directly implied by the current scientific theories.[21]

All these four models of interaction between science and religion can very well be identified in their long history of interaction. Depending on the subject of debate one or other model of interaction can be identified in each case. However, in recent times, what we find is more a move towards the integration model of interaction between science and religion.

Endnotes

1 Barbour, *Religion and Science*, Ch.4, pp. 77-105.

2 Barbour, *Religion and Science*, pp. 78-79.

3 John F. Haught, *From Conflict to Conversation* (New York: Paulist Press, 1995), p. 28.

4 Jaques Monod, *Chance and Necessity* (New York: Vintage Books, 19720, p. 180.

5 Edward O. Wilson, *On Human Nature* (Cambridge: Harvard University Press, 1978), p. 4.

6 Barbour, *When Science Meets Religion - Enemies, Strangers or Partners?* (New York: Paulist Press, 1995), p. 12

7 Stephen Barr, *Modern Physics and Ancient Faith* (Notre Dame: University of Notre Dame Press, 2003.).

8 Barr, p. 17.

9 Barr, p. 77.

10 Barr, p.116.

11 See Karl Barth, *Dogmatics in Outline* (New York: Harper and Row Publishers, 1949).

12 Haught, *From Conflict to Conversation*, p.1 8.

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14 See Karl Rahner, *Foundation of Christian Faith* (New York: Seabury, 1978). See also Brbour, *Religion and Science*, p. 92.

15 David Tracy, *Blessed Rage for Order* (New York: Seabury, 1975). See Barbour's discussion of Tracy, *Religion and Science*, p. 92.

16 Haught, *From Conflict to Conversation,* p. 79.

17 John Polkinghorne, *One World - The Interaction of Science and Theology* (Princeton: Princeton University Press, 1987), p. 64.

18 Michael Polanyi, *Personal Knowledge* (Chicago: Chicago University Press, 1958). See Barbour, *Religion and Science*, p. 94.

19 Holmes Rolston, *Science and Religion - A Critical Survey* (New York: Random House, 1987).

20 Haught, *From Conflict to Conversation*, p. 4.

21 Barbour, *When Science Meets Religion*, p. 31.

Chapter 3

Interaction in Introspect

Science is ordinarily understood as the systematic study of the things of the natural order. Bertrand Russell defines science as "the attempt to discover by means of observation and reasoning, based upon the facts with one another and making it possible to predict future occurrence."[1] According to Alister E. Mcgrath, Science is, "a systematic field of study or body of knowledge, that aims through experiments, observation and deduction, to produce reliable explanation of phenomena with reference to the material and physical world or systematic observation of natural events and conditions, in order to discover facts about them and to formulate laws and principles based on these facts."[2] While science is concerned with the things of the natural order, religion is considered to be dealing with the supernatural order. Therefore, religion, for many is belief in a supernatural being or it is a commitment to some transcendent other. Religion also implies the realization of a higher order of things other than the direct objects of the senses. Science

as a knowledge seeking enterprise "makes claims about nature of the reality; its very success in understanding and predicting the behaviour of the universe The claims of science are different from and superior to the claims made by religion, because unlike religion, science makes no presuppositions in its enquiry and is based on hard and unchangeable facts."[3] It is not yet time to debate the superiority of the claims of science over religion as contented by Coulson. Religion has a powerful control in guiding and defining the meaning and destiny of the individuals and collectively of the humanity. Given the overarching impact of science and religion on the individual and social life of the humans, any possible interaction between the two needs to clarify primarily their fundamental assumptions, scope and methodologies.

Similarities and Differences

A constructive rapprochement between religion and science is facilitated by the renewed understanding of the methodic and structural commonalities between these two disciplines. The developments in the 20th century in linguistic analysis and historical criticism have removed several epistemological and methodological barriers that obstructed the intersection of both in the past. The critical introspection that science has undergone and the revolutionary transitions associated with the new theological consciousness have broadened the scope for a fair and just representation of both disciplines while preserving their uniqueness and distinctiveness.

Language: Literal or Metaphoric

During the 1930s and 1940s the positivists had claimed the scientific knowledge to be fully certain. The verification principle of the positivists stated that statements are meaningful only if they can be verified by sense data. This verification program besides locking up science with quantitative reductionism turned out to be too strict to satisfy, even in science. Today, the crisis of the modern science comes not so much from anything less than its own methods: "The scientific method of analyzing, explaining and classifying has become conscious of its limitation.... *The scientific world view has ceased to be a scientific view in the true sense of the word.*"[4] The limitations of the scientific method finally confessed by Werner Heisenberg, one of the high priests of the modern physics, is paradoxically a positive note

on scientific language that beyond the strict scientific character of its theories and formulae, there is an unexplored dimension of reality. Beyond the literal meaning of the scientific language, there is a "metaphorical" depth which can be comprehended only through speculative interpretation. In other words, the scientific awareness of the limitations of its own methods is an affirmation that even physical reality cannot be contained in the limited horizons of quantifiable categories. Even a sketchy overview of the images, analogies and metaphors used by scientists to convey their experience of the perceptual data cannot in the end do without interpretative structures. "Language by physicists about the universe as a whole is highly metaphoric. In fact the possibility of speaking about the universe as an entire unity is itself problematic, even metaphoric, in physics.... Physics and astrophysics, despite their explanatory mathematics, emerge from a rhetoric and use metaphor-driven models to communicate their insights to appropriate audiences."[5] The scientific models and theories drawn from observation, so fundamental to the scientific enterprise, too exhibit the same inexhaustible dimensions. Barbour defines a scientific model: "A theoretical model, then, is an imagined mechanism or process, postulated by *analogy* with familiar mechanisms or processes and used to construct a *theory* to correlate a set of *observations*."[6] A model is used to generate a theory to explain the behavior of an observable system.[7]

Now, none of the scientific models can be considered as closed in themselves. "They are open-ended, extensible and suggestive of new hypotheses."[8] Philosophically speaking, these models are a symbolic representation of what is directly inaccessible to us: "Models are taken seriously but not literally. They are neither literal pictures of reality nor `useful fictions', but partial and provisional ways of imagining what is not observable; they are symbolic representation of aspects of the world which are not directly accessible to us."[9]

It goes without saying that religious language is highly metaphor-ridden and highly symbolic. Theological language is a "uniquely useful, system of symbols which is action guiding for the believer, ..."[10] The biblical literature cannot be understood truly without exploring the hidden depths of the symbols and images prevalent in it. It is natural that Vatican II's doctrine on Revelation, *Dei Verbum,* succinctly

summarizes the biblical revelation using the biblical metaphors of hearing, speaking, seeing, etc.[11] Revelation in the Old Testament is characteristically expressed in the modes of word or speech. (Is.1:2; Jer.1:2; Ezk.1:3; Mic.1:1, etc.). Abraham being called the friend of God or Moses being said to have spoken face to face with God make complete sense only in their metaphorical sense. The symbolic meaning of the creation narratives, the symbolisms associated with the feast of the Passover, etc., disclose the close link between symbolism and religious language from ancient times onwards.

The entire prophetic literature, not merely its language indulges heavily in symbolic gestures and deeds. The interpretation of the tearing of Samuel's garment by Saul as the sign that Yahweh had torn the kingdom from Saul (1Sam.15:27ff), the cutting of Abhijah of Shiloh's new cloak (1Kgs.12:30ff), the vision of Amos, the names of Hosea's children (1:2-5, 6-7; 2:21-23), Jeremiah's encounter with the earthen flask, etc., testify to the symbolic connotations of prophetic literature. Neither is the New Testament lacking in records and events with symbolic value. The withering away of the fig tree, the cleansing of the temple, the tearing of the temple curtain, the apocalyptic visions, etc., raise more symbolic questions than their historic significance. The complex set of symbols used to denote the Jewish experience of the presence of God such as the God who *comes*, the God who *leads*, the God who *abides* and the God who *hides* have been used by Christians to describe the experience of the risen Christ.[12] It shows the ever-increasing grip of symbols on theological thinking.

The above mentioned exploration of the symbolic and metaphoric value of the scientific and religious language does not permit us to make an easy juxtaposition of the two. Compared to the scientific expressions, the evocative and existential value of the religious language cannot be overlooked. Without a thorough-going analysis of the profound ways in which theological statements are said to be symbols or metaphors, one must not dare draw one to one parallels between science and theology which would prove to be hazardous and comical. The total personal involvement and the call to commitment are intrinsic to religious language. A proper understanding of the direct relationship between religious images and experience, as expressed in rituals, morals, etc.,[13] would avoid the awkward comparison between

data in science and experience in religion and many other unjustified parallelisms. It is to be noted that while most of the scientific theoretical symbolisms remain more at the epistemic level, the symbolic value of the religious statements are much more essential and substantive.

History: Objective or Subjective

"Studies have revealed in striking ways the extent to which seemingly objective theories are both culture-dependent and subject-dependent. Science as a whole is now coming to be seen as a far more relativistic project, influenced to a considerable extent by social ideologies and attitudes. Its imperialistic claim to be the single road to certain knowledge has thus been largely eroded, and it is increasingly being viewed as just one of the ways in which humans have sought to make sense of their world."[14] Mooney's account of the changing aspects of the scientific knowledge which regards it as "just one of the ways" is bit exaggerated and misleading. However, it speaks volumes about the renewed understanding of scientific knowledge. Scientific knowledge was once considered to be fully objective and universal, totally devoid of any subjectivistic or cultural considerations. However the historians of science in recent years have questioned these assumptions. The presumed impersonal objectivity of the sciences have been challenged by the established notion of *Weltanschauung* often used by many philosophers of science. It meant that the beliefs and world view of the scientist have a tremendous impact upon the scientific picture of reality. It makes science partially a social enterprise. The complex of personal, social, intellectual and cultural interactions determines the acceptance or rejection of a theory.[15]

Einstein's own rejection of the Quantum Theory or the massive resistance to the expanding universe in the initial decades of this century are examples of it. These reactions "provide an interesting demonstration of the response of the scientific mind - supposedly a very objective mind - when evidence uncovered by science itself leads to a conflict with the articles or faith in our profession. It turns out that the scientist behaves the way the rest of us do when our beliefs are in conflict with the evidence...;"[16] comments an astronomer. Thus we could say that the once supreme faith in the mathematical and

experimental objectivity of the sciences has partly given way to subjective and value-laden understanding of scientific theories forcing an interpretative approach towards them.

The historical critical method employed in the modern biblical studies has brought out parallel transitions in the self-understanding of theology. Scholarly biblical researches have shown that the scriptural texts are not infallible divine dictation, but divinely inspired interpretations of the events as experienced as revelatory of God's message as in the history of Israel or in the person of Jesus. Scripture is no more an a-historical revelation of God but a historically defined and spatially conditioned meaning-giving instrument. "Because there is no such thing as uninterpreted experience there can therefore be no such thing in the Bible as an uninterpreted revelation of God."[17]

The two social theories of scriptural inspiration, viz., Form Criticism and Redaction Criticism testify respectively to the communitarian and individual roles on the formation of the writings. According to Form Criticism[18] the written text has undergone several changes according to the life situations (*Sitz im Leben*). As members of the faith community, the hagiographers represent views of the community. Thus biblical books are also the products of the community. Redaction Criticism attributes due role to the creativity and individuality of the writers. The writers approach the topics from their own original theological perspectives. Thus Redaction Criticism has reversed the understanding of evangelists as theologians against mere collectors or gatherers of tradition.

The historical parallels between the scientific and religious methods assert that science is not that objective or religion is not that subjective as they were thought of. However the similarities between the two are only analogical. The intensity of the personal experience of the biblical writer, the existential thrusts of reconciliation, the reorientations coupled with the scriptural writings, etc., have no parallels in science. Besides, the temporality and continuity of the theological dynamism cannot be attributed to scientific knowledge in the same degree.

Paradigms: Static or Dynamic

During the 1930s and 1940s the positivist contention that science is based on observation independent of any theories was held widely.

However, the positivist position suffered a serious setback with the publication of the influential book *The Structure of Scientific Revolution* by Thomas Kuhn, a theoretical physicist turned historian of science. Kuhn maintains that the *paradigms* guide the thought and action of the scientific community. Observations and criteria in science are paradigm-dependent. Paradigms are the worldviews that govern the scientists, and it defines and limits their questions and solutions.

When normal science meets with unexpected findings, it results in gradual shift of paradigms tantamount to scientific revolution. The transition from the Ptolemic worldview to Copernican worldview or the displacement of Newtonian mechanics with Relativity and Quantum Theory are examples of paradigm shifts. The two paradigms are incommensurable in the sense that there is very little in common between them. This is shown in the radically different understanding of the fundamental concepts of time, space, mass, velocity, etc., in the old and the new paradigms. Paradigm shifts are made possible not by data but by intuition and as such it is a conversion experience for the scientists. For Kuhn, paradigm shifts are like political revolutions, which clash with vested interests.[19]

Kuhn's analysis of the paradigm shifts in science offers us a sound analogy to the paradigm bound evolution of the theological doctrine. All theological discourse takes place within a paradigm. Hans Kueng has applied Kuhn's analysis to the evolution of the theological paradigms.[20] "Normal theology" shows conservative traits like that of "normal science." When theological work is carried out in the context of community expectations, it causes challenges to the existing paradigms. Although there are periods of uncertainty between transitions, the crisis breaks out suddenly resulting in a new interpretative framework. Kueng identifies five such paradigm changes in the history of Christian theology: from the apocalyptic paradigm of primitive Christianity to the Hellenistic paradigm of patristic period and subsequently to the Augustinian paradigm, the Thomistic paradigm and the critical enlightenment paradigm. Unlike the incommensurable scientific paradigms, here there is continuity and a root conceptual stability. In the transitions, the original tradition is reformulated, the original biblical message of God's self-revelation in

Jesus is freshly communicated. The truth of Christian faith is the unifying thread between the paradigms in tradition.

This discussion highlighting some of the linguistic, historical and paradigmatic similarities and differences between science and theology was aimed at the clarification of certain methodological presuppositions of the science-religion enterprise. In the explicit secularization of the theological categories vivid in certain science-theology literature, it is of crucial significance for, "any attempt to relate "scientific" and "theological" ventures is essentially one of appropriate methodologies or ground rules, in the sense of understanding the *kinds* of statements that are involved, in particular the richness of theological language that includes moral, volitional, and even aesthetic elements that are systematically excluded in scientific judgments."[21]

2. A Common Quest for Understanding

Science and theology have ever been the two most powerful and influential enterprises of humans determining the properties of their very being and defining the destiny of the humanity at large. The dictums and contours of the world of their meaning have been extensively processed by science and theology. The apparent dissonance between them, as was vivid in the past and even today, leaves one amused as to their meaning-making task besides raising several serious fundamental questions. Given the interwoven and overarching framework of their enquiry, what justification is there for the discordant note that they strike with each other? The tension between the religious experience and the quest for an absolute and certain knowledge, does it betray a fundamental dichotomy in the very structure of our rationality or our failure to reconcile the seemingly opposing elements of our knowledge-process? The belief in the fundamental unity of human rationality and the concern of science and theology with fundamental questions refuse to admit a fundamental dichotomy at their conceptual domains. There can be no tension between truth and truth. Once we discover the unitary conceptual grounds and frameworks of interaction, we will be able to identify the real problem in the apparent discordance between science and theology. Once the problems are identified we learn to ask the right questions on issues of dissonance.

Revelation Revisited

Traditionally theology has been defined as "the faith seeking understanding." The data of this enterprise come from revelation and tradition. The revelation that has taken place in history is encoded in the Scripture. Personal experience of God and its expressions in various forms constitute the norm of truth and authority to which believers respond in faith. The language of revelation, so fundamental to religious epistemology is a profound proclamation before the humanly constructed epistemological modalities testifying to the non-rational and supernatural horizons of truth, over and above the rational and natural domains. Revelation comprehended in its proper sense will be a holistic activity subsuming and subserving all other modes of knowing. For this, the hermeneutical matrix and the interpretative tools of revelation must be as holistic and as dynamic as the content of any authentic revelation. The process of understanding the "historical" revelation will be an ongoing hermeneutical enterprise so as to encounter the trans-historical aspects of the divine mysteries.

Nevertheless, the apologetic writings relying heavily on rational and historical evidences for the legitimization of revelation have tended to enclose it into quite parochial frameworks of reason, history, etc. The categories of revelation have been conceived of as products than processes. When the language of revelation is conceived as complete in itself, a beleaguered recourse to faith alone becomes the only way to comprehend them. This realist approach towards revelation with its consequent faith reductionism have forced the compartmentalization of itself as yet another mode of knowing, often in tension with other modes, perpetuating a radical dichotomy at the heart of the activity of knowledge. Truth has been considered as an object to be preserved in custody. The extreme reliance on faith and static outlook towards truth seem to have alienated the revelatory truth from cognitive and natural credibility. The final outcome was a systematically produced disillusionment in at least some of the hearers of revelation.

The claims of the supremacy of authority was evident in the statement of Pope Pius XII: "Investigations in science may go forward as long as all are prepared to submit to the judgment of the Church...."[23] The claims of the supremacy of revealed knowledge on supernatural grounds is very vulnerable to critical assault, because

the parochial understanding of theology of the supernatural as well as natural rules out the critical analysis of the fundamental assumptions of its own categories. An adequate knowledge of the material, physical, and biological aspects of the object of description ever escaped the attention of dogmatic formulations. Hence at the basis of theological knowledge was a set of static categories.

This is not to overlook the hermeneutical or mystical consciousness of theology. Despite the awareness of the historical and cultural dependence of the theological statements, a serious consideration of the material and the organic matrix and the laws and principles governing it which permeate every animate and inanimate being still eludes theology. The Scripture had underscored the role of the created realities in unraveling the mystery of the creator. "They shall not hurt or destroy in my entire holy mountain; for the earth shall be full of the knowledge of the LORD as the waters cover the sea" (Is.11:9 RSV). "Ever since the creation of the world, the invisible existence of God and his everlasting power have been clearly seen by the minds understanding of created things" (Rm.1:20). In the fourth century St. Augustine had called nature the prime Word of God. However it is doubtful whether these verses have obtained sufficient attention in Christian thinking more than their rhetorical and aesthetic values, except for a few mystical traditions.

In the modern times, the serious challenge to the taken-for-granted assumptions of the theological fundamentals comes from physics and philosophy. Although history and historical categories are fundamental to Christian theology, except for the cultural and social dimensions, the more fundamental nuances of being historical like space, time, etc., seem to have eluded Christian theology. The ever progressive understanding of the scientific fundamentals like space, time, mater, energy, etc., can revise the often static and deterministic nature of such concepts in theology. And as we discover the full nuances of the very fundamentals of theology many of the supernatural might turn out to be quite natural or some of the "natural laws" might be proved to be only "human laws."

A thousand years ago, Western philosophy had raised the splendid question: what is a thing? The epistemological crisis that still haunts the Western philosophy has shown that asking "what is a thing" is

also to ask "what does it mean `to be'?"[24] As the foundations of science and philosophy are shaken by the epistemological "revolutions" of the times, a credible theological proposition that does not submit itself to such serious and fundamental epistemological scrutiny will not be able to withstand the test of the times. Unless the natural and inward dynamisms of revelation are explored with critical acumen, revealed set of truths, the very starting point of theology itself would be proved to be a secondary reality. Such an introspective operation would reassert revealed knowledge itself as not that non-cognitive or non-objective as we have made it of. This will be the great epistemological awakening into the unity of knowledge dispelling the stubbornly persistent illusion of the dichotomy between reason and faith.

There are schools of thought which still uphold the supremacy of religious premises on a discordant note. "Religious thought is concerned with language and with the riddle of life, and has no need to defer to highly specialized and marginalized forms of technical expertise (like science)."[25] "Yet it is not clear if viewing God `within' nature (as implied by the scientific worldview) is any better than seeing him `outside' of nature..."[26] These statements only betray the intellectual addiction to the traditional dualistic epistemology. It is slightly surprising that St. Augustine had a challenging response to such thinking in the fourth century itself:

> It often happens that even a non-Christian knows a thing or two about the earth, the sky, the various elements of the world, about the movement and revolution of the stars and even their size and distance... How are they going to believe our books concerning... the kingdom of heaven when they think they are filled with fallacious writing about things which they know from experience or sure calculation? There is no telling how much harm these rash and presumptuous people bring upon their more prudent brethren when begin to be caught and argued down by those who are not bound by the authority of our Scriptures, and when they then try to defend their flippant, rash, and obviously erroneous statements by quoting a shower of words from those same Sacred Scriptures, even citing from memory those passages which they think will support their case.[27]

It is an optimistic fact that the Church has come to this realization, as evident in the words of Pope John Paul II: "It (Theology) must be in vital interchange today with science... Theology will have to call on the findings of science to one degree or another as it pursues its primary concerns for the human person,... Can we not hope that the sciences of today,... may invigorate and inform those parts of the theological enterprise that bear on the relation of nature, humanity and God?"[28]

Another imperative for the intersection of science and theology is generated by culture. The praxis of modern culture, including its life-styles, values, metaphors, language, myths, etc., have been generated and dominated by science. The scientific culture is universal because, as Peacocke has rightly judged, "today one of the universal languages of humanity cutting across all cultural boundaries is that of science."[29] The meaningful articulation of the theological truth in a scientific age necessitates an integration of the reliable scientific insights into theology. "We need to apply our reason to our sources - the Bible, the tradition.... The contemporary person needs to hear the word that is eternally uttered by the creator to his creation in a language that he or she can understand and respond to."[30] Thus science can enable theology for a praxis based cross-cultural theology. The moral values and standards advocated by theology without scientific plausibility will be theologically arbitrary and socially unappealing.

Science as Hermeneutical

As regards science, the necessary corollary of the awareness of the unity of knowledge is openness for constructive dialogue with theology. The methodic and epistemic challenges in the self understanding of science, as discussed earlier, have dispelled the unjustified claims associated with physical and mathematical realism. Physicist Despagnat's classic distinction between "the meaningful" and "the scientifically meaningful" as suggested by the terms themselves provide a solid analogy to the demarcation between the finite horizons of meaning possessed by science and the infinite horizons

transcending it.[31] Given that the megalomaniac claims of the scientific theories of the past are untenable and also given the new metamorphic and evolutionary understanding of them, science itself is to be viewed as a dynamic hermeneutic enterprise. More than a custodian of truth, it is a candidate for reality always open to modification and correction from the data, more accurate concepts and models.

An extrinsic dynamism that can enhance the scientific picture of reality is recognition of the relation of its truth with the religious truths. "A scientific community that ignores the relation of its truth and its life to law, to morals, and to fundamental religious symbols... only makes itself and its culture vulnerable to ideological capitulations. Ignorance of the religious in both its demonic and its creative forms can be even more fatal for a scientific culture than ignorance of new scientific and technological developments."[32]

It is necessary that those scientifically trained thinkers venturing on the coupling of the scientific discoveries with theology have the preliminary knowledge of theology as well. One author's serious contention is that the number of individuals in the universe must be finite if God is to be able to exercise care for each.[33] Another author's crucial anxiety is "can God escape the consummation of the world?"[34] Physicist Davies Paul thinks that the speculated presence of humans on other planets causes serious problems to the Christian doctrine of incarnation whereby Christ was born only on this earth.[35] Such theological anxieties only betray the unequipped and unreflective juxtaposition of science and theology.

The Common Quest

As the deceptively held epistemological dichotomy between science and theology gets dispelled, we realize the pseudo nature of their conflict. "Never mind whether religion and science were really in conflict; they were increasingly *thought* to be in conflict."[36] Once the pseudo nature of the problem is identified there emerge the domains of substantive and constructive interaction between science and theology. If God is the all-encompassing reality, the biological, chemical and physical languages also will be evocative of a deeper experience of God. The theological claim of the divine unity of creation necessarily entails a coherent and unified conception of reality. As this totalistic view of reality begins to be mutually implicated and structurally shared

by science and theology, both would transcend their finite horizons into the overarching horizons of truth and reality. Tremendous will be the implications of this fusion for the perennial issues of the human pursuit after truth, viz. God, world, and human. That sets the agenda for the rest of our inquiry. The assimilation and integration of it becomes an imperative for the humanity as well. As Whitehead has remarked: "When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them."[37]

End Notes

1 Bertrand Russell, *Science and Religion* (London: Oxford University Press, 1935), p. 8.

2 Alister E. McGrath, *The Foundation of Dialogue in Science and Religion* (New York: Blackwell Publishers, 1998), p. 1.

3 Charles A. Coulson (ed.), *The Similarity of Science and Religion* (New York: Harper and Row Publishers, 1968), p. 58.

4 Werner Heisenberg, *The Physicists Conception of Nature* (London: The Scientific Book Guild, 1962), p. 29.

5 Stephen Happel, "Metaphors and Time Asymmetry: Cosmologies in Physics and Christian Meanings," in Robert John Russell, et.al. (eds.), *Quantum Cosmology and the Laws of Nature - Scientific Perspectives on Divine Action* (Vatican: Vatican Observatory Publications, 1993), p. 109.

6 Ian G. Barbour, *Myths, Models and Paradigms - A Comparative Study in Science and Religion* (New York: Harper and Row Publishers, 1974), p. 30.

7 Illustrative example of a theoretical model is the billiard ball model of a gas. From the observation of gas is developed the kinetic theory of gases. The theory involves equations interrelating the masses (m), velocity (v), energy and momentum of the hypothetical spheres. Models also intimate that same theoretical terms might be related to the observable perspectives of the gas. With these assumptions one can derive several of the well known experimental gas laws, Boyle's Law, for instance, which states that if the volume (v) of a gas is reduced by 50% then the pressure (p) of the gas will double, the temperature remaining constant (See Barbour, *Myths, Models and Paradigms,* p. 31).

8 Barbour, *Myths, Models and Paradigms,* p. 48.

9 Barbour, *Myths, Models and Paradigms,* p. 7.

10 Janet Sockie, "Knowledge and Experience in Science and Religion: Can We Be Realists?" in Robert John Russell, et.al. *(eds.), Physics, Philosophy and Theology*

- *A Common Quest for Understanding* (Vatican City: Vatican Observatory, 1988), p. 175.

11 See *Dei Verbum*, 2-6. Austin Flannery (ed.), *Vatican Council II - The Conciliar and Post Conciliar Documents* (Mumbai: St. Paul's Publications, 1992), pp. 663-665.

12 Peter E. Fink, "Perceiving the Presence of Christ," in *Worship* 58 (1984), p. 20.

13 See Barbour, *Myths Models and Paradigms*, p. 69.

14 Christopher F. Mooney, *Theology and Scientific Knowledge* (London: University of Notre Dame Press, 1996), pp. 5-6.

15 See Arthur Peacocke, *Intimations of Reality - Critical Realism in Science and Religion* (Notre Dame: University of Notre Dame Press, 1983), p. 18.

16 Cited in Robert Jastrow, "Have Scientists Found God?" in *New York Times* (June 1978), p. 20.

17 Mooney, *Theology and Scientific Knowledge*, p. 13.

18 Form criticism was founded by Hermann Gunkel who studied Genesis and Psalms. Rudolf Bultmann applied the theory to the New Testament Gospels.

19 Kuhn has been much criticised for his extreme subjective and irrational outlook towards science. Writes Lakatos: "In Kuhn's view a scientific revolution is irrational, a matter of mob psychology" (Cited in Barbour, *Myths, Models and Paradigms*, p. 108). In the second edition of his book in 1970, Kuhn has altered some of his earlier positions giving greater attention to the control of theory by experiment and the role of criteria independent of particular paradigms. Now paradigms are considered to be shared crucial examples for which he suggests the term *exemplars* (See Barbour, *Myths, Models and Paradigms,* pp. 93, 108).

20 Hans Kueng, "Paradigm Change in Theology and Science," in *Theology for the Third Millennium* (New York: Doubleday, 1988), pp. 123-169. See Mooney's discussion of Kueng in *Theology and Scientific Knowledge,* pp. 17-19.

21 Claude Welch, p. 39.

22 This title is an allusion to Russell, *Physics, Philosophy and Theology - A Common Quest for Understanding*.

23 Pius XII, "*Humani Generis*," 181, in Claude Carlen (ed.), *The Papal Encyclicals 1939-1958* (Pierian Press, 1990).

24 See C. J. Isham, "Quantum Theories of the Creation of the Universe," in Russell, *Quantum Cosmology and the Laws of Nature* (Vatican: Vatican Observatory Publications, 1993), pp. 81-82.

25 Donn Cuppitt, *Creation Out of Nothing* (Philadelphia: Trinity Press, 1990), p.4.

26 Langsfeld, "Creation and Evolution," in *Creation and Evolution - Proceedings of the ITEST Workshop*, October, 1997 (Missouri: ITEST Faith/Science Press, 1997), p. 111.

27 St. Augustine, *De Genesi ad Litteram,* 1:19. Cited in Lazarus Walter Macior, "Critical Scientific Concepts in the Creation/Evolution Controversy," in *Creation and Evolution Evolution - Proceedings of the ITEST Workshop*, October, 1997 (Missouri: ITEST Faith/Science Press, 1997), pp. 30-31.

28 Pope John Paul II, Message on the Occasion of Newton Tricentennial in 1987, in Robert John Russell, et.al. (eds.), *John Paul II on Science and Religion - Reflections on the New View from Rome* (Vatican City: Vatican Observatory Publications, 1990), M11, M12.

29 Arthur Peacocke, "The Challenge of Theology to Science and the Church," in John M. Mangum, (ed.), *The New Faith-Science Debate - Probing Cosmology, Technology and Theology* (Minneapolis: Fortress Press, 1989), p. 11.

30 Peacocke, "The Challenge of Theology to Science and the Church," p. 11.

31 Despagnat, p. 176.

32 Langdon Gilkey, "The Creationist Issue: A Theologian's View," in Tracy and Lash (eds.), *Cosmology and Theology* (New York: Seabury, 1983), p. 68.

33 See G. F. R. Ellis, "Theology of the Anthropic Principle," in Russell, *Physics, Philosophy and Theology – A Common Quest for Understanding* (Vatican City: Vatican Observatory, 1988), pp. 384-386.

34 Mark William Worthing, *God, Creation and Contemporary Physics (*Minneapolis: Fortress Press, 1996), p. 159.

35 Davies, *God and the New Physics* (Harmondsworth: Penguin Books, 1987), p. 71.

36 Claude Welch, p. 34.

37 Alfred North Whitehead, *Science and the Modern World* (New York: Free Press, 1967), p. 81.

Chapter 4

Probing the Origins

Beyond the frontiers of epistemology and methodology, the contemporary experience of the natural sciences envisages a very substantive and constructive interaction between science and theology. The conceptual presupposition that facilitates the dialogue between science and theology, as we have seen, is the dialectical relationship between God and the world in unraveling the mystery of each other. Exploring the metaphysical implications of the nature of the world as conceived by science can unravel perhaps several so far undreamt cases of polyvalence of divine action and divine nature. The perennial problematic concerns of the human quest for understanding regarding the origin, evolution and destiny of the world serve as common bedrock between science and theology. Before reflecting upon the theological implications of the modern cosmology, we attempt a brief sketch of the scientific account of the origin, evolution and end of the world in this part.

1. The Big Bang

Understanding the very origin of the universe is one of the greatest adventures of modern science. As a result today we have a number of challenging scientific theories which give a rather plausible account of the enigma of the origin of the universe. The Big Bang Theory is the most leading scientific contender for the origin of the universe today.[1] We consider Stephen Hawking's no boundary theory also along with the Big Bang Theory owing to its implicit theological challenges.

Theoretical Assumptions

The General Theory of Relativity is the theoretical foundation of the Big Bang Theory. Einstein's relativistic understanding of gravity implied that the universe was not static but a dynamic inter-relational field. It was followed by the dynamic vision of the universe implied by the Hubble Expansion. In 1929 Edwin Hubble made an observation that the universe was expanding. Hubble formulated the famous *Hubble's Law* which stated that "the more distant a galaxy is from the earth, the faster its recession velocity."[2] It inaugurated the universe was expanding and that it must have a definite beginning in time which by implication would presuppose a centre from where the expansion starts its expansive mode. Thus cosmology is now placed on the track of the Big Bang.

The Russian mathematician Alexander Friedmann also proposed the same idea of the expanding universe in a paper published in the German journal *Zeitschrift fur Physik* though it failed to evoke desired results in the scientific circles. Although the term Big Bang was first coined by Fred Hoyle, the exponent of the steady state theory who was radically opposed to the claims of Big Bang, the Big Bang Theory was first formulated by Georges Lemaitre, a Belgian priest who chanced to land on this insight while working with the equations of the General Theory of Relativity in 1927. The implications of the Relativity Theory, he argued, postulated a universe which is expanding at the same rate everywhere and in all directions.[3] He proposed that the universe must have been formed in an explosion, a radioactive disintegration of a condensed primeval atom that contained all the matter in the universe. All matter, the stars and galaxies, was concentrated into a very confined region in a primordial "matter soup,"

to use Heinz Pagel's term.[4] This matter soup expanded rapidly and exploded. In exploding so, it cooled down, forming nuclei, then atoms, and finally galaxies, stars and planets. This expansion is still going on, except that the universe is much colder today. We will attempt a short scientific sketch of the history of Big Bang.

The Singularity

Singularity is a boundary or point of limit where all the laws of physics breakdown. The beginning of Big Bang is considered to be a singularity in science. If we move backward on the Big Bang clock we would appear to encounter a "beginning" at which everything hits everything else, all the mass in the universe is compressed into a state of infinite density, infinite pressure, and infinite temperature.[5] This point is technically described by cosmologists as $t = 0$. This state is called as the singularity. Based on the present rate of expansion of the universe and the rate of deceleration of the expansion the initial singularity lies about twelve to fifteen billion years ago.

The First Second

The recent findings from the particle physics enable scientists to state with some accuracy the details of the physics and geometry of the universe at a microsecond after the Big Bang. Their experimental methodology is to accelerate proton or electrons to tremendous energies and collide them in particle accelerators. These collisions are more or less able to recreate for a brief moment the conditions existed in the early moments of the universe. The highest energy collisions possible in the laboratory have energy equivalent to 10^{12} electron volts or 10^{16} K. This was believed to be the temperature of the universe about 10^{-10} seconds after the Bang. Beyond this point our knowledge of the properties of matter ends, and hence we are able only to speculate about the universe at earlier times.[6] But scientific speculations, it is to be noted, are always tangible and therefore highly probable.

What might have been the physical state of the matter soup before 10^{-10} seconds? The period between 10^{-10} and 10^{-43} is era of super symmetry between the four fundamental forces of the nature. At extremely high energy universe should have undergone a series of *phase transitions.* At 10^{-43} seconds super symmetry between the

gravitational force and other forces was lost. Then at 10^{-35} seconds the symmetry between the strong and electro-weak forces was lost. This is called the era of Grand Unity. Finally at 10^{-10} seconds the weak force was separated from the electromagnetic force and its is often called the era of weak unity. The universe before 10^{-4} seconds was a primordial soup of elementary particles; leptons (electrons, muons, taus, neutrinos) and hadrons (quarks and gluons). At a tenth of a millisecond (10^{-4} sec) after the Big Bang there were no individual neutrons and protons but for a brief moment the universe was one giant nucleus.[7] The decrease in the density and temperature of the universe enabled the birth of neutrons and protons.

Formation of Quarks and Antiquarks

Quarks are the mysterious particles, which are components of protons and neutrons. During the first microsecond of cosmic history, the primordial matter soup existed in the form of quarks and their antiquarks, because at very high temperatures matter prefers to live in the form of free quarks. The quarks produced in the explosion are what eventually made up the matter of today's universe. A unique and interesting feature of our universe, which reflects the wisdom of Big Bang, is that our universe today is primarily composed of matter rather than antimatter.[8] Existence of anything would have been impossible unless for wonder our universe contained about 10^{78} protons and neutrons, with a relatively negligible admixture of antiprotons and other antimatter particles.[9] At a cooler period, the quarks condense into composite particles called hadrons which include the protons and neutrons. At this time the temperature must be one trillion degrees Kelvin. These background conditions are conducive that protons and neutrons can now burst into existence which are the essential components of the entire matter in the universe.

Nucleosynthesis

Nucleosynthesis started one second after the Big Bang at the temperature of 10^{10} K. At first the nucleus of hydrogen and helium and lithium formed. Then the production of small compound nuclei, such as helium, deuterium and lithium occurred as a result of the nuclear fusion reactions during the first few minutes of time. This nuclear activity lasted about three minutes. The phase of

nucleosynthesis ended at a temperature of one billion degrees Kelvin. "Primordial nucleosynthesis was thus a kind of cosmic race. The starting gun went off when the universe was about one second old, when the temperature first became low enough for nuclei to survive. Then the process of nucleosynthesis and the production of elements began. The race ended approximately three minute later when the expanding universe became too cool to drive nuclear fusion reactions."[10]

Galaxy Formation

For the next 300,000 years the universe was in a state of relative stasis. There was a sea of hydrogen and helium nuclei, photons and free electrons all around space in a state of constant interaction. This is called thermal equilibrium. Although the universe was cooling down during this period, the shower of photons did not allow the formation of any structures. When the universe cooled down to a temperature of about 3000 degree Kelvin, the electrons and atomic nuclei combined to form ordinary atoms, mostly hydrogen. As the photons suddenly lack energy required to separate electrons from the nuclei, the particles combine to form neutral atoms. By now the sea of photons has no further interactions with matter. The hydrogen and helium atoms are then free to collapse under the influence of gravity. This collapse produces stars, gas and other matter which is now known as galaxies.

Stars and Quasars

The birth of galaxies was accompanied by the birth of stars. Stars are formed within molecular clouds which are aggregations of molecular gas residing in galactic disks. The formation of quasars or distant light sources is an interesting development of this period. In the two or three 3 billion years that followed the Big Bang, the central cluster of a large number of galaxies became a beacon brighter than 1000 galaxies like ours leading to the birth of quasars. The study of quasars is difficult due to their great dist great distance from us. The detailed models that describe quasars as the bright rings that surround giant black holes in the cores of distant galaxies so far don't contradict observations and indeed seem to explain all the observable properties.[11]

History of the Universe[12]

Epoch	Age	Size	Temperature
Now	14 billion years	1	2.73 K
Earth forms	9 billion years	0.34	3.67 K
Oldest quasars	1 billion years	0.2	13.6 K
Comfort zone	12.5 million years	0.009	295 K
Atoms melt	26000 years	0.0007	3850 K
Radiation era	31200 years	0.0002	15800 K
Nuclei melt	1 second	10^{-10}	10^{10} K
Nucleons melt	10^{-4} seconds	10^{-12}	10^{12} K
Weak unity	10^{-10} seconds	10^{-16}	10^{16} K
Grand unity	10^{-35} seconds	10^{-28}	10^{28} K
Super unity	10^{-43} seconds	10^{-32}	10^{32} K
Singularity	0	0	Infinite

Tests for Big Bang Theory

The Big Bang Theory fortified with Inflationary Theory with is supported by a number of important observations. Hubble Expansion, Cosmic Microwave Background Radiation, COBE Research, Uniformity of Black Body Radiation, Darkness of the Night Sky, etc., are the observational proofs for the Big Bang.

Hubble Expansion

Scientists had generally assumed that the universe is static. In 1920 Edwin Hubble found that every galaxy that he observed is moving away from us. The precise value of the expansion rate is called 'Hubble Constant.' Hubble observed that all but the very closest galaxies are retreating from our galaxy. The farther a galaxy is, the faster it moves. This relationship between distance and velocity is called Hubble's law. The spectra of the light from the galaxies were used for the measurement of velocities. When light from a star or galaxy is broken into its components by a prism it is found that the pattern includes

sharp lines produced by particular elements, such as hydrogen, helium, calcium and iron. If the source is moving, the frequency of these lines is altered by an effect known as Doppler Shift. If the object is moving toward the observer the frequency of the line increases and if the object is moving away from the observer, the frequency is decreased. Hubble's measurement based on Doppler shift found that galaxies are running away from us. If the universe is expanding, by implication it means that it had a finite beginning in the past.

Cosmic Microwave Background Radiation

The most substantial evidence to the Big Bang was proposed in 1965, when two scientists from the Bell Laboratories happened to detect a steady 'hiss' of Comic Microwave Background Radiation. This isotropic[13] radiation was almost uniformly distributed all over space and the redshifting of this low level radiation also implied that it originated approximately some 15 billion years ago.[14] Owing to the universal and uniform distribution of the radiation, it was calculated that the radiation must have been dating back to the inception of the universe itself. The isotropic distribution also suggested the isotropic expansion of the universe.[15] Nemesszeghy opines that, "Cosmic background radiation is a remnant glow of the Big Bang when the early universe was very hot and dense. We are able to see this glow of the early universe because the light from very distant parts of the world is only now reaching us. This light must be 'red shifted' because of the rapid expansion of the universe. In fact the wavelength of this electromagnetic radiation is increased so much that it is experienced as microwave radiation."[16]

The COBE Exploration

The gravitational instability depending on the concentration of matter is accountable for the formation of galaxies. The variations in the temperature of the microwave background radiation today provides us with a snapshot of the matter distribution in the universe when it was only a million years old, long before fully fledged galaxies formed. Cosmologists were in search for these variations with ground-based detectors and finally the COBE (Cosmic Background Explorer) satellite found them. They were only one part in one hundred thousand. This number tells by how much the non-uniformities need to amplify by means of gravitational instability, in order to become strong enough

to create the first galaxies and clusters when the universe is billions of years old. Thus the COBE search also strengthens the Big Bang origin of the universe.[17]

The Inflationary Universe

The properties of our universe namely its large size, flatness, extreme uniformity, etc., are not explained in Big Bang Theory. Alan H. Guth's Inflationary model resolves these limitations as well. Inflation explains well why the universe is so large and so uniform and addresses the flatness problem scientifically. "One of the attractive features of the Inflationary universe theory is a new understanding of the homogeneity of the Big Bang. The Inflationary universe can explain why the Big Bang explosion occurred homogeneously throughout the observed universe, while at the same time the theory suggests that the observed universe is only a minute part of a vastly larger space that is far from homogeneous."[18]

The basic idea of Inflation is that at an early phase in the history of the universe, it suddenly expanded in size. Thus it refers to a 'super-rapid exponential expansion' of the universe in the first microseconds of the Big Bang. According to Malone, "during what has been described as a 'sliver of a second,' the universe expanded at a rate exponentially greater than it now does going from something analogous to a pinhead to the size of an orange or a softball in an infinitesimal amount of time."[1919] Malone, p.10.

The exponential expansion of the universe was in a mind-boggling momentum, doubling its size roughly once every 10^{-43}. After at least 85 such doublings, the temperature, which started out at 10^{32} K, could have dropped to very low values near absolute zero. To understand why Inflation took place, we need to explain the concept of vacuum energy.

This extremely rapid expansion is possible if the energy density of the universe is dominated by 'vacuum energy density'. Vacuum energy is a mysterious type of energy exhibiting the curious property of a negative pressure. Since a large amount of energy is associated with the vacuum, it greatly affects the expansion of the universe. As implied by Einstein's famous formula $E = mc^2$, these large vacuum energies have large gravitational effects. It pulls matter together and slows

down the expansion rather than accelerating it. But the curious property of the vacuum energy is that it exhibits a negative pressure. General Theory of Relativity demands that pressure has gravitational impact. While positive pressure pushes outward, and its gravitational effect pulls inward, in the negative pressure, the gravity pushes outward resulting in driving the universe to expand at an accelerating rate. The net result of this stupendously large and negative pressure is to enormously enlarge the universe within a tiny fraction of a second. This accelerated expansion is called exponential expansion.[20] The properties of flatness and uniformity are results of the culmination of the Inflation.[21] False vacuum state[22] is unstable in super-cooling and hence the exponential expansion cannot continue forever. Stoeger shows how Inflation solves the horizon problem: "If inflation occurred, then the ancestral region from which our observable universe originated was much, much smaller just after the Big Bang than it would have been without Inflation. This simply means that with Inflation that part of the universe from which our observable universe originated was causally self-connected beforehand, and therefore remained causally self-connected thereafter, eliminating the horizon problem."[23]

Multiple Universes Conjecture

The Russian Physicist Andre Linde gave a different interpretation to the Inflationary Theory. His version, called the Eternal Chaotic Inflation, implies the existence of multiple universes. A salient feature of his theory is that it avoids the postulation of initial condition and thereby a Big Bang singularity. According to Linde, quantum effects do not permit localized initial conditions. Dissipative processes in which imhomogenities are converted to homogenous structures of the universe over a period of billions of years was a necessity in the earlier versions of the chaotic cosmology. The imagery of Drees puts it very well. Imagine two beaches in which one is not touched by any and in the other children building castles and huts with sands. Observing a beach a few days, we find the tides and winds have washed the latter beach like the former and both would look alike. This is the assumption of he dissipative processes that similar results will be produced by them.[24]

Linde, disagrees with this view and holds that "conditions for inflation might have been satisfied in some regions (domains) of the Universe while not, or only later, in other domains."[25] Some of these domains would inflate and can develop into large bubbles[26] or mini-universes. Each one of these universes can resemble a Big Bang itself homogenous in nature. Bubble formation could go on forever though the mini-universes and the objects in them perish after a period of time. According to Linde: "no longer (it) seems necessary to assume that there actually was some *first* mini-universe appearing from nothing or from an initial singularity at some moment $t = 0$ before which there was no space time at all."[27] This view thus dissolves the singularity problem. Although this theory sounds very provocative and looks plausible, it lacks sound evidences to prove it. The French physicist Trinh Xuan Thuan writes, "Our universe is just a tiny bubble, lost in the vastness of another bubble, a meta-universe, or super-universe, that is tens of million billion billion times larger. And that meta-universe is itself lost among a multitude of other meta-universes, all created during the Inflationary era from infinitesimally small regions of space, all disconnected from one another."[28] However, the multiple universes conjecture is gaining more and more acceptance among the scientists. The enormously vast size of our universe does not let us obtain information about those possible countless universes millions of light years away from ours.

Beyond the First Microsecond

Modern scientists to a great extent succeed in explaining the origin and evolution of the universe. But still we lack a definite, certain and complete knowledge about the origin of our universe. There are scientists who hold that notwithstanding the advancements in science, the ultimate origin of the universe would remain shrouded in mystery forever. The Uncertainty Principle of Heisenberg, the Inflationary Hypothesis and the multiple universes conjecture limit our knowledge about the universe. According to Uncertainty Principle we cannot know both the momentum and position of a particle exactly and simultaneously. Thus, Heisenberg's Indeterminacy Principle imposes two limitations on our ability to obtain information about the very early universe. Firstly, the indeterminate behaviour of the particles has blurred away the information about the early universe. Secondly,

each quantum of matter produced in Big Bang has been massive enough to distort the spacetime continuum and what we have is an indecipherable tangle of space-time foam which prevents us from having a full and correct understanding of the physics of the first microsecond.

The Inflationary model universe also set some limits to our knowledge about the universe. As we have seen, this hypothesis states that the universe expanded very fast, much faster than the speed of light, for a brief but significant moment during the first second. To know how this limits our knowledge about the origin of the universe, Laughlin borrows a metaphor from Professor Linde: "Imagine that information about the very early universe was written across the fabric of space-time. No matter how small the writing, information would have stretched it out so that the message got too big to read. Each observer could detect only a small part of one letter, and consequently none could piece together the message. In such a picture the secret of cosmic origin, even if globally decipherable, is locally indecipherable. So Inflation may in that sense have erased information about creation."[29] The next difficulty is posed by the possibility of multiple universes. Even if we could find the origin of one universe it wouldn't be same origin for all other universes. Here too, solving the riddle of genesis becomes as difficult as asking, amidst a tangle of vines in a rain forest, what properly is to be called the point of origin of any one vine.[30] As Arnold Benz says, "Corresponding to the unpredictable future of a chaotic system, its past is also cloaked in darkness. The past year's weather cannot be calculated in detail, either. Since the present is not completely predetermined, the past thus loses significance. The beginning can no longer be regarded as the dictator of all that follows."[31]

Beyond the Big Bang

As spacetime has originated with the Big Bang, any question as to what was before the Big Bang is logically impossible. However, scientists are tempted to look beyond the first hundredth of a second. Here there is only speculation based on the data available from high energy physics and unified field theories. How did this Big Bang happen? What was the origin of the primordial soup of quarks, leptons, and gluons? Physicists cannot answer these questions fully based on

experiment and theory. The speculative answer to the question, "where did the universe come from?" is that it came out of the vacuum. The entire universe is a reexpression of sheer nothingness. This argument is based on the observation that the universe even in its present form is equivalent to nothing. A remarkable feature of the present day universe is that if we add up all the energy in the universe it almost adds up to zero. Firstly there is the potential energy of the gravitational attraction of the various galaxies for each other. This is proportionate to the mass of galaxies. Since one must supply energy to push the galaxies apart, this counts as a huge negative energy in our energy bookkeeping. On the positive side of the ledger is the mass energy of all the particles in the universe. The total of this positive energy is about a factor of ten smaller than the negative energy.[32] If the two numbers of energy are added, the total energy of the universe would be zero and it would not take any energy to create the universe. Yet the question remains: how can the vacuum spontaneously turn itself into a fireball of quarks, leptons, and gluons - the Big Bang? This, physicists understand in terms of the quantum probability, the example of which is a nuclear decay. The nuclei of atoms can disintegrate spontaneously in a spectacular reaction which is manifested as radioactivity. There is no consistent scientific explanation for nuclear decay; we can only say that there is a probability for the nuclear decay. So also there is no explanation for the vacuum becoming Big Bang. We can only say that there is a tiny quantum probability that a vacuum will convert itself into a Big Bang explosion.

Big Bang and God

Here we attempt a random exposition of the leading theological responses of the theologians and scientists to the Big Bang account of creation. A more constructive dialogue between the scientific and biblical account of creation will be attempted in the third part.

Big Bang Supports Creation

Many scientists and theologians think of the Big Bang as supportive of the creation of the universe in time and thereby arguing for the existence of God from cosmology. The priest and theologian Stanley Jaki appeals to the limits of scientific explanation as far as the beginning and the contingency of the universe are concerned. According to him the built-in inadequacy of the scientific answers show the universe

to be contingent. Its contingency "is intimated in the scientific portrayal of the specificity of the Universe. Universe which is contingent is the very opposite of cosmic necessitarianism, the age-old refuge of materialists, pantheists and atheists."[33] Specificity being a sign of limitation, specific entities could be explained only with reference to a creator, who is the totality of perfection. Without the metaphysical assumption, science should commit "the fallacy of infinite regress," argues Jaki. He also thinks that as scientific cosmology cannot exclude hypothetical previous times, the "universe carries on itself the stamp of time."[34] "The Singularity of the universe is a gigantic springboard which can propel upward anyone ready to exploit its metaphysical resilience and catch thereby a glimpse of the absolute."[35] Worthing too finds Big Bang as evidence for an original creation. He writes, "No other theory of modern science has corresponded more closely to (nor met so well the requirements of) a doctrine of creation than the theory of the Big Bang. If we follow the path of expansion from the Big Bang singularity back in time, we seem to be led to a point where one can speculate about the origin or creation of our universe."[36]

Most theological responses to the Big Bang presuppose an absolute beginning to the universe in time and rules out the plausible conception of an eternal universe. A strong argument raised in support of a universe contingent in time is from the second law of thermodynamics which states that the entropy of the universe in increasing. Entropy is the measure of the unuseful energy in the universe. According to Spitzer, "Every instance of work (use of free energy in a system) gives rise to an increase in entropy. The amount of energy that is available for conversion into usable forms of work always decreases."[37] If the universe has been existing eternally, the entropy of the universe must have come to a thermodynamic equilibrium without even a single trace of useful energy. However the present day account of entropy states that its measure is very low, ruling out the possibility of a universe existing forever. The ambiguity with regard to pre-singularity state of affairs also is a theological starting point for many to infer the creation of the universe by God. As Ted Peters observes,

The idea of initial singularity characterised by infinite density and temperature is produced by extrapolating backwards from the currently observed expansion of the cosmos. The bang, or initial singularity, is the event at which space and time were created. Now this marks the

end of the line for scientific research, because astrophysicists cannot within the framework of their discipline talk about the singularity, let alone what was going on before it.

We may not be talking about the very beginning, however, we are not yet talking about the 'origin' of the original singularity. There are initial conditions which have an ontological (though perhaps not a temporal) priority. The Big Bang model will not permit us to do what Augustine forbade, namely, to ask intelligibly about what was happening before the beginning. Scientifically speaking, we can go as far back as the initial singularity, not to the nothingness which may or may not have preceded it.[38]

Creatio Ex Nihilo and Original Creation

Creation out of nothing and the concept of an original creation are very coherent for many philosophers and theologians. Worthing comments, "If the universe had a beginning…this beginning must have been a true beginning with no previous time or space, and not simply a beginning out of a previous chaos or other unknown state."[39] Process theologians reject creation *ex nihilo* for philosophical illogicality. They advocate creation out of absolute chaos where only low-grade actual occasions happen at random without being ordered into enduring objects. Cambridge based physicist and theologian, John Polkinghorne, has outrightly rejected the claim of the process philosophers finding in it a retrieval into ancient Greek thinking where a Demiurge is invoked to order the universe into its present form out of chaos. Here God is devalued as a 'god of the gaps.' Such attempts offer unconvincing resistance to God to be God.[40] According to Worthing, "If the universe is truly finite in space and time, as many believe, then its beginning must have been *ex nihilo.* If a non-*ex nihilo* beginning is postulated (to accommodate the idea of creator), it is ultimately not an actual beginning of space-time but only the beginning of our particular space-time out of some prior reality…. The fact that such a reality may be in principle scientifically inaccessible to us would seem to make the issue somewhat irrelevant as seen from the perspective of potential practical applications of the theories of physical science."[41]

Some others go to the extreme of drawing a one to one parallelism between the scientific and biblical accounts of creation. For instance, for Peter Stoner the second verse of Genesis 1, about the earth being

void and formless and the darkness upon the face of the deep, refers to a dark nebula which is the origin of our solar system. This and many other parallels show the Scripture to be authentic.[42] Worthing too tends too fall in this line at times, especially as he finds "correspondence" between the views of science and Scripture: "Modern science would like to find a 'creation' or origin out of nothing, as this would settle the question of whether the universe is ultimately contingent in its existence…. The Christian affirmation of a creation out of nothing is a recognition that the universe in the entirety of its space-time existence is dependent on God. Hence the *ex nihilo* affirmation corresponds with the confession of a Creator who transcends creation."[43]

No Big Bang

For some the Big Bang looks too much like a creation with explicit theistic implications. It betrays the scientific credibility of the theory. A scientific theory must not contain any elements of metaphysics or mythology. For Hannes Alfven and Fred Hoyle, "the abrupt beginning in the Big Bang Theory is a repugnant metaphysical idea and infusion of religion into science…." A Scientific theory must "not contain any elements of metaphysics or mythology. An attempted picture of the universe should embrace a logical synthesis of the observations, with all guesswork left out…. This 'watchdog' duty is no less imperative today, especially since our contemporary myths like to garb themselves in scientific dress in pretence of great respectability."[44] Alfven thinks the Big Bang Theory was acceptable to Lemaitre "because it gave a justification to the creation *ex nihilo*, which St. Thomas had helped establish as a credo."[45] Hoyle and Alfven also refute the Big Bang Theory on scientific grounds as well. For instance, the Big Bang does not account for the elements heavier than helium and the theory is wrong in predictions of the density of the universe. They say the Big Bang model can only be saved by *ad hoc* hypotheses, similar to the way in which the Ptolemic system was saved by adding more and more epicycles.[46]

Big Bang as Religiously Neutral

Many argue for the religious neutrality of the Big Bang Theory. The non-applicability of our present understanding of time to the

beginning of the universe and the theory-dependence of the beginning are the main arguments for this view. On a different definition of time, the singularity might have been an infinite time ago. Our mode of defining time on the basis of clock cannot be applied to the beginning because no single clock would work all the way back to the moment of infinite density and temperature. Therefore, "the usual statement that the Universe is ten or twenty billion years old, is not accurate for philosophical or theological discussions."[47] For Milton Munitz, the unexplained domains of the Big Bang are no justification to jump into religious conclusions. "Science is grounded in the Principle of Sufficient Reason and, therefore, always leaves open the possibility of finding the explanation of any event. To say there is some unique event, marking the beginning of the Universe for which no explanation can be given, is to say something contrary to the method of Science."[48]

Many have been eager to point out that both the steady state theory and the theory can be interpreted in terms of world's utter dependence on God as well as quite atheistically. Therefore we could only say that the universe and its scientific descriptions are only religiously neutral as well as ambivalent.[49] Besides, many share the opinion of John Hick that "If the scientific picture should change in the future each new version will be equally amenable to a religious interpretation."[50]

2. Hawking's No Boundary Theory

In physics, in general, the physical state of a system at a certain moment, t_2, can be calculated when the state at another moment, t1, is known, plus the laws which describe the evolution from one state to another.[51] In the Big Bang Theory, the state of the universe at any moment consists of information about the material content (particles, represented as fields) and the curved three dimensional geometry which describes the effect of gravity on space. The state of a universe at one time can, again, be calculated by using the equations and the state at another time as a boundary condition. A disadvantage of this description is that it presupposes the boundary conditions. When applied to a primordial event like the Big Bang, one needs to specify the boundaries of space and time. Such a theory will not have much to speak of the very origin of space and time itself. This is avoided in the Hartle-Hawking proposal which we discuss now.

1. Theoretical Assumptions

1. Hawking presupposes that the unification of both General Theory of Relativity and Quantum Mechanics is possible, although he admits that no such theory exists so far.

2. The sum-over-histories approach to Quantum Mechanics. He accepts the idea that the Quantum Mechanics should be formulated in terms of sum-over-histories.

3. He accepts the Euclidean model of space-time as a mathematical devise in which space and time are on the same footing. There is no distinction between both space and time.

4. His theory can be conceived true only in imaginary time. In real time we will still have singularities. Hence imaginary time is very essential in Hawking's theory.

5. The removal of boundary conditions at the beginning of the universe, or establishing that there is no edge to space-time is consequent of this theory.

Quantum Theory of Gravity

The General Theory of Relativity cannot be applied to the very singularity of the Big Bang. When the General Theory of Relativity breaks down, the quantum effects become very significant at that stage. So Quantum Mechanics has to be applied to the early history of the universe. Thus, combining General Theory of Relativity with Quantum Mechanics, Hawking suggests to form a Quantum Theory of Gravity, i.e., no boundary theory. Such a Quantum Theory of Gravity has to formulate Quantum Theory in terms of sum-over-histories as Feynman has proposed.[52] In order to avoid the technical problems in doing it, the use of imaginary time is a must. Hawking says, "Imaginary time is indistinguishable from directions in space.... There can be no important difference between the forward and the backward directions of imaginary time."[53] The resultant space-time is simply a four dimensional space. Secondly, the theory should include the version of gravity as prescribed in Einstein's General Theory of Relativity. In that theory, gravity is the distortion of space-time due to the presence of matter in it. Using these ideas, Hawking came up with his new proposal.

Euclidean Space

The model proposed by Hawking is a closed four dimensional Euclidean space, resembling a three-dimensional sphere. In the Euclidean system time and space are counted on equal footing. Its boundary is a single three dimensional space. Its characteristics are that it has no end or edge, but finite. One can move on its surface without falling off the edge. So, it is finite but unbounded. There singularities that give rise to the breakdown of the laws of science do not occur. And since there is no edge to spacetime, no need to appeal to God for the explanation of boundary conditions. Here is the way Hawking describes the situation: "When quantum mechanics is taken into account, there is the possibility that the singularity may be smeared out and that space-time together may form a closed four-dimensional surface without boundary or edge like the surface of the earth.... One would not have to specify the state in the infinite past and there would not be any singularities at which the laws of physics would break down."[54] In classical theory of gravity, there were two possible ways the universe could behave. Either it had an infinite time in the past or else it had a beginning in singularity in finite time. But a third possibility of space-time to be finite in extent and yet to have no singularities that formed a boundary or edge arises in the Quantum Theory of Gravity.[55]

Compact Three Dimensional Space

The whole history of the universe is pictured by Hawking in analogy with the surface of the earth. Suppose, it starts as a single point in the 'North pole' representing imaginary time, it expands with the increasing of imaginary time, assumes a maximum size at the equator and contracts to a single point at the 'South pole'. The size of the universe will be zero in North and South poles. However, there will not be singularities. Laws of science would hold at them. The only condition here is that the three-dimensional spaces are closed (compact), just as the surface of a balloon is closed in two dimensions. If the surface is closed, a single three-dimensional surface is the only boundary of the four-dimensional spaces used in the path integral, just as the two-dimensional surface of the balloon is the only boundary in the calculation, instead of the two surfaces as boundaries, an initial

one at t_1 and a resulting one at t_2. "By evaluating the path integral over compact metrics, one eliminated one of the two parts of physics, the boundary conditions. There ought to be something very special about the boundary condition of the universe and what can be more special than the condition that there is no boundary."[56]

Imaginary Time

The use of imaginary time is another requirement for Hawking's model as implied by the unification of the Theory of Relativity and Quantum Physics. In order to avoid singularities or edge, the theory must be formulated in imaginary time. Hawking says, "When one goes back to the real time in which we live, however, there will still appear to be singularities."[57] It is clear when he says, "The so-called imaginary time is really the real time, and what we call real time is just a figment of our imaginations."[58]

The problem of singularity invites the divine intervention into the theories about the origin of the universe. The divine intervention does not satisfy a scientist's mind. So Hawking tries to avoid this. Now, in order to avoid the divine intervention, one has to show that the initial singularity or the fist event is not there. Then there will not be a beginning to time and the universe. No boundary or edge to the space-time will be there. If the universe had a beginning, it is reasonable to suppose that it had a creator. But, in the proposed theory, the universe is completely self-contained without any boundary or edge or a beginning or end. In earlier models of cosmology, the starting point of the universe was left to God who set the boundary conditions. Now science is able to explain the initial state. We no more need to appeal to God. As Hawking says, "So long as the universe had a beginning, we could suppose it had a creator. But if the universe is really completely self contained, having no boundary or edge, it would have neither beginning nor end; it would simply be. What place, then, for a creator?"[59]

Hawking - A Philosophical Critique

An article on Hawking's book in the German tabloid *Stern,* concluded, "In his system of thought there is no room for a creator God. Not that God is dead: God never existed."[60] Here we subject Hawking's theory to a philosophical and religious scrutiny.

God as Sufficient Reason

While it is true that he rejects God's role as creator of the universe in the sense of an efficient cause producing an absolutely first temporal effect, Hawking appears to retain God's role as the sufficient reason for the existence of the universe, the final answer to the question, why is there something rather than nothing.[61] Hawking distinguishes between the questions what the universe is and why the universe is. Hawking himself says that having answered the question what the universe is, he is left with the unanswered why question. At face value, then, God for Hawking serves as the sufficient reason for the existence of the universe. "Thus, it seems to me that far from banishing God from reality, Hawking invites us to make Him the basis of reality."[62]

God as Metaphysically First Cause

Traditionally, creation was thought to involve two aspects: *creatio originans* and *creatio continuans.* Only the first notion involves the idea of temporal beginning. *Creatio continuans* could involve a universe existing from everlasting to everlasting, that is to say, a universe temporally infinite in both the past and the future at any point of time. In Aquinas' view even *creatio ex nihilo* does not necessarily entail a temporal beginning of the universe. According to Aquinas, all finite beings, even those like the heavenly spheres or prime matter which have absolutely no potential for generation or corruption and are therefore by nature everlasting, are nevertheless metaphysically contingent in that they are composed of essence and existence, that is to say, their essential properties do not entail that such a being exists. If these essences are to be exemplified, there must be a being in whom essence and existence are not distinct and which therefore is uncaused, and it is this being which is the creator of all finite beings, which he produces by instantiating their essences.[63]

Even if we maintain that a doctrine of creation does entail a temporal beginning of the universe, the point remains that this doctrine also entails much more than that, so that even if God did not bring the universe into being at a point of time as in Hawking's model, it is still the case that there is much more for him to do, for without His active and continual bestowal of existence to the universe, the whole of finite reality would be instantly annihilated and lapse into non-being.

Thus any claim, that Hawking has eliminated the creator is seen to be theologically frivolous.[64]

God as Temporally the First Cause

An examination of the theoretical fallacies in the Hawking's model of the universe would say that he has not succeeded even in removing the role of the creator as temporally the first cause. Hawking's claims are highly dubious, for his model is founded on philosophical assumptions that are just unexamined and unjustified and at worst false. Craig comments that most people would find it fantastic to think that Feynman's sum-over-histories approach describes what really happens, that an elementary particle really does follow all possible space-time paths until its wave function is collapsed by measurement. Why not a Copenhagen interpretation which eschews realism altogether with regard to the quantum world? Or an alternative vision of the Copenhagen interpretation which holds that no quantum reality exists until it is measured? Why not hold that the uncollapsed wave function is, in Bohr's words, "only an abstract quantum mechanical description" rather than a description of how nature is. A disavowal of realism on the quantum level does not imply a rejection of a critical realism on the macroscopic level.

To say that Hawking's use of Feynman's sum-over-histories approach may be an instrumentalist approach does not hold, for it does not work in Hawking's model which presumes the real existence of a superspace. This superspace is not a fiction but the primary reality. Since Hawking takes the wave function of a particle to be the analogue of a physical space-time that represents the history of the universe, an instrumentalist interpretation of the sum-over-histories approach leads to an equally instrumentalist, non-realist view of space-time, which betrays Hawking's whole intent.

Hawking's wave functional analysis of the universe requires the Many Worlds Interpretation of Quantum Physics and Hawking admits as much. But for many physicists, the Many Worlds Interpretation is outlandish. Then quantum cosmology far from obviating the place of a creator, might be seen to create for Him a dramatic new role. Therefore "a realist construal of Hawking's account involves extravagant and dubious metaphysical commitments, such that his model can hardly be said to have eliminated the place of a Creator."[65]

Problems with Imaginary Time

The impression that Hawking's model is thoroughly non-realist is heightened by his use of imaginary time in summing the waves for particle histories. Although Hawking claims that imaginary time is a well-defined mathematical concept, the question is whether that mathematical concept has any counterpart in realty.[66] In his model the imaginary time and Euclidean space-time are suddenly supposed to be, not merely conceptual devices, but actual representations of physical reality. This "ontologizing" of mathematical operations is not only neither explained nor justified, but metaphysically absurd. Although the whole presentation of the imaginary time leaves the impression that it is a mere mathematical construct without ontological import, Hawking draws the astounding conclusion that imaginary time is really the real time and that what we call real time is just a figment of our imagination. Only if Hawking proves that imaginary time is ontologically real and real time fictitious has he succeeded in obviating the need for a creator.

Equation of Space-time

Hawking reduces empirical time to a spatial dimension and conflates empirical time with ontological time. He winds up with a tenselessly existing space-time which he wishes to pass off as reality. According to Hawking, the Theory of Relativity put an end to the idea of absolute time and we must accept that time is not completely separate from and independent of space, but is combined with it to form an object called space-time.[67] According to Craig, this is similar to one of the most widespread and persistent errors concerning the interpretation of the Special Theory, that is the failure to distinguish between what we may call measured time or empirical time and ontological time. Einstein did not eliminate absolute simultaneity. He merely redefined it and established a sort of empirical time, which would be subject to dilation and in which the occurrence of identical events could be variously measured.[68] It is metaphysically misguided to identify ontological time as a dimension of space. That time and space are ontologically distinct is evident from the fact that a series of mental events alone is sufficient to set up a temporal series of events even in the absence of spatial events. If ontological time is scientifically useless

and therefore to be left to the metaphysician, then the point is that, "Hawking is doing metaphysics. When he begins to speculate about the nature of space and time and to claim that he has eliminated the need for a Creator, then he has... entered the realm of the philosopher and here he must be prepared to do battle with philosophical weapons on a broader conceptual field or else retreat within the walls of a limited scientific domain."[69] Given these loopholes, the metaphysical absurdity of Hawking's vision of the world seems starkly apparent which "forces us and Hawking to confront squarely a different question: What price, then, for no Creator?"[70]

3. Theological Questions

A brief overview of the theological reflections over the creation reveals that the God they try to assert or to dispel is a God of the gaps. Scientific theological speculations are yet to free itself from the overriding clutches of deism. This is true of the theologisation on both the Big Bang and Hawking's models. Neither the Hawking version of atheism itself is free from this.[71] Given the philosophical limitations and theoretical loopholes in Hawking's no-boundary theory, even some of the vehement exponents of scientific atheism might be inclined to dispel the pernicious theological claims of Hawking as fallacious, as is evident in the remarks of Quentin Smith on Hawking's atheistic arguments that "this is probably the worst atheistic argument in the history of the Western thought and I shall not waste the reader's time refuting it."[72]

Granted that there are several illogicalities, imaginative speculation and metaphysics in Hawking's physics, such an attitude to this wonderful theory appears to be so naive and minimalist. Such an approach would leave unexplored the profound religious implications hidden in the metaphysical depth of this theory. If one day the speculative and imaginary conditions of this theory were to be proven to be realistic and scientifically established, the opponents of this theory would run the chance of being falsified. An evaluation of the theological implications of this theory from a different religious perspective would produce a lot of scientifically justified theological data for redefining our traditional conceptions of God, erasing the implicit deistic traits in several religious creationist doctrines.

It is interesting to note that when a reader of an earlier summary draft of Hawking's book in *American Scientist* complained that Hawking seemed afraid to admit the existence of a Supreme Being, Hawking countered that "I thought I had left the question of the existence of a Supreme Being completely open.... It would be perfectly consistent with all we know to say that there was a Being who was responsible for the laws of physics."[73]

A critique of the religious critique of Hawking's theory would show that they are founded on a conception of the transcendental creator as understood in the Aristotelian-Thomistic tradition which later on dominated the philosophical world of the Christian West. The conceptual framework and logical conditions of such a divine conception would seem to be irreconcilable with the seemingly atheistic nature of Hawking's model. In the epistemology of the religious truth, the subjective and relativistic character of the theistic or atheistic concepts cannot be ruled out and as such it would not be proper to judge a scientific theory with a conceptually conditioned theological doctrine. Does the no-creator theory of Hawking suggest anything about the creatorless philosophy of the Chinese? Does the eternal IS-ness of the Hawking's universe speak anything for the organic effluence of the world from God as intuitively conceived by the Indian sages? Does it imply something in the line of an "ontological ultimate" as has been envisaged in the process philosophy of Whitehead? Perhaps a presupposition-free exploration of the opaque depths of the religious implications of Hawking's "atheistic" theory would suggest it to be theologically richer than the traditional religious dogmas and documents and as such it has opened up fresh areas of collaboration before science and religion, to join their hands together to begin the great task of exploring the real.

End Notes

1 The steady state theory of the origin and development of the universe also needs attention here. This theory states that there was no creation of the universe and it always existed pretty much in the way we see it today. There is no beginning and no end; the universe is in eternal equilibrium.

2 Anand Severes, "Philosophical Implications of Moderns Scientific Cosmologies," in *Divyadaan* 10:1 (1999), p. 65.

[3] John Malone, *Unsolved Mysteries of Science* (New York: John Wiley & Sons Inc., 2001), p. 6.

[4] See Heinz R. Pagels, *The Cosmic Code - Quantum Physics as the Language of Nature* (New York: Simon and Schuster, 1982), p. 312

[5] Edward W. Kolb, "The Big Bang Origin of the Universe," in Clifford N. Matthews and Roy Abraham Varghese (eds.), *Cosmic Beginnings and Human Ends* (Chicago: Open Court, 1995), pp. 72-73.

[6] Kolb, p. 74.

[7] Kolb, p. 73.

[8] When placed sufficiently close together, matter and antimatter annihilate with one another and leave behind an energetic burst of radiation.

[9] The laws of physics do not favour matter over antimatter. Particles made of ordinary matter, like protons and neutrons are called baryons. Particles of antimatter are called antibaryons. The net baryon number of the universe is the total number of baryons minus the total number of antibaryons. See Fred Adams and Greg Laughlin, *The Five Ages of the Universe: Inside the Physics of Eternity* (New York: A Touch Stone Book, 1999), pp. 23-24.

[10] Laughlin, p. 26.

[11] Kolb, p. 71.

[12] Reproduced from Kolb, p. 70. The distance between any two pints in the universe is proportional to *size*. For instance, a point that is 100 Mpc away today was only 20 Mpc away at the time of the formation of the oldest visible quasars.

[13] Isotropic is a term coined by Timothy Ferris meaning that "any observer, anywhere in the universe, should measure the background as having the same temperature everywhere in the sky"(Malone, *Unsolved Mysteries of Science,* p.7).

[14] The age of the universe can be calculated using the inverse of the Hubble constant (H_0). (H_0) is the ratio of the recessional velocity of the galaxies to the distance of the Milky Way. The time required for a galaxy to reach its present position in the universe at the recessional velocity can be calculated with the inverse of the Hubble constant (H_0^{-1}). This would give the age of the universe if the universe were accelerating uniformly. But since the universe is slowing down "H_0 will have to be modified by the degree to which the recessional velocity was slowed down by gravity throughout the universe's expansion (q_0). Sandage and Tammann's best estimates for H_0 are 55km s^{-1} Megaparsecs^{-1} …. Inasmuch as a Megaparsec is 3,260,000 light years, H_0^{-1} (Hubble time) would be approximately 18 billion years old (55÷3.26)." However, since the universe is slowing down, the Hubble time must be modified to suit the decelerating proportionality of the universe too. "The cause of this deceleration is gravitational attraction from the total mass of the universe (currently estimated to be 10^{53}kg). When average mass density is used to calculate q_0 (the decelerating parameter) and this, in turn, is used to modify Hubble time (H_0^{-1}), the resultant age of the universe seems to be approximately 15 billion years old" (Robert J. Spitzer, "Indications of Creation in Contemporary Astrophysics," *Ultimate Reality and Meaning* 24:1 (2001), p. 217).

[15] Spitzer, p. 219.

[16] Ervin Nemesszeghy, "Searching for the Ultimate in Physics after the Big Bang," *Ultimate Reality and Meaning*, 24:3 (2001), p. 141.

[17] John D. Barrow, *The Origin of the Universe* (New York: Basic Books, 1994), pp. 75-79.

[18] Alan Guth, *The Inflationary Universe* (New York: Helix Books, 1997), p. 75.

[19] Malone, p. 10.

[20] That is, the expansion is described by a doubling time, which for typical Grand Unified Theory numbers is about 10^{-37}seconds. In this brief interval of time, all distances in the universe are stretched to double their original size. See Guth, pp. 173-175.

[21] See Fred Adams and Greg Laughlin, p. 9.

[22] The theories of elementary particles predict the existence of the false vacuum which is a peculiar form of matter. Particle physicists describe the false vacuum in terms of fields. With its negative pressure, false vacuum creates a repulsive gravitational field, capable of driving the universe into a period of exponential expansion. (See Guth, pp. 256-269).

[23] William R. Stoger, "Developments in Contemporary Cosmology: The Challenges and Opportunities to Religion," in Job Kozhamthadam (ed.), *Contemporary Science and Religion in Dialogue: Challenges and Opportunities* (Pune: ASSR Publications, 2002), p. 53.

[24] See Willem B. Drees, *Beyond the Big Bang,* pp. 48-49.

[25] Drees, *Beyond the Big Bang*, p. 49.

[26] Andrej Linde had himself developed a Bubble domain theory advocating multiple universes. (Cited in Malone, p. 12).

[27] Drees, p. 50.

[28] Trinh Xuan, *The Secret Melody*. Cited in Malone, p. 12.

[29] Timothy Ferris, "Science and Genesis," in Clifford N. Matthews and Roy Abraham Varghese (eds.), *Cosmic Beginnings and Human Ends* (Chicago: Open Court, 1995), p. 43.

[30] See Timothy Ferris, p. 45.

[31] Arnold Benz, "Theology in a Dynamic Universe", in *Zygon* 6:3 (September 2001), p. 560.

[32] Now, astronomers are searching for the "missing mass" that would make the total energy zero. There are lots of places where this missing mass could be hiding. (1) Galaxies have most of their mass in large halos that are invisible. (2) There could be some large invisible black holes at the core of galaxies. (3) The most recent candidate for the missing mass is a small neutrino mass. The universe could be filled with missing neutrino mass. Once the missing mass is found out the total energy of the universe would be zero.

[33] Stanley Jaki, "From Scientific Cosmology to a Created Universe," in *Irish Astronomical Journal* 15, p. 258.

[34] Jaki, "From Scientific Cosmology to a Created Universe," p. 260.

[35] S. Jaki, *The Road of Science and the Ways to God* (Chicago: University of Chicago Press, 1978), p. 18.

[36] Worthing, *God, Creation and Contemporary Physics*, p. 85.

[37] Spitzer, p. 221.

[38] Ted Peters, "On Creating the Cosmos," in Robert Russell, William R. Stoger and George V. Coyne (eds.), *Physics, Philosophy, and Theology – A Common Quest for Understanding* (Vatican City: Vatican Observatory, 1998), p. 283.

[39] Worthing, *God, Creation and Contemporary Physics*, p. 93.

[40] See John Polkinghorne, *Science and Creation: The Search for Understanding* (London: SPCK Publishers, 1989), p. 60.

[41] Worthing, *God, Creation and Contemporary Physics*, pp. 93-94.

[42] Peter Stoner, "Genesis 1 in the Light of Modern Astronomy," in J. C. Monsma (ed.), *The Evidence of God in an Expanding Universe* (New York: Putnamis Sons, 1958), p. 141.

[43] Worthing, *God, Creation and Contemporary Physics*, p. 108.

[44] H. O. Alfven, *Worlds-Antiworlds: Antimatter in Cosmology* (San Francisco: Freeman, 1966), p. 3.

[45] Hannes Alfven, "Cosmology Myth or Science?" in W. Yourgrau and A. D. Breck (eds.), *Cosmology, History and Theology* (New York: Plenum Press, 1977), p. 7. Drees comments that Alfven's opinion on Lemaitre's motive is historically false. Lemaitre was very unhappy with the way Pope Pius XII, in 1951, used the Big Bang Theory as a physical proof for creation.

[46] Alfven, p. 16. Drees comments that these objections are scientifically untenable and unfounded. See Drees, pp. 23-24.

[47] Charles Misner, "Cosmology and Theology," in W. Yourgrau and A. D. Breck (eds.), *Cosmology, History and Theology* (New York: Plenum Press, 1977), p. 92.

[48] Milton Munitz, *The Mystery of Existence* (New York: New York University Press, 1974), p. 139.

[49] Drees, p. 26.

[50] John Hick, *An Interpretation of Religion* (Houndmills & London: Macmillan, 1989), p. 96.

[51] See Drees, *Beyond the Big Bang*, p 233.

[52] It is one of the interpretations of quantum theory. According to sum-over-histories, an elementary particle, instead of taking a single path between two spacetime points, takes all the possible paths connecting those points. Hence, in order to get the probability of a particle's path, we have to sum up the wave amplitudes associated with every possible history that passes through that point. But a particle's path is restricted to a very finite number of most probable

histories, because the waves having equal amplitudes and opposite phases mutually cancel out.

[53] Stephen W. Hawking, *A Brief History of Time* (New York: Bantam Books, 1988), p. 151.

[54] Stephen W. Hawking, "The Edge of Space-time," *in American Scientist* 72 (1984), p. 358.

[55] Hawking, *A Brief History of Time*, p. 143.

[56] Hawking, *A Brief History of Time*, p. 145.

[57] Hawking, *A Brief History of Time*, p. 147.

[58] Hawking, *A Brief History of Time*, p. 147.

[59] *Hawking, A Brief History of Time*, p. 149.

[60] William Lane Craig, "What Place, Then, for a Creator? Hawking on God and Creation," in Craig and Quentin Smith, *Theism, Atheism and Big Bang Cosmology* (Oxford: Clarendon Press, 1995), p. 279.

[61] Craig, p. 280.

[62] Craig, p. 281.

[63] St. Thomas Aquinas, *Summa Theologiae*, 1a. 2. 3. See Craig, p. 283.

[64] See Craig, p. 283.

[65] Craig, p. 291.

[66] See Craig, p. 294.

[67] See Hawking, *A Brief History of Time*, pp. 21, 23.

[68] See Craig, p. 297.

[69] Craig, p. 298.

[70] Craig, p. 300.

[71] Ted Peters reassures our theological critique of Hawking by observing that Hawking's "anti-religious agenda" is one in which the God whom he rejects is the God of deism, not the God of the monotheistic religions. See "The Trinity in and Beyond Time," in Russell, et.al. (eds.), *Quantum Cosmology and the Laws of Nature - Scientific Perspectives on Divine Action* (Vatican: Vatican Observatory Publications, 1993), pp. 278-279.

[72] Quentin Smith, "The Wave Function of a Godless Universe," in Craig and Smith, p. 322.

[73] Cited in Craig, pp. 280-281.

Chapter 5

Evolutionary Theory and Theology

The one absolutely impossible conception of God, in the present day is that which represents him as an occasional visitor. Science has pushed the deist's God further and further away, and at the moment when it seemed as if He would be thrust out all together, *Darwinism appeared and under the disguise of a foe, did the work of a friend...* Either God is everywhere present in nature, or He is nowhere (Emphasis mine).[1] The ground-breaking Evolutionary Theory of Charles Darwin proposed in his *Origin of Species* is one of the greatest monuments of human intellectual history. Since its first appearance, Evolutionary Theory has been a topic of heated debate between science and religion. In the light of the greater scientific credibility that it continues to acquire, the Theory of Evolution is of utmost theological significance even today.

1 Scientific Assumptions of the Evolutionary Theory

The etymological root of evolution is the Latin *evolvere,* meaning to unfold. In the 18th century, the term referred to the process of ontogeny in which a single organism develops from a fertilized egg into an adult. In Darwin's theory, the meaning of the term itself underwent a transition from ontogeny to polygeny. Thus now it is applied to the process of 'descent with modification', the term coined by Darwin himself, whereby new species emerge from ancestral forms.[2] "According to the biological theory of evolution the variety and forms of life on earth are the result of descent with modification from the earliest forms of life."[3] Evolution is also defined as "an integration of matter and concomitant dissipation of motion, during which the matter passes from an indefinite incoherent, homo sensitivity; to a definite coherent, heterogeneity and during which the retained motion undergoes a parallel transform ation."[4]

As the Theory of Evolution emerged, vast majority of the scientists accepted the theory as a proven fact, though scientists like Adam Sedgwick, Darwin's teacher, took exception to many of Darwin's claims. However, in recent times there have been several differing voices on the different claims of the theory and its status as a fully established scientific theory. H. H. Newman said, "honestly tell, the evolutionists too admit that there is no absolute proof for organic evolution."[5] According to Goldschmidt of the University of California, "The statement of the problem already indicates that I cannot agree with the viewpoint of the textbooks, that the problem of evolution has been solved as far as the genetic basis is concerned.... Nowhere have the limits of the species been transgressed and these limits are separated from the limits of the next good species by the unabridged gap, which also includes sterility."[6] Nowadays theory of evolution is part of the common man's wisdom. In the *Darwin Centennial Number of the Rice Institute Pamphlet*, Professor James Street Fulton remarks: "An essay on the philosophy of evolution in the century since the publication of Darwin's *Origin of Species* can be written in two sentences. By the end of the first 50 years, everybody in the educated world took evolution for granted, but the idea was still intellectually exciting and its philosophical explanation was entering upon a period of full maturity. By the end of the next 50 years, evolution

belongs to common sense almost as thoroughly as the Copernican hypothesis and other early landmark of the scientific evolution; but the idea is no longer exciting, and evolutionary philosophy is out of fashion."[7]

Natural Selection

The uniqueness of Darwin's Evolutionary Theory consists in his proposal of *natural selection*, the mechanism by which the evolutionary change is effected. Natural selection is "the favoring of survival and reproduction of organisms that possess traits adapting them to a particular environmental situation at a particular time and the elimination of organisms that do not possess those traits in the same environment."[8] In other words nature selects organisms with adaptive features and avoids non-adaptive organisms. Speciation occurred where there was relatively rapid change in the environment. The environmental pressures that operated upon the variations over the generations produced divergence of the descendent groups. These divergences were substantial that the descendant groups could not interbreed with the ancestral ones. This reproductive isolation was the cause and result of speciation in sexually reproducing species. Thus variations within collective heredity and natural selection are the two factors operating behind the origin of species. Survival of the fittest is a common characterization of this process.[9] Natural selection in Darwin's own words:

As more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical condition of life…. Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in someway to each being the great and complex battle of life, should occur in the course of many successive generations. If such do occur, can doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favourable

individual differences and variations, and the destruction of those which are injurious, I have called Natural Selection, or the Survival of the Fittest.[10]

Natural selection and sexual selection are the two pillars of Darwin's adaptationist paradigm. Sexual selection is the struggle between individuals of a one sex, generally males, for the possession of the other sex. It implies that the survival is also dependent on your ability to attract mates with some features such as body, size, etc. Mutation is yet another factor causative of the evolutionary change. By mutation Darwin meant only a sudden change in the species which was not fully explained by him.

Supporting Evidences of Evolutionary Theory

From a hypothetical status, Evolutionary Theory has evolved into an established scientific theory being explicated by several supported proofs. Evidence from fossils is considered to be one of the best proofs for the Theory of Evolution. Fossil forms of skeletons, shells, seeds, insects, etc., which are over 10,000 years old gives a general record indicating the orderly change in the history of the living beings. The similarity of the older fossils testifies to the relationship among species. The theory is also supported by geographical distribution of plants and animals. "Present day geographical distribution is best explained by the view that the plants and animals have descended from ancestors evolving either where they are at present or form ancestors that evolved elsewhere but were able to reach their present sites because no barriers prevented their migration."[11] Taxonomy, the practice of classifying organisms on the basis of their structural resemblances, also is a proof to the Evolutionary Theory. Although plants and animals are very distinct in nature, several common characteristics have been identified among them like the presence of DNA and amino acids, similarity in the process of cell division, fundamental laws of heredity, etc. There are also immunological evidences to the Theory of Evolution. It has been identified that the humans and the apes are much alike in the possession of genetic codes accountable for the immune system. While all these proofs are based on rather old scientific discoveries, recent scientific revolutions like the Human Genome Project has stretched these arguments far

out in the corroboration of an evolutionary continuity between species.

The Human Genome Project and related developments show the unity in diversity of the living world. Just as atoms of different material elements are made up of the same fundamental particles, the DNA of different living beings is made up of the same four fundamental nucleotides, viz., A (Adenine), G (Guanine), C (Cytocine), and T (Thymine). Even in the sequencing also one can see a remarkable similarity. Thus the genomes of yeast, nematode worm, fruit fly, mouse, etc., show remarkable similarity with the human genome. According to some estimates, humans share 98.4% of DNA with chimps. This means the difference between the genomes of a human being and a chimp is only 1.6%. With cow the overlap or the DNA shared is 90%, with mouse 75%, with yeast about 30%, with *E. coli* bacterium 15%, etc.[12] The human race has crossed the six billion mark some time ago. Despite such large numbers spread over many continents, cultures, and races, humans show a remarkable deeper unity in their biology. It is found that any two individuals differ on the average only in one nucleotide per one thousand. Venter points out that the "genome research shows humans to be 'clearly part of a biological continuum.'" In fact, according to him, "if we showed you the mouse genome today, you would not be able to tell its difference from the human genome. There are very few changes."[13]

Several other findings in genetic research also confirm this deep-rooted unity. For instance, it is found that "60% of the known human disease genes have equivalents in flies and that about 7,000 (50%) of all fly proteins show similarities to known mammalian proteins."[14] In the case of the proteins of the nematode worms, roughly one third is similar to those of mammals. 38% of all yeast proteins also show similarity with mammalian proteins. The mouse genome is even closer since more than 90% of mouse proteins identified till recently show similarities to known human proteins. All these data reveal the deep unity existing among the innumerable living beings.

2. Human Evolution

Scientists accept that *human being* is the product of biological evolution and he participates in the same complex process of organic

derivation that affects all the rest of the living world. Yet, quite many details of the stages in human evolution remain uncertain and the construction of human genealogical tree is only provisional. From the palaeontological records, human being is very much placed in the general succession of living things. However, zoologists place human being separately due to special features arising from their upright stance - curved spine, enlarged pelvis, vertical upper and lower limbs, etc., and other differences like the reduction in the bones of the face, the development of chin, the presence of canines not protruding above the other teeth, the absence of the central bone of the wrist, etc. Here too there are scientific problems to be tackled.

As the present researches in human evolution is concerned, the totality of the human phenomenon cannot be explained by it and there are no experimental evidences to show that human evolution is just a continuation of the natural process. As maintained by Alfred Russell Wallace, "because man's physical structure has been developed from an animal form by natural selection, it does not necessarily follow that his mental nature... has (also) been developed by the same causes only."[15] With the appearance of human awareness evolution enters the domain of spirit, from simple practical intelligence to an unseen universe; where this transition occurs, natural selection loses its explanatory power.

According to the Theory of Evolution the human too has evolved from a common ancestor as in the case of other mammals. The evolutionary vision of the human is an accepted assumption in scientific and popular circles. "All agree that humans evolved from some ape like ancestor. What then is evidence for the evolution of humans from a subhuman ancestor? The data from anatomy, embryology, cytology, and molecular biology all support the concept that human like any other animals evolved. One might say that despite of all these evidence human did not evolve from some animal ancestor, then no animals evolved at all, all are specially created. No scientists today could accept such a conclusion."[16]

There are telling evidences for the human evolution from the lower species. The nucleic content of the human cells has the same DNA

as in other animals. The human cells are made up of same chemical elements of the other organisms. Darwin did not have enough of fossil records in support of human evolution. The skull discovered at Gibralter in 1848 with thick bones, prominent eyebrow ridges and massive jaws and the similar one discovered in Neander in Germany are proofs for the origination of the humans from the apes. At Dordogne in France human skeletal remains were found buried with stones and tools better made than those found with the Neaderthal man. In 1942 the skull of a child was discovered by Raymond Dart in South Africa which was a mixture of apes and human features. It is believed that the homosapiens first appeared in Africa at 200,000 years ago. They were characterized by increased brain size. Darwin stated in the *Descent of Man* that it is liable to receive from the lower animals and to communicate to them, certain diseases, as hydrophobia, variola and these factors prove the close similarity of their tissues and blood. The bodily structure of man, his embryonic development, similarity in the rudimentary organs, etc., show the descent of human from the lower animals.[17]

3. Theory of Evolution Today

The modern Evolutionary Theory is called Neo-Darwinism. It implies a synthesis between Darwin's principles of natural selection and the discoveries of population genetics, palaeontology, molecular biology, etc. "Charles Darwin posited instead small variations in degree within a surplus of offspring, a struggle for survival and a natural selection by which the more fit survive. Though he held no theory for the variations, genetics was subsequently to supply one, and Darwinism plus genetics is commonly called neo Darwinism, or the synthetic theory."[18] Though there is an uninterrupted intellectual continuity between the old and the new theories, the latter is more synthetic as the result of contributions of various field researchers - geneticists, palaeontologists, embryologists, etc. A convergence has emerged in the opinions of palaeontologists, geneticists and systematists that while they consider natural selection very important, they reject the characteristics acquired by inheritance. Evolutionary Theory too is no exception from the approximation of truth. Although the explanatory power of the Theory of Evolution is tremendous, it lacks predictability.

As Rolston puts it: "This theory does not allow us to say, after the events, why they happened, and why other events failed to occur. There is only one explanation of why such ones as are selected nothing more."[19] Barbour comments about the limitations of the Theory of Evolution:

It becomes hard to see how the theory is hypothetico-deductive in the sense of deriving outcomes out of it, at least in any larger or interesting sense that illuminates us about what did or did not happen over longer spans of time. It becomes hard to see how the theory offers any puzzle – interpreting pattern by which we make intelligible why vertebrates occupied dry land, why mammals followed dinosaurs, why learning followed instinct, why sentience followed reflex, why culture followed nature, describe these events though evolutionary science may. The theory is really vacant about how we steadily get order out of chaos, about the forces that order life up to its high levels of achievements.[20]

David M. Raup also shares some apprehensions about natural selection, the core of the Theory of Evolution. "It is safe to say that we know for sure that natural selection, as a process does work. There is a mountain of experimental and observational evidence… which shows that natural selection as a biological process works…. There has been complete turn over in the biological world many times. This record of change pretty clearly demonstrates that evolution has occurred. If we define evolution simply as change, but it does not tell us how this change took place. If we allow that natural selection works, as we almost have to do the fossil record does not tell us whether it was responsible for 90% of the change we see, or 9%; or .9%."[21] The failure to explain the origin of life from the evolutionary point of view and the lack of transitional forms in the fossils, etc., are considered to be limits of the Theory of Evolution. Evolutionary Theory does not explain the origin of life itself or the history of the changes of the non-biological parts of the universe whereas it gives a unified and naturalistic explanation for the diverse features of life and for a wide range of other biological phenomena like diversity of life forms, their adaptation to the environment, their possession of vestigial organs, the resemblances among them, etc.

1. Evolutionary Theory and Theology

The Evolutionary Theory has come a long way since its original appearance. More than a theory that is concerned with the origination of species and the associated environmental factors, the subsequent developments have been able to situate this theory in a wider scientific and natural framework, pregnant with several philosophical and theological underpinnings. Metaphysical evolutionists extend the idea of evolution to include the mind, the soul and the entire universe. Evolution is no more limited to the scientific realms but it becomes essential in the context of religion to which the universe seems as the drama of progressively unfolding consciousness. Evolution becomes, in their hands, a cosmic phenomenon shaped either by divine forces or by mysterious emergent tendencies that operate from within the forces themselves.

On a general philosophical plain, one could say that the Theory of Evolution has brought out an inherently creative, dynamic and evolutionary worldview, a view of the world that is ever in the making. The older assumptions of immediate creation with its static and fixated account of origination reserved no place for a dynamic worldview. The evolutionary, changing and historical nature of the world as has been discovered today owes much to the Theory of Evolution. This worldview is so profound that drawing out the implicit anthropology and cosmology of it would be reformative of our self-understanding and our understanding of any reality at large. The poetic observation of Darwin himself is a legitimate appreciation of the Theory of Evolution. "There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being, evolved."[22]

At a more fundamental level the most substantial unit of this new worldview is to be identified as the grand discovery of the inherent and inbuilt potentialities of matter. The evolutionary perspective has enormously enhanced our understanding of matter. The ability of matter to organise itself into self-organising systems and its inbuilt urge towards greater complexity are the vital dynamisms of the

evolutionary process. One will be caught by surprise to learn the miraculous paths that matter has trodden and the revolutionary choices that it has made to obtain such behaviours to which we attribute consciousness and all the more, self-consciousness in a complex mechanism like human brain. "Each level of the development of the cosmos can, it appears, legitimately be regarded as a manifestation of the potentialities of matter which have been implicit in it from the beginning in its simplest forms and have only gradually unfolded."[23] The intrinsic and self-contained mechanism of this transition requiring apparently not any, what is traditionally termed as, direct intervention or occasional visits of the divine may carry with it many unknown blueprints of divine action and divine providence.

The continuity between the living and the non-living worlds as implicated by the matter mechanisms implicit in Evolutionary Theory warrants the cosmic and totalistic applicability of the theory itself. As noted earlier, the neo-Darwinian synthesis of the Evolutionary Theory discovers a wider cosmic process implicit in the evolutionary emergence of matter. "Today we can place biological evolution in a cosmic context that involves a continuous development of the forms of matter from the original `hot big bang', through atoms and molecules, to those complex structures that could self-produce their pattern of organisation and can be properly designated as `living'... The potentiality of matter to develop new forms of organisation... stretches back beyond the beginning of living forms, and may well stretch on into the future beyond their eventual demise on the surface of the earth."[24]

5. Evolution and Divine Design

A serious point of rapprochement between science and religion was the issue of divine intelligence and design in an evolutionary perspective. For some evolution was a religiously neutral doctrine or disproving the religious claims of a divine design in the universe. The universe must be godless and impersonal in an evolving world. Haught has identified three lines of arguments in such anti-religious interpretations of the Theory of Evolution. Firstly, the workings of nature must be accidental and irrational as the variations leading to differentiation of species are purely random. Even in recent times the

causes of genetic mutation is attributed to mere chance by some biologists. Secondly, the struggle for survival point to the basic cruel and unjust cosmic set up irreconcilable with a just God. Thirdly, the mindless process of natural selection also point to a world that is not friendly to life and humanity.[25]

Most of these arguments philosophically unfounded as they are for their parochial perspectives on reality can easily be ruled out even from the traditional philosophical perspectives within the frameworks of the natural theology. Long before the emergence of the evolutionary hypothesis, St. Thomas Aquinas had stated that there was no contradiction between chance and divine providence. "It would be inconsistent with divine providence if all things happened of necessity…. Therefore it would be contrary to the nature of providence or to the perfection of the world if nothing happened by chance."[26] Peacocke too finds the hand of God operative in mechanism of chance. For Peacocke, Chance is the biological tool used by the immanent creative action of God to explore and activate the rich potentialities of matter.[27]

In response to the role of randomness as opposed to divine role, it could be responded that what we consider to be random need not necessarily be random at all, as our perceptions and judgements are conditioned by the limitations of our perspective. What is scientifically an absurd chance could be quite rational and coherent from a divine point of view. The evolutionist anti-religious agenda on the basis of the unjust and cruel cosmic set up can also be countered on the basis that even the biblical God of Mercy is a God who reveals Himself in the agony of Job and in the Crucifixion of Jesus. Haught finds an analogy with the law of Gravity to counter the alleged impersonal and blind path of natural selection. Despite the at times deadly pull of gravity towards earth to weak and powerful alike, no philosopher has used gravity for arguments against God and hence natural selection too cannot be viewed no less leniently.[28] As Haught observes, what evolution demands basically is a fresh way of looking at God. "Ours is a God who wishes to share the Divine creative life with all the creatures, and not just humans. Such a God renounces from the outset any rigid control over the process of creation, and

gives to creation a significant role, indeed a partnership, in the ongoing evolution of the world. Such a gracious self-denying love would be quite consistent with the world open to all the surprises we find in the physical record of evolution. And it would also be logically consistent with the struggles (and differing – check) that we witness in life and its evolution."[29]

Organic evolution is Darwin's expression for change that occurs in organisms between parents and offspring. The process of organic evolution is often misrepresented as resulting from the operation of blind chance alone.[30] However this view betrays Darwin's own intimations: "Whether or not we are able to believe that every slight variation of structure - the union of each pair in marriage, the dissemination of each seed - and other such events, have all been ordained for some special purpose."[31] Darwin has been careful to speak of "the laws impressed on matter by the Creator."[32] R. Dawkins sums up the debate over the role of chance in Darwinism: "Living things are too improbable and too beautifully `designed' to have come into existence by chance.... The belief that Darwinian evolution is `random' is not merely false. It is the exact opposite of the truth. Chance is a minor ingredient in the Darwinian recipe.... The end-product of one generation of selection is the starting point for the next generation of selection and so on for many generations."[33]

Creation in Evolution

Viewed from this perspective, the divine act of creation can also be redefined from an evolutionary point of view. Creation need not just be an originative act but an ongoing act. "In an evolving cosmos creation is still happening, no less in the present than in the beginning. The *Big bang* universe continues to unfold, and so any day is still the 'dawn of creation.'"[34] Theory of Evolution has thus enabled theology to give up a vision of creation which is taking place in the remote past and instantaneously completed. Evolutionary perspective is more in congruity with a divine act of origination that is incessantly operative in the processes of the universe.

Creation has to be understood as the initial motion setting in which the creation as a whole is taken along into the future and hence it is a kind of continuous creation. Evolution by implication is a process of

becoming from quarks and gluons to human being. Many theologians find a Trinitarian element operative in this becoming process. There is a force that unites simple elements into complex molecules and ultimately bringing out a complex life-form in the form of human being which again becomes a being of consciousness and soul. Here we could identify a God who is present as the unifying force. The Trinity can be the unifying force, since Trinity itself is the best example of 'becoming' and 'unification' into one Godhead. So basically the universe is creation in evolution which is essentially being unified into the Trinity.[35]

6. Christian Anthropology and Evolution

We could also not overlook the anthropological implications of this intrinsic thread of unity underlying the totality of creation. The evolutionary hypothesis is a fertile ground for exploring the cosmic implications of the psychosomatic unity of the humans. However, we need to confess that the popular conception on Evolutionary Theory even today is as having degraded human dignity to that of a naked ape.[36] But a substantive dialogue with the Evolutionary Theory would teach us that "(a) naked ape is something enormously fine that none of us could ever deserve to be."[37]

It has been traditionally held that there is in human a specific spiritual element called soul. The origin of the soul is very much contented in the context of the evolution. There are two assumptions regarding the origin of soul. The soul is considered to be emerging into each human being when human is conceived biologically. It would attribute to the evolutionary process the property of transforming the consciousness of the soul. Secondly, the soul is considered to be created afresh by God each time when a human being is conceived. The official Catholic position on the evolution of the soul was that the natural selection couldn't account for the emergence of the soul, which is spiritual and immortal. Pope Pius XII in his encyclical *Humani Generis* held that although biological continuity is a fact, mere material antecedents couldn't explain the human soul. The response of the Church to the theory of evolution has changed from outright denial to a qualified acceptance of it. In 1996, Pope John Paul II made his revolutionary observation that Theory of Evolution is more than a

hypothesis. In his message to the Pontifical Academy of Science Pope said:

I am pleased with the theory you have chosen, that of the origins of life and evolution an essential subject which really interests the Church, since revelation, for its parts, contains teaching concerning the nature and origins of man…. On his encyclical *Humani Generis* (1950), my predecessor Pius XII had already stated that there was no opposition between evolution and the doctrine of the faith about man and his vocation… Today, almost half a century after the publication of the Encyclical, new knowledge has led to the recognition of it more than a hypothesis to a theory of evolution. It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge.[38]

Endnotes

1 Aubrey Moore, "The Christian Doctrine of God," in C. Gore (ed.), *Lux Mundi* (London: Murray, 1891), p. 73.

2 See Elliot Sober, "Evolutionary Theory and Social Science," in Edward Craig (ed.), *Routledge Encyclopedia of Philosophy*, vol. 3 (New York: Routledge, 1998), p. 483.

3 Elizabeth A. Lloyd, "Theory of Evolution," in Edward Craig (ed.), *Routledge Encyclopedia of Philosophy*, vol. 3 (New York: Routledge, 1998), p. 476.

4 Thakur Jai Dev Singh, *Philosophy of Evolution -Western and Indian* (Mysore: Prasaranga University, 1970), p. 9.

5 Cited in H. Enoch, *Evolution or Creation,* 2nd ed. (Bombay: Jyothi Pocket Books, 1973), p. 92.

6 Cited in Enoch, p. 92.

7 John Herman Randall, "The Challenging Impact of Darwin on Philosophy," in Philip Appleman (ed.), *Darwin - Texts, Backgrounds, Contemporary Opinion, Critical Essays* (New York: W. W. Norton & Company Inc., 1957), p. 411.

8 Lazarus Walter Macior, "Critical Scientific Concepts in the Creation/Evolution Controversy," in *Creation and Evolution - Proceedings of the ITEST Workshop*, October, 1997 (Missouri: ITEST Faith/Science Press, 1997) p. 33.

9 Darwin used this expression only in his later writings and that also with reservation since being the fittest must be identified with a very narrow set of environmental circumstances collectively termed an ecological niche (See Macior, p. 38).

[10] Darwin, *Origin of Species*, Appleman (ed.,) *Darwin- Texts, Backgrounds, Contemporary Opinion, Critical Essays* (New York: W. W. Norton and Company Inc., 1970), p. 120.

[11] Paulinus F. Forsthoefel, *Religious Faith Meets Modern Science* (New York: Alba House, 1999), p. 58.

[12] For details see Michio Kaku, *Visions* (Oxford: Oxford University Press, 1998), pp. 152-153. Please note that the percentages given are only approximate, since different researchers give slightly different figures.

[13] Thomas Jay Oord, "The World in a Grain of Sand: Genome Project Centre Stage at AAAS," in *Research News and Opportunities*1 (April 2001), p. 15.

[14] Oord, p. 43.

[15] Cited in Theodore Roszak, "Evolution," in Mircea Eliade (ed.), *The Encyclopedia of Religion*, vol. 5 (New York: Macmillan Publishing Co., 1987), p. 213.

[16] Barbour, *When Science Meets Religion,* p. 80.

[17] See Darwin, *Descent of Man*, in Appleman (ed.), *Darwin - Texts, Backgrounds, Contemporary Opinion, Critical Essays* (New York: W. W. Norton and Comp any Inc., 1970), pp. 202-220.

[18] Holmes Rolston, III, *Science and Religion – A Critical Survey* (New York: Random House, 1987), p. 90.

[19] Rolston, p. 119.

[20] Rolston, p. 120.

[21] David M. Raup, Conflicts between Darwin and Paleontology," in *Field Museum of Natural History Bulletin* 50:1 (January 1979), pp. 25-26.

[22] Darwin, *The Origin of Species by Means of Natural Selection* (London: John Murray, 1859), p. 460.

[23] Arthur Peacocke, *God and the New Biology* (San Francisco: Harper and Row Publishers, 1986), p. 94.

[24] Arthur Peacocke, "Biological Evolution and Christian Theology," in John Durant (ed.), *Darwinism and Divinity* (New York: Basil Blackwell Ltd., 1985), p. 116.

[25] Haught, *Science and Religion*, p. 48.

[26] Thomas Aquinas, *Summa Theologica,*I, Ques. 105, art. 5.

[27] See Jaques Monod's discussion of Peacocke, *Chance and Necessity*, p. 76.

[28] See Haught, *Science and Religion*, pp. 59-60.

[29] Haught, *Science and Religion*, p. 63.

[30] For instance, "Evolution by natural selection is therefore, in essence, strictly analogous to problem solving by trial and error and it leads to the immense claim that all design in the biosphere is ultimately the fortuitous outcome of an entirely blind random process - a giant lottery" (M. Denton, *Evolution: A Theory in Crisis* (Bethesda: Aadler and Adler, 1985).

[31] Charles Darwin, *The Descent of Man and Selection in Relation to Sex* (London: Murray, 1871). See also Macior, p. 35.

[32] Darwin, *The Origin of Species by Means of Natural Selection,*1859, p. 459.

[33] Richard Dawkins, *The Blind Watchmaker - Why the Evidence of Evolution Reveals a Universe Without Design* (New York: W. W. Norton, 1987). Cited in Macior, p 36.

[34] Haught, *God after Darwin*:*Theology of Evolution* (London: Westview Press, 2000), p. 37.

[35] See K. Schmitz-Moormann (ed.), *Schoepfung und Evolution* (Duesseldorf: Patmos, 1992), pp. 115-130. See Franics Xavier, "Creation in Evolution," in *Indian Theological Studies*38:1 (March 2001), pp. 66-69.

[36] The first reaction of the Catholic Church was to reject the theory of evolution out outright. Nevertheless, towards the end of the 19th century Christianity made efforts to see the relevance of the theory of evolution and tried to assimilate it. Pope Pius XII in his encyclical *Divino Afflante Spiritu* (1943) maintains that though biological continuity might be a fact, the human soul which is spiritual and immortal, is not explained by purely material antecedents. The same Pope in another encyclical letter *Humani Generis*, strongly holds that Darwin's theory could at the most explain the evolution of matter; there is an essential difference between matter and spirit; the natural selection can't account for the emergence of the nature of the soul, which is spiritual and immortal.J. Neuner and J. Dupuis (eds.), *The Christian Faith* (Bangalore: Theological Publications in India, 1998), p. 170, no. 419.

[37] Bengt Gustafsson, "The Current Scientific World View," in John M. Mangum (ed.),
The New Faith-Science Debate - Probing Cosmology, Technology and Theology (Minneapolis: Fortress Press, 1989), p. 6.

[38] Message of Pope John Paul to the Pontifical Academy of Sciences on 22.10.1996. Web material.

Chapter 6

Scientific Eschatology

Only in recent times has Eschatology become a respected field of study within physics and cosmology. Eschatology deals with the "last things," the most significant aspects of human being, the things that he or she really hopes for. If hope is intrinsic to human beings no one can be indifferent to Eschatology.[1] We could classify Eschatology in terms of two broad types: temporal and ontological.[2] By temporal Eschatology we mean an Eschatology which seeks fulfillment in terms of time. Eternity of "forever" is its primary concern. It tries to overcome the contingency of time that we encounter in our daily life. Similarly the ontological Eschatology attempts to deal with the contingency of matter or being. It is here that the crucial aspect of the perfection of being becomes significant.

From the last century onwards, the laws of thermodynamics have been used by the German physicist Herman von Helmholtz to predict the most depressing scenario of the end of the universe: the "heat-death" theory. It had been generally accepted by the

scientific community.[3]But today the second law of thermodynamics and its application to the cosmos leading to the "heat death" theory of the cosmos is seriously questioned. It has almost lost its acceptance in the contemporary scientific circles.[4] The despair in terms of "heat death" is unwarranted as far as today's scientific information is concerned.[5] Hence, Drees's comment is significant: "Because of the general nature of this law (of thermodynamics) and because of the disputes about its applicability to the Universe as a whole, it is preferable to base reflections upon the far future of the Universe on more concrete physical theories: general relativity as the theory about the structure of space and time and quantum theories as the relevant theories about the material constituents of the Universe."[6]

Based on general relativity we study the closed and open universes and based on Quantum Mechanics the bubble universe. After the notable discovery based on the Big Bang Theory that we live in an ever expanding universe, the significant question is whether we live in an open or closed universe. The Russian scientist Alexander Friedmann in 1922 developed a model of a universe, based on the Big Bang that predicted not only its expansion but also its eventual recollapse. This came to be properly called a closed universe model. As against this, in an open universe of the Friedmann type, the universe continues to expand indefinitely with an ever-decreasing restraint of gravitational attraction. In the flat model the universe continues to expand at just the critical speed needed to prevent its recollapse.

1 Open Universe Eschatology: Life Forever

If the universe is open, the averages distance between galaxies increases continuously. The background radiation, which has today a temperature of about three degrees Kelvin, spreads over ever larger volumes. It gradually loses temperature and intensity approaching about absolute zero. Freeman Dyson,[7] the most prominent protagonist of this theory, has attempted to change the pessimistic outlook of the open universe according to the heat death theory. He addresses the basic question of the future of life. What really can happen to human life in the distant future? Then Dyson tries to apply a sort of Darwinism to the open model of the universe, which he believes can give an enormously greater scope for the activities of life and intelligence than a closed universe. Taking into account the tremendous and successful adaptation of life to changing environment Dyson thinks

that human beings in particular or life in general can adapt further to the drastically changing scenario of the open universe.

Dyson rightly argues that it is "impossible to calculate in detail the long-range future of the universe without including the effects of life and intelligence." Intelligent life produced by purely natural selection can possibly "guide the physical development of the universe for its own purposes."[8] Without making any apologies for mixing "philosophical speculations with mathematical equations" he affirms that his aim is to establish the "numerical bounds within which the destiny of the universe must lie."[9] Secondly, Dyson assumed that the protons are ultimately stable against all decay into lighter particles. If it were not so then all matter would ultimately decay and must eventually dissolve into radiation. In fact, Dyson sees the unending existence of protons (or matter) as a prerequisite for the indefinite continuation of life. Other scientists like Youkow Zeldovich, John Barrow and Frank Tipler suggest the probability of proton decay. So Dyson has modified his theory accepting this challenge and notes: "I do not know whether we can survive without protons. But I do not see any reason even then to declare the situation hopeless. If the assumptions of abstraction and adaptability are correct, the patterns of life and consciousness should be transferable without loss from one medium to another. After the protons are gone, we shall still have the electrons and positrons and photons, and immaterial plasma may do as well as flesh and blood as a vehicle for the patterns of our thought."[10]

Thus Dyson certainly considers the open model to provide the best chance for the indefinite continuation of life. "So far as we can imagine into the future, things continue to happen. In the open cosmology, history has no end."[11] This picture seems to be supported by the theoretical work of Barrow and Tipler published recently.[12] In their joint work they narrate a novel picture of the universal heat death in which an open universe becomes increasingly irregular and unstable in the far future. This is further corroborated by the eminent scientist Steven Frautschi who writes: "Modern cosmology does not terminate in the classical heat death of the 19th century. The classical heat death was characterised by statistical equilibrium of matter at constant temperature and entropy. An expanding universe never achieves equilibrium and never reaches a constant temperature."[13]

About the possibility of indefinite survival of intelligence, it is obvious that the condition in the far future in an open universe is incompatible with human life as we know today. Therefore, Dyson hopes that life, especially intelligent life, will evolve in a direction that will allow it to survive in the distant future. Assuming that life is based not on conscious matter but on structure, it is possible to imagine life and intelligence in terms of abstract terms, independent of the details of organic chemistry and physiological properties of flesh and blood. Dyson adds further: "It is conceivable that in another 10^{10} years life could evolve away from flesh and blood and become embodied in an inter-stellar black cloud or in a sentient computer."[14] In this model Dyson accomplishes almost the impossible. He enables a species with an infinite subjective time to live with finite energy in a finitely open universe. According to him this would not be possible in a closed universe. That precisely is countered by Frank Tipler who claims that only in a closed universe can an infinite subjective time for life be thought.

2. Closed Universe Eschatology: The Omega Point

If the universe is closed, its expansion will continue for a long time. The closer the density is to the critical density, the longer the remaining time until the turning point. The shortest possibility consistent with present observational evidence is about 50 billion years, but it could be much longer. The future until the turning point is very similar to the future of an open universe for the same time span. Once the universe contracts, its density and temperature (background radiation) will rise.[15] Finally, extreme temperatures and densities are reached, as near as the Big Bang. The collapsing phase ends with something very similar to the Big Bang: the distance becomes zero, the density becomes infinite. So too the temperature. Then occurs the Big Crunch. Here the space tends to be nil and the matter is finally annihilated.

Tipler and Barrow visualize that life existing into the future is to be understood in terms of three characteristics: 1) Information processing - that is the running of programs - continues along at least some endless time-like curve all the way to the boundary of the universe. 2) The amount of information processed between now and the boundary is infinite; and 3) the amount of information stored diverges as the leaves of the curvature approach the future boundary. So the possibility of an infinite life depends on the availability of infinite amount of

information processing to take place between now and at the "Final State."

Tipler also acknowledges that in a closed universe an ever-increasing amount of energy is required per bit near the final singularity. In the final stages the temperature approaches infinity and so very large amounts of energy will be required. Still Tipler suggests that this energy will come from a shear effect produced by an unevenly collapsing universe. He understands that most closed universes are expected to undergo a shear effect when they collapse. They will in fact expand in one direction while at the same time collapsing in the others. "This shearing gives rise to a radiation temperature difference in different directions, and this temperature differences can be shown to provide sufficient free energy for an infinite amount of information processing between now and the final singularity."[16] This is the key idea Tipler proposes to go round the difficulty of experiencing infinite subjective time in a finite objective time.

Assuming the shear effect to provide the necessary energy for information exchange we could speak of indefinite continuation of life in a universe that will come to an abrupt end because sufficient energy exists for an infinite amount of information processing between now and the final singularity "even though there is only a *finite* amount of proper time between now and the end of time in a closed universe. Thus although a closed universe exists for only a finite proper time it nevertheless could exist for an infinite subjective time, which is the measure of time that is significant for living beings."[17] In this "infinite subjective time" life will completely engulf the universe and will incorporate more and more material into itself, and the distinction between living and non-living matter will lose its meaning. It is here that omega point is reached.[18]

If life evolves in all of the many universes in a quantum cosmology, and if life continues to exist in all of these universes, then all of these universes, which include all possible histories among them will approach the Omega Point. At the instant the Omega Point is reached, life will have gained control of all matter and forces not only in a single universe, but in all universes whose existence is logically possible; life will have spread into all spatial regions in all universes which could logically exist, and will have stored an infinite amount of information, including

all bits of knowledge which is logically possible to know. And this is the end.[19]

3. Bubble Universe Eschatology: Quantum Universe

We have already discussed Andre Linde's bubble universe conjecture. The universe consisting of a whole set of bubbles has no clear development or final state; new bubbles will begin as offsprings of others. He therefore argues that life appears again and again in new bubbles. Even stronger, he hints at the possibility of traveling or at least communicating between bubbles. The condition within the bubbles is that the vacuum energy density is extremely close to zero. This shows the potential practical importance of research on the vacuum energy density.

The pioneering work of physicists Sidney Coleman and Frank De Lucia on "Gravitational Effects on and of Vacuum Decay" in *Physical Review* (1980) throws frightening or creative prospects for the entire cosmos based on such a quantum cosmology. From a quantum mechanical perspective what appears to us as vacuum may be in reality "seething with ephemeral quantum activity, as ghostly virtual particles appear and disappear again in a random frolic."[20] Such a vacuum state may not be unique; there could be several quantum states, all appearing empty but enjoying different levels of quantum activity and having different energy levels.

It is a known fact in quantum physics that an atom in an excited, unstable state will try to decay to its lowest energy or 'ground' state. Similarly, an excited vacuum will try to decay to the lowest energy or true vacuum. The Inflationary universe is based on the theory that the very early universe had an excited or 'false' vacuum state, during which time it inflated frenetically, but in a very short time this state decayed to the true vacuum and so the Inflation ceased. The usual assumption is that the present state of the universe corresponds to the true vacuum; that is, empty space at our epoch is the vacuum with the lowest possible energy. The energy and true pressure of the true vacuum would create a gravitational field so intense that the region embraced by the bubble would collapse in less than microseconds. Here there is no gentle fall toward the big crunch, rather an instant crunch.[21] Paradoxically, in a slightly different context, the vacuum-bubble formation itself could be a way out. The one way

to escape the impending death of the universe is to create a new one and escape into it. Bizarre it may seem, such "baby universes" have been discussed in recent years and are theoretically rendered possible by physics.

4. Theological Implications

The three prospective theories on the end of the universe show a positive or optimistic view on the possibility of the continuity of life and intelligence. Of course, the life and intelligence postulated to exist, will not be the human life or intelligence as we know today. Nor can we overlook the reductionist strategies employed in these theories. Still today's science is not totally opposed to a continuation of life or an infinite life. At the same time, it is to be admitted that most of the conclusions remain tentative and are the result of speculative passions of the scientists. The possibility of falsification is very much for these three theories.[22]

However, the temporal and ontological eschatologies conceived by sciences can be helpful in completing the axiological eschatological model of Christianity. The temporal, ontological and axiological fulfillment of the human person fulfilled by Christ and his Resurrection can be enhanced by the theological nuances of the scientific speculations. Moreover the inseparable physical and material dimensions of the scientific Eschatology would throw open new speculative agenda for theology like cosmic transcendence, Christification of the cosmos, etc. Only by affirming both the autonomy as well as the mutual complementarity of the scientific and biblical eschatologies, can we avoid the dangers of scientific reductionism or religious solipsism. We dwell at some length on the theological implications of the scientific Eschatology in the third part.

Endnotes

1 Kuruvilla Pandikattu, "Eschatology: Interaction between Science and Theology," Manuscript of the Article to *Jeevadhara* (April 1999), p. 1.

2 A third type, axiological eschatology, could be seen in Drees's elaboration of esch atology (See Drees, *Beyond the Big Bang*, p. 150). By axiological eschatology is meant the fulfillment in terms of values and aspirations. It is the realm of justice and love where evil is overcome and love triumphs. Here the good becomes the eschat *on* and values are seen as ultimate.

3 The second law of thermodynamics states that the entropy of the universe taken as a closed system always increases. Entropy is the measure of the quantity of the un available form of energy. The total energy of the universe consists of available ene rgy (vitamins, sun rays, coal, etc.) and unavailable energy (particle energy). The constant conversion of available energy into non-available energy leads to energy starvation.

4 Six objections to the cosmological applicability of the second law of thermodynamics could be found in Drees, *Beyond the Big Bang*, p. 243. See also similar position of Milne, in Worthing, *God, Creation and Contemporary Physics*, pp. 179-181.

5 Pandikattu, p. 2.

6 Drees, *Beyond the Big Bang*, p. 244.

7 For a summary description of Dyson, see Worthing, *God, Creation and Contem porary Physics*, pp. 164-175. See also Drees, *Beyond the Big Bang*, pp. 122-126.

8 Freeman Dyson, "Time Without End: Physics and Biology in an Open Universe," in *Review of Modern Physics* 51:3 (July 1989), p. 448.

9 Dyson, "Time Without End," p. 447.

10 Dyson, *Infinite in All Directions* (New York: Harper and Row, 1988), p. 111.

11 Dyson, "Time Without End," p. 453.

12 John Barrow and Frank Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon Press, 1986).

13 Steven Frautschi, "Entropy in an Expanding Universe," in *Science* 217:4560 (August 1982), p. 597.

14 Dyson, "Time Without End," p. 453.

15 This does not exactly mirror the expansion phase because the produced radiation as well as the irregularities produce a certain pressure. See Drees, *Beyond the Big* Bang, pp. 128-141, 246-251.

16 Tipler, "The Omega Point as Eschaton: Answers to Pannenberg's Questions for Scientists," in *Zygon* 24:2 (June 1989), p. 226.

17 Tipler, "The Omega Point as Eschaton," p. 227.

18 Tipler argues for the physical mechanism for the resurrection of the dead and the social immorality from the omega point theory (See Tipler, *The Physics of Immortality*
(New York: Pan Books, 1994), pp. 217-229.

19 Barrow and Tipler, p. 676.

20 Paul Davies, *The Last Three Minutes* (London: Phoenix, 1995), p. 178.

21 See Davies, *The Last Three Minutes*, pp. 182-184.

22 See Pandikattu, p. 4.

Chapter 7

Genesis Revisited- A Pneumatic Effluence

At this moment it seems as though Science will never be able to raise the curtain on the mystery of creation. For the scientist who has lived by his faith in the power of reason, the story ends like a bad dream. He has scaled the mountains of ignorance; he is about to conquer the highest peak; as he pulls himself over the final rock, he is greeted by a band of theologians who have been there for centuries."[1] The extraordinary relationships in the world in analogical resemblance of the perichoretic communion evoke further questions on the origin of the universe. The scientific theories of origination along with other scientific assumptions of the non-local fabric of the universe can help us to revision the biblical vision of creation. Some clarification on the biblical view of the creation of the world is necessary here.

The Bilblical View of Creation

"In the beginning God created heaven and earth" (Gen. 1:1).[2] This dual confession has become

inextricably bound with the concept of a creation out of nothing, or *creatio ex nihilo*. Ludwig Kohler observes: "The Old Testament story of creation does not answer the question, 'How did the world come into being?' with the answer: 'God created it', but answers the question `From where does the History of God's people derive its meaning? with the answer: 'God has given the history of His people its meaning through creation.'"[3] Thus we see in the Bible that God is the creator and redeemer (Is.43:14-19; 51:9-10).

The Hebrew verb *bara* is used almost fifty times in Scripture, and it always used to mean God's activity, and always something that only God could do (Is.4:5).[4] But *bara* does not of itself mean making out of nothing or making without the use of matter already existing. Thus to say that the world is created means that all non-divine reality comes into being without any non-divine preconditions and so God is the author of everything.[5] The Yahwistic creation story (Gen.2:4-25) as Von Rad points out, is to be understood as a prologue and as a commencement of the divine saving work of Israel. In the pre-exilic writings, Jeremiah clearly speaks of Yahweh creating the world (Jer.27:5) and Isaiah pictures God as the one who shapes history (Is.37:26).[6] Creation by God's Word is most expressed in the Priestly account of creation (Gen.1:1-2,4). In the Psalms, creation is depicted as a struggle or battle in which God vanquishes chaos, a primordial monster (Ps.73:12-15). Deutero-Isaiah (40-55) toward the end of the Babylonian exile, developed the concept of Yahweh as creator and prepared the way for the profound theology of the Priestly account. He thus presents creation as a saving event, an act of salvation, to be consummated by the second creation on the eschatological day of theLord.

Creatio Ex Nihilo

Creatio ex nihilo has often been read into Gen.1:1-2. The doctrine of creation out of nothing seems to have had universal consensus among the early fathers of the Church. Irenaeus developed an original doctrine of creation which is totally Christocentric. Clement of Alexandria holds the view that God brought forth the entire creation simultaneously in one single act. In the West St. Augustine's view of creation became authoritative. He was influenced by neo-platonic thought. His doctrine of divine ideas was epoch-making in that he

synthesized the Old Testament Wisdom doctrine and Platonic doctrine of ideas.

Although we have no explicit statements in the Bible about creation out of nothing, we can still trace some basic passages in the Bible which are pointers to the establishment of the doctrine under consideration. The statement in Job 26:7, "poised the earth on nothingness" is a poetic hyperbole, as the mythopoetic context shows.[7] Job 26:7 uses `chaos' or `void' (*tohu* as in Gen.1:2 - formless and empty - *tohu wabohu*) and nothing (*belima* literally, without what) as contrasting parallels to the heavenly mount of assembly and the earth. Since the language here is highly poetic, it is difficult to state that verse 26:7 is a clear statement of creation out of nothing. The author of the book of Wisdom employs a Platonic term to paraphrase the creative activity of God: "Created the world from formless matter" (Wis.11:17). It is very doubtful that formless matter would literally mean total and absolute nothingness. Christian writers, from the time of Origen had considered the passage in 2Macc.7:28, "God made them out of what did not exit" as the first unequivocal and explicit statement in Scripture of the doctrine of *creatio ex nihilo*. But modern scholars still dispute about this verse, that because of the ambiguity of the Greek terms, even this verse is not an unequivocal statement of creation out of nothing. The New Testament passages "calls into existence what did not exist" (Rom.4:17) and "from the invisible the visible world came to be" (Heb.11:3) are also debated as to whether referring to *creatio ex nihilo.*

Theological Implications of Ex Nihilo

The purpose of this doctrine, initially, was to eliminate the nature gods of the ancient world. In course of development, it faced with similar challenges from pantheism, dualism, gnosticism, etc. Hence this doctrine was pledged to affirm the transcendence of God, the goodness of creation, and the contingency of the world. Therefore *creatio ex nihilo* is more an ontological doctrine than an historical one. "To hold a doctrine of creation ex nihilo is to hold that all that is depends, now and always, on the freely exercised will of God. It is certainly not to believe that God started things off by manipulating a curious kind of stuff called `nothing'."[8] "In the doctrine of Creation out of nothing.... Christians replaced the notion of irrational accident or blind chance by the concept of contingence."[9]

Theologically this doctrine implies that God is the supreme power and his creative activity is all encompassing and no other power is equal to Him. "The doctrine of creation, then, is preeminently an affirmation about the sovereignty of God and the absolute dependence of all creatures on God. To say that Yahweh made the earth is to confess that it belongs to its Maker; Yahweh is its Owner (Ps.24:1-2; 89:11; 95:5)."[10] Every creature in creation points beyond itself to the God who is high and so worthy of praise of all beings. Thus the proclamation that Yahweh as the sovereign creator is a summon to worship, for the creation testifies His Wisdom and power (Ps.104:24; Prov.3:19; Jer.10:12-13).

This doctrine also highlights the aspect of God creating by His super will. "*Creatio ex nihilo* was clearly a possible development of the biblical idea that the sovereign God had created all things just by the word of his mouth. Like a super-king, he had called them into existence. He had named them, and there they were."[11] In its most basic sense, the understanding of this theological doctrine is an attempt to express the great conviction that God is the sole source of all existence and he is the mystery of absolute origin and ground of all things.[12] An equally significant factor is that *creatio ex nihilo* doctrine implies the rejection of any dualism. The theology of creation out of nothing necessarily indicates the fact that every creature is necessarily related to God and God alone for its very being.

Physical Dissonance and Metaphysical Consonance

The soteriological and ontological nature of creation in Bible and the historical and physical character of the scientific creation do not allow us to draw direct parallels between the biblical and scientific doctrines of creation. Besides, one should be conscious that the question of absolute beginning is an unsettled issue in science as well as in theology. Although the Big Bang is considered to be very likely a singular event, the challenges from the oscillating picture of the universe connected with the idea of the big crunch or the questions raised by the eternal universe of Hawking and steady state theory cannot be overlooked. The question of the finiteness of the past is still a disputed issue in theology. Thomas Aquinas accepted a beginning in time as part of Scripture. But he also argued that a universe that always existed too would require God as creator and sustainer.[13] According to David Kelsey, the basic experience of gratitude for life

as a gift has no essential connection with speculations about unique events at the beginning.[14]

But there are possible examples of consonance between the scientific and theological doctrines regardless of the possibilities of either poles of the debate over absolute beginning being true. According to Barbour, the scientific view of creation implies the contingency of existence, the contingency of boundary questions and the contingency of laws which are in consonance with the theological doctrine of creation.[15] In science, even if there are new evidences for cyclic universe, the contingency of existence would remain and the message of creation ex *nihilo* applies to the whole of creation. In science even if time was infinite, there would still be boundary conditions and this contingency shows the message of *ex nihilo* without requiring an absolute beginning. The contingency of laws due to its relation to chance, etc., can be compared to the orderly aspect of creation in theology. In short, the scientific creation accounts cannot account for universe emerging out of necessity. The subsequent implications of this argument, despite its deistic connotations, as enhanced by the scientific theories, can clarify the natural processes and physical mechanisms implied in a sweeping biblical creational statement like, "in the beginning God created heaven and earth."

Apart from these logically deduced complementarities, drawing parallels between the Big Bang and the *creatio ex nihilo* on a natural level may be unjustified. "A parallel between Genesis 1 and the Big Bang idea would not imply that the Big Bang theory confirmed a religion based on the Old Testament." "Claiming such parallels is only possible if the text or idea is taken out of its context."[16] It may be this conviction that leads Peacocke to the following bold assertion: "Scientific cosmology, in investigating and making theoretical deductions about the remote history of our universe cannot, in principle, be doing anything which can contradict such a (biblical) concept of creation."[17] Hence it is our contention that the depth implications of the actual consonance between the scientific and biblical doctrines of creation are to be exposed more at an ontological level than on a natural, historical level. We will see that the evolutionary origination of the universe as pictured by scientific theories would promote the Christian notion of *creatio continua* with a more divinely effluent

view of the universe, the Christian model for which is the pneumatological understanding of creation.

Ongoing Creation

There is another strand of thought on creation, dormant in the Christian tradition termed as *creatio continua.* According to *creatio continua* God holds the creation in being and, continually interacting with it, is present in the evolutionary processes of the world. *Creatio continua* is the immanent pole of creation. According to Edmund Jacob, due to the emphasis on biblical texts focusing on primordial creation, other texts were not seriously considered. "Other texts, generally more ancient, draw much less distinction between the creation and conservation of the world, and make it possible for us to speak of a *creatio continua*."[18] "For cattle you make the grass grow, and for people the plants they need" (Ps.104:14). "Send out your breath and life begins; you renew the face of the earth" (Ps.104:30). "Now I am going to reveal new things to you, secrets that, you do not know; they have just been created, nor long ago, and until today you have heard nothing about them" (Is. 48:6-7).

In the 4th century, St. Augustine had written, "In the first instance God made everything together without any moments of time intervening, but now He works within the course of time, by which we see the stars move from their rising to their setting."[19] Moltmann also echoes a similar note: "Creation at the beginning is simultaneously the creation of time; therefore it must be understood as *creatio mutabilis*... Creation at the beginning establishes the conditions for the possibilities emergent in the history of creation ... Creation at the beginning is not a balanced or fulfilled reality."[20] The physical and biological evolutionary nature of the world, the continuous and inbuilt creativity of the world, etc., are the scientifically supported factors for a *creatio continua.* Peacocke argues that in the context of the emerging scientific world view we must say that God's relation to the world is that of a permanent creatorly relationship. "So, if we identify the creativity of the world with that of its Creator, we must emphasize that God is *semper Creator*, all the time creating - God's relation to the world is perennially and eternally that of Creator... This identification means we must stress more than ever before God's *immanence* in the world .... Thus the natural, biological, and human worlds are in themselves a mode of God in action..."[21]

This theological shift in emphasis from *creatio originans* to *creatio continuans* and transcendence to immanence, somewhat exclusively launched by the natural sciences has found its repercussions in the central themes of most of the contemporary attempts at conceiving divine action, viz., process theology, pan-en-theism, personal agent models, etc. Process theology rejects causality in terms of primary and secondary causes. According to Whitehead, "He (God) is not *before* all creation but *with* all creation."[22] In pan-en-theism, "the world is regarded as being as it were, `within' God, but the being of God is regarded as not exhausted by, or subsumed within, the world."[23] The personal agent models[24] use body-soul analogies and feminine metaphors to conceive of creation and divine nature. These models, despite their vulnerability to several philosophical critiques and marginalised conceptions of the divine seem to implicate a rather organic origination of the world from the divine. It should be noted that neither *creatio continua* nor the modern models are alternatives to *creatio ex nihilo.* They cannot be substituted for one another. As Pannenberg has observed: "The *creatio continua* formula presupposes the strict conception of creation as *creatio ex nihilo* in as much as it characterizes God's preserving activity as the continuation of the creation out of nothing."[25]

The broader nuances of the ontological compulsions of the scientific and theological accounts of creation must lead us to asking fundamental questions about the complementarity between *creatio continua* and *creatio ex nihilo.* In asking such questions we will be compelled to go beyond Pannenberg's continuity between *creatio ex nihilo* and *creatio continua* to promising reflections into the very ontological structure and process of the *creatio ex nihilo.* According to Paul Tillich, Democritus' philosophical dictum, *ex nihilo nihil fit* (nothing comes out of nothing), correctly understood, has much in common with *creatio ex nihilo* which would imply creation out of God's own fullness of being. A creation out of absolute nothingness is an impossibility and a creation out of God's own 'substance' leads to a pantheistic deification of the physical world. *Creatio ex nihilo*, therefore, signifies the theological recognition that God created a universe distinct from the divine being, not out of any pre-existing matter or principle, but of nothing other than the fullness of God's own being.[26] According to Moltmann it is God's own being that

becomes the space for creation. "It is only God's withdrawal into himself which gives that nihil the space in which God becomes creatively active."[27] The creation in a way is the kenotic self-manifesting transfiguration of the divine into the world. The logic of the kenotic manifestation can only be a logic based on love and freedom of the divine. Only the fullness of the divine beingness can fill sheer nothingness with creative and originative beingness.

As God fills the nothingness with his own fullness He cannot be an absolute, who says, 'let there be', which implies the will to bring into existence a future being. 'Let there be' is a dynamic expression of the divine itself, a voice addressed to God Himself, an imperative that fell upon Himself, the vibrations of which never detached from himself echo unceasingly in dramatic and colorful patterns of origination. Creation owes its existence to this creational transfiguration of the divine in himself. The visible and the finite world is the effluence of the invisible and infinite patterns of the divine mode of being. What more revelatory encouragement of such a super-relational bond between God and the world do we find than the Pauline unparalleled assertion that it is "in him that we live and move and exist" (Acts.17:28). Every material body is in a way a spiritual body and every spiritual body is in a way material body as well.

The traditional objections against a pantheistic or pan-en-theistic or such doctrines of creation betray at their operational level a dichotomic epistemology or a dualistic mind-set with classification, division and analysis as its main tools, the culmination of which is often the postulation of a deistic transcendental deity. Whereas an intuitive and mystical mind-set, as that of the East, may conceive of the divinely incompatible worldly elements of creation as part of a holistic web of reality and of the extra-ordinary patterns of ontological relationships dispelling the traditional logical impossibilities associated with spirit and matter, body and soul, etc. The ultra theological conclusions of the scientific worldview as to the being, manifestation and action jointly resulting into origination may imply a constructive acknowledgement of the theological richness due to a metaphorical understanding of certain unorthodox positions on creation. Where attitudes define behaviour, it may be wiser to believe in an "unorthodox" doctrine that can produce authentic action than to believe in an "orthodox" doctrine generating disharmony. More than a dualistic

transcendentalism, a "pan-en-theistic" immanence may better promote the ecological harmony.

Pneumatic Creation

The *creatio continua* and its consequent implications for *creatio ex nihilo* could be said to have resemblance with the Christian notion of a pneumato-centric creation. There are profound metaphors in the Scripture which express the pneumatic dimensions of creation. "There was darkness over the deep, with a divine wind sweeping over the waters" (Gen. 1:1).[28] "Turn away your face and they panic; take back their breath and they die and revert to dust. Send out your breath and life begins" (Ps.104:29-30; Prov.8:22-31). It shows that the Spirit of God is the source of all being and life. Such a biblical rendering is made comprehensible by Church father Gregory of Nyssa who having refuted the definitions of matter of Plato, Aristotle and Stoics taught that matter is *energeia theou* - the energy of God.[29] We must say that the Spirit has made eternal the grass that shoots up today and thrown into fire tomorrow. It is this power that we encounter in the current of the streams, in the flower that blooms and in the burning wick that refuses to go off. "From the continual inflow of the divine Spirit (*ruach*) created things are formed *(bara*). They exist in the Spirit and they are `renewed' (*hadash*) through the Spirit .... The existence, the life and the warp and weft of interrelationships subsist in the Spirit .... The patterns and the symmetries, the movements and the rhythms, the fields and the material conglomerations of cosmic energy all come into being out of the community, and in the community, of the divine Spirit."[30] A full theological development of the pneumatic creation may suffice to account for the marvels of creation as pictured by theology and science.

An Ecological Praxis

Our revisioning of the mystery of creation has profound implications for our contemporary ecological thinking. Ecology is basically a religious attitude. The experience of the divine in the cosmos is consequent of a holistic vision and it serves as the most solid foundation for the deep ecology of the oneness of being. The conception of a transcendental creator God has resulted in viewing the world as secular and profane. In the Christian Scripture we find several examples where the world is considered as evil and therefore to be denied.

"Do not have the world or the things in the world. …For all that is in the world, the lust of the flesh and the lust of the eyes and the pride of life, is not of the Father, but is of the world (1Jn.2:15-16).

The new worldview helps us give up many of the false assumptions of God, nature and human. Firstly, the assumption that God is a being who totally transcends nature is given up. In the West God was looked upon as the supreme being who is situated above the earth. This resulted in finding the intrinsic worth of the nature outside nature. Such an understanding of God was also responsible for taking away the mystery of nature. The relationship between the Creator and the creation in a monotheistic transcendental understanding of God is that of dominance and dependence. Here God is looked upon as a prime mover who holds the string form behind the curtain. Secondly, we have given up the idea that the world is profane and matter is evil. Though in the Christian Scripture, there were sufficient resources for a worldview which asserts that world was loved and cared by God, and it was the manifestation of Him, our medieval rational determinism overlooked this aspect and began to interpret worldly realities as to be renounced for one's own salvation.

In the light of the new insights from the scientific worldview we have a new image of God, which can serve as the unifying ground for an integral vision of reality. Today we find that an isolated interpretation of the realities God, the World, the Human Being becomes impossible. In other words, in an integral vision, sometimes called as "cosmotheandric" vision, terms like cosmology, theology, and anthropology are metaphorical-ly synonymous. Cosmotheandric integration could mean "the dynamic process of resetting what has gone to pieces after being origi-nally in a state of unity and wholeness. It is a way of healing and restoring to wholeness and harmony that which is sick, broken, or abused."[31]

There is an aspect of our understanding of the divine which was not given sufficient importance in our theology and which was over emphasized in the Eastern theology. It is the immanence of God. The immanence of the divine in the world would be the most solid metaphysical grounding for a peaceful human society and the best aid for the ecological healing. In the Scripture we find adequate support for the immanence of God. The extreme formulations of the

immanence of God have culminated in the pantheism of the East. Pantheism is not the alternative for a transcendental monotheism because it reduces the reality into total identity. In an indwelling understanding of the divine the sacramental value of the world is asserted. "The primary sacrament is creation itself."[32] "According to this cosmotheandric vision the divine is not considered exterior to creation, but expresses itself through natural phenomenon.... Since the cosmos is per-meat-ed with the divine, this mentality could not but perceive the nature as theocosm, the divinised universe. In a divinised cosmos, all expressions of nature were looked upon with awe; as a result co-existence was sought with all creatures including the vegetation."[33] The immanence of God in the final analysis could be described as this: "God at home in creation and with his people and they in turn at peace with him and each other."[34]

Endnotes

1 R. Jastrow, *God and the Astronomers* (New York: Warner Books, 1980), p. 120.

2 Israel's concept of creation as it is found in the creation narratives of the Bible must be studied in its ancient Near Eastern background. The old Babylonian creation concept as it is found in the *Enuma Elish* myth begins with *Apsu* and *Tiamat*, male and female deities, begetting other gods. *Apsu* is killed by his offspring *Ea*and *Tiamat*is killed by *Marduk*, *Ea*'s son, after he has been proclaimed the chief god. And *Marduk*fashions the world from the remains of *Tiamat. Kingu*, *Tiamat*'s Counselor is slain and humankind is fashioned from his blood. In Memphis it was said that the god *Patah*was the creator and all the living beings came into existenceby his thought and what his tongue commanded. In Canaan the god *El* bore the title of 'creator of creatures' and father (creator of men

3 Ludwig Kohler. Cited in Bernhard W. Anderson, *From Creation to New Creation: Old Testament Perspectives*(Minneapolis: Fortress Press, 1994), p. 4.

4 F. J. Sheed, *Genesis Regained* (London: Sheed and Ward Ltd., 1969), p. 50.

5 Michael Schmaus, *Dogma, God and Creation: The Foundations of Christology*, vol. 2 (New York: Sheed and Ward, 1969), p. 9.

6 E. Loveley, "Creation," in *New Catholic Encyclopedia*, vol. 4 (New York: McGraw Hill Book Co., 1967), p. 418.

7 See Carroll A. Newsom, "The Book of Job," in *The New Interpreter's Bible*, vol. 4 (Nashville: Abingdon Press, 1996), p. 518.

8 John Polkinghorne, *Science and Christian Belief* (London: Society for Promoting Christian Knowledge, 1994) p. 75.

9 T. F. Torrance, *The Christian Frame of Mind* (Helmers and Howard, 1989), p. 12.

10 Anderson, p. 28.

11 Don Cupitt, *Creation Out of Nothing* (London: SCM Press, 1990), pp. 7-8.

12 See Zachary Hayes, *What are They Saying about Creation?*(New York: Paulist Press, 1980), p. 35.

13 See Barbour, *Religion and Science,* p. 201.

14 David Kelsey, "Creation *Ex Nihilo*," in Ernan McMullin (ed.), *Evolution and Cre ation* (Notre Dame: University of Notre Dame Press, 1985).

15 See Barbour, *Religion in an Age of Science*, pp. 144-145.

16 Drees, *Beyond the Big Bang*, p. 36.

17 Arthur Peacocke, *Creation and the World of Science* (Oxford: Clarendon Press, 1979), p. 79.

18 Edmund Jacob, *Theology of the Old Testament* (New York: Harper and Brothers, 1958), p. 139.

19 Cited in Polkinghorne, *Science and Christian Belief*, p. 75.

20 Juergen Moltmann, "Creation and Redemption," in R. W. A. McKinney (ed.), *Cre ation, Christ and Culture*(Edinburgh: T. & T. Clark, 1976), pp. 124-125.

21 Peacocke, *God and the New Biology*, pp. 95-96.

22 Alfred North Whitehead, *Process and Reality* (London: The Free Press, 1978), p. 343.

23 Peacocke, *Creation and the World of Science*, p. 207.

24 The phrase is of Russell, *Quantum Cosmology and the Laws of Nature*, p. 8.

25 Wolfhart Pannenberg. Cited in Worthing, *God, Creation and Contemporary Physics*, p. 113.

26 Paul Tillich, *Systematic Theology*, vol. 1 (Chicago: University of Chicago Press, 1951), pp. 188-189. See also Worthing, *God, Creation and Contemporary Physics*, pp. 74-75.

27 Moltmann, *Trinity and the Kingdom of God,* p. 109.

28 There are also differing scholarly opinions holding that due to the creation through the Word, the divine wind may not refer to the Spirit and his role in creation.

29 See Paulos Mar Gregorios, "Six Bible Studies," in John M. Mangum (ed.), *The New Faith-Science Debate - Probing Cosmology, Technology and Theology* (Minneapolis: Fortress Press, 1989), p. 120.

30 Moltmann, *God in Creation,* pp. 10-11.

31 Samuel Rayan, "Theological Perspectives on the Ecological Crisis," in R.Sugir rtharaja (ed.), *Frontiers in Asian Christian Theology* (New York: Orbis Books, 1994), p. 226.

32 Mathew Fox, *Original Blessing* (Santa Fe: Bear and Co., 1983), p. 90.

33 Oliver Inchody, "Ecoharmony: An Answer to Ecological Consciousness," in *Journal of Dharma* 28 (1993), pp. 333, 334.

34 Rudolf C. Heredia, "*Towards an Ecological Consciousness - Religious, Ethical and Spiritual Perspectives,"* in *Vidyajyoti Journal of Theological Reflection* 55:9 (1991), p. 501.

Chapter 8

The Intra - Cosmic Christism

The Christian understanding of world as God's creation is defined by the revelation of the redemption in and through Jesus Christ. In the Christian vision, the creator of heaven and earth is 'the Father of Jesus Christ.' Creation is an activity of the Father through the Son in the Spirit. Hence it is necessary that in the mysterious depths of the natural processes evolving through the passage of matter and the world at large we recognize the active presence and creative touch of the Son - the image and likeness of the Father. The dialectical meeting between God and world must specifically be a Christic mystery and a Christic process.

The Divinised Cosmos

Before attempting to spell out the Christological implications of the scientific worldview, we will articulate the theological framework for the same by recapitulating the major tenets of the scientific world view which are significant for such a view. It is a wide-spread popular conception that science has nothing to do with personal

qualities like love, freedom, humour, beauty, irritation, etc. From a contemporary point of view, although no claim for the full analysability of these are made in science, exploring the holistic depths and the cosmic roots of such phenomena would rule out the misconceptions associated with the absoluteness of such allegations. As there are no phenomena which are not cosmically evolved, the personal properties experienced at the human realm, also testify to the remote personalistic character of the universe. The "extra-physical" mechanisms operative in the evolutionary world can generate unimaginable products of evolution. This factor alone can give us an allusive glimpse into the possibility of a Christic mechanism - the fullness of the personal qualities, operative within the cosmic process.

The stuff and structure of the universe is such that it is the fundamental matrix of the development of personality and personal quality. The inherent vitality of the cosmic process can attain new properties to being, can decorate it with new dimensions of existence and convert the unknown possibilities into ever new actualities. This extraordinary stuff must have extraordinary properties so as to actualize the divergent possibilities combining the most complex and the most simple, unifying the opposites and integrating the contradictories. The sciences shed light on such mysterious horizons of reality.

In our discussion of the scientific worldview at the macroscopic and microscopic levels, we have used categories which were hitherto unknown to the scientific world. The nuanced epithets of holistic, open-ended, non-reductionistic, emergent, evolutionary, dynamic, non-local, trans-material, superluminal, continuous, self-organizing, self-transcending, etc., are substantially essential for the description of this new perspective. The strangeness and diversity of expressions correspond to the strangeness of the enigma underneath. The new perspective on matter which implies the potentials for several other perspectives is at the chore of this new world view. "There is less and less support for any form of matter-spirit dualism, except for the radical dualism of God and not God .... Matter and spirit must be different aspects of the same reality - spirit arises out of matter and is based somehow in matter."[1] "I would say that if `dead' matter has reared up this curious landscape of fiddling crickets, song sparrows and wondering men, it must be plain even to the most developed materialist that the matter of which he speaks contains amazing, if

not dreadful powers, and may not impossibly be ...`but one mask of many worn by the Great Face behind."[2]

If the inner being of matter is essentially dynamic and evolutionary, the becoming of matter into grater complexities opens up further transcendental possibilities to it. As Rahner has observed: "take into consideration the known history of the cosmos as it has been investigated and described by modern natural sciences: this history is seen more and more as one homogeneous history of matter, life and man. This one history does not exclude differences of nature but on the contrary includes them in this concept, since history is precisely not the permanence of the same but rather the becoming of something entirely new and not merely of something other."[3]

The essential newwardness and upwardness of the evolutionary matter and its consequent natural potentialities and supernatural possibilities for the world at large give us a vantage point from which to conceive the naturalistic dimensions and implications of the profound Christological mysteries. Thus the natural sciences have given us a new theological framework for Christological reflections. This framework can substantially enhance the biblical view of Christ in cosmic categories. The biblical image of the cosmic Christ serves as the bedrock between natural knowledge and revealed knowledge in Christological reflections.

The Cosmic Christ

The Christian Trinitarian doctrine of creation was also developed from the biblical idea of Christ as the ground of the whole creation and humans alike. This is related to the New Testament notion of Christ as 'mediator in creation', beginning with St. Paul. "For us there is only one God, the Father from whom all things came and for whom we exist, and one Lord Jesus Christ, through whom all things come and through whom we exist" (1Cor.8:6).

> He is the image of the unseen God,
> the first born of all creation,
> for in him were created all things
> in heaven and on earth:
> everything visible and everything invisible,
> thrones, ruling forces, sovereignties, powers -

> all things were created through him and for him,
> He exists before all things
> and in him all things all hold together.- Col.1:15-17.

"God wanted all fullness to be found in him and through him to reconcile all things to him" (Col.1:19). The word fullness (*pleroma*), according to scholars, seem to refer to the biblical concept of the entire cosmos as filled with the creative presence of God (Ps.24:1; 50:12; 72:19; Wis.1:7; Sir.43:27; Is.6:3; Jer.23:24). Paul teaches that the Incarnation and Resurrection make Christ head of the created cosmos as well.[4] The expressions used in Heb.1:3 "the reflection of God's glory" and "bears the impress of God's own being" are symbols used by Israel's Wisdom literature to describe God's eternal Wisdom through whom God created and sustains the world (Prov.8:22-31). Christ's mediation in creation is affirmed on the basis of *Sophia* Christology which considers Jesus as God's Son and his eternal Wisdom. The Johannine Logos Christology echoes the same:

> In the beginning was the Word:
> the Word was with God
> and the Word was God
> He was with God in the beginning
> Through him all things came into being,
> not one thing came into being except through him. - Jn.1:1-3.

Although we cannot identify the divine creative action with the natural processes or the entire richness of the beautiful Christic reality to the evolutionary structures, the reenchanted spiritual universe at large provides a better comprehension of this cosmically defined Christic reality with greater meaningfulness and credibility. The mystery of Christ is a mystery intrinsically constituting the world, extrinsically manifesting the world and perennially unfolding itself in and through the world. At the background of the material universe is the primordial personhood of Christ. Christ is the primordial womb in which took place the primordial conception of the physical, biological, and chemical stuff of the universe, the patterns of structures, the interacting fields, and the evolving energies. The Christic dimension upholds the essential personal character of the entire reality stretching out to consciousness

and self-consciousness. If the cosmic self-consciousness could set out a voyage into its own primal origins, it might land up on the shores of the Christic mystery through whom all things came into being. In this way a scientific inquiry is in a way a Christological exegesis of the cosmos and conversely Christological reflections are a scientific hermeneutic of the cosmos.

Incarnation - The Enfleshment of the Cosmic Newwardness

The word became flesh, he lived among us. - Jn.1:12.

These few words of St. John sums up the unfathomable mystery of incarnation. Incarnation is considered to be an event by which God unites himself to humanity. Modern Christologies have tended to conceive it more in an anthropological sense. However New Testament traditions and patristic theology have seen it also in a cosmological sense. Moltmann comments:

But it is not merely a decorative appendage to the Christmas story when, in Luke 2.9-15, the heaven opens and angels in the glory of God appear, to proclaim from heaven the Gospel about the birth of the Savior. Nor is it merely poetic license when an old German Christmas carol calls upon the earth to 'break into leaf.' It is true that everything the angels say refers to the divine child in the manger; but we must not overlook the cosmic phenomena which accompany the event of his birth.[5]

H. Berkhof also argues the same point:

To take seriously the final events in Christ, must also mean that he is confessed as the ultimate secret of creation.... When a choice is to be made (between descending Christology and the cosmic Christology), the decision has to be in favour of the second doctrine, because the first cannot give a satisfactory explanation of three passages in the New Testament (Jn.1; Col.1 and Heb.1) which deal with Jesus Christ as mediator of creation.[6]

The "divinisation" of nature indirectly implicated by the cosmological experience of the natural sciences and subsequent reflections on it, enable us to consider the cosmos in a way as a "Christosmos". In such a theological matrix, we could look at Incarnation also as the personalistic unfolding of the intra-cosmic Christism. Incarnation was

also that kairological moment in the natural history of the cosmos whereby the annunciation to matter on laying the foundations of the world (Prov.8:22-31) of a divine conception in the immaculate womb of the cosmos which was nurtured by the magnificat of the entire emergent cosmic processes came to the fullness of its emergence. Incarnation was therefore the triumph of the matter, of having given the fullest expression to its otherwise almost impossible potentialities. The continuous creative immanence of God in the world would offer the conceptual foundation for the poetic note of our argument. Peacocke holds that incarnation exemplifies the emergence-from-continuity which characterizes God's creative immanent activity:

Taking the clue from the Johannine prologue, we could say that the manifestations of God which Jesus's contemporaries encountered in him must have been a manifestation emanating from within creation, from deep within those events and processes which led to his life, teaching, death and resurrection. That is to say, in the light of our understanding of God's creation and presence in the world, we must understand 'incarnation' not to involve any 'descent' into the world of God conceived of as 'above' it ... but as the manifestation of what, or rather the One who, is already in the world but not recognized or known.[7]

According to Peacocke, from John's Prologue (Jn.1:1-12) we can learn that the Word uttered in creation is dispersed throughout creation. It is general, perennial, implicit but incognito. The divine immanence in creation becomes focused, historic, particular, explicit and manifest in incarnation.[8] In the writings of many Fathers of the Church too, Incarnation is a universal act which brings into a culmination a universal pattern of activity. Origen had declared that the entire cosmos is taken into Christ in Incarnation and matter is vivified thereby. Maximus the Confessor, one of the important Byzantine thinkers, says: "The word of God, who is God, wills at all times and in all things to work the mystery of his incarnation."[9]

The manifestation of God in the flesh of Christ while consummating that self-transcending quest of matter also assures a new mode of existence to every being. This is the potential Christ-likeness of every being. The idea of 'newness' is intrinsically associated with the Christ mystery in the Pauline theology and that too often in a universal sense:

"The older is gone and a new being is there to see" (2Cor.5:17). "What matters is a new creation" (Gal.6:15). This newness in a cosmic context could be seen as the transformative potentialities of the world into Christ-likeness, the possibility of which is foreshadowed in Incarnation. Therefore Christ is the prefect exemplar of this emergent newness. Incarnation as the historical process of the matter becoming flesh or the flesh being enabled to accommodate the Word is the consummation of a past natural history and the beginning of a new newwardness which continues to call out the inner self-transcending core of matter to ever new actualities.

The evolutionary dynamic and the self-transcending newness of Incarnation has been developed in depth in the Christology of Rahner. According to Rahner, God's immanence in the world is a loving self-bestowal to matter. It pressures the matter from within to transcend itself into the genuinely new and ultimately into the human. As the acceptance of the divine bestowal of grace in the world was total and irrevocable in Jesus, Incarnation means the unique inner moment in the universal bestowal of grace, as well as the unsurpassable climax of God's creative immanence in the world.[10] What God was doing in Jesus must somehow be related to what God was doing in the history of the universe because we know that the body of Jesus shared the same chemical elements from the cosmos common to all. Therefore the ultimate, intrinsic dynamism of matter is transcendence into the divine life itself. William Dych comments on Rahner's View: "Hence the Incarnation is not an abrupt interruption or aberration in the normal course of history but the fullness of time, the culmination of a movement began with creation itself."[11] According to Rahner, "the Incarnation appears as the necessary and permanent beginning of the divinisation of the world as a whole."[12] "The Incarnation appears ontologically as the unambiguous goal of the movement of creation as a whole..."[13]

The Christological reflections of Pierre Teilhard de Chardin deserve our special mention here. Like Rahner, Teilhard too was convinced that a Christology dissociated with the evolution of matter will be dismissed as mythology.[14] He insisted that Christ as the Lord of the universe must be explainable in evolutionary categories. His key category *genesis* referring to evolutionary change, starts from

cosmogenesis moving toward biogenesis, anthropogenesis or noogenesis and extends to Christogenesis. The Christian revelation and the scientific data were the two sources for him in coining Christogenesis. "Fundamentally," says Teilhard, "one single thing is always and forever being made in creation: the Body of Christ."[15] God's redemptive presence in matter through Christ is "a prodigious biological operation," that will enable creation to reach completion at the parousia, which according to him is *the pleroma* referred to in Col.1:15-20.[16]

The Christic Lamb of the Cosmic Pasch

Evolution always implies the emergence of the new. This emergence is not merely the appearance of complex structures but the actualization of new dimensions of existence, new modes of being and radically new properties of becoming. The entire orientation of this open-ended process is towards harmony and interrelationship. As the prime cosmic directiveness is towards harmony, the subsequent biological, psychic, social and moral domains cannot deviate themselves from harmony. Christ as the principle of unity and fullness (Col.1:19; 1Cor.8) must retain the creation in its unity and fullness. This setting enables us to see the universalist nature of the redemption - the fundamental work of Christ, brought out through his Passion, Death and Resurrection.

Sin can be considered the refusal to be in harmony, to be being with, a retrieval into the egoistic self from the cosmic community, a choice of the individualistic against the universalistic. Therefore every sin is a sin against the cosmos against the entire processes of the cosmic past and the entire purposiveness of the cosmic future. Perhaps this was the lesson that God wanted to teach Cain: "Your brother's blood is crying out to me from the ground. Now be cursed and banned from the ground that has opened its mouth to receive your brother's blood at your hands. When you till the ground it will no longer yield up its strength to you. A restless wanderer you will be on earth" (Gen.4:10-12).

The salvation brought about in Jesus, understood as making wholeness, very well brings out the universal character of the redemption. Wholeness reinstates the ontological, existential and moral harmony between beings. In this experience of the wholeness, humans

experience the intrinsic interrelatedness of the entire reality. Therefore we must consider salvation history as the self-transcending continuity of the physical, biological, psychological and social histories. Cross is the symbol that instrumentalises this wholeness. Creation is the gratuitous gift of God. "The love of God is the *causa finalis* of the Creation."[17] Love entails suffering. The fundamental structural unit of harmony is the self-emptying love. "Cross is no longer the point at which the paradoxical love of God embraces men at the moment when they are supremely unlovable."[18] Cross as the ultimate symbol of creating and recreating love and all-embracing openness stands at the center of the cosmos. While its vertical root stemming from the cosmic primordial milieu exerts the creative and reconciling love-energy into the creation, its upper ends point to the infinite transcendence that is embedded with cross. Cross turns the nights into days; straightens the crooked paths. Cross retains the entire creation in its ever-new beauty, by healing the sick, by calming the sea and by bandaging the wounded. Cross is the outward visible symbol of the inward spiritual kenosis in matter. Peacocke confirms our views: "If Jesus is indeed the paradigm, and paragon, of the potential unity of the created with the Creator, then the tragedy of his actual human life can be seen as a drawing back of the curtain to unveil a God suffering in and with the sufferings of creative and created man and so implicitly, by a natural extension, with all creation. Jesus then is, as it were, a bearer of God's pain, the pain of the creative process."[19]

But, cross is the final word neither to the processes of the Christified cosmos nor to the intra-cosmic Christism. The triumph of matter in enfleshing the incarnating Word of God experiences its supreme glorification in Resurrection. The changing nuances of the scientific fundamentals, the inwardness of space time, the opaque depths behind the emerging cosmological experiences, coupled with the self-transcending spiritual potentials postulate a certain amount of cosmic mustness to the Resurrection of Jesus Christ. The power of the Father that raised Jesus from the dead was also a power embedded in the cosmic unrest that called out the dormant Christic mechanism to rise up. Therefore Resurrection is the culmination of a self-transcending "materialism." We will return to this theme in our consideration of the theology of eschatology in the next sect. The historic Resurrection

inaugurated the beginning of a new destination to the cosmos. Thus in Resurrection, the yesterday of the cosmos meets with its tomorrow, adding a new Christological dimension of contemporaneousness to cosmos and history.

A hermeneutical exposition of the revealed set of Christological truths in a scientific context is highly rewarding. On a poetic note, shall we say that it is the same beauty that was transformed on Mount Tabor that transforms itself into plants, trees, flowers and butterflies? Or that the entire universe is a Mount Tabor, in the miracles of which His face shines like the sun and his clothes becoming as dazzling as light?

Endnotes

1 Stoeger, "Key Developments in Physics Challenging Philosophy and Theology," p. 198.

2 Loren Eiseley, *The Immense Journey* (New York: Vintage Books,1957), p. 20.

3 Karl Rahner,"Christology Within an Evolutionary View," *Theological Investigations*,vol. 5 (London: Darton, Longman and Todd, 1966), p. 166.

4 This argument follows from the Pauline idea that everything that was involved in the fall is equally involved in salvation. See Rom.8:19-22; 1Cor.3:22; 15:20-28; Eph.1:10; 4:10; Phil.2:10; 3:21; Heb.2:5-8; Col.2:9.

5 Moltmann, *God in Creation*, p. 170.

6 H. Berkhof, "God in Nature and History," in *Faith and Order Studies*, 1964-7 (Geneva: World Council of Churches, 1968), pp. 12, 13.

7 Arthur Peacocke, *Theology for a Scientific Age - Being and Becoming, Natural, Divine and Human*(Minneapolis: Fortress Press, 1993), pp. 301-302. Also see Peacocke, *Creation and the World of Science*, pp. 240-242; "The Incarnation of the Informing Self-Expressive Word of God," in W. Mark Richardson and Wesley J. Wildman (eds.), *Religion and Science - History, Method, Dialogue* (New York: Routledge, 1996), pp. 330-332.

8 See Peacocke, *The Challenge of Science to Theology and the Church*, p. 19.

9 Cited in Peacocke, *Creation and the World of Science, p. 289.*

10 See Karl Rahner "Christology in the Setting of Modern Man's Understanding of Himself and His world," in *Theological Investigations,* vol. 2 (New York: Seabury, 1924), pp. 224-228. See also Mooney's discussion of Rahner, pp. 158-168.

[11] William V. Dych, *Karl Rahner* (Collegeville: Liturgical Press, 1992), p. 79.

[12] Rahner, "Christology Within an Evolutionary View," p. 167.

[13] Rahner, "Current Problems," p. 165.

[14] See Mooney, p. 168.

[15] Teilhard de Chardin, *Christianity and Evolution* (New York: Harcourt Brace Jovanovich, 1971), p. 177.

[16] See Mooney, p. 169.

[17] Emil Brunner, *The Christian Doctrine of Creation and Redemption* (London: Lutterworth Press), p. 13.

[18] G. W. H. Lampe, "The Atonement: Law and Love," in A. R. Vidley (ed.),*Sounding* (Cambridge: Cambridge University Press, 1963), p. 187.

[19] Peacocke, *Creation and the World of Science*, pp. 229-230.

Chapter 9

Eschatology : The Cosmic Transcendence

For Christians, Christ and the Resurrection affirm the eschatological fulfillment in terms of its axiological, temporal and ontological dimensions. Christian Eschatology primarily deals with the axiological Eschatology, of a God who "will wipe away tears from all faces" (Is.25:8). The axiological, personal and social dimensions are stressed in the eschatological descriptions in Mt.25 and in the book of Revelation. By Eschatology, however, we have dealt with the cosmic significance of the same earlier. Hence the intersection of scientific and theological Eschatology necessitates that we affirm and respect the autonomy of both.[1] The statement of Pannenberg acquires significance in this context: "The biblical eschatology which portrays an imminent end of the world - even if no specific timetable is set (Mk.13:22) - is not congruent with scientific extrapolations which point toward the remote future in regard to a possible

end of the world. It cannot, therefore, be easily contended that both have to do with the same event."[2]

What the biblical Eschatology affirms fundamentally is that God is the ultimate destiny and goal of human beings as well as of the whole cosmos. This will be true both in a universe which exists forever or in a universe that ends in a big crunch. Hence, scientific Eschatology, though it leads to positive appraisal of the cosmic destiny does not diminish the import of the biblical Eschatology. Even in a universe infinitely existing, we can still meaningfully talk of individual and social eschatologies. However, this does not allow us to carry on the distinction between personal, social and cosmic eschatologies beyond certain limits. These are deeply intertwined notions. In the context of the vision of the human and the world provided by the modern scientific and theological scenario, the personal is intrinsically merged with the horizon of the cosmos. Hence to speak of the personal Eschatology is also to speak of the cosmic Eschatology. At a more fundamental level, the personal Eschatology cannot be considered apart from the cosmic Eschatology. There can be no axiological fulfillment apart from personal and social fulfillment. To imagine that love will ultimately triumph without the existence of the person or the cosmos would be hardly possible. Hence scientific Eschatology can indirectly enhance the biblical Eschatology in several ways. Each can contribute to each other by offering insights, criticism and background for reinterpretation.

The Unrest of the Cosmic Heart

The extra-ordinary features of the world as we have scientifically read into the world and the innate potentialities of it compel us to think of the final destiny of the cosmos. Can the future of the cosmos even if infinite and eternal be as dry and dull as have been portrayed by the scientific theories? The trinitarian perichoretic resemblance of the inner structure of the world, the intra-cosmic christism, the effluence of the divine into the cosmos, the cosmic actualisations in the emergence of the humans - all serve as a compelling framework which becomes a conducive interpretative horizon of the new heaven and the new earth. The ultimacy of the heat death or cold death of the divinised and enchanted cosmos will be an unjust sabotage of the essential nature of reality entailed by our modern scientific and religious experiences. The inward and onward dynamisms of the world is the

urge for a restful comfort: "everything that *is*, is restless and on the search for a place ... for a `resting place'. It is not merely the human heart which is `restless' until it finds rest in Thee', as Augustine said. The whole creation is filled with this same unrest, and transcends itself in the search for the rest in which it can abide."[3]

The movement of a world that draws its being from the divine fullness, a world that continues to be filled with the divine fullness in ongoing creation, a world that exhibits clear qualitative transcendence in its emergent evolutionary stages can be depicted as a pilgrim movement towards the heavenly Jerusalem; towards a new heaven that will appropriate its urges, a new earth that would be full of actualities. "A world (without heaven)... would be a closed system, resting and revolving within itself. A world without transcendence is a world in which nothing new can ever happen. It is the world of the eternal return of the same thing."[4]

Where the ontological gap between God and the creation is reduced, it also cuts short the distance between heaven and the earth. The ethereal earth of ours is in a way a natural heaven. Heaven need not be anything that we find only at the end of a long journey, but a proximate possibility that always accompanies the world that is embedded in the spirituality of the universe. According to Moltmann, the divine openness of the cosmic system enables us to call the determined side of this system 'earth' and the undetermined side 'heaven'.[5] According to Moltmann, the *eschaton* of the Bible is neither the future of time or eternity but it is God's coming. God's arrival means the establishment of his eternal kingdom and his indwelling in the cosmos, in his creation. All particular promises in history points forward to this universal appearance of God. When he comes in glory, he will fill the universe with his glory and radiance.[6] Because, basically our Christian belief consists of faith and hope. It is a faith in a loving God who created the world and sustains it. And it is a hope in God that He will not allow his beloved creation to come to nothing. The redeemer God of Christianity would not be the loving God if He does not redeem what He has created.[7] The human in the Bible is intrinsically part of the cosmos. Therefore, it is reasonable to think that there is no redemption of human nature apart from nature. "*Therefore, to conceive the human salvation, there is a need for a redeemed creation, a new creation and new earth.* Can there be

an eternal life for human beings without the change in cosmic condition? The new world is God's home, God's eschatological *shekinah*."[8]

The Universal Eschatological Feast

The biblical Eschatology could be broadly seen in a cosmic context. The biblical literature is rich with eschatological references not only of the individual and the social, but of the world as well. An integral eschatological perspective is available from the setting of creation in the book of Genesis itself.

Because Genesis 1 is a portrait of what God intends, it is also an eschatological statement. This serene, beautiful world, in which all is ordered to humans, and humans are ordered to God, is how it will be at the end. The stories of human sin, which follow Genesis 1, cannot permanently disfigure the original divine intent. God's world will triumph. Rev 21-22 is the description of God's new world, appropriately drawn on this chapter.[9]

The idea of cosmic redemption comes to light quite powerfully in the Pauline theology. In the Pauline thought all reality has a touch of God who inserted himself into his creation especially in his incarnation. The world has been given to us as a manifestation of God's love. Material reality has an intrinsic value. With the spread of the Church in the gentile world, it was Paul's eschatological vision that was more firmly established. However, Church's fight against the gnostic ideas sought to exclude material body from salvation and gradually Pauline cosmic emphasis was sidelined.

Paul speaks of the eschatological aspects especially in the light of creation to redemption and the eschatological happenings at the end of time (Rom.5:12-21; 1Cor.15:21ff, 21& 45ff; 1Cor.8:6; Rom.11:36; Eph.4:5-6; Col.1:16; Eph.1:3-14; Phil.2:6-11, Eph.1:20-21; Col.1:15-20, 2:8-10; Rom.8:8-39). These texts, especially Rom.8:19-23, present Paul's theology of creation to redemption:

for the whole creation is waiting with eagerness for the children of God to be revealed. It was not for its own purposes that creation had frustration imposed on it, but for the purposes of him who imposed in - with the intention that the whole creation itself might be the children of God. We are well aware that the whole creation, until this time has

been groaning in labour pains. And not only that: we too, who have the first fruits of the Spirit, even we are groaning inside ourselves, waiting with eagerness for our bodies to be set free.

Rom.8:19-23

Here we find Eschatology merged with cosmology and anthropology. The world cursed for sin in Gen.3:7, now shares the destiny of the humanity, to be redeemed and glorified like the human body. The reality of Christians and the reality alongside are bound by the one redemptive purpose at work in both Christians and other creatures. They have the characteristic of hope as the creation is waiting with eager longing for the revealing of the children of God. "The `sons of God' are not selected for their own sake alone, but their redemption means the redemption of a world of being besides themselves."[10]

When the entire creation is referred to, Paul intends to say that there is a relation and fellowship between human beings and the rest of the creation and the rest of the creation is affected by what human beings do.[11] Also, in its very 'creatureliness' the creation is a receiver of God's grace in 'hope'. Paul holds that one cannot speak of creation without speaking of human or validly speak of human without speaking of the world in which he/she lives. Redemption takes place in human and also in the world he/she lives in.[12] The worth of creation does not depend on the presence of human in the universe, but on God's grace. The world is something that is made by God, not something neutral. Thus the eschatological imagery detectable in Rom.8:38-39 suggests a renewed and fulfilled creation. Rom.8:19 and the following is one of the many instances of the universal character of a kind of the "cosmic liturgy."[13] Paul assures that the hope of the creation is hope assured by the Resurrection of Christ. The suffering of the creation with Christ will result in glorification with him. It is the glorified Christ who is the ultimate answer to the groaning and unrest of the cosmos. From a different angle, Rahner also has underscored the cosmic significance of the Resurrection. "Jesus's resurrection ... is the beginning of the transfiguration of the world as an ontologically interconnected occurrence. In this beginning the destiny of the world is already in principle decided and has already begun."[14]

Endnotes

1 Pandikattu, p. 6.

2 Pannenberg, *Systematic Theology*. Cited in Worthing, *God, Creation and Contem porary Physics*, p. 177.

3 Moltmann, *God in Creation*, p. 282.

4 Moltmann, *God in Creation*, p. 163.

5 See Moltmann, *God in Creation,* p. 163.

6 See Juergen Moltmann, *The Coming of God* (Minneapolis: Fortress Press, 1996), p. 23.

7 See Moltmann, *The Coming of God*, p. 259.

8 Moltmann, *The Coming of God*, pp. 260-261.

9 Roland E. Murphy and Richard C. J., "Genesis," in *The New Jerome Biblical Commentary* (Bangalore: Theological Publications in India, 1995), p. 11.

10 Sanday and Headlam, *The Epistle to the Romans*(New York: Scribner's Sons, 1896), p. 212.

11 John G. Gibbs, *Creation and Redemption: A Study in Pauline Theology*(Leiden: E. J. Brill, 1971), p. 40.

12 A. N. Wildern, "Eschatological Imagery and Earthly Circumstance," in *New Testament Studies* 5 (1958-59), p. 232.

13 See Gibbs, p. 41.

14 Karl Rahner, "Resurrection," *Sacramentum Mundi*, vol. 5 (New York: Herder and Herder, 1972), p. 39.

Chapter 10

The Church : A New Community Mode of Being

The context in which we are now compelled to look at the Church is the emergent evolutionary perspective of reality that is continuous and creative. This perspective introduces many novel elements into the ever new Church, especially in areas of defining its own self-understanding and mission.

Defining the Self

In the onward movement of the self transcending quest of the world, the reality of the Church could be considered as a new mode of being that facilitates the passover of the inward dynamism of the evolutionary reality towards its final destiny. The unitary matrix of the original mode of being cannot be transferred to an individual and isolated mode of movement, but retains and fulfills its unitariness in the togetherness of a community. The personal and harmonious dynamism of reality in search of its fullness expresses itself in a full but yet incomplete mode of being in the

communitarian beingness of the Church. The history of the Church therefore extends to the history of the cosmos. The presence of the Church in the cosmic history lays out a free abode of actuality to all the beings of the past and a new fulfilling communitarian givenness to all the beings that are yet to participate in the cosmic harmony. Therefore, the existence of the Church could be regarded as a divinely set up cosmic pattern to retain and fulfill the ontological harmony of existence.

What we have been trying to articulate philosophically is a fundamental insight of the biblical theology of the Church. The view of the Church as the new Israel and the original vision behind it confirm that the primary vocation of the Church is to promote the wholeness of existence.[1] The biblical story begins with the creation of the heavens and the earth' (Gen.1:12) and ends with 'the new heavens and the new earth' (Rev.21:10). According to Soares-Prabhu, this is "The story of the 'evolution ' of humankind and the cosmos in their journey towards wholeness (*shalom*)."[2] Creation is God's act of establishing order out of chaos. But the sinfulness of humanity destroys the order and harmony. Then God takes the initiative to restore order to the universe. With this intention, He chooses the nation Israel. The universal scope of God's renewal project is stressed from the very beginning. According to Walter Brueggemann, "the call to Sarah and to Abraham has to do not simply with the forming of Israel but with the re-forming of creation.... It is the hope of God that in this new family all human history can be brought to the unity and harmony intended by the one who calls."[3]

Along the line of Israel and as the continuation of God's plan, the meaning of the existence of the Church could be the maintenance of harmony and wholeness. The mission of harmony and wholeness has been carried on in the New Testament through Jesus Christ. "God was in Christ reconciling the word to himself, not holding anyone's faults against them, but entrusting to us the message of reconciliation" (2Cor.5:19). The Church as entrusted with Christ's message of reconciliation serves as the source of the harmony of the world. The Church denoted by the biblical symbol of the kingdom of God also conveys significantly the meaning of the Church as a promoter of harmony and newness. The idea of the kingdom of God is based on the ancient Near Eastern myth of the kingship of God. According to

this myth, God shows himself to be king by creating the world by overcoming chaos. God is also the king in increasing the fertility of the earth. Thus the fertility of the earth is the reenactment of God's primeval creative action. We could say that the Church as the kingdom of God carries within it the divine task of creating harmony amidst chaos and renewing this harmony in every processes of the world. We could see that the biblical metaphors of the Church like `salt of the earth' and `light of the world', too, could be interpreted to include this perspective.

The Church and the Sacraments

The Church lives and grows in and through the sacraments. Sacraments are essentially constitutive of the life and mission of the Church. Church's holistic call to be the new community mode of being invites her to discover the holistic depths of her sacramental life. The metaphysical framework of the scientific worldview also enables us to articulate the wider implications of the sacramental theology. The mysterious universe of the sciences is in a way a "sacramental" reality which can give new orientations to our understanding of the Christian sacraments.

The Sacramentality of the Cosmos

As a mode of divine revelation and an expression of the divine nature, the world has been considered to be a symbolic reality in Christian theology, though this perspective is yet to be developed in its full details. The world is the expression of an opaque depth and a testimony to the supernatural beauty and glory of the divine. "Ever since the creation of the world, the invisible existence of God and his everlasting power have been clearly seen by the mind's understanding of created things" (Rom.1:20). "The heavens declare the glory of God, the vault of heaven proclaims his handiwork (Ps.19:1)"

The world is the primary locus of the divine manifestation. The Trinitarian mystery is presented in terms of the activities of the triune God in creation. A symbol is that which evokes the presence of the reality. The presence of the reality of the divine in the symbol of the world transcends every imagination as the divine being placed itself in the very stuff of the universe in the incarnation in Jesus Christ. The sacramentality of the cosmos declares its fullest potentialities in

actualising the divine incarnation. As He who was to become the centre of every sacrament placed Himself in the matrix of the world, the world has the prerogative of being part of the constitutive core of the sacraments. As the world is being continuously transformed by the Christic reality, the sacramental dynamic of the world is ever towards the fullness of its sacramentality, towards the fullest outbreaking of the contained or the symbolized.

Therefore the history of the world is in a way the first literature on sacramental theology. The natural processes and the cosmic phenomena are the "cultic" events that impact the sacramental efficacy and evoke the experience of the core for the cosmic community. The inquiries into the nature and processes of the world and activities directed towards the world are sacramental in nature by the very sacramental matrix of their operation. Rather than promoting a naive optimism or an unrealistic justification for all the happenings in the world, this view envisages a more ontologically beautiful and graceful world. The liberation theologian Leonardo Boff has developed the sacramental view of creation in his sacramental theology. The whole universe, according to Boff, is shot through with the reality of God.[4] Through the notion of the transparence of the world, Boff envisages a new sacramental structure and sacramental thinking. The world is not divided between transcendence and immanence, but the intermediary category, transparence, embraces the other two and participates in both the transcendent world and immanent world. Thus the transcendent is rendered present in the immanent and the immanent is transfigured by the transcendent.[5] These categories are summed up in Eph.4:6: "There is one Lord, one faith, one baptism and one God and father of all, over all (transcendence), through all (transparence) and within all (immanence)." What the Psalmist has poetically expressed or what Paul has stated of the created things seem to imply that there is a definite surplus of meaning, surplus of reality and surplus of mystery that is present with our cosmos. This intention has been resembled in the conclusive observation of Davies in the scientific field: "No one who has studied the forces of nature can doubt that the world about us is a manifestation of something very very clever indeed."[6] It is this graceful inward realm of the mystery of the world as articulated in revelation and implied by the sciences that enables us to regard the entire cosmos as a sacramental reality

that makes God present to us and provides meaning to our existence by participating us into it. This sacramental understanding of the world has much in common with what Vatican II calls the symbolism model of sacraments.[7] In this symbolism model world is the locus of God's presence. The Christian mission is the explicitation of the grace which is already at work. God is present in Christ who is in a world which is already redeemed.

The Cosmicality of the Sacraments

The sacramentality of the universe becomes a compelling force to look for broader bases of the sacramental theology. Where we understand reality as an interconnected wholeness, every instance, event and gesture that evokes the experience of the reality must have this holistic aspect. Sacraments as evocative of divine experience and constitutive of our personal and communitarian meanings must have an integration of the cosmic dimension of reality in order that the experience that it evokes and the meaning it constitutes be authentic and holistic. O.C. Quick states that "a sacrament has significance only as part of a whole of which the true relation to God is being represented and effectively realized."[8] The anthropological emphasis of the present day sacramental theology needs to be corrected and complemented and completed by the cosmic constituents of the sacraments. Francis X. D'sa comments: "The world is the primordial sacrament, the *Ursakrament* the *sacramentum mundi*. To neglect this aspect is to neglect the foundation of all sacramental theology, as the history of most of our sacramental theology testifies. It is rare that we find a theology of the sacraments that takes the world seriously."[9]

However, it is to be acknowledged that the core of the Christian sacramental language and sacramental symbolisms imply a very positive affirmation of the profound cosmic depth of the sacraments. The physical elements like water, oil, bread, wine, etc., used in sacraments are only some pointers to it. It was the profuse fusion of the sacrament of creation and the sacrament of God - Christ, that took place at the Last Supper when Jesus looking at the bread and wine said that this was my body and blood. As He transformed the bread and wine into His body and blood, the entire creation has been re-formatted and re-created into a radically ontologically new mode

of being. The cosmos converges with its creator in the Eucharist and the divine as the grounding of the cosmos comes to its periphery in the Eucharist. The Eucharist is the dazzling flame on the radiant candle of the cosmos. Thus the Eucharist can ever retain the cosmos in its newness and newwardness. The eucharistically imputed new mode of being turns the world into a simultaneous process of creation, evolution and fulfillment. The ongoing impact of the Eucharist suffices to maintain the creation in harmony and solidarity over chaos and rebellion. The mystery of the Eucharist, thus, reminds us of the utmost reverential treatment that the stuff of the universe demands of us. As this transformed stuff of the cosmos merges with our being in holy communion, we too join that rhythmic dance of love and harmony at the spiritual centre of the cosmic heart. This is the ecstatic kairological moment of the ultimate oneness of the divine, human and the cosmic. In the second century Irenaeus had a deep insight into the inexplorable depths of the Eucharist. He believed that Jesus was instructing his disciples to offer to God the first-fruits of His own creation, not as though He had need of them, but that they themselves might be neither unfaithful nor ungrateful, He took that bread which cometh of the (material) creation and gave thanks saying, This is my Body. And the cup likewise which is (taken) from created things, like ourselves, He acknowledged for His own Blood and taught the new oblation of the New Covenant... we ought to make oblation to God... offering first-fruits of these things which are His creatures.[10]

More explicit are the reflections of Allchin,

The Liturgy itself is an offering of the world to God by man, it is a passing over; in no sense a static thing, but rather a movement from this world to the world to come, from earth to heaven... the whole of mankind and indeed the whole of the universe is conceived to be in some way associated with this movement of offering, this coming to God.[11]

We also need to remind ourselves that as powerful and as universal the harmony and wholeness of reality, so too the impact of disharmony and fragmentation due to sin. It is here that we realize the depth of repentance leading to reconciliation. The tears of repentance rolls down unto the boundaries of the universe restoring the distorted harmony and revitalizing the broken hearts. The sacrament of

reconciliation is a supernatural mechanism in natural garments that does the repairs and maintenance in the body of the cosmic wholeness. It is a maintenance free of charge, a joyful reaping without sorrowful sowing for it alone suffices to pay off our liabilities to the cosmos. The Eucharist along with reconciliation retains the entire creation as a divine milieu. The extra-ordinary nature of the basic stuff of the universe and the indescribable metaphysical underpinnings of the overall structure of the world as envisaged by the modern sciences might render some support to what we have commented in our reflection on the Eucharist and reconciliation.

Re-enchanting the Theocosm

The universal call of the Church to the promotion of wholeness provides the locus from where it can redefine its priorities and reinforce its actual emphases on mission. The greater ontological significance of the Church in the mystery of creation, perhaps, tell us that Her mission and vocation are much more universal than what we have thought of. The Church may not have to worry about its identity, uniqueness or future for its identity is so universal and so fixated in the cosmic arena of existence. Hence the context of the emergent worldview assures the Church of that confidence whereby it can give up any apologetic attitude and come to the forefront with concrete commitment and action for the transformation of the world and humanity. Hence the new commitment of the Church could be nothing less than a total commitment to a perfect universalism - a universalism that binds the divine, the human and the cosmic in its fullest dimensions. "The cosmic, historical and spiritual dimensions of the biblical story must enter into Christian mission so that its horizons are as large as the cosmos (for God the Redeemer is also God the Creator who does not abandon creation), and its concerns embrace (like the biblical story) every aspect of human and cosmic liberation."[12]

Today, the primal sacramental value of the world needs to be reinforced in the face of a secular and profane cosmology. We need to re-discover the mystery of the universe, which we have lost in our evolutionary progress, and a sense of the symbolism of the universe, which we had condemned as superstitious in our extreme fidelity to rationality. The material universe of the classical physics is to be replaced by a mysterious universe, which is pregnant with the divine.

The passive and inert cosmos of the anthropocentric human is to be replaced by a symbolic universe, which would be the abode of an all-embracing harmony. A discerning of the cosmic and divine depths of our being as a solution to the ecological crisis will be the re-discovery of the mythic wisdom of the Genesis where the divine and the cosmos blend into each other. The assertion of the symbolic value of the cosmos as the grounding for eco-sensitivity too, is not a new insight of the eco-thinkers, but a retrieval into the deep intuition of our sages and *rishis*, a vision that actually guided their respectful and affectionate encounter with nature. A re-reading of the biblical episode of creation from an ecological perspective, and a listening to the chants of the cosmic theologies of Eastern mysticism would take us to an experience of the cosmos mystical in its being and metaphorical in its structure.

The experience of the divine in the cosmos is consequent of a holistic vision and it serves as the most solid foundation for the oneness of being. Perhaps the most profound and powerful metaphor in Biblical literature concerning the world and creation could be seen in Gen 1:31. "And God saw everything that he had made, and behold, it was very good." This is a theology of creation culminating in a theology of wonder and amusement. The joy and wonder of an artist or an architect at his creation is a wonder at his own self extended to the product. The self-giving of God to His Creatures was so profound that He wonders at the self-actualising presence of Himself in His creation. It is this self-giving, self-actualising and self-manifesting immanence of God in creation that is the ontological ground for the goodness and beauty of each being. Divinity in its original manifestation was unreserved in its affirmation that it knew no distinction in creation between good and evil. There was no qualitative hierarchy of objects; no contrasting dichotomies such as the useful and the useless, between the meaningful and the meaningless. The divinity that the first human experienced was so binding that he/she encountered it in each and every being resulting in a cosmic communion and fellowship.

It is interesting to note that in Genesis the paradise of God is not different from the earth. When the first book of the Bible affirms the unity between heaven and earth, the last Book, Revelation, in its apocalyptic vision regards the new heaven and the new earth as equally important. Paradise includes the divine, human and the non-human, in a harmonious blend of each other. The word heavens always appears

in the plural in the Old Testament. Given the initial vision of the paradise, this plurality could be understood not as a numerical multiplicity but as an unbreakable bond between heaven and earth. The episode of creation presents earth itself as a divine milieu. It is God's spirit that removes the darkness and invokes creation into existence. It is the spirit of God that is the mysterious creative energy of each being. The Spirit promotes harmony among creatures. Creation is an ongoing activity of the spirit and it is wrong to say that human holds the key to the evolutionary progress of the world. Eco-sensitivity could spring forth only from a discernment of the spirit of God immanent in each being leading it to greater perfection and actualization. If ecological healing demands a re-creation of the world in its primal beauty and harmony, a total openness to the spirit is essential. Rabindranath Tagore had this discernment of the spirit in the creation as He would exclaim, "Silence my Soul, these trees are prayers."[13]

"And they heard the sound of the LORD God walking in the garden in the cool of the day." (Gen 3: 8). Walking is an active sign of presence and friendship. Earth is the garden, which has the footprints of its creator in every part. This is an image of presence, which is equivalent to the image of God in man. He walks with millions of creatures on this earth on each day and hour of time. At the root of the ecological crisis is a misplacement of the human ego and individuality. Thus it is not able to see the divine walking with His creatures. Not perceiving the divine footprints we have reduced the earth to the footstool of the great king, man. Ecological sensitivity could spring forth only from an experience of paradise within oneself as a togetherness of the divine, human and the non-human.

A conflict and alienation with the forerunners of humans in the cosmic drama of existence gradually culminate in the mutual rebellion among humans, which is depicted in the tale of Cain killing Abel. God's words to Cain are profoundly significant in this context. "The voice of your brother's blood is crying to me from the ground. And now you are cursed from the ground, which has opened its mouth to receive your brother's blood from your hand" (Gen.4: 10-11). It affirms that every sin is a sin against nature; an endorsement that to whatever extent human may make a flight from the company of his non-human beings and the cosmos, ultimately he/she has no escape from the cosmic array of divine unity. The more he/she alienates himself from

the cosmic alliance, the more he/she is indebted to it. The episode of the first killing asserts that the ultimate triumph will be of the cosmos and not of an alienated human for it has the divine certificate of everything being good. It also shows that the problems and conflicts in human society need a radical re-thinking for a lasting solution. Reconciliation between brothers in rivalry, between nations in rebellion, demands primarily reconciliation with our infrahuman brothers and sisters. Justice to the oppressed and freedom to the captives necessitate a cosmic justice to be shared with our non-human fellow beings.

Samuel Rayan observes that the Christian creed, which starts with a confession of God, creator of heaven and earth, and of all that is in them, gradually forgets everything except human beings and God's dealings with them.[14] Christian theology did not give sufficient importance to matter – the source of all, with its preoccupation with the spirit. In fact, in the Bible nature is pictured as something unique with which God is pleased. The Word of God having produced light, the earth by herself had been able to bring forth other beings, because divinity had bestowed upon the earth. Thus it might not be wrong to suppose that each entity of the world becomes and expression of the divine, as part of God's own being:

Creation has in its depth, in its limbs a feel for God who has made it; it senses God's presence, and thrills at God's touch... Created reality is structured like Elizabeth with the baby leaping in the womb at the approach of the Lord and his presence however hidden. The sensitivity of elements, the magnetism in things, the chemisms and tactisms of which Teilhard de Chardin speaks, the loyalty of a dog, the memory an elephant can keep, the teachability of dolphins, and the affinity between leaf and light – all seem to suggest that every creature retains in its heart the echo of the cell that brought it into being and feel of the fingers that shaped its limbs and knit its spirit.[15]

It could be such a divine outlook towards natural realities that is behind certain "superstitions" of the aboriginal people, behind the love of our fishermen towards the sea, behind the love of the farmers towards the seeds, behind the mythical conceptions of animals like rats, cows, etc., as the carriers of gods. The earth has in her memory

a long history of her love rela-tionship with her "Father," with her "Bridegroom." Earth is a benevolent piece of art and God is the artist; She is God's "First- born" daughter. She was there hidden from all eternity in the bosom of her Father. She was the chosen maiden of God who was to conceive all His sons and daughters. His nature love, patience, tolerance, care, etc.- is the nature of the earth. God is a worshipper and worship in nature, for He adorned her before the appearance of the so called rational beings, with flowers, fragrance, incense, greenery, lawns, etc., in which He worships Himself. How poetic our God's sense is! He is the poet and the earth is His poem.

God's appearance to Moses in the desert is profoundly meaningful in this context. He is a God who did not speak from above. God did not appear to Moses, but Moses' eyes were opened to see God. With His appearance to Moses He revealed that every plant and every particle of soil is burning with the fire of God. Holistic vision is a mystical vision that we find when we transcend our physical sight. In an indwelling understanding of the divine, the sacramental value of the world is asserted: "Since the cosmos is permeated with the divine, this mentality could not but perceive the nature as theocosm, the divinised universe. In a divinised cosmos, all expressions of nature were looked upon with awe; as a result co-existence was sought with all creatures including the vegetation."[16] The commitment of the Church in the context of our scientific and theological thinking needs to acquire a definite shape in its concern for the earth, the fundamental locus of all our experiences.

A Kenotic Praxis

Besides, a commitment to the promotion of justice, promotion of the kingdom values of freedom and fellowship, commitment to the liberation of the poor, commitment to the meaningful and deeper involvement in interreligious dialogue, etc. are certain fields of vital significance whereby the Church can be the abode and source of wholeness and harmony in the current world. The II Vatican Council had well realized the universal significance of its mission: "In pursuing its own salvific purpose not only does the Church communicate divine life to men but in a certain sense it casts the reflected light of that divine life over all the earth..."[17]

The fullest understanding of the universal significance of the Church brings out that dimension of her self-hood that her authentic identity consists not in a conceptually constructed and doctrinally defended uniqueness, but in an ontologically authenticated self-emptying. The mystery of the Church is not a mystery of the fullness alone, but a mystery of nothingness, of kenosis and self-giving as well. Kenosis is the key to her authentic self-hood as the sacrament of wholeness and harmony. That which isolates itself from the whole can neither be the whole nor promote wholeness. Therefore, this forceful proclamation of Jesus is also to be regarded today as an ecclesial statement: "Unless a wheat grain falls into the earth and dies, it remains only a single grain; but if it dies it yields a rich harvest" (Jn.12:24).

"It may seem bizarre, but in my opinion science offers a surer path to God than religion."[18] Paul Davies does overstate the case. From the minimalist picture of the divine in Davies' own views or from the seemingly unceasing debates between the theistic and atheistic interpretations of the scientific principles in the scientific circles itself, it is not difficult to identify the overestimated account of Davies' claim. It was not too long since we had the anti-religious agenda from Hawking: "What place, then, for a creator?" The rich elusiveness and the deep allusiveness of the religious truths cannot be said to be possessed by a scientific mind-set. Neither has the Western analytical mind-set developed an epistemology at full length that can integrate and incorporate the depth and profundity of its own experiences. Therefore, any religious claim on a scientific footing alone is destined to be parochial and obsolete.

There is much more a broadening of the scientific horizons necessary for a full length appropriation of the theological beauty into the sciences, although it may be presumptuous to imagine so much and science may not be science as such as understood today at such a level of knowledge. The scientific assumptions on uncertainty, indeterminacy, etc., are not to be viewed as a retreat to the human pursuit after truth, but as an awakening into the innumerable polyvalence of truth and reality. This is a momentum towards the replacement of the reductionist strategies with the holistic approaches. It is in completing the picture of truth that faith and theology come to the aid of science. Unlike the age-old theological intrusions into science through the God of the gaps,

today the new scientific scenario is much conducive to a constructive accommodation of the rich theological metaphors. The God of the physicists, as some physicists would say, is the cosmic order. Science also has the profound insight into the inherent harmony of the entire creation. But, will science ever be able to call this order as a principle of love? Or, to identify this harmony as a supreme ultimate, say, the Father of Jesus Christ? The rich elusiveness of theology has many things at stake whereby it can play a vital role in complimenting, bettering, and even perfecting the picture of truth portrayed by the natural sciences. Vitalising the scientific reductionist caricatures and sweeping away the vacuum of the nihilist know-how-s of science are possible only with the collective elusiveness of the religious and theological themata.

However Davies must be right in saying that science offers us "a path", a path that can lead to several hitherto unknown polyvalence of truth. It was this path offered by the sciences that we have been treading on throughout. As we come to the end of our journey we realize that it is not a path that neither begins fully in sciences nor that ends fully with sciences, but a path that passes through the sciences. It is a path extending down through the history of the intellectual curiosity of the humanity. The scientific colouring of this path is so tempting and fascinating that it rejuvenates and re-invigorates any passer-by on it.

What we have been trying was to read the inscriptions on the milestones on the path of science. As the road of revelation encounters its natural order, both of them are in a way absorbed into each other on a fundamental highway of reality. In the challenging assumptions of this fusion of horizons, the path includes the passer-by as well and the very road shows itself as constitutive of the very destiny of our journey. It was in a way a revelation within revelation; an epiphany within the divine. There we find the profound mysteries of the Christian truth vibrating its radiance and splendor in a single unified mode of being. We find the creation to be the effluent expression of the inward fullness of the divine and we ourselves are shooting up from this all-pervasive wholeness. 'Cosmic' has been the all-embracing epithet that we extensively coined in describing this new epiphany. Our pursuit of truth here has been a simultaneous meditation of God, world and

ourselves. This dialectical convergence of the human and the cosmic on the bosom of the divine forms the hermeneutical circle from where we draw the authenticity of our multifaceted experiences of being in the world, of our religiosity, of our sacramentality, of our communitarianism and of our finality. Our self-actualisation is a response to the call of our selves hidden in the other and the 'infra-human.'

We have been only on the threshold of a wholeness supported by science and theology. A deeper explicitation of the contents of this interdisciplinary horizon, preparing the epistemological grounds for the proper articulation of these paradigm shifts, integrating the profound insights of the Eastern mystical traditions, etc., are imminent challenges before this enterprise. That sets the future directions for this programme.

The cosmic mode of being and the holistic way of existing is not a metaphysical abstract devoid of the beauty and qualifications of life. It sets up an entirely new set of concrete meanings and authentic experiences to our day-to-day life. Being in the world is ever accompanied by an ever-new experience of homecoming. Religious events are not static events of the past. To use some poetic license, salvation history is inaugurated and completed in the time-span of a sunrise and sunset. Incarnation and Resurrection are encountered in the falling of a leaf and the blooming of a flower. This was the experience that stirred the mystics and moved many of the Fathers of the Church; the affectivity that permeated and echoed and reechoed in the primal doxologies.

The music of the cosmos exerts an enchanting ache in our hearts. Every sight becomes an insight; every moment a new *kairos*; every encounter a new covenant. The simplicity of the unfathomable fascinates us; the intimateness of the awful penetrates us; the naturalness of the supernatural pacifies us. Metaphorically speaking, we see the apophatic Trinity so evidently unraveled in the spattering raindrops. There we experience the incalculable joy and the immeasurable beauty of being called into existence. The experience of this wholeness and oneness bursts forth into a compelling prayer of the heart, for the cosmos, with the cosmos and as the cosmos:

Endnotes

1 Here I rely on George Soares-Prabhu's article "Expanding the Horizon of Christian Mission - A Biblical Perspective," in Augustine Kanjamala, (ed.), *Paths of Mission in India Today* (Bombay: St. Paul Publications, 1996), pp. 33-48. Also see Kurien Kunnumpuram, "The Church as the Sacrament of Unity," in Francis X D'Sa,. Issac Padinjarekuttu and Jacob Parappally (eds.). *The World as Sacrament - Interdisciplinary Bridge-Building of the Sacred and the Secular* (Pune: Jnanadeepa Vidya Peeth Theology Series, 1998), pp. 149-157.

2 Soares-Prabhu, pp. 13-14.

3 Walter Brueggemann, *Genesis* (Atlanta: John Knox, 1982), p. 54.

4 Leonardo Boff, *Sacraments of Life, Life of the Sacraments* (Washington, D. C: The Pastoral Press, 1987), p. 77. See Marie Conn, "The Sacramental Theology of Leonardo Boff," in *Worship* 64 (1990), p. 525.

5 See Conn, p. 525.

6 Paul Davies, *The Forces of Nature,* 2nd. ed. (Cambridge: Cambridge University Press, 1986), p. 167.

7 *Sacrosanctum Concillium* 7.

8 O. C. Quick, *The Christian Sacrament* (London: 1932). Cited in Peacoke, *Science and the Christian Experiment*, p. 181.

9 Francis X. D'sa, "*Sacramentum Mundi*," in Francis X D'Sa,. Issac Padinjarekuttu and Jacob Parappally (eds.), *The World as Sacrament - Interdisciplinary Bridge-Building of the Sacred and the Secular* (Pune: Jnanadeepa Vidya Peeth Theology Series, 1998), p. 249.

10 Cited in Peacocke, *Science and the Christian Experiment*, p. 182.

11 Allchin, in Montefiore (ed.), *Man and Nature,*pp. 148-149. Cited in Peacocke, *Creation and the World of Science*, p. 297.

12 Soares-Prabhu, p. 16.

13 See Samuel Rayan, p. 233.

14 See Samuel Rayan, p. 227.

15 See Samuel Rayan, p. 231.

16 Oliver Inchody, "Eco-harmony: An answer to Ecological Consciousness," in *Journal of Dharma* 28 (October - December 1993), p. 334.

17 *Gaudium et Spes* 40. Flannery, p. 826.

18 Davies, *God and the New Physics,* p. ix.