

Globethics Repository

The logo for Globethics, featuring the word "Globethics" in white, sans-serif font centered within a solid blue rectangular background.

Earth - The Lose Paradise of Happiness

This page was generated automatically upon download from the Globethics Repository. More information on Globethics see <https://www.globethics.net>. Data and content policy of Globethics Repository see <https://repository.globethics.net/pages/policy>.

Item Type	Preprint
Authors	Kasi, Rayappa A.
Publisher	Kasi, Rayappa A.
Rights	With permission of the license/copyright holder
Download date	2026-07-08 23:17:21
Link to Item	http://hdl.handle.net/20.500.12424/175945

EARTH

The Lost Paradise of Happiness



Rayappa A. Kasi

Book for the Moment...

Must for all those who care for the Planet...

This riveting, galvanizing book will convince the humanity that the Earth genuinely does hang in the balance. It's an adrenaline rush from start to finish, an inspiring look at the Natural and Spiritual Worlds. (Dr. Soundararaju, Bishop of Vellore, India) Rayappa A.Kasi is a grand rhetorician and his seven chapters in the book are high entertainment, a tendentious delight, a caustic and even a brilliant book. His indictments are trenchant and witty and the book is a treasure house of zingers. (Dr.S.J. Anthonysamy).

Very creative, mystical and mesmerizing, transcends time and space. The book takes the reader on a roller-coaster ride through, Eons, Eras, Ages, Periods, Epochs and the ride is absolutely free and it's all paid for. It's most awesome, beautiful and mentally stimulating work of all. (Dr. Cruz Hieronymus). Fr. Rayappa has taken a provocative and interesting look at our world in the light of science and theology. Father invites the reader to enter into the challenges of our present day and to think more clearly about the environment and our personal response to our loving and gracious God who has lavished us with his gifts of creation. (Mrs. Francine Bell, D.R.E, Boston).

A daring attempt to delve into the deep time and painstakingly unravels dazzling and mind-boggling concepts like Geology to Theology, Hominoids to Image of God, Matter to Mind. This book is a time machine, could be a "survival manual" for future generations. Father is indeed a Maverick Writer... (Rev Msgr. Jim Flavin, Boston). Earth-The Lost Paradise of Happiness is a classic that anybody with an interest in the Cosmic-Geologic beginnings of Universe must read. It is a work of uncompromising scholarship and a labor of love. (Dr. Joemics, Director, Bible Institute, Chennai, India).

This book is an intriguing encounter between science and religion, which is the surprisingly stirring truth. It's an exhilarating and honest look at life. For many who wish to apply scientific-spiritual approach to living, there has never been a book which brings classical beliefs so vividly into the real world. (Fr. D. Maria Joseph. S.T.L, India).Fr.Rayappa A.Kasi has fathomed the ecological sphere with the curious eyes of an innocent child and with the pensive mind of an adult believer. The book makes an interesting study of the nature manifesting the wonders that humanity has inherited yet exposing at the same time the irresponsibility of man in preserving the environment. It presents concrete inputs for theological reflection on ecology and for responsible pastoral action in the future. (Dr. Roy Lazar A., Dept. of Christian Studies, Chennai).

Earth-The Lost Paradise of Happiness is undoubtedly the most boisterously entertaining contribution to the Natural Science and Eco-theology. Kasi's writing is beautiful, his turn of phrase awe-inspiring, and his arguments mature. (Dr. Stephen Pillai, St.Paul's).

About the Author:



Rayappa A.Kasi, a native of A.Kattupadi, Vellore, a Catholic priest, a freelance Geologist, an aspiring Naturalist, and a passionate Ecologist, who was a pastor in Chetpet, Tirupattur, Vandavasi, Thachambady, Haffieldpet and Alapakkam, very small and insignificant parishes in the Roman Catholic Kingdom. The people living out there are very poor, socially sidelined, no land, no cars, no modern technology and development, struggling for their own survival. For these people, just staying alive itself could be environmental. However, these peoples have something remarkable and special to teach to others how to live! These are

the finest examples to the world for "*Sustainable Development*," and "*Sustainable Retreat*," perfectly aligned with the natural world, taking just enough resources for survival than their counterparts, the rich who are the gas guzzlers. This book has been inspired from the lifestyles of these peoples and places. Often the author expresses his wish to be with the poor in India, living with them and considers poverty is a blessing while the richness is seen as the curse of plenty. Recently, the author has been lecturing to students around the world on Global Warming and Climate Change.

For talks, seminars, retreats, multi media presentations, for resources on Ecology, Geology, Biology, Environmental Sciences, Ecotheology and Environmental Ethics.

Please contact me on my

Mobile phone: 09443537885 Email: soundchaser@vsnl.com

Printed by Permission

Most.Rev.Soundararaju, Vellore, India

Copyright 2009

Price : 14.99 USD

Earth

The Lost Paradise of Happiness

Rayappa A. Kasi

Contents

Preface

1. **Chapter One- God of Eath**
 - * Mythology
 - * In the beginning... Man created Gods
 - * Man...The God-Chaser
 - * God against Gods-Monothemism against Pantheism
 - * Types of monotheism-Inclusive and Exclusive
 - * And... Man created Gods in his own image
 - * A new Mathematics
 - * From Trinity... What is next?
 - * Parousia
 - * Eschatology
 - * Armageddon
2. **Chapter Two- Creation of Matter into Creation of Mind**
 - * Our place in the Cosmos
 - * Time before our solar system
 - * Black Holes
 - * Matter-Choreographer of Cosmic dance
 - * The Living Universe
 - * Staying Alive
 - * The secret of life on Earth
 - * Sacred Planet
 - * New Earth
 - * The Fate of the Universe.
3. **Chapter Three-God of Cosmic-Geologic Time Scale- God of Big Bang**
 - * Precambrian Eon and Phanerozoic Eon
 - * Paleozoic Era
 - * Mesozoic Era
 - * Cenozoic era
 - * Das Avatars or Ten Incarnations
 - * God years
 - * God's Eye
 - * PDR Code
 - * Actions of Cosmic God
 - * God of Geological Time Scale
 - * God of Ancient Life
 - * God of Middle Life
 - * God of Recent Life
 - * Life Here and Now
 - * God of History-Goal of our Existence
4. **Chapter Four-Hominoids to Imagio Dei**
 - * Homo erectus to Homo sapiens
 - * Homo sapiens to Homo sentiens
 - * Social Roots of Human Evolution
 - * Darwin's African Guess
 - * Homo sentiens to Imagio Dei
 - * Earth based Psychology and Path Awareness
 - * Enlightenment-Awakening
 - * Humanity's Future

5. Chapter Five-Weather and Climate-Source of Life and Death
 - * Extinction and Speciation
 - * Rebirth
 - * Plate Tectonics
 - * Messengers from Space
 - * Global Conveyer Belt
 - * Global Climate Change
 - * Weather and Climate
 - * Earth's Climate System
 - * CO2-Blessing and Burden
 - * Efficiency, Quantity, Lifetime of Greenhouse Gases
 - * Industry and Greenhouse Gases
 - * Aerosols
 - * Past the Teacher and Future the Student
 - * Overall Global Effects of Climate Change
 - * Legacy of Calamities
 - * An Ozone Hole over Antarctica
 - * Human Activity and Extinctions
 - * Role of Religions on Climate Change
 - * Vatican Documents on the Environment
 - * Pressure on our Children
 - * Who is the Black Sheep?

6. Chapter Six-Some of the Eco and Enviro Issues in Old Testament
 - * Adam and Eve-Exploitation of Natural resources
 - * Magna Carta
 - * The Legend of Noah's Flood
 - * Babel-The failure of Civilization
 - * Sodom and Gomorrah-The Doomed
 - * Famine in Egypt-The Global Catastrophe
 - * Too Many People-Over Population
 - * Slavery and Racism
 - * Ten Plagues-They're revisiting

7. Chapter Seven-Some of the Eco and Enviro Issues in New Testament
 - * Over fishing to Fishers of Men
 - * Parable of the laborers in the Vineyard-Unemployment
 - * Golden Age of Work and Popes
 - * Multiplication of Loaves-Hunger
 - * Samaritan Woman-Water Problem
 - * Parable of the Sower-Soil Science
 - * Twelve Soil Orders or Soil Taxonomy
 - * You are Rock-Geology to Theology *Igneous Rock
 - * Metamorphic Rock *Sedimentary Rock
 - * Lost Sheep-Extinction of Species
 - * Prodigal Son-Homecoming to "Stewardship"-Rags to Rapture
 - * What Man can do?
 - * Faith as Guiding Light
 - * Our Aspirations
 - * Finally...

Glossary

Bibliography

Preface

Earth-The Lost Paradise of Happiness, expresses wonder and awe for God's creation and cautions humans the danger of modern technology and development and points out the urgency of coming back to the "stewardship." Christian theology holds that the Earth is a gift from God that humans share with all other creatures, and it is obvious that our relationships with other beings, humans or not, are affected by the physical environment. To show disregard for the air that others breathe and the quality of the water they drink is to sin against God and against other people, who disproportionately turn out to be the poor who tend to live in especially polluted areas. Such disregard for ecological degradation damages not only inanimate objects but also humankind's overall relationships with living things. Wasting and polluting precious natural resources is justifiably deemed sinful, for it is an offence against all the things, living and inert, biotic and abiotic that God has blessed us with.

Perhaps every generation has a sense that we stand a crossroad, a place and time where human choices and actions will have severe and long lasting consequences not only for ourselves, but in fact for all who will come after us. It seems in this present day the crossroad is more dramatic and consequential than ever. We are witnesses to a climatic time in the history of the earth we are seeing changes in our planet that no one has seen before. Antarctica continues to melt at an alarming rate, the Grand Canyon, once a place of pristinely clear air, the cleanest air in North America, is now experiencing the effects of pollution and scorching heat pervades much of the world as we have never seen before. Surely one must begin to question these changes in the light of modern development. Under the pretext of creating a science and high technology based society we have allowed progress to ruin our beautiful planet. The question that we have to ponder is whether it is possible even now, although late, to salvage this planet and make it a habitable place for all living things. We seem to have taken this beautiful planet Earth for granted and assumed that it is there forever for us to exploit. While the past is now out of our control, we can still change the future by sensibly reframing our present attitudes and lifestyles.

First, there is a growing worldwide consensus that damage to the environment is reaching to a critical point in the early years of the twenty first century. Although these have been significant efforts and movements for ecological improvement for many decades human abuse of the resources of the earth has left the world's waters, wetlands and atmosphere crying out for renewed attention. Mass destruction is taking place all over the world. Water is polluted; air in many places is almost un-breathable. Rain forests are being hacked down mercilessly, thus changing the weather pattern all over the globe. Population growth is going out of control. No matter how we look at the state of affairs around the world, the Earth seems to be a

doomed planet. Man, the natural enemy of all living things, has been destroying it systematically and no wonder that thousands of species of animals and insects are disappearing from the face of Earth (lost sheep). We are (prodigal sons) squandering all the natural resources without foresight. Concern about global warming and climate change due to carbon emissions and greenhouse effects is only the most dramatic of many campaigns geared to promote awareness and change human behavior. This represents a set of urgent challenges that can no longer be ignored by individuals or the groups. They belong to social organizations, religions and faith-based non-profit organizations.

Second, there are already some initial hints that the message of environmental concern is beginning to take root in the minds of some religious and social leaders, especially on the local level. Many people, parishes and dioceses have adopted programs to raise awareness of pollution and to organize efforts to preserve our fragile ecosystems. Projects and efforts to alleviate the environmental problems have made an important impact on the lives of many people of faith, feeding their spirituality and rekindling their commitment to the life of discipleship. Many people express hope that their grass-root efforts will capture the attention on high social and religious officials and make their way into the formulating of some environmental action, the social teaching of pontiffs.

This book is an attempt to reexamine some of the things I've learnt from school, back in 1970's and 1980's. Many things were not understood at that time, however I cherish what has been taught. In my school days it was sin to talk about Galileo, Darwin, Newton, Einstein and other great scientists. I never heard words like "Big Bang," "Big Crunch," "Evolution," "Natural Selection." My deep instinct tells me that nobody is fully right and nobody is fully wrong. I simply want to listen to what those wonderful people have to say. Indeed, there is a portion of imagination at work here as well, just as it is in any body of analyses and projections. This imagination is born in past history and refreshed for future time. I have worked hard not to be fanciful, but to be realistic in the transition from times-that-were to times-to-come. This book is all about freedom, exploration, possibilities, discoveries, inspiration, imagination, dreaming, existence, essence, openness, oneness and it's about the celebration of life and relationships. I wish to thank the many people who, over several decades now, have helped me understand and develop the ideas in this book, the many teachers, classmates and friends, who took the time to debate with me the merits of various views of social and religious awareness of Global Warming and Climate Change.

In the beginning, man created Gods. The book starts with the ever elusive notion of God who is the source of all things, including the power and freedom of thought and continues to explore the ever changing relationship between man and God. Theo-genesis started with fear, giving rise to mythology, drifting

into pantheism, later reaching to monotheism. The second chapter details the creation of God, the physical and the natural world, matter and mind, the beginning and the end of universe. In the third chapter we try to delve into the unknown realm of thought, our attempt to penetrate into the actions of God of history, the cosmic and geologic time scale, even though it was very hard for St. Thomas Aquinas and St Augustine, who did not have the gift of modern science and did not have any idea of deep time. If you don't have time to read this entire book, you can get a glimpse of my premise by reading chapter four. This chapter deals with the creation of man, shooting all the way back five million years, from hominoids to the ascending Image of God, detailing the human transitions, stage by stage. In fact, this 4th chapter is being developed in to a separate book on demand of my friends. The next chapter five is the longest chapter in the book which analyzes the hazards of human activity that have caused global warming and created the greenhouse effect, calling humans to make a collective examination of conscience and to redirect our actions toward sustainable development, before it is too late. Chapter Six brings to our attention some of the ecological and environmental issues in the Old Testament (Bible) and the final chapter seven draws the reader's attention to some of the ecological and environmental issues in the New Testament (Bible). This book need not be read cover to cover in lockstep fashion. I would take two weeks to read and complete the book, at 20 pages a day.

I'm especially indebted to Francine Bell, Theresa Moses, Kevin Brophy, Fr.Roy Lazar, who read the earliest versions of each chapter. I dedicate this book to my friends Fr.Andreas Pathi (his legend still lives on), Fr. John Shea, Fr.Paul MacDonald, Fr. James Flavin, Fr. Paul Ring, Fr.Brian Smith, Fr.Brian Flynn who were objects of my inspiration and admiration. I wish to thank my other friends: May and Tom Brophy, Steve and Laurie Cavanaugh, Vivian Lassitter, Carol Madsen, Rachaelle Lynn, John and Eddy Meehan, Lillian Smith, Anne Spillane, Nancy Noonan, Mary Lou Costello, Debbie Cotter, Debbie Sawaya, Alfreda Strother, Lilly and George Madathil, Fr.D. Maria Joseph, Fr. Nambikai Raj, Fr.S.J.Antonymsamy, Fr.A.T.James, Fr.James Vincent, Fr.Gnanajyothei, Fr.Arulsamy, Fr.K.O.Abraham, Fr.Lourdu Xavier, Fr.Christian, Fr.Johnson, Fr.Lawrance Varam, Fr.Chinnappa, Fr.Stephen, Fr.Octavius, Fr.Martin, Fr.Samuel, Fr.Edward Raj, Fr.Albin Justus, Fr.Daniel, Fr.Joe Lourdusamy, Fr.S. Lourdusamy, Fr.D.F.Bosco, Amalorpavadoss Susai, Sathiasaelan, Sr.Auxilia, Sr.Leonie, Sr.Baby Victoria, Sr.May, Sr.Josephine, Sr.Felix, Sr.Margarite, Sr.Gracien, C.Rakshitha, Dave and Carol Spada, John and Rosemary Corcoran, Ralph and Jean Casale, Maureen and Ron Dimillio, Maureen and Pat Smith, Geri Erineri, Zahola Seufert, Jack and Marie Fargo, Kathy and Ray Henningson, Frank and Joan Silvio, Jerry and Kathy Walsh, Arthur and Kathy McClaren, Judith Kelley.

I would like to thank in a special way to Most Rev. Soundararaju, Bishop

of Vellore, who is my friend, for his support and guidance and also I thank the former Bishops, Most Rev. Michael Augustine and Most Rev. A.M. Chinnappa who had faith in me all the way. Over the years the following Bishops have been my friends and source of admiration, Most Rev. Peter Fernando, Most Rev. Ananda Rayar, Most Rev. Thomas Aquinas, Most Rev. Tony Devotta, Most Rev. Lawrance Pious, Most Rev. Pappusamy Anthony, Most Rev. Porunnedom Jose, Most Rev. Kakoza Christopher (Uganda), Most Rev. Susai Manickem, Most Rev. Amalanathar. Most Rev. Brian Finnigan (Australia).

I thank my mom, dad, brothers and my family for teaching me to respect and cherish our rich and fragile natural heritage, I also wish to thank to the people who live in A.Kattupadi (my native village), which lies at the backdrop of Eastern Ghats, could be a 8th wonder of the world for its endemic species of animals and plants, for its scenic beauty, for its mild temperatures and for its biodiversity. With the vibrating ecosystems and with the sound understanding of the need to respect, save, conserve, preserve our world and our environment and moving the people toward a sustainable development, A.Kattupadi is indeed, one of the greatest places on Planet Earth.

Rayappa A.Kasi
A.Kattupadi
Vellore – 632 011
India

Chapter - One

God of Earth

“For God so loved the world that he gave his only begotten Son, that whoever believes in him should not perish but have everlasting life.”
John 3:16

Early hominids expressed their belief in god out of fear and we could see it in their primitive ventures in prehistoric art, cave paintings, later through mythology. What is prehistoric art? There are several forms of prehistoric artifacts and artwork. These are small stone figurines, petroglyphs, geoglyphs, megaliths and last but not least, *cave paintings (Bhimbhetka, MP in India, Chauvet cave in France)*. The term “prehistoric” indicates that the culture that produced the artwork did not have a written language. Some of the more famous examples are *Stonehenge, the Nasca lines in Peru, and Lascaux Cave*. Prehistoric artifacts and artwork can be found all over the world. Prehistoric societies were hunters and gatherers and their paintings reflected their way of life like hunting, foraging. In the Paleolithic period, for example, when agriculture was developing, the cult of the Mother Goddess expressed a sense that the fertility which was transforming human life was actually sacred. Later, when the language was invented, man began telling stories about gods, and mythology found its compelling and ever lasting presence in the society.

A myth is simply a story, and it can be either spoken or written. Myths arise within every culture, especially during its infancy, because they offer people a way to understand and explain their experiences. Usually myths are not based on actual events; myths are created by people striving to find purposes and reasons for the things happenings in their lives and the lives of those around them. Myths are created to explain many things, including natural phenomenon, the existence of good and evil, even the origins of mankind. Characters in myths are often called “gods” and thought to have special powers. For example, a violent and destructive storm could be understood as the reaction of an angry or offended god. There are many different genres of myths. One that is perhaps the most recognized today is pagan myths, such as those of the Greeks and Romans. *Pagan myths* describe the relations between humans and gods. *Primitive myths*, by contrast, are stories about nature, while *sacred myths* are the stories of the religions of the world, such as Hinduism and Christianity. *Cosmic myths* consist of the stories about how the world was created and how it will end. Similarly, there are myths about scientific phenomenon which have yet to be researched and understood. Finally, there are myths that relate to places and things. Perhaps one of the best known of these is the story of Camelot.

Mythology

Every culture has evolved its own mythology, defining its character and

offering a way to understand the world. The collection of myths contains stories drawn from many outstanding traditions of Europe and from the great civilizations of Asia, some of the oldest, most powerful narratives in the world. *Greek, Celtic and Norse legends* form the core of European mythological thought. Myths from the Middle East include those of the Sumerians and Babylonians; the ancient Iranians; the Egyptians; the Canaanites and Hebrews. The section on South and Central Asia deals with the Hindu and Buddhist deities of India, Sri Lanka, Tibet and Nepal (Jatakas or stories). *Daoist and Buddhist myths*; the folk religion of China; the *Shinto* deities of Japan; and animist and shamanistic religions practiced from Siberia to the South-east Asian archipelago are some of the greatest contributors in the evolution of mythology.

From Mesopotamia, the cradle of western civilization, come legends of which we are able to glimpse only fragments, while the belief systems of other ancient societies, such as the Egyptians and Greeks, are far more readily accessible. The stories that have survived from these ancient civilizations describe gods that have long passed into history. Other deities, such as those of Hinduism and Buddhism, remain at the centre of living faiths, worshipped by millions of present day devotees. Even though lots of primitive myths and stories of gods long vanished from human history, *they still continue to exert their influence on the civilizations of the world*, as their themes are explored in literature and the visual arts, and the archetypes they present help to deepen our understanding of human psychology.

Another strand of mythology recounts the experience of human or semi-divine heroes, and touches upon the fundamental issues of existence. These stories deal with the large themes which underlie our present day consciousness, expressing these profound ideas in terms of individual biographies and events comprehensible in human terms. The legends of heroes endure from age to age, and hold our attention because they dare to go to the extremes of human terror and delight. *Myths of every culture reveal the power of love, with its accompanying anxiety and jealousy; the conflict between the generations, the old and the new; the violence of men, especially on the battlefield or in hand to hand combat; the mischief of the trouble maker, bored by the steady pace of everyday events; the sadness of illness or injury; the mystery of death; and the possibility of another life after it.* Stories about individual heroes chart the effect of enchantment upon mind and body; the horror of madness with its disruption of human relations; the incidence of good luck and misfortune, and the whole issue of fate; the challenge of the unknown, whether a voyage into uncharted waters or a quest for a sacred object; the personal danger of a contest with a monster, even a beheading game; and the sadness of betrayal and treachery by family or friends. Myths about the wider world try to

explain its mysteries, dealing with the cycle of fertility in human beings, animals, and plants; the relationship between humankind and the gods; the creation of the world and the origins of society; and, last, but not least, the nature of the universe.

Different myths tackle these great questions in distinct ways. But the heroes and heroines of every civilization find themselves facing the same basic problems. The Hindu hero Arjuna (Pandavas the good) on the eve of the great battle of *Kurukshetra* against his enemies the villainous Kauravas (the bad) has a crisis of conscience when he realizes that he can only achieve victory at the cost of killing his own relatives, and is only saved from his loss of nerve by the encouragement of his close friend, the god, Krishna. Such stories underline both the variety and the continuity of human nature. Though the great myths concern gods, heroes and monsters, much of their fascination lies in the human values they illuminate. Very many myths reveal an interwoven pattern of circumstances outside the control of both mortals and gods. Fate and destiny in mythology are almost beyond manipulation. Attempts may be made to slow down the operation of fate's decrees; sometimes to thwart them entirely, but they never work.

The great hero Gilgamesh accomplishes feats beyond the strength of any other man. He even succeeds in reaching the underworld in his search for the secret of immortality. But the knowledge he ultimately returns with is that he cannot avoid his own death. The tangled web of difficulties which besets the Greek hero Theseus can be traced to a number of actions, but one stands out clearly; the refusal of king Minos of Crete to sacrifice the white bull from the sea to the god Poseidon, its real owner. Once this sacrilege has been committed, the fate of Minos and his family, intertwined with that of Theseus, is sealed. The gods are equally subject to the working of fate. The Celtic sun god Lugh cannot save his son Cuchulainn on the battlefield. And even immortal Zeus, the chief god of the Greeks, has a duty to see that fate takes its proper course. He cannot control events.

One of the most striking characteristics of myths is the way they have been adopted and adapted by successive cultures. The myths of Asia were carried by missionaries from one part of the continent to another, giving rise to subtle variations in archetypal legends, and different manifestations of important mythological figures. Buddhism, for instance, which arose with the teachings of Gautama Buddha in Northern India around 500 BC, was introduced to China around the time of Christ and to Japan in the sixth century AD. The Buddha Amitabha, whose cult may in turn have been influenced by Iranian religion, became the leading figure of Japanese Buddhism as Amida, who was more highly venerated in Japan than Gautama himself. *Gautama, meanwhile, was accommodated in Hindu myth as an avatar of Vishnu.* Similarly, when the Romans absorbed Greek mythology, they adopted figures such as Aphrodite (translated into goddess Venus) who

had evolved from older Mesopotamian deities including Inana, Ishtar and Astarte.

The themes of the great myths are universal. Creation myths have evolved in every culture, often with striking similarities, such as the limitless ocean from which the universe arises. A major preoccupation is that of life after death, which is explained in terms of parallel worlds; the underworld to which the dead descend to be judged; and the heavens to which the righteous aspire. Even within Hinduism and Buddhism, in which life is seen as a succession of reincarnations leading to the final release of nirvana, complex pictures of these unearthly realms have arisen. The idea of a catastrophic flood is another powerful and recurring theme, illustrating the potential power of the gods to destroy humankind, and *arising from a universal awareness of the precariousness of human existence*. Thus do the myths peculiar to each culture and religion point to the essential truths common to all humanity. *The abiding interest of mythology is its frankness about basic human drives*. It could almost be described as sacred literature undisturbed by theologians. The raw and ragged ends of existence are still visible in its tales of both men and God.

In the beginning.... Man created Gods

The History of God plays an investigative role in humanity's timeless and unrelenting struggle for faith, comfort, and understanding. Many people's sense of God's role in the world is very primitive and simplistic. For some, God is used to fill in for anything we don't understand in the world. For others, God is a tyrant who punishes anyone who does not live a life of faith. *History of religion has revealed that human beings are spiritual. Indeed, there is a case for arguing that Homo sapiens also "Homo religious."* Men and women started to worship gods as soon as they became recognizably human; they created religions at the same time as they created works of art. These early faiths expressed the wonder and mystery that seem always to have been an essential component of the human experience of this beautiful yet terrifying world. Like art, religion has been an attempt to find meaning and value in life. *Like any other human activity, religion can be abused*, but it seems to have been something that we have always done. It was not tacked on to a primordially secular nature by manipulative kings and popes but was natural to humanity. All human societies recognize powers that are greater than them, such as light and dark; sun, storm and frost; flood and drought; and the growth of the plants on which their lives depend. Investigating such powers with spirits that have a recognizably human nature has allowed people to make greater sense of a random and threatening universe. Propitiating the spirits with offerings and prayers allows their worshippers to feel that they have a degree of control.

Contemporary theologians like Karl Rahner and John Shea call these experiences "*encounters with Mystery*." We intuitively sense that there is

something beyond the boundaries of our own ego, even beyond the collective egos of the rest of humankind. There is a presence and a power in the universe that is somehow addressing us. On our side, the fact that we keep wondering and asking questions about meaning, purpose and the ultimate reveals our capacity for reaching beyond ourselves. *Theologians call this "self-transcendence."* Now, a crucial question: Is this wondering and questioning of ours finally in vain? Is "the encounter with Mystery" nothing but a projection of our wishes for a parent-figure or some other form of security? "Yes!" would be the answer *of Freud and others skeptics and agnostics.* "There is nothing out there. This is the only world there is, the only life there is, and the only noble thing to do is to accept it and make the best of it." On the other hand, religious people refuse to believe that their experience of transcendence is only a projection of their mind. They accept the existence of the mystery, and they even give it a name: God. Moreover, they believe that this God is not different to them. Rather, God is calling them into personal relationship with himself. *Karl Rahner would claim that religious experiences can occur even if God is not explicitly recognized them.*

The essence of religious experience is that it nudges us to wonder and to ask the deeper questions. It happens, for example, whenever we find someone hanging on to hope even when most others have given up; whenever a person keeps loving even though their love is not returned; whenever someone forgives a terrible injury committed against him or her; whenever one continues to stand up for the truth, even at the risk of great personal loss. All these situations confront the human observer with the inexorable questions: Why? What motivates them? What is the secret of their endurance, their commitment, their serenity in the face of personal suffering? Note, however, that none of these experiences or all of them together, can absolutely prove the existence of God. The point I wish to make, though, is that no one can lay God and his kingdom on the table before us like irrefutable truth in a court trial. *The fact is both belief and unbelief are choices. Both are a leap in the dark. Both are made with doubt and hesitation.* The atheist cannot prove that our faith is groundless, but neither can we prove the absolute validity of our faith.

It is hard to understand the history of the ineffable reality of God himself, which is beyond time and change. The human idea of God has a history, since it has always meant something slightly different to each group of people who have used it at various points of time. *The idea of God formed in one generation by one set of human beings could be meaningless in another. History repeats itself; the great religions of today, perhaps would be just a history in another two hundred years unless they make a huge shift in their belief that could irresistibly accessible to the younger generations.* Indeed, the statement "I believe in God" not always has the

same objective meaning, as such, but like any other statement only means something in context, when proclaimed by a particular community. New thoughts, new revelations, new councils and new theology eventually would replace the existing “Credos.” When one conception of God has ceased to have meaning or relevance, it has been quietly discarded and replaced by a newer one.

Man: The God-Chaser

Human beings continued to chase God who was the first cause of all things and ruler of heaven and earth. When people began to devise their myths and worship their gods, they were not seeking a literal explanation for natural phenomena. The symbolic stories, cave paintings and carvings were an attempt to express their wonder and to link this pervasive mystery with their own lives; indeed, poets, artists and musicians are often impelled by a similar desire today. Artists carved those statues depicting her as a naked, pregnant woman who archaeologists have found all over Europe, the Middle East and India. These myths were not intended to be taken literally, but were *metaphorical attempts* to describe a reality that was too complex and elusive to express in any other way. These dramatic and evocative stories of gods and goddesses helped people to articulate their sense of the powerful but unseen forces that surrounded them. Indeed, it seems that in the ancient world people believed that it was only by participating in this divine life that they would become truly human.

Earthly life was obviously fragile and overshadowed by mortality, but if men and women imitated the actions of the gods they would *share to some degree their greatest power and effectiveness*. Thus it was said that the gods had shown men how to build their cities and temples, which were mere copies of their own homes in the divine realm. The sacred world of the gods, as recounted in myth, was not just an ideal toward which men and women should aspire, but was the prototype on which our life here below had been modeled. *Everything on earth was thus believed to be a replica of something in the divine world*, a perception that informed the mythology, ritual and social organization of the most of the cultures of antiquity and continues to influence more traditional societies in our own day.

A similar spirituality had characterized the ancient world of Mesopotamia. The Tigris-Euphrates valley, in what is now Iraq, had been inhabited as early as 4000 BC by the people known *as the Sumerians*, who had established one of the first great cultures of the Oikumene (the civilized world). In their cities of Ur, Erech and Kish, the Sumerians devised their cuneiform script, built the extraordinary *temple-towers called ziggurats* and evolved an impressive law, literature and mythology. Not long afterward the region was invaded by the Semitic Akkadian, who had adopted the language and culture of Sumer. Later still, in about 2000 BC, thus Amorites had conquered this

Sumerian Akkadian civilization and made Babylon their capital. Finally, some 500 years later, the Assyrians had settled in nearby Ashur and eventually conquered Babylon itself during the eight century BC. This Babylonian tradition also affected the mythology and religion of Canaan, which would become the Promised Land of the ancient Israelites.

Like other people in the ancient world, the Babylonian attributed their cultural achievements to the gods, who had revealed their own lifestyle to their mythical ancestors. *Thus Babylon itself was supposed to be an image of heaven*, with each of its temples a replica of a celestial palace. This link with the divine world was celebrated and perpetuated annually in the great New Year festival, which had been firmly established by the seventeenth century BC. Celebrated in the holy city of Babylon during the month of Nisan (our April), the festival solemnly enthroned the king and established his reign for another year. Eleven days of celebration marked the event. These celebrations thus had a sacramental value; they enabled the people of Babylon to immerse themselves in the sacred power or consciousness on which their own great civilization depended.

It seems that *creating gods is something that human beings have always done*. When one religious idea ceases to work for them, it is simply replaced. Jewish religion is attributed in the Bible to Abraham, who left Ur and eventually settled in Canaan some time between the twentieth and nineteenth centuries BC. We have no contemporary record of Abraham, but scholars think that he may have been one of the wandering chieftains who had led their people from Mesopotamia toward the Mediterranean at the end of the third millennium BC. These wanderers, some of whom are called Abiru, Apiru or Habiru in Mesopotamian and Egyptian sources, spoke west Semitic language, of which Hebrew is one. They were not regular desert nomads like the Bedouin, who migrated with their flocks according to the cycle of the seasons, but were more difficult to classify and, as such, were frequently in conflict with the conservative authorities. Their cultural status was usually superior to that of the desert folk.

The stories about Abraham in the book of Genesis show him serving the king of Sodom. Who is Yahweh? We encounter this word very often in the Bible. Did Abraham worship the same God as Moses or did he know him by a different name? It is highly likely *that Abraham's God was El*, the high god of Canaan. The deity introduces himself to Abraham as El Shaddai (El of the mountain), which was one of El's traditional titles. Elsewhere he is called El Elyon (the Most High god) or El of Bethel. The name of the Canaanite high god is preserved in such Hebrew names as Isra-El or Ishma-El. El was depicted as a good friend of Abraham. Centuries later we found the presence of Yahweh was a terrifying experience. On Mount Sinai, for example, he would appear to Moses in the midst of an awe-inspiring volcanic eruption, and the Israelites had to keep their distance. In comparison,

Abraham's god El was a very mild deity. He appears to Abraham as a friend and sometimes even assumes human form. This type of divine apparition, known as an epiphany, was quite common in the pagan world of antiquity.

Even though in general the gods were not expected to intervene directly in the lives of mortal men and women, certain privileged individuals in mythical times had encountered their gods face to face. *Homer's Iliad is full of such epiphanies. The gods and goddesses appear to both Greeks and Trojans in dreams, when the boundary between the human and divine worlds was believed to be lowered.* It seems that ordinary folk may have believed that such divine encounters were possible in their own lives: this may explain the strange story in the Acts of the apostles when, as late as the first century AD, the apostle Paul and his disciple Barnabas were mistaken for *Zeus and Hermes (Greek Gods)* by the people of Lystra in what is now Turkey.

In much the same way, when the Israelites looked back to their own golden age, they saw Abraham, Isaac and Jacob living on familiar terms with their god. El gives them friendly advice, like any sheikh or chieftain: he guides their wanderings, tells them whom to marry and speaks to them in dreams. Abraham is a man of faith because he trusted that his El would make good his promises, even though they seem absurd. How could Abraham be the father of a great nation when his wife, Sarah, is barren? Indeed, the very idea that she could have a child is so ridiculous. *Sarah has passed menopause.* When against all odds, their son Isaac is born and god makes an appalling demand; Abraham must sacrifice his only son to him. Human sacrifice was common in the pagan world. It was cruel but had a logic and rationale. There was no reason for the sacrifice. Indeed, the sacrifice would make nonsense of Abraham's entire life, which had been based on the promise that he would be the father of a great nation.

Yet to modern ears, this is a horrible story: it depicts God as a despotic and capricious sadist, and it is not surprising that many people today who have heard this tale as children reject such a deity. The myth of the Exodus from Egypt, when God led Moses and the children of Israel to freedom would be equally offensive to modern sensibilities. God sent ten fearful plagues upon the people of Egypt. The Nile was turned to blood; the land ravaged with locusts and frogs; the whole country plunged into impenetrable darkness. Finally God unleashed the most terrible plague of all: he sent the angel of death to kill the firstborn sons of all the Egyptians, while sparing the sons of the Hebrew slaves.

It seems that Yahweh carried out a systematic terror net-work in Egypt. Pharaoh decided to let the Israelites leave but later changed his mind and pursued them with his army. He caught up with them at the Sea of Reeds,

but God saved the Israelites by opening the sea and letting them cross dryshod. When the Egyptians followed in their wake, he closed the waters and drowned the Pharaoh and his army. This is a brutal, partial and murderous god: a god of war. He is passionately partisan has little compassion for anyone but his own favorites and is simply a tribal deity. We shall see that *Yahweh did not remain the cruel and violent god of the Exodus*, even though the myth has been important in all of the monotheistic religions. Surprising as it may seem, the Israelites would transform him beyond recognition into a symbol of transcendence and compassion. *Yet the bloody story of the Exodus would continue to inspire dangerous conceptions of the divine and a vengeful theology. Like any human idea, the notion of God can be exploited and abused.*

The Israelites called Yahweh “the God of our fathers,” yet it seems that he may have been quite a different deity from El, the Canaanite high god worshipped by the patriarchs. He may have been the god of other people before he became the God of Israel. In all his early appearances to Moses, Yahweh insisted repeatedly and at some length that he was indeed the God of Abraham, even though he had originally been called El Shaddai. *It has been suggested that Yahweh was originally a warrior god, a god of volcanoes, a god worshipped in Midian, in what is now Jordan.* We shall never know where the Israelites discovered Yahweh, if indeed he really was a completely new deity. Again, this would be a very important question for us today, but it was not so crucial for the biblical writers.

In pagan antiquity, gods were often merged and amalgamated, or the gods of one locality accepted as identical with the god of another people. All we can be sure of is that, whatever his provenance, *the events of the Exodus made Yahweh the definitive God of Israel and that Moses was able to convince the Israelites that he really was one and the same as El, the God beloved by Abraham, Isaac and Jacob.* The Bible shows that the people were not true to the covenant. They remembered it in times of war, when they needed *Yahweh’s skilled military protection*, but when in times were easy they worshipped *Baal, Anat and Asherah* in the old way. There was always a danger that the cult of Yahweh would eventually be submerged by the popular paganism. At the same time, each region developed a distinctive ideology to address the nature of God.

In the seventeenth century BC, Aryans from what is now Iran had invaded the Indus valley and subdued the indigenous population. They had imposed their religious ideas, which we find expressed in the collection of odes known as the “Rig-Veda.” There we find a multitude of gods, expressing many of the same values as the deities of the Middle East and presenting the forces of nature as instinct with power, life and personality. Yet there were signs that people were beginning to see that the various gods might simply be manifestations of one divine Absolute that

transcended them all. Like the Babylonians, *the Aryans* were quite aware that their myths were not factual accounts of reality but expressed a mystery that not even the gods themselves could explain adequately. When they tried to imagine how the gods and the world had evolved from primal chaos, they concluded that nobody, not even the gods could understand the mystery of existence. The oldest text from Rig Veda reads:

Who then knows whence it has arisen: Whence this emanation hath arisen,

Whether God disposed it, or whether he did not,

Only he who is its overseer in highest heaven knows.

Or perhaps he does not know.

The religion of the *Vedas* did not attempt to explain the origins of life or to give privileged answers to philosophical questions. Instead, it was designed to help people to come to terms with the wonder and terror of existence. *It asked more questions than it answered*, designed to hold the people in an attitude of reverent wonder. By the eighth century BC, changes in the social and economic conditions of the Indian subcontinent meant that the old Vedic religion was no longer relevant. The ideas of the indigenous population that had been suppressed in the centuries following the Aryan invasions surfaced and led to a new religious hunger. *The revived interest in "karma," the notion that one's destiny is determined by one's own actions*, made people unwilling to blame the gods for the irresponsible behavior of human beings. Vedic religion had become preoccupied with the rituals of sacrifice, but the revived interest in the old Indian practice of Yoga, meant that people became dissatisfied with the religion that concentrated on externals. *Sacrifice and liturgy were not enough; they wanted to discover the inner meaning of these rites.*

In India, the gods were no longer seen as other beings who were external to their worshippers; instead men and women sought to achieve an inward realization of truth. The gods were no longer very important in India. Henceforth they would be superseded by the religious teacher, who would be considered higher than the gods. It was a remarkable assertion of the value of humanity and the desire to take control of destiny; *it would be the great religious insight of the subcontinent.* The new religions of Hinduism and Buddhism did not deny the existence of the gods, nor did they forbid the people to worship them. During the eighth century, sages began to address these issues in the treatises called *the 'Aranyakas' and the "Upanishads," known collectively as the "Vedanta"; the end of Vedas.* More and more Upanishads appeared, until by the end of the fifth century BC there were about 200 of them. Upanishads did evolve as a distinctive conception of godhood that transcends the gods but is found to be intimately present in all things.

In Vedic religion, people have experienced a holy power in the sacrificial ritual. They had called this sacred power Brahman. The priestly caste known as Brahmanas is also believed to possess this power. Since the ritual sacrifice was seen as the microcosm of the whole universe, Brahman gradually came to mean a power which sustains everything. *The whole world was seen as the divine activity welling up from the mysterious being of Brahman, which was the inner meaning of all existence.* The Upanishads encouraged people to cultivate a sense of Brahman in all things. It was a process of revelation in the literal meaning of the word; it was an unveiling of the hidden ground of all being. *Everything that happens became a manifestation of Brahman:* true insight lay in the perception of the unity behind the different phenomena. Some of the Upanishads saw Brahman as a personal power, but others saw it as strictly impersonal. Brahman cannot be addressed as “thou”; it is a neutral term, so is neither he nor she; nor is it experienced as the will of a sovereign deity. Brahman does not speak to mankind. It cannot meet men and women; *it transcends all such human activities.* Nor does it respond to us in a personal way: sin does not offend it, and it cannot be said to love us or be angry. Thanking or praising it for creating the world would be entirely inappropriate.

The techniques of Yoga had made people aware of an inner world. These disciplines of posture, breathing, diet and mental concentration have also been developed independently in other cultures and seem to produce an experience of enlightenment and illumination which have been interpreted differently but which seem natural to humanity. *The Upanishads claimed that this experience of a new dimension of self was the same holy power that sustained the rest of the world. The eternal principle within each individual was called “Atman”:* it was a new version of the old holistic vision of paganism, a rediscovery in new terms of the One Life within us and abroad which was essentially divine. The “*Chandogya Upanishad*” explains that the salt dissolved in the water symbolizes the *Brahman pervading the world and as Atman,* is found eternally within each one of us.

Atman prevented God from becoming an idol, an exterior reality “out there,” a projection of our own fears and desires. God is not seen in Hinduism as a Being added on to the world as we know it, therefore, nor is it identical with the world. There was no way that we could fathom this out by reason. *It is only revealed to us by an experience (anubhava) which cannot be expressed in words or concepts.* Brahman is “what cannot be spoken in words, but that whereby words are spoken... what cannot be thought with the mind, but that whereby the mind can think.” It is impossible to speak to a God that is immanent as this or to think about it, making it a mere object of thought. It is a Reality that can only be discerned in ecstasy in the original sense of going beyond the self: God comes to the thought of those who

know it beyond thought, not to those who imagine, it can be attained by thought. *It is unknown to the learned and known to the simple.* It is known in the ecstasy of an awakening that opens the door of life eternal. Like the gods, reason is not denied but transcended. The experience of Brahman or Atman cannot be explained rationally any more than a piece of music or a poem. Intelligence is necessary for the making of such a work of art and its appreciation, but it offers an experience that goes beyond the purely logical or cerebral faculty.

The ideal of personal transcendence was embodied in the Yogi, who would leave his family and abandon all social ties and responsibilities to seek enlightenment, putting himself in another realm of being like Buddha. Like the sages of the Upanishads, the Buddha insisted that “Nirvana” could not be defined or discussed as though it were any other human reality. *Nirvana literally means “cooling off” or “going out.” Nirvana calls for an end to all the sufferings, freedom from afflictions.* Attaining nirvana is not like “going to heaven” as Christians often understand it. The disciples of Buddha would know that nirvana existed simply because their practice of the good life would enable them to glimpse it. His monks should not speculate about the nature of nirvana. All that the Buddha could do was provide them with a raft to take them across to “the farther shore.” When asked if a Buddha who had attained nirvana lived after death, he dismissed the question as “improper.” It was like asking what direction a flame went when it “went out.” It was equally wrong to say that a Buddha existed in nirvana as that he did not exist: the word “exist” bore no relation to any state that we can understand. The Buddha was trying to show that language was not equipped to deal with a reality that lay beyond concepts and reason.

God against Gods (Monotheism against Pantheism)

Pantheism is a philosophy that allows us to relate emotionally, intellectually and physically to nature, to understand our place within the universe and to satisfy our spiritual needs without abandoning reason or common sense. Pantheism regards the universe as a whole as worthy of the deepest reverence, perceives nature as divine and promotes a path that honors, reveres and, of necessity, cares for the natural world which is itself a unity of inextricably linked living beings, a complex and quite wonderful web of life. *Pantheism requires no scripture, no dogma, no clergy, and no central authority. Pantheistic ethics emphasizes basic human rights coupled with environmental awareness.* Pantheism believes that nature created us and natural universe is by definition omnipresent, universe is virtually infinite and practically eternal.

Nature is omniscient, the consciousness is found not just in humans but throughout nature, all the way down through animals, plants and minerals to the atomic level and beyond. There is no wholly transcendent, personal,

supernatural, thinking, creator entity which monitors, judges, punishes or rewards humans. Life has its own meaning. The purpose of life is to perpetuate itself, to evolve and to progress. *The animist view is acknowledged in that every living being has its own presence or spirit that is worthy of profound respect.* It follows that all species have a right to survive, that biodiversity must be promoted, that all natural habitats must be preserved and that all damage to the environment must be minimized. Nature herself is sacred. Humans are participants in the natural community. As such, we must work with nature, not against her. We must live sustainably from her resources, not exhaust them. We must value nature, not dominate or exploit her. In short Pantheism holds that everything is god.

There do not seem to have been monotheists anywhere that we can find as few as 5,000 years ago. Today western culture and much of the world's population claim to be adherents of one sort of monotheism or another. How did monotheism arise in the background as a fundamental inheritance of the Christian tradition? Philosophers and scholars of religion have theorized for centuries about the origins of the worship of one God alone in the worldwide polytheism of human culture. It is surprisingly complex phenomenon with a wonderfully rich history of development. Historians have observed in the cultures of the ancient Near East the appearance of several types of monotheism long before the founding of the kingdom of Israel. *Monotheism appeared in many forms, often in highly charged situations of religious reform and conflict.* It was used as a major tool for the building and consolidation of empires and, in contrast, as a solace for the loss of political independence.

In Israel, there were a number of important critical steps taken toward the eventual development of the particular Jewish form of monotheism: the exclusive worship of the national God, Yahweh. The greater issue that the historical process and eventually to face was that of the divine nature itself: How was God to be conceived at all? What was God made of? Answers to these and other similar questions raised further questions: How big and where was God? What were God's characteristics? The old answers, that God had a body, sat on a throne on top of the sky, and spent sleepless nights jealous of other gods and angry with humans, became inadequate as time went on. Culture was growing: humans were learning more and more about the world in which they lived. *Science changed and grew in conception, and slowly religion responded and changed. The two together, culture and science produced a new understanding of the very nature of divinity that became the foundation of Christian theology.*

For all cultures in the ancient Near East, the process of creation began with "chaos," the Greek word used to signify the undifferentiated material out of which the universe was made. Chaos was imagined as water in darkness, much like a stormy sea at night that filled everything. There was

no concept of “*creation ex nihilo*,” (*creation out of nothing*), it simply did not yet exist. That idea was a much later invention, not gaining full expression until the Christian period. It was a concept that developed after and because of monotheism, in controversies about what was eternal: Was God alone at the beginning, or was the “stuff” out of which the world was made there also? Was there one eternal principle or two, God and chaos? We are told that before there was heaven and earth, there was only water. Freshwater and saltwater mingled together and began to engender all the other gods. So the world arises out of preexisting material that has the power to generate the first gods. The Gods who were created were not themselves preexistent and eternal, as they would later come to be understood. They also arose out of the process that began with chaos.

In the Mesopotamian epic “Enuma Elish,” for example, the original gods of the waters of chaos first bore and then came into conflict with their younger offspring. The younger gods, headed by Marduk, entered into combat with the primeval saltwater, named Tiamet. After a pitched battle, *Marduk slew Tiamat* and from her watery corpse created the universe. Both gods and humans are seen as material beings. Gods and humans arise out of the same substance, out of the same primal matter though at different in density. The concept of “immaterial” is not invented until Plato in the fourth century BC: there was not even a word for it earlier. *In Homer, being “invisible” was not to be without visible form but to be cloaked in mist and therefore unseen and unrecognized.* All the gods have bodies; recall in the Bible God walked in the Garden of Eden (Gen 3:8) and showed his hand and back to Moses on the mountain (Ex 33:23).

Most gods are in the form of humans; others, especially those of the underworld or sea, are often monstrous beings; still others are of mixed nature, partly human and partly animal or something else out of evil imagination. It would be more proper to say that humans have the form of gods, and not that the gods are in human form, since traditionally humans are made in the image of the gods. Humans are creatures, made by the gods out of the heavy elements, earth and water. The gods are of heavenly elements, yet are nevertheless substantial and material beings. The physical universe as the ancients perceived it was small, much like a sphere half filled with water, upon which floated the flat disk of the earth. There was water everywhere else, above the heavens, around the earth, and below, flowing around the underworld.

According to an old myth, the Mesopotamians imagined the earth as a disk surrounded by a rim of mountains and floating on an ocean of freshwater. Resting on these mountains and separated from the earth by the atmosphere was the sky vault, along which revolved the astral bodies. A similar hemisphere under the earth formed the netherworld, where lived the spirits of the dead. *This is known as the three-story universe: heaven above, the earth in*

the middle, and the underworld below. The whole universe was immersed like a gigantic bubble in a boundless, uncreated, primeval ocean of saltwater. The earth itself consisted of nothing more than Egypt or Greece or Mesopotamia and its neighboring lands; in the center stood the city of Babylon for the Babylonians, Nippur for the Sumerians and Delphi for the Greeks, and Jerusalem for Israel. Heaven was thought to be a dome made of a hard substance not far from the earth, above which dwelt the gods in their homes. Those homes were sometimes conceived as being on a high cosmic mountain, such as Mount North in Canaan or Mount Olympus in Greece.

The gods “looked down” from heaven on human affairs and were close enough to hear human outcry. In Babylon, human commotion kept *Enlil awake at night*. In Israel, god “sits above the circle of the earth and its inhabitants are like grasshoppers” (Is 40:22). Heaven could be reached by those on the earth: two sons of the *Greek sea god Poseidon* threatened to pile three mountains on each other and climb to the sky; for that they spent the rest of time in Hades (Homer’s *Odyssey* 11. 315-316). With a similar goal, the tower of Babel was to have its top in heaven (Gen 11:4). A later text tells us that men built the tower of Babel and, “taking an auger, they attempted to pierce the heaven, saying, “Let us see whether the heaven is made of clay or copper or iron.” (3 Baruch 3:7). Below the earth was the underworld, conceived of as a kind of kingdom under the ground, roofed over by the disk of the earth. *These three domains, the sky, the sea, and the Underworld, were spheres of divine power divided among the gods.* In Greece, the three spheres were chosen by lot. Poseidon tells of the events in Homer’s *Iliad*: “We are three brothers born by *Rheia to Kronos, Zeus, and I, and the third is Hades, lord of the dead men.* All was divided among us three ways, each given his domain. When the lots were shaken drew the grey sea to live in forever; Hades drew the lot of the mists and the darkness, and Zeus was allotted the wide sky, in the cloud and the bright air. But earth and wide Olympus are common to all three (15.187-193).”

The book of Isaiah looks forward to a time when “the Lord... will punish *Leviathan*, the fleeing serpent, *Leviathan* the twisting serpent, and he will kill the dragon that is in the sea” (Is 27:1). There was, in addition, under the earth the kingdom of a great dragon with the deadly tail of a scorpion, *Mot*, whose very name meant “death.” His main function was to swallow forever all who crossed over from life. Again, the book of Isaiah foresees a time when the Lord will turn the tables and “*swallow up Death forever*” (Is 25:7). For the apostle Paul, this dragon “Death” was the last enemy to be defeated at the end of time: “The last enemy that will be abolished in Death” (1 Co 15:54). And then he asks, “*O Death, where is your sting?*” (1 Cori 15:55), showing that the terrifying tail has been vanquished. Divine society was seen by the ancients as a mirror of human society, and the whole of heaven was populated by powerful humanlike divine beings who had both

human appearance and human weaknesses: although highly intelligent, the gods could run out of ideas; generally righteous, they could act capriciously and even wickedly. They were subject to passion, hatred, love. They ate and drank and got drunk; they sometime quarreled among themselves. They could even die, that is, go and live in the underworld. They engaged in sexual activity, bearing offspring who were lesser deities. In Canaan, El and his wife, Asherah, bore seventy children. Gods even occasionally mated with humans and produced heroic individuals far superior to normal humans.

The religious world was understood by the ancient Near East to be organized as a great hierarchy, from the oldest high gods of nature to the lowliest tree sprites, known as the Great Chain of Being. *The greater gods ruled the cosmos by means of lesser gods and spirits.* The world was full of spiritual life; everything in the cosmos had an associated deity, no matter how small. All major natural phenomena, such as stars, sun, and moon, were understood as divinities. Winds of every direction and intensely were spiritual beings. These divinities were organized into different rankings and different functions. Some controlled the many aspects of nature, winds and rain, lightning and storm, crops and hunting, the sea and its bounty. Others were concerned with human political events, deities of war and peace, kingship, government, cities, and especially law. Others oversaw more personal aspects of human life, such as fertility, birth, coming of age, marriage, health or disease, wealth or poverty, and finally death.

Every human act had its patron deity, and every failure or success, disease or recovery, had its cause in a spiritual being. In the early period there was no devil or demons which tempted one to sin and go to hell; there were only spirits who oversaw things inimical to humans, as there were those who oversaw things healthful. There were no morally evil gods. The spirit of the desert storm or of the plague had its place and function in the larger scheme, as did that of the spring rains and puberty. Destructive spirits, spirits of calamity, served the will of the greater gods in bringing just punishments to those who deserved them, and when the time came, death to all. *It was not until Zoroastrianism began its influence that the idea of a battle between good and evil divine forces arose.* In the Christian period, the Romans still had no morally evil deities.

The word “pantheon” denotes all of the gods worshiped by a particular group of people. Thus Jupiter, Juno, Minerva, Vulcan, and rest of the Roman gods, taken together, made up of pantheon of Roman gods. The word comes from two Greek words, “pan” meaning “all,” and “theos,” meaning “god.” Each of the larger ethnic groups of the ancient Near East shared a pantheon common to themselves but distinct from those of neighboring groups. *For example, the Canaanites, including Israel, had a pantheon that was headed by El and his wife Asherah, whose seventy children ruled the seventy nations of the Earth. In Greece the pantheon was traditionally*

that of the twelve Olympian gods, headed by Zeus and his wife, Hera.

Even though all of the major cultural groups had a pantheon headed by some particular high gods, *none was originally monotheistic*. Each city and people had its own protecting deity who was part of a larger pantheon of gods. This is called “henotheism,” or sometimes “*monolatry*,” the worship of one particular god by one people with the full recognition of the existence of other gods of other peoples. *Henotheism was the standard mode of religion in the ancient Near East*. In Israel, the commandment, “You shall have no other gods before me... for I the Lord your God am a jealous God” (Ex 20:2-5), presupposed the valid, though despised, existence of other gods. The point at issue in the passage is whether the Israelites would choose to worship Yahweh alone or one or more of the many other gods available to them in their culture. This was not monotheism as it came to be understood many centuries later, *but henotheism, the worship of one particular god chosen out of many*. At that early stage in Israel’s history, the people were not yet monotheists.

From the families of these high gods came the so-called national or city gods. If a particular deity ruled a relatively large territory, lesser gods related to his family ruled the smaller political units that made up the larger territory. So, for example, while nearly all the Greeks worshiped *the twelve Olympian gods headed by Zeus and his wife, Hera*, cities often held one or another of the Olympian or their children in special regard. Athens was named after its city goddess, Athena; Delphi was especially devoted to the worship of *Apollo*. Similarly in Egypt, each city had its own special deity even though for much of its recorded history the whole country was united under the religion of the king, the religion of the *Sun God Re*. In India deity is identical with the city names like Kanchi Kamakshi, Madurai Meenakshi and Kasi Visalachi (places and deities in India).

Originally, before the rise of monotheism and the universality of the god of the ruling class, gods belonged to a specific people and land. The gods dwelt in and protected a specific place; in turn, their people honored them with worship and sacrifices and when individuals moved, they worshiped the gods of the new land. *On the contrary, the psalmist complains, for example, that he cannot worship Yahweh in Babylon (Ps 137); he has been exiled and no longer in the land of the Lord. “By the rivers of Babylon we sat and wept when we remembered Zion. There on the poplars we hung our harps, for there our captors asked us for songs, our tormentors demanded songs of joy; they said, “Sing us one of the songs of Zion!” How can we sing the songs of the Lord while in a foreign land?”*

In times of war, greater gods conquered lesser ones, or so it was claimed in the language of praise for the victor and shame for the subjected people.

This arose from the fundamental tenet that the god of a people was the real ruler, and that events in the political sphere were religious events. The gods of the empires were the greatest because they conquered those of the smaller states that they absorbed. So the gods of Rome were the greatest, and the universal gods, for they ruled the world. The losing theologians, therefore, said that their own god had decided to allow their land to be conquered because of fate or the sinfulness of its inhabitants. These claims were made after the Trojan War in the epic of Homer's Iliad.

Types of Monotheism-Inclusive and Exclusive

Monotheism arose in more than one form in the cultures of antiquity, but the oldest conceptions never did die out; they continued to survive alongside or even inside the various monotheisms. *The most common form of non-monotheistic religion was monarchical polytheism.* In this conception, the pantheon of gods of greater or lesser function was overseen by a single high god to whom all other gods owed submission. Since nearly all views of the cosmos (outside of Egypt) were divided into arenas of power (upper world, waters, and underworld) this tended to produce more than one powerful high god with attendant servant deities. The high god of the upper world (the sky God), however, was always the most powerful and was the deity who ruled the human sphere. In more than one culture, these gods came into conflict in a great battle known as the "combat myth," and the upper-world god gained victory. The point of bringing up this clearly non-monotheistic world view is that in the final expression of the great monotheisms, Judaism, Christianity, and Islam, the one God is served by innumerable lesser divine beings who do his bidding (the angels) and is opposed by an enemy god with attendant beings (the Devil and the demons) who will one day be defeated.

Monotheism arose out of politics, either for the building and maintaining of empire or as an explanation for its loss. The most common form is what may be termed "*inclusive monotheism.*" Greek writers of the fifth century BC articulated a theory known as the "*Interpretatio Graeca.*" That theory stipulated that the god of a particular function in one place was the same deity as a similar god of a different locale with a different name; our Zeus is really your Jupiter or Amon by another name. So, one god may replace another with similar attributes without difficulty. Such gods may be formally identified with another and their names compounded, such as Zeus-Amon, a compounding of the high gods of Greece and Egypt. *Inclusive monotheism went one major step further; it sought not only to identify gods, but to absorb them.*

The basic theory was that the highest god of the conquering or ruling people was in one way or another expressed in the other gods or was in some way present in all the local deities of the cities or groups under political control. Each of the lesser deities was not only a servant of the high god, but

was an actual manifestation of some aspect of the god of the rulers. The fundamental motivation for making such a claim was for the king to be able to use religion to expand and solidify control over a wider territory. Thus the god of the new empire would absorb the qualities of the other gods, and the other gods would become expressions of qualities of the conquering high god. That lesser gods could express qualities of their parents, the higher gods, was an old idea that found expression in more than one way. In Greece, for example, Apollo, son of Zeus, held the power of healing and disease; but in time, the power to heal devolved, especially to his son *Asklepios*. In Persia, God emanated archangels who carried even in their names qualities of God. *So in Zoroastrianism one finds archangels with names such as "Immortality," "Love," and "Perfection."* This way of naming archangels and angels found its way into Judaism, Christianity, and Islam. The archangels Gabriel, Uriel, and Raphael, for example, carry in their names the qualities of the strength of God, the light of God, and the healing power of God.

The other main type of monotheism, "*exclusive monotheism*," denies the existence or validity of other deities and appears in several varieties. In the first, the exclusive monotheism of worship, the high god is extolled in language that claims a "one and only" status. In the words of Morton Smith, exclusive monotheism "is often an expression of local patriotism, which achieved it by a chain of exaggeration something like this: *Our god is the greatest of all gods, there is none like him and there is none other.*" A second form appeared in Persia at the end of the second millennium BC. The exclusive monotheism of *Persian Zoroastrianism demonized all other gods* and all other religions. There was for them only one true god; all other gods were demonic powers with no rightful claim to divinity. In Egypt, at roughly the same time, a third type of exclusive monotheism appeared during the *reign of Akhenaton* in the fourteenth century BC. During most of its history, inclusive monotheism had been the normal mode of religion in Egypt. Under Pharaoh Akhenaton, however, the very existence of other gods was denied. Their names were even chiseled off monuments, and they were never mentioned in the literature of this rule.

Perhaps one of the most famous examples of this latter type of exclusive monotheism is to be found in the writings of the prophet known as Second Isaiah. In those writings, the Lord of Israel declares in Isaiah 45:5 "I am the Lord and there is no other; beside me there is no god." For some modern scholars, this last form is the significant one, and it is Second Isaiah who takes the final step of the "*breakthrough into true monotheism.*" But as we shall see, the development of monotheism did not stop with the formulation of Second Isaiah. *The four great religions commonly described as exclusively monotheistic, Zoroastrianism, Yahwehism, Christianity, and Islam, are all genetically dependent: Persia dominated the ancient Near East in the sixth century BC and brought*

Zoroastrianism to conquered Israel; and out of Israel and the Greco-Roman world arose Christianity and then, after nearly six hundred years, Islam. Monotheism, however, underwent its most important advances long after its appearance in Israel because of contributions by Greek science. Centuries later, Christians of many stripes discussed and argued until the great councils of the church arrived at the particular expression of monotheism that is Christian Trinitarianism. Judaism and Islam, of course, along with many Christian groups rejected Trinitarianism as polytheism.

And... Man Created Gods in his Own Image!

The single most important step taken in the journey toward the Christian understanding of God *did not come from religion at all, but from science*. The view of the cosmos in the great civilizations and the Old Testament was that of the three-story universe. Greek mathematicians and astronomers made a number of important advances beginning in the sixth century BC and later. Their discovery of the five planets (only five are visible to the naked eye) presented a major difficulty for astronomers. How did they move? New models for explaining not only the movements of the planets but also the very design of the universe were required; the three-story universe had to be discarded. *What was required was a new view of the cosmos itself*. One of the most important discoveries, credited to Pythagoras was that the earth was not a disk, but a sphere. Eratosthenes, in the third century BC, calculated its circumference at approximately forty thousand kilometers, wonderfully close to its actual size. Scientific observation and mathematical calculation replaced the small disk-shaped earth of old tradition, the “circle” floating on water of the Bible, with as much, much larger spherical earth, very much as we understand the earth today. So there developed an entirely new understanding of the cosmos, never before conceived.

The effects on religious conception of this scientific advance over the previous three-story universe were fundamental. One of the most important was the new view of the physical size of the universe. The distance to the dome of the sky, once thought to be just a few thousand feet, was increased enormously. The firmament of the “fixed stars” was no longer within the reach of a mud-brick tower, but had been removed by verifiable mathematics to an almost infinite distance. This new view of the cosmos removed God far away, beyond any previous position or conception.

God could no longer be a humanlike being who could eat with Abraham and show his back to Moses. God had to be something else, entirely different, “qualitatively” different, from previous conceptions; God could no longer have a body. From time immemorial, the high gods had been likened to light or understood as beings of light. The encounter with the gods “enlightened” the understanding. In Egypt for much of its history God was the sun itself. The God of Israel was likewise often likened

to the sun; accordingly, the prophet Isaiah declared; “Arise, shine; for your light has come, and the glory of the Lord has risen upon you” (Is 60:1). The implications of the new science for understanding the nature of God were almost inevitable. Further thinking about the nature of the elements that made up the cosmos produced even more profound changes. Empedocles (ca. 492-432 BCE) theorized, as had others before him in Greece and elsewhere, that there were *four basic “elements” that made up the material world: earth, water, air, and fire*. He went on to apply this theory to the geocentric universe.

Why was the earth in the center? It was because it was made of heavy elements, earth and water. It was surrounded by air, the next lightest element. Above the lower air was a traditional fifth element, found in Homer and established in scientific thought by Aristotle as occupying the cosmos above the moon: *Ether. For Homer, the allotment of Zeus was “in the clouds and the ether” (Iliad 15.192), which was the bright, clear air above the lower atmosphere*. Aristotle, building on his philosophical predecessors, theorized that ether extended from the moon to the outer boundary and was the substance from which the stars and planets were made. If God was outside the boundary of the spheres, God must be enormous, Aristotle and his contemporaries concluded, and must be made out of light, or fire, or spirit, or ether. It is hard even now to answer the question as to the “stuff” God is made of. In any case, God could no longer have a body. *The Aristotelian system of five “elements” held sway among scientists for nearly two millennia. It was not until Einstein in the early twentieth century that the concept of ether as a substance in space was finally overturned*. The new cosmology required God to be spiritual, made as we saw of light or fire or ether, “spirit,” in the words of the Gospel of John.

God was enormous, beyond human comprehension, hidden and infinite behind the veil of the vastly distant space. Meditation on the problem of the original cause of all things had long since brought religious thinkers to claim that at the beginning stood the one God as source. *But here a wholly new basis for the one God, for monotheism, was found: in the new understanding of the structure of the universe, there was no place to put another infinite being. This God came to be termed the Monad, the “One” (from the Greek word meaning “one alone”), who was the source of all else*. Plato and his followers had postulated that all things were made from patterns, ideas in the mind of God that existed in an eternal and immaterial divine dimension; the pattern of everything was “*the Good*,” Plato’s term for God. Aristotle considered the problem of movement and concluded that at the beginning of all things there must have been an “*Unmoved Mover*.” The relevance of this to our discussion here is that the question of a single and eternal being at the source of all else had become a major philosophical issue.

The conception of Plato that God was “the Good” pointed to something fundamental about the nature of God that would become almost explosive in the controversies over the Old Testament view of God among the traditional and Hellenized Jews, and among Christians of many denominations. Ethics had always been a prime concern among religious authorities from time immemorial; in fact, *one of the prime functions of religion in society is and has always been to define and enforce ethical norms*. Originally the gods had laws, based in nature and written on heavenly tablets, that humans had to obey. Both gods and humans, however, violated their commandments often for the reason that they had passions and appetites that the threats of laws could not overcome. As the complex of ideas that made up the geocentric universe became more and more influential, ethics came to be seen in a wholly different light. Human beings were seen to be made up of *two essentially different parts, body and soul*. Passions and appetites, quite obviously, belonged to bodies. The Monad, however, the one God of all at the source of all, was wholly spiritual. The Monad did not even have a spiritual body, that is, a localized and measurable body made of some spiritual substance, like the bodies angels were later thought to have. No anthropomorphic terms were applicable. No expressions such as “the hand of the Lord was stretched out” or “may his face shine upon you” were permitted. In fact, the entire vocabulary developed over millennia for describing the gods and their actions had to be discarded.

God cannot have a face from which Cain can flee anytime he wishes, God cannot have a body. Epicurus (341-270 BC), Greek philosopher and the founder of Epicureanism had claimed that the gods had bodies and lived wholly apart from our world in bliss. The Egyptian gods likewise all had bodies; the “atheism of the Egyptians” in the eyes of the rest of the world lay in the fact that the Egyptians conceived of gods as animals. Philo shows that not only these “pagans” held “impious doctrines” about the divine nature; so did a literal reading of the Bible. The God of the Bible also had a body with its passions; it too had to be reinterpreted. Even describing the Monad took considerable skill and sophistication.

In place of the old anthropomorphic terminology, *philosophers developed what was much later called as “negative theology.”* This meant explaining God by saying what God was not (from the Greek word apophasis: negation, saying no), because God was so big as to be beyond human comprehension. According to this mode of description, God is infinite, immaterial, unknowable, invisible, immeasurable, and the like. *Note that the words are all prefixed by a negative particle; that is apophatic theology.* A wonderful example follows: “He who is ineffable. No principle knew him, no authority, no subjection and no creature from the foundation of the world, except him alone.” For he is immortal and eternal, having no birth, for everyone who has birth will perish. He is not-begotten, having no beginning; for everyone

who has a beginning has an end. No one rules over him. He has no name; for whoever has a name is the creature of another he is unnamable. He has no human form... He is infinite; he is incomprehensible. He is ever imperishable and has no likeness (to anything). He is unchanging good. He is faultless. He is everlasting. He is blessed. He is unknowable.

But in the Monad is so far beyond the insignificant human sphere, so self-sufficient, where did the world come from? Why should the Monad do anything at all, let alone create this world in which we live? A second text, from a Jewish Gnostic group that had its roots in the second century BC, addresses this very problem. God is again first described in apophatic language, and then the influence of Plato's "good" God is seen in an inspired statement of positives: "He is pure, immeasurable Mind. He is life-giving life. He is a blessedness-giving blessed one. He is knowledge-giving knowledge. He is goodness-giving goodness. He is mercy and redemption-giving mercy. He is grace-giving grace... (Apocryphon of John 4:2-9)." He is the motivation for the One to become many: it is its very nature to overflow in joy.

The Monad, who exists in depth and peace and silent rest, bubbles over in its abundance? From a "scientific" viewpoint, the heavy elements out of which the cosmos was made were different in quality from the Monad. Earlier conceptions had essentially ignored the problem. The old creator gods with bodies were made out of the same "stuff" as the cosmos itself. They formed the material world out of preexisting chaos directly with their hands, or they birthed it or spoke it from into existence. In the new conception of the geocentric universe, the fact that the cosmos was material and dark was taken quite seriously; both qualities were the direct opposite of the Monad. The dark material world did not and could not have contact with this wholly spiritual, immaterial God of light. So someone other than the Monad must have been the cause, either in accordance with or against God's will.

In either case, however, whether the material world began in goodness or not, it is still a problem; it is in fact a dark cosmos, while the Monad is a God of light. Some account, therefore, of how it become dark must be told. *In Persian Zoroastrianism, inherited by Christianity, the world was created good and was then defiled by the Devil; its destiny was that it would be destroyed and replaced with a new world.* In Plato's system, especially as articulated by his later followers, the material cosmos was created by an intermediary good God, whom Plato termed the Demiurge (from the Greek word, "*demiourgos*" means skilled workman, craftsman). This Craftsman created the good cosmos out of preexisting chaotic water according to the patterns designed by the highest God. People, however, were created by less skilled lower divinities, with material bodies that attracted the soul. Humans, in their heavy bodies, were "*weighed down*" with sins. Thus the problem was materiality itself; the spiritual soul belonged to the upper world and needed to escape.

A third view was that of an influential form of Gnosticism, which held that the lesser divinities; it was not “good” at all. *These three views, that of Zoroastrianism, Plato, and Gnosticism were combined to form the worldview of Christianity.* The Old Testament was written during times when essentially all gods lived in the small three-story universe. The controversies among Jews of the pre-Christian era and Greek philosophy left their mark on Christian views of God. The fact that God is immaterial and spiritual is such a normal modern view that we hardly realize that the issue was still being argued during the era of the writing of the New Testament. Just such a situation arises in the conversation between Jesus and the Samaritan woman at the well. She brings up the controversy about which temple, *Mount Gerizim of Samaria* or Jerusalem of Judea, God should be worshiped in? Jesus retorts that neither temple is adequate, for “God is spirit and those who worship him must worship him in spirit” (John 4:24). Other texts illustrate the vacillation between spirit and light used to describe God’s essence. We read that “God is light” (1 John 1:5) and that Jesus is the “radiance of his glory” (Heb 1:3). God as a spiritual being is the basis for the Christian rejection of animal sacrifice of any kind, whether in Jerusalem, Samaria, or any other cult center.

The idea that the Christian God is the Monad and the original eternal and self-existent “One Who Is” is found in more than one important passage. First Timothy 1:17 declares God to be *the “only God,” using Greek term “monos,” which lies at the root of the term Monad.* First Timothy 6:16 adds: “It is he alone who has immortality.” In the words of the Gospel of John, “the Father has life in himself” (John 5:26). He is therefore called the “living Father” (John 6:57). Here God is the only one with life as a personal characteristic, the self-existent source of all other life. That the Christian God as Monad is invisible, hidden, and unknowable is not often heard in churches, but it was required by the logic of Greek science and philosophy and is therefore often found in the New Testament. First Timothy 1:17 again declares God to be “invisible.” First Timothy 6:16 continues that God “dwells in unapproachable light, whom no one has ever seen or can see.” So also the prologue of the Gospel of John concludes with the statement that “no one has seen God at any time” (John 1:18).

The only way that such a hidden and unknowable God can be perceived at all by human is through the process of the one becoming many. For early Christians this was the function of the Logos who became incarnate as the Son of God, Jesus, the mediator of the One to creation. So John 1:18 continues, “... the only begotten God (Jesus), who is in the bosom of the Father, has explained him.” *Jesus the Son is the explanation of the unknown Father.* That is why later in the Gospel of John, when Philip asks Jesus to show him the Father, Jesus replies, “He who has seen me has seen the Father” (John 14:9). Recall that the Father has no body and is therefore invisible; no one has seen him. Again in Mathew 11:27 Jesus declares, “All things have been

handed over to me by my Father; and no one knows the Father except the Son and anyone to whom the Son chooses to reveal him.”

A New Mathematics-One God to Three Persons

Christianity was born in controversy. It arose as a monotheistic faith through the beliefs of Persia, Egypt, Greek and later Israel. But it was complicated by early Christian reverence for Jesus himself, and later for the Holy Spirit, as divine persons in their own right. During the second and third centuries, a number of powerful Gnostic Christian groups taught that there were *far more than three forms of divinity*. In contrast, at the beginning of the fourth century, Arius, the presbyter of Alexandria, taught a widely popular doctrine that there was one God alone; the Father and all else, including Jesus and the Holy Spirit, were creations. In the crucible of such debates arose the theology of Trinitarianism. When viewed against the background of the wider ancient world, the Christian concept of God is far more sophisticated than the mere problem of number of gods would indicate. The issue of whether God was a simple one or a Trinitarian unity, while important, was in no way comparable to the problem of the very conception of what constituted divinity. And that question depended, as we have seen, on science and a new and more accurate understanding of the universe itself.

Scientific understanding of the cosmos grew and progressed, in the modern sense; forcing religions to change and grow in response. Understanding of the divine nature had to change because the worldview on which the old gods with bodies depended was overturned. The old three story universe was shown to be false. God was now something qualitatively different; God was infinite; God was immaterial; God was ultimately beyond human comprehension. We must view the development of the Christian conception of God, Trinitarianism, as the culmination of a long process that included not only the mere concept of number, but also the very being of God.

Triadic arrangements of gods were surprisingly common in the ancient Near East. Statues from Jericho, for example, show divine triads of Father, Mother, and Son from the sixth millennium BC. Similar triads were common in India (Brahma, Shiva and Vishnu), and in South Arabia. As historian W.F. Albright notes, “Early Hebrew popular religion was presumably similar, with a Father (El), a mother (Elah), and the son who appears as the storm God.” These triads were far from Trinitarianism, but the effect of such Semitic families of gods ran right into the second and third Christian centuries, as Semitic speaking Christian groups *understood the divine family as God the Father, Spirit the mother, and Jesus the son*. Because the word spirit in Hebrew and Aramaic is grammatically feminine, the Spirit as mother conception came naturally. Christian Trinitarianism arose out of the heated controversies over the nature of God among various Christian groups. The

old concept of a divinity who sat on a throne surrounded by angelic beings, and the cosmology on which that concept is based; the three story universe survived among some Christians into the New Testament period and literature.

One finds in the book of revelation, for example, a vision of the throne-room of heaven: “Behold, a throne was standing in heaven, and one sitting on the throne. And he who was sitting on the throne was like a jasper stone” (Rev 4:2-3). This vision draws heavily on the similar vision in Ezekiel (1:26-27), where the heavenly throne and the humanlike being sitting on it are also described using the language of precious stones. In Ezekiel 10:20, this figure is named “the God of Israel.” Gospel of John states, “All things came into being through him, and without him not one thing came into being” (John 1:3). Paul writes: “There is one God, the Father, from who are all things and one Lord, Jesus, through him are all things” (1 Corinth 8:6). *These texts illustrate the early Christian understanding of God as Monad.* The point of these observations is that the move from understanding God as a small material being with a body in a three-story universe to understanding God as the infinite, immaterial Monad in the geocentric cosmos was still going on as Christianity was being defined.

We have traced the development of different types of monotheism from the third millennium BC to the time of Jesus. *Jesus himself was a monotheist.* But Christians were called Christians because they followed Christ, not merely the monotheistic God alone; the point is inherent in the very name. Where is the Holy Spirit in this context? Jesus was anointed with the Holy Spirit. Early Christian experience was filled with encounters of the divine, with Jesus himself and the Spirit. Yet many New Testament passages left the Holy Spirit out of the discussion. The reason for this lack is the fact that Christians had not yet developed their central doctrine of God, the trinity itself. *It is fair to say that no one in the first century was a Trinitarian as the doctrine was later defined in the creeds of the fourth century.* Trinitarianism was stimulated by the worship of the one God, the worship of Jesus the son of God, and the sense of the presence of God in the experience of the Spirit; in addition, Christians were baptized and blessed in the threefold name of God.

Trinitarianism arose as a brilliant solution to a long series of questions that began to be asked in order to define the relationship of Jesus to the Father, and then the role of the Holy Spirit. Only a few of the questions and none of the eventual answers had yet been formulated in the first century. First Corinthians 8:6 has been termed a “*binitarian*” formulation, and it clearly embarrassed scribes who copied the text in later times. In the time of the New Testament, however, not only had the relationship between the Father and Son not been clarified, but the very nature of the Holy Spirit had not been defined or even understood. There had not been a clear concept of the Holy Spirit before the Christian era; no such doctrine

seemed necessary.

In Hebrew, the word *Spirit (ruah)* is grammatically feminine, and so the male God Yahweh sent his female Ruah as agent. Far back in time, the male high god nearly always had a female wife or consort. In Israel this consort had become God's agent in creation. By a process we cannot trace in specifics, but one that clearly continued, Jewish Christians of the early Christian period understood this Lady Spirit to be the mother of Jesus. Thus in the east among Jewish Christians, there was an early Trinity of the Father, Mother (Spirit), and Son. Origen (ca. 185-ca. 254), one of the church's most brilliant exegetes, quotes from the non-canonical "Gospel According to the Hebrews," where the savior himself says, "My mother, the Holy Spirit, took me by one of my hairs and bore me away to a great mountain, Tabor." Another text of the same era, the "Gospel of Philip," uses the "fact" of the female gender of the Holy Spirit to attack the doctrine of the virgin birth," some said, 'Mary conceived by the Holy Spirit.' They are in error... when did a woman ever conceive by a woman?" such a Trinity of Father, mother, and Son found among Jewish Christians in Syria can easily be understood as a development of this very old Semitic tradition.

The story of the development of the doctrine of the Trinity is the story of monotheism confronted by Jesus and the Holy Spirit. For Christians, the obvious divine presence in Jesus and the Holy Spirit required a new understanding, required that a place be found for them in the one God; but where, and how? The constant propaganda of religious and political authorities for most of the three millennia of empire-builders has been that of inclusive monotheism; the one high God came in many forms, under many divine names and held sway over all lands. In addition, stories had been told throughout the ancient world, including Israel, of the appearances of God or individual gods on earth in human form. *In the most influential tales of the Greek world, Homer's Iliad and Odyssey, gods time and again took on human form and dimension and appeared on earth to influence human events, often changing their appearance to look like someone else.* Athena, for example, changed herself into the form of Hector's brother Deiphobos in order to deceive him into fighting Achilles (Iliad 22.227). Three men appeared to Abraham in order to secure the destruction of Sodom and Gomorrah, one of whom was said to be Yahweh (Gen 18). In the town of Lystra, Paul and Barnabas were taken for Hermes and Zeus because they healed a lame man; the townspeople declared, "the gods have become like men and have come down to us" (Acts 14:11).

Tertullian, writing about the year 200 in his work "Against Praxias," left us an important record of the viewpoint of the majority of Christians during his time. In his own presentation of the doctrine of the Trinity, he used the Greek term "*oikonomia*" (economy, dispensation) to describe

how the one God was “dispensed” or distributed in three persons. The majority view, if Tertullian’s estimation is correct, was that God (the Father) transformed himself into Jesus (the Son) and walked the earth as a man, just as in the traditional stories of the gods. From the accusation against Tertullian and his cohorts that they were preaching “two gods and three gods,” we see that again the Holy Spirit was at least at times left out of consideration. According to the more sophisticated of the modalists, the Father became Jesus at the incarnation, and Jesus at the ascension became the Holy Spirit. So for those who held this popular view, the entire time, there was only one God in three transformations. The language “one God in three persons” would even work. The Latin word “persona” originally referred to the mask that an actor wore to mark the character itself. So, *one God played three roles, not simultaneously, but successively*. The modalistic view of the Trinity was not only a natural deduction given the cultural traditions of the Greco-Roman world, it was also, apparently, the view prevalent in the Church of Rome in the decades surrounding the year 200.

The greatest challenge that the developing Trinitarian doctrine faced was that of a school of Christian scholars founded by Lucian of Antioch. Lucian founded a theological school that numbered among its students some of the most important opponents of Trinitarianism in church history, two of whom were Arius (ca 260-336) and Eusebius of Nicomedia (died ca. 342). The most significant figure in the controversy was Arius, from *whom the movement Arianism gets its name*, given the fact that his opponents never impugned his morals. Arius, like Lucian before him, must have led an exemplary ethical life. He was ordained a priest in Alexandria and was appointed preacher in the church of Baucalis, one of the principle churches of the city, where he achieved marked success as a popular teacher. Arius and his fellow teachers were reacting to the growing Trinitarian movement that had begun at the end of the second century. They understood Trinitarianism to be a compromise of monotheism, if not outright polytheism. The doctrine that he and others of the Arian party advocated were derived from traditions found in Greek philosophy and Judaism that had been developed in both Alexandria and Palestine. For Arius, God was the eternal and unknowable Monad of Greek philosophy; he alone was ingenerate, alone eternal, alone without beginning; he was the source and origin of everything. From the exclusive camp they took the further step applying Isaiah 45:5 (I am the Lord and beside me there is no other), to the Monad, thereby eliminating emanation as a possible divine activity. *For the Arians, the essence of God was incommunicable, lest he be diminished, divided, or changed*. His nature was unchangeable, and therefore indivisible. The argument that a parent is not divided or diminished by bearing children held no sway, for if another were to share God’s essence, there would be a plurality of divine beings (polytheism).

Christ, the Logos, was for the Arians not like God the Father by nature, but was a creature. God was not always a father; is one of the Arians' favorite formulations. "*There was when the son was not.*" Yet he was a divine being as one might speak of the angels; indeed, even higher; he was the uniquely born one (in Greek, monogenes), as the highest and firstborn of all creatures, and creator of all else. He was god and unchangeable, but unchangeable by choice, not by nature. As an incarnated being, Jesus was subject to temptations and free to sin, yet he did not sin by resolute action of his will. He learned righteousness and progressed to the point of exchangeability. *Thus the core of the Arian controversy had in its background the exclusive monotheism of Jewish Christianity presented in far more sophisticated philosophical terms.* Yet the continuity is unmistakable; there was but one true God, served by the Son, a creature promoted to the status of a god. The controversy spreads quickly, supported by other disciples of Lucian. Alexander, the bishop of Alexandria (312-328), excommunicated Arius in 321 at a council of the clergy of Alexandria. Arius appealed of support in a letter to his friend Eusebius of Nicomedia, bishop of the imperial city of the east. But, bishop Eusebius could not support his friend. So, Arius calls Eusebius "orthodox" and the Trinitarians "heretics."

Constantine had marched victorious into Rome in 312, making him ruler of the western empire. Twelve years later, in 324, he defeated his rival in the east, *Licinius (emperor of Rome 250-325)*, and became the sole master of the whole empire. Constantine was very much a Christian, as his letters and edicts demonstrate: he outlawed all sacrifices to the pagan gods, the creation of new statues of the gods, divination, and the consultation of pagan oracles. At the end of 324, he set out to visit the territories in the east and planned then to turn south to Egypt. While traveling, he heard news of the raging Arian controversy in Egypt and its neighboring states; the crisis caused him to cancel his plans and return to capital. Unity among Christians for the sake of the progress of the gospel was of great importance to Constantine. He complained that the Christian message was being "exposed to the most shameful ridicule in the very theaters of the unbelievers" because of the public arising of dissension by partisans of both sides. *To heal the rift and bring unity to the faith, a council was held in Antioch in 325 and later that same year reconvened in Nicaea; a council that the emperor himself attended. Constantine's goal was to produce a creed that all present would agree on and sign.*

No official creeds existed in the first Christian centuries, not only because there was no doctrinal unity, but also because there was as yet no recognized central authority to oversee doctrinal formation. The churches in the early period had been founded by apostles and missionaries with differing ideas concerning the religious life; some emphasized continued obedience to the Mosaic Law, some the enlightenment of gnosis, some the walk of faith and

grace. The target communities were also different; Semitic Jews, Hellenized Jews, pagans of several sorts, philosophical Greeks and Romans. So, churches grew in relative independence from one another and only slowly began to draw together under the pressure of persecution and apologetic need. The teaching of the church developed over time, in response to the challenges of Judaism, paganism, and heresy. The doctrinal formulations of later generations would have seemed foreign and would certainly have been misunderstood by earlier generations. Later Christians developed new concepts and new technical language in historical contexts determined the meaning.

Creeds developed into two forms. *Baptismal creeds* were summaries of Christian teaching for the education of the church members themselves. They were used to separate Christian from non-Christian, with the goal of producing educated and initiated church members. *Declaratory creeds*, on the other hand, were summary statements of faith made for the heresy or schism. They were defined by authoritative bodies of bishops who championed one particular view against other leaders and bishops. Declaratory creeds did not even exist until the later third and early fourth centuries, when schism, “heresy,” and unity were political issues of great importance. *Constantine convened what was the first “general council” of the church, attended by more than 250 bishops from all over the empire.* Their task, according to Constantine’s opening speech, was to become “united in one judgment” on the matters of faith. Under Constantine’s guiding hand, *the council produced the Creed of Nicaea*, which all participants were required to sign; only Arius and a few of his supporters refused, and they were immediately forced into exile. The result of the council, were a victory for the Orthodox and a heavy defeat for the Arians. The creed reads in part: “We believe in one God the Father almighty... and in one Lord Jesus Christ, the Son of God, begotten from the Father only-begotten, that is from the *essence (ousia)* of the Father, God from God, light from light, true God from true God, begotten not made, *same essence (homoousion)* with the Father... and in the Holy Spirit.”

In spite of the creed of 325 and the efforts of Constantine, the Arian controversy would not go away. As with Scripture itself, group after group had its own interpretation of the creed, allowing them to continue to hold to what they had previously believed. All but a few Arians were thus able to sign the creed, and Constantine’s subsequent efforts to unify the whole church eventually reconciled most of them. After Constantine’s death in 337, the empire was divided between his sons, Constantius in the east, who sided with the Arians and Constans in the west, who sided with the Nicenes. When Constans was killed in 350, Constantius rose to power over the whole empire. He and a group of Arian bishops forced through an Arian creed after the council of Rimini in 359 to replace the previous Nicene Creed. After several more twists and turns, Theodosius, a supporter of Nicaea,

became sole ruler in 379 and *sponsored the council of Constantinople of 381*, the council that would define Nicaea as the basis of “orthodoxy” for the remainder of Christian history. The issues that this council faced were not only later versions of Arianism, but new controversies over of the nature of the Holy Spirit. The logic of the Arian position dictated that the Holy Spirit was a creature, just as they had asserted about Christ. Bishop Athanasius (ca. 296-373), writing to the orthodox Roman Emperor Jovian, complained that the Arians were blaspheming “against the Holy Spirit, in affirming that it is a creature, and came into being as a thing made by the son.”

The council of Constantinople settled among other questions, the dispute over the Holy Spirit. Gregory of Nazianzus, who presided over the council for a time, described it’s works, in part, as “completing in detail that which was incompletely said by them at Nicaea, concerning the Holy Spirit, for that question had not then been discussed, namely, that we are to believe that the Father, Son, and Holy Spirit are of the one Godhead, thus confessing the Spirit also to be God.” *About 150 bishops and the emperor affirmed the Nicene position and extended the ascription of deity to the Spirit. The resulting creed reads in part: “And the Holy Spirit, Lord and life-giver, who proceeds from the Father, who with the Father and the Son is together worshiped and together glorified.”* Trinitarianism, one God and in three persons, has been the official teaching of the Christian church from the Council of Constantinople to the present day.

From Trinity – What is next?

After the year 6000 (in Jewish calendar), the seventh millennium will be an era of holiness, tranquility, spiritual life, and worldwide peace, called the Olam Haba (future world), where all people will know God directly. It is worth noting that the Talmud state, “The world is to exist six thousand years; the first two thousand are to be “void of Torah,” the next two thousand are the period of the Torah (from Abraham until the completion of the Mishna, the first part of the Talmud), and the following two thousand are the period of the Messiah (the Messianic age could commence during this time).” Stemming out from Judaism, Christianity borrows a significant amount of theology. Different religions received revelations over eons, epochs and periods, while the God of Judaism and Christianity report the frequent incarnations and redemptions in a very small scale of time. The God of Judaism and Christianity as Talmud describes on Olam Haba, perhaps, *follow a two thousand year cycle* to enact the salvific acts of incarnation, redemption and salvation. If it is true, we can look for a new salvific event in next two thousand years. As our actions cause, the destruction of ecosystems, we realize that our own human ability itself isn’t enough to save the Earth from disaster and as we are hoping and praying, the incarnation, redemption

and salvation is immanent.

In his encyclical “*Redemptoris Mater*” Pope John Paul II recognizes fittingly the importance of Mary’s role in the history of salvation, and sees the Blessed Mother of God in the saving mystery of Christ, deeply rooted in humanity’s history, in man’s eternal vocation according to the providential plan which God has made for him from eternity. Mary is maternally present and she is helping the humanity in the many complicated problems which today beset the lives of individuals, families and nations. She is an integral part of God’s plan for man from all eternity. The church recognizes Mary as helper and mediator in the constant struggle between good and evil. Does Pope John Paul II suggest something great for Mary in the far future, leading into the possibility of “*two thousand year cycle?*” That would be awesome for the future church, defining the role of women in a broader dimension. One side the religions glorify women, defining motherhood as something divine, calling them Shakthi (power), Gaia (mother), Ruha (Spirit), Immaculate conception, etc... But on the other hand religions suppress women, denying them of the same equality, given to man. This is *known as the Androcentrism*. Androcentrism is the man centered approach, sidelining his own counter part: the women.

Obviously, the churches are filled with women in leadership capacity, from church treasurers to Sunday school teachers, from lectures to Eucharistic ministers, from counselors to choir directors. What aspects are acceptable, and what would be considered outside the realm of acceptability. The history of religions, speak about the importance of the female deity. Prehistoric pantheon reflects a society dominated by the Mother goddess. Earlier civilizations like Minoans of Crete (2000 to 1450 BC) and Egyptians worshipped some kind of feminine divinity. Hinduism from its Vedic times could not imagine a religion without female deity. In fact as I mentioned earlier the word “ruha” is feminine in gender, which denotes “spirit.” Raising Mary to higher level could revive Christianity, would add significant amount of dignity to women, who can give a new life, revitalize and add more years to already dying church. There is much to support this view. Certainly religions seem to be disappearing from the lives of an increasing number of people, especially in western world. However, *these religions have played a crucial role in our human history and have been one of the greatest human ideas of all time*. In Europe, the churches are emptying; atheism is no longer the painfully acquired ideology of a few intellectual pioneers but a prevailing mood. Many people are unmoved by the prospect of life without God. Others find his absence a positive relief. Those of us who have had a difficult time with religion in the past find it liberating to be rid of the God who terrorized our childhood. It is wonderful not to have to cower before a vengeful deity, who threatens us with eternal damnation if we do not abide by his rules. We have a new intellectual freedom and can boldly follow up

our own ideas without pussyfooting around difficult articles of faith, feeling all the while a sinking loss of integrity.

As we are living in third millennium, it seems likely that the world we know is passing away. For decades we have lived with the knowledge that we have created weapons that could wipe out human life on the planet. We are facing the possibility of ecological disaster. The AIDS virus threatens to bring a plague of unmanageable proportions. Within two or three generations, the population will become too great for the planet to support. Thousands of people are dying of famine and drought. How will the idea of God survive in the years to come? For 5000 years it has constantly adapted to meet the demands of the present, but in our own century, more and more people have found that it no longer works for them, and when religious ideas cease to be effective they fade away. Jean-Paul Sartre (1905-80) spoke of the God shaped hole in the human consciousness, where God had always been. Nevertheless, he insisted the idea of God negates our freedom. Traditional religion tells us that we must conform to God's idea of humanity to become fully human. Rather than accept Sartre's view, we must see human beings as liberty incarnate. Sartre's atheism was not a consoling creed, but other existentialists saw the absence of God as a positive liberation. *A passionate and committed atheism can be more religious than a weary or inadequate theism.*

The Jewish theologian Richard Rubenstein found it impossible to understand how they could feel so positive about Godless humanity so soon after the Nazi Holocaust. He himself was convinced that the deity conceived as God of History had died forever in Auschwitz, Poland. All mystics had seen God as a nothingness from which we came and to which we will return. Rubenstein agreed with Sartre that life is empty; he saw the God of the mystics as an imaginative way of entering this human experience of nothingness. Hans Jonas, a Jewish theologian, believes that after Auschwitz we can no longer believe in the omnipotence of God. An impotent God is useless and cannot be the meaning of human existence. It is better to return to the classic explanation that God is greater than human beings and his thought and ways are not ours. God may be incomprehensible, but people have the option of trusting this ineffable God and affirming a meaning, even in the midst of meaninglessness. The Roman Catholic theologian Hans Kung notes that human beings cannot have faith in a weak God but in the living God who made people strong enough to pray in Auschwitz.

The view of faith outlined by Jesus is one that knows no boundaries of sect or creed because it is based on the universal truth of the "light that lights every person coming into the world." It belongs to all, regardless of ethnicity, color, or clime. Significantly, it applies to the millions of humans who were born and died long before Christianity as a religion was ever thought of; it belongs to now and to the future as well. Some theologians

argue that “Our Church and our view of Jesus remain the only way,” is extremely divisive and will never lead to the solidarity of all humanity. It remains a serious source of global disharmony and, at times, vicious open conflict. It may be a harsh statement at least for now. But in far future Christianity based religions could lead to a “Biblical one Shepherd and One Universal Community.” *The Church could get a new make over.* The theologian Hans Kung has said repeatedly that there *will never be global peace until there is harmony between the world’s great religions*, especially Islam and Christianity. But this will never happen while some religions claim to hold a monopoly on divine truth. We are not pleading here for one totally homogeneous faith to replace the current religious pluralism. Rather, we are urging the adoption of a profoundly unifying basis to transcend the divisive outlook that so often accompanies our traditional differences.

As the poet W.H. Auden has warned us, we must either learn to love or die. Finally, what is appropriate to our time is the expansion of religion, not its diminishment into obscure violence and superstition. We expand by opening one door and closing the other, emerging from the protective cocoon. We open and feel the air of the suddenly immense universe and the divine in creation, but we must be ready. For at this time, the story is going to change. When the story changes it is absolutely necessary that the new story be a good story not a horror story. For the new story to be good, we must be good. What does Jesus’ royal announcement means to each generation? Jesus Christ will do what he does best: heal, forgive, save, redeem, and ultimately, love all generation by showing us the wounds his body is bearing. The Book of Revelation unveils future events and hidden mysteries of God. The church awaits the return of Jesus with indescribable anticipation. *When he comes he will not be crucified; on the other hand he will crucify the bad and reward the good.* There are two concepts of importance when we define the divine future; Parousia and Eschatology.

Parousia

Acts 1:4-12 refers to the second coming of Jesus, which is known as “*parousia*” in Greek, “Men of Galilee, why do you stand looking into heaven? This Jesus, who was taken up from you into heaven, will come in the same way as you saw him go into heaven.” The return of Jesus to earth is in two stages. First, he arrives unannounced to call out the true church, his bride. This event described in 1 Thessalonians 4 and usually called “the rapture.” It is distinguished from his visible return in power and glory seven years later. Two different Greek words are used. Parousia, meaning “presence” describes the coming of Jesus for his saints, and epiphaneia, meaning “appearing” describes his public unveiling (apokalupsis) in splendor, power and glory. A number of passages in the Bible describe the glorious second coming of the Messiah Jesus to save our beleaguered planet from total destruction, and to set up his kingdom on earth. Here are some of the

references: Zech 14:1-9, Isaiah 63:1-6, Mathew 24:29-31, Mark 13:24-27, Rev 19:11-21.

Apostle John also presents a full picture of the coming of the Lord Jesus with his saints. “Then I saw heaven opened a white horse! He who sat upon it is called faithful and true, and in righteousness he judges and makes war. His eyes are like a flame of fire, and on his head are many diadems and he has a name inscribed which no one knows but himself.” Here Jesus declares his credentials. *He is the Alpha and Omega, the beginning and the end.* Christians in the first century believed he was coming soon, and he never came. Some even say, the book of Revelation is wrong. The book of Revelation makes clear it is the fact that John’s vision links time and eternity in ways that transcend human understanding. We look at a time as a straight line, marked off in years like inches on a ruler. We see John’s era of the first century AD as being at one point on the ruler, our own era some 2,000 years later, and the events of Revelation as occurring at some time further along the ruler.

Properly understood, however, the events of Revelation were no further off in John’s future than they are in yours and mine. The final destiny of a human being, whether lost or righteous beings the instant that individual dies. Eternity is never more than a heartbeat away, never farther in the future than one’s own death. It won’t be long before both you and I step out of time and into eternity. And when we arrive in eternity, the saints who preceded us in death by a hundred or a thousand or two thousand years won’t say to us, “What took you so long?” Jesus is coming soon. He was coming soon in the day of John the apostle. Even if the events of Revelation do not take place for another thousand years or ten thousand, this statement would still be true; Jesus is coming soon.

Eschatology

Eschatology from Greek “eskhatos” is literally means the study of the eschaton, a “discourse about the last things,” a doctrine concerning life after death and the final stage of the world. In Zoroastrianism, Christianity, Rastafari, and in Norse pagan theology, eschatology is a theology concerning the end of the world, as predicted in the prophecies of these faiths, and as recorded in their sacred texts. In other religions, especially the western monotheistic faiths, it is study of general afterlife concepts. In this broader sense, eschatology can refer to the Messiah, a messianic era, the afterlife.

Hindu Eschatology - Contemporary Hindu eschatology is linked in the Vaishnavite tradition to the figure of *Kalki* or the tenth and last avatar of Vishnu (refer to chapter 3 on God of Cosmic, Geological time scale), before the age draws to a close, and Shiva simultaneously dissolves and regenerates the universe. Most Hindus acknowledge as part of their cosmology that we

are living in the *Kali Yuga* literally “age of darkness,” the last of four periods (Yuga) that make up the current age. Each period has seen a successive degeneration in the moral order and character of human beings, to the point that in the Kali Yuga, the very laws of *Karma* (*action and rebirth*) are reversed, evil is ascendant in high places, and good people suffer in misery. Often, the invocation of Kali Yuga denotes certain helplessness in the face of the horrors and suffering of the human condition and nostalgia for a golden past or a future salvation. However, Hindu conceptions of time like those found in other non Western traditions are cyclical in that one age may end but another will always begin. As such, the cycle of birth, growth, decay, death, and renewal at the individual level finds its echo in the cosmic order of all things, yet affected by the vagaries of the comings and goings of divine interventions in the Vaishnavite belief (followers of Vishnu).

Buddhist Eschatology – Maitreya is a bodhisattva who Buddhists believe will eventually appear on Earth, achieve complete enlightenment and teach the pure dharma. *The Maitreya Buddha* will be the successor of the Gautama Buddha or *Shakyamuni Buddha*. He is predicted to be a “world ruler,” uniting those who he rules over. Maitreya is comparable to second coming prophecies in other religions, such as the coming of Kalki, the final avatar of Vishnu in Hinduism, Parousia in Christianity and Saoshyant in Zoroastrianism. The Maitreya’s coming coincides with a new school of teaching to surpass that of the original Gautama Buddha. The Maitreya is predicted to attain Bodhi in a single year rather than other prolonged pursuits of enlightenment, which take a minimum commitment of several years. The Maitreya’s coming is characterized by a number of physical events. The oceans are predicted to decrease in size, allowing the Maitreya to traverse them freely. The event will also allow the unveiling of the “true” dharma to the people, in turn allowing the construction of a new world. The coming also signifies the end of the middle time in which humans currently reside, characterized as a low point of human existence between the Gautama Buddha and the Meitreyia. In order for the world to realize the coming of the Meitreyia, a number of conditions must be fulfilled. Gifts must be given to monks, moral precepts must be followed, and offerings must be made to shrines. Some of the events foretold at the coming of the second Buddha include an end to death, warfare, famine, and disease, as well as the ushering in of a new society of tolerance and love.

While a number of persons have proclaimed themselves the Mitreya over the years following the Shakyamuni Buddha’s death, none has been officially recognized by *the Sangha* and the Buddhist peoples. Indo-Tibetan art typically depicts Maitreya sitting on an altar with both feet on the ground, indicating that he has not yet completed ascending his throne. Chinese art typically shows him as *the monk Hotei* – *the familiar smiling, shaven-*

headed, big-earlobed figure with a pot belly suggesting prosperity. The prophecy strangely contradicts certain Buddhist teachings, suggesting it may have been a borrowed eschatology rather than originating with Shakyamuni Buddha. In the I-Kuan Tao (pronounced “yee guan dao”) religious movement of Taiwan, it is believed that Maitreya has already appeared on Earth.

Zoroastrian Eschatology – Zoroastrianism is the first historical Millennialism. It believes in successive thousand year period, each of which will end in a cataclysm of heresy and destruction, until the final destruction of evil and of the spirit of evil by a triumphant king of peace at the end of the final millennial age. Then Soshyant (end of everything) makes the creatures again pure, and the resurrection and future existence occur (Zand-I Vohuman Yasht 3:62). According to this belief, at the end of the world the worshipers of the Lord Mazda will be distinguished from all other people by successfully enduring the ordeal of molten metal and the good will then be rewarded. This concept is found in the Gathas (hymns), the earliest part of the Avesta, the bible of Zoroastrianism. It is not certain that the idea of a resurrection from death goes back to the period represented by the Gathas. But the Greek historian Herodotus seems to have heard of such a Persian belief in the 5th century BC and Theopompus of Chios, the historian of Philip II, king of Macedon, described it as a Mazdayasnian doctrine (of Zoroaster).

Greek Eschatology – The ancient Greeks arrived at their eschatology by considering the functions of the mind as a purely spiritual essence, independent of the body, and having no beginning or end; this abstract concept of immortality led to the anticipation of a more concrete personal life after death. The Homeric poems and those of Hesiod show how the Greek mind conceived of the future of the soul in Elysium or in Hades (heaven and hell). Through the Orphic and Eleusinian mysteries this thought was deepened. That the future of nations and the world also played an important role in Greek and Roman thought is evident from the prophecies of the Sibyls, a person with mystical abilities, including the power to foretell the future in prophecies and monitor events in other planes of existence (Sibylla).

Jewish Eschatology – Jewish eschatology is concerned with Mashiach (messiah) the continuation of the Davidic line and Olam Haba (Hebrew for “the world to come,” i.e. the afterlife). The Hebrew word Mashiach means anointed one and refers to a mortal human being. Within Judaism the Mashiach is a human being who will be a descendant of King David continuing the Davidic line and who will usher in a messianic era of peace and prosperity for Israel and all the nations of the world. According to Jewish tradition, the end of the world will see: the ingathering of the scattered Jewish exiles to geographic Israel, the defeat of all of Israel’s enemies, the building of the third Jewish Temple in Jerusalem and the resumption of the sacrificial offerings and Temple service, the revival of the dead (techiat hameitim), or the Resurrection, the Jewish Messiah become the anointed King of Israel.

He will divide the Jews in Israel into their original tribal portions in the land. During this time Gog, king of Magog will fight a great battle (war at Megiddo) in which many will die on both sides, but God will intervene and save the Jews. This is the battle of Armageddon (more to read later in this chapter). God will accordingly banish all evil from human existence. One of the sages of the Talmud says that “Let the end of days come, but may I not live to see them,” because they will be filled with so much conflict and suffering.

Islamic Eschatology - Islamic Eschatology is concerned with the Qiyamah (end of the world) and the final judgment of humanity. Islam adopted from Judaism and Christianity the doctrine of a coming judgment, the resurrection of the dead and everlasting punishments and rewards; the righteous are rewarded with the pleasures of Jannah (paradise), while the unrighteous are punished in Jahannam (hell). A significant fraction of the Qur’ān deals with these beliefs. According to the Islamic view Jesus (Isa, in Arabic) is not the Son of God, but was a very important prophet. It is believed that Isa never died and he was not crucified; instead he was raised into heaven still physically alive, where he lives now. At the time of appointed Allah, Isa will physically return to this world, end all wars, and usher in an era of peace, a messianic era.

Ancient Aztec Eschatology – It was centered on the belief that four worlds had existed before the present universe. Those worlds or “suns” had been destroyed by catastrophes. Humankind had been entirely wiped out at the end of each sun. The present world was the fifth sun, and the Aztec thought of themselves as “the people of the sun.” Their divine duty was to wage cosmic war in order to provide the sun with his *tlaxcaltiliztli* (nourishment). Without it the sun would disappear from the heavens. Thus the welfare and the very survival of the universe depended upon the offerings of blood and hearts to the sun, a notion that the Aztec extended to all the deities of their pantheon. The present sun was called *Nahui-Ollin* (4 earthquakes), and was doomed to disappear in a tremendous earthquake. Two deeply rooted concepts are revealed by these myths. One was the belief that the universe was unstable, that death and destruction continually threatened it. The other emphasized the necessity of the sacrifice of the gods. *The Aztec legend quotes a story that the gods assembled in the darkness at Teotihuacan (Mexico) to create the sun and the moon after the destruction of the former sun and moon.* There were richly bejeweled gods who threw themselves in the flames, from which the former emerged as the sun and the latter as the moon. Then the sun refused to move unless the other gods gave him their blood; they were compelled to sacrifice themselves to feed the sun.

Christian Eschatology – Views about Judeo Christian eschatology are often limited to the coming of the kingdom of God and the transformation or

transcendence of history. The immortality of the soul, the second advent of Christ or parousia, the end of the world, resurrection of the dead, final judgment, renewal of the creation, heaven and hell, the consummation of all of God's purposes, are other relevant issues of eschatology. In Roman Catholic Church, eschatology includes, additionally, the beatific vision, purgatory, and limbo. Eschatology has been a revived theme among theologians in the 20th century. In the second half of the 20th century, eschatology was equated by some theologians with the doctrine of Christian hope, including not only the events of the end of time but also the hope itself and its revolutionizing influence on life in the world. The most eloquent exponent of this eschatology is the German theologian Jurgen Moltmann. Other radical theologians have provided various interpretations of the book of Revelation and other prophetic parts of the Bible, such as the Book of Daniel and various sayings of Jesus in the gospels have given way to the consistent eschatology of Johannes Weiss and Albert Schweitzer, the "realized eschatology" of C.H.Dodd and Rudolph Otto; the "dialectic eschatology" of Karl Barth and Rudolf Bultmann, and the "death of God" eschatology of Thomas J. Altizer.

In addition to the prophecies and other doctrines of the Bible, there are also traditional teachings or writings of people supposed to be extraordinarily gifted with insight into spiritual things, or granted gifts of prophecy or a special visitation by messengers from heaven, such as angels and saints. Such extra-biblical revelations have additional eschatological significance for those who believe them. In fact, it is fundamental to nearly all traditions of Christianity that death and dying will not be finally removed from the Earth until the second coming of Christ. Suffering, disease, injustice and war will continue until the end of the world, according to the Christian view of last things. The Christian hope will not be realized in this lifetime, and instead has the practical purpose of instructing the Christian to pray and work for a fuller measure of those blessings now. However, there are dissenting traditions, which teach it to be an ethical or moral principle that all suffering ought to be eliminated prior to Christ's return.

Armageddon – This site, according to Revelations, is where the final battle will be between the forces of good and evil. The word Armageddon in scripture is known only from a single verse in the Greek New testament, where it is said to be Hebrew word, "Har Megido," meaning "mountain of Megiddo." Revelations 16:16 reads, "And he gathered them together at a place called in the Hebrew tongue, the Armageddon." Megiddo was the location of many decisive battles in ancient times. Before the Second World War, the First World War was commonly referred to in newspapers and books as "Armageddon," in addition to "the Great War." In Revelation, angels pour "seven bowls of the wrath of God" upon the Earth. Armageddon follows the pouring of the sixth bowl: "The sixth angel poured his bowl on the great

river Euphrates and its water was dried up in order to prepare the way for the kings from the east. And I saw three foul spirits like frogs coming from the mouth of the dragon, from the mouth of the beast, and from the mouth of the false prophet. These are demonic spirits, performing signs which go abroad to the kings of the whole world, to assemble them for battle on the great day of God the almighty. And they assembled them at the place that in Hebrew is called Harmagedon.”

In fact, a gathering of the Roman army occupied at this place as a staging ground for one of their assaults on Jerusalem in AD 67. This is consistent with the preterits interpretation that seventh bowl of wrath refers to events culminating in the destruction of Jerusalem in AD 70. Megiddo is mentioned various times in the Hebrew Bible. The book of Kings and Chronicles describe a battle that took place there in 609 BC. This resulted in the death of Josiah, a young and charismatic ruler whose quick and untimely death precipitated the decline of the dynasty of David and may have inspired stories of the return of a Messiah from this lineage. The valley is marked by the presence of the archaeological mound representing the accumulated ruins of Bronze Age and Iron Age settlements that flourished between 5,000 years ago and 650 BC.

The Hindu holy book, “*Bhagavat Gita*” states, “At every time “*adharma*” (*injustice*) prevails and prevents evolution, the Cosmic Intelligence (God) embodies itself as a matter of course. Man may not pray or beg God’s help, however, it is god’s job and duty to save. In other words whether you like it or not, God is involved anyway. The sacred script reads in *Sanskrit*: (Bhagavad Gita- chapter 4. verse 7): “*Paritranaya sadhunam vinasayasa duskrtam dharma samsthapanarthaya sambhavami yuge-yuge.*” *Similar words from the Bible, “I will be with you always, even until the end of time” (Mathew.28:20). Whether humans have religions or no religions, it is their ability that has enabled them to survive in the constant cultural changes and force them to dominate such vast areas of planet Earth and make religions the greatest of all.*

Chapter- Two

Creation of Matter into Creation of Mind

Look out the night sky. What do we see? We see the planets, the stars, a million points of light. We are looking at our universe. In this chapter we will experience first-hand the wonders of the universe, its power and its danger. We'll seek out alien life. Witness the birth of new worlds. And we'll discover why what happens out there in space, affects all of us here on the one small planet we call our home. We'll take you from the beginning of time, to the far future of humanity. This is the voyage of a life time. This is the voyage into space. We begin with the big question; where did we come from? What would you think if I told you that you, me, everyone came from the outer space? Weird though it sounds, it's true; *we're all aliens*. Once upon a time, every single thing that makes us what we are came from the stars. We live in a small corner of the universe. This is our neighborhood; the solar system; at its center, the sun; and just 150 million kilometers away is our home; the Earth. It's an astonishing planet. The only place we know of in the whole universe where conditions are right for life. The air we breathe; rich seas and oceans; our planet is alive! What remarkable is; it shouldn't be. Life on Earth shouldn't even exist. So where did it all come from; me, you, the planet we live on, even our sun? It's a puzzle because at the beginning none of it was here. This is the moment it all started, *the Big Bang*.

Big Bang created the universe, but universe containing only a vast cloud of hydrogen gas. So how did something so featureless create our world? And how did it create us? *The journey from a cloud of hydrogen to the building blocks of life is extraordinary*. The calcium in my bones, the oxygen we breathe, where did it come from? It all began at the time the universe gave birth to the stars. For millions of years, the entire universe was nothing but the single vast cloud of hydrogen gas created in the Big Bang. But within the cloud, something amazing was happening. Shockwaves from the Big Bang were echoing through the cloud, making it billow and swirl. Huge whirlpools of hydrogen formed, sucking in the cloud that created them, spinning them tighter and faster to form huge balls of gas. And as they span, these enormous spheres got hotter and hotter, until the moment came that changed the universe forever. The first-ever stars were born. But these stars alone are not enough to explain why we're here. What turned stars into us?

Beneath the deserts of Arizona (USA), is a device which may reveal the answer. It's a weapon silo. The closest we've been able to come to that incredible release of energy, associated with the violent birth of a star is with the hydrogen bomb, or the super-bomb. Hidden in bunkers, is the technology that allows us for a moment to understand what goes on in the heart of a star. It's the most destructive weapon on our planet. It's a power of a hydrogen

bomb. It's the same hydrogen that fuels the fire of every star in the universe. The amount of hydrogen gas in an H-bomb is tiny. It's barely enough to fill a volley ball bladder. But the energy it can unleash is devastating. This is the same energy which keeps the stars alight. All these devastation is from a single bladder-full of hydrogen. The ball of hydrogen that makes a star is a million kilometers across. A star releases the energy of millions of H-bombs every second. But, far from destructive, *inside the nuclear furnace of every star, there is an extraordinary process of creation.* When you ignite a hydrogen bomb, everything will be evaporated. But it's also likely that almost every element in the universe would be created. Just as inside stars hydrogen fuses to form helium, which fuses to form carbon, then nitrogen, then oxygen, silicon, iron. As we look around us, everything we see was once inside of a star. *Every atom came from inside of a star.*

The universe began with hydrogen. And hydrogen created the stars. And the stars created the elements we need for life; oxygen in the air, calcium in our bones. It all came from the stars, but how? If it was created there, how did it make our world? It's astonishing to think all the ingredients to make the Earth and every living thing were created inside stars. Every star is an immense factory churning out billions of tons of chemicals. But chemicals aren't much use to anybody while they're in there. Luckily for us, stars don't last forever. Just occasionally they explode. Amazing! But true. Entire stars can blow themselves apart. To understand why, let me take you back to the very last few moments of a star's life, just as it teeters on the point of destruction. Let us take a star as an example that died billions of years ago. It's huge, its' life has been violent and short. And its death made our lives possible. It is one of the most violent and wondrous events in the cosmos. The star has run out of hydrogen fuel. The nuclear fires that have kept it burning for millions of years have gone out. As it cools, it shrinks. It starts to collapse under its own weight, it crashes inwards and explodes. The whole event is over in a thousandth of a second. They call it *a supernova*, an explosion so bright it outshines entire galaxies. Billions of tones of star stuff hurtle outwards, into space. So, look at a supernova and you're witnessing a moment of creation. But even with our most powerful telescopes, these explosions remain frustratingly distant.

To understand the moment of creation that happens when a star dies, you have to study the explosion. Exploding stars release a huge amount of energy. We can't do that here on Earth. We'd blow up the solar system. But, what we can do is concentrate a great deal of energy into a small volume. To generate anywhere near the force of a supernova, we use the world's powerful laser and focus it onto a point smaller than the head of a pin. The target is a tiny tube containing the same materials you'd find at the heart of a star. When, laser hits the target that creates a shockwave that's so strong that it shreds the material inside that tube. It tears the atoms apart.

The inside of a dying star is made up of layers, *like the layers of an onion*. The outer layers are the remnants of the gases that fuelled the star, mostly hydrogen. Deeper there are layers of calcium, sulfur, carbon, and its heart a dense core of molten iron.

The complex patterns of an exploding star could be seen in astonishing detail. The beautiful and precise motions that scatter the building blocks of life are out into space. That explosion throws the elements that were formed in the star outwards into the galaxy. Some of them gather together and form other stars, solar systems, even planets, like the Earth. The most powerful telescopes can capture the remains of these violent events in supernovas. *Vast clouds of star stuff expanding through space, one of the breathtaking sights in the universe*. But there's a puzzle in these pictures. It may be the stuff of life, but these are just clouds. What could turn a cloud into rocks or water? What could turn a cloud into life? We've begun to piece the puzzle together. We've traced the whole process from the death of a star to the creation of new worlds. It has taken the most powerful telescopes and years of patient searching by hundreds of scientists.

There's a bright supernova once in every hundred years or so in a galaxy. So you're pretty lucky if you see one in your own lifetime. In 1987, the astronomers' dedication finally paid off. For the first time, they saw the moment of destruction, a star exploding; a supernova in a nearby galaxy. They call it supernova 1987 A. The heavy elements that could make a new planet someday are in this cloud in the center. Over tens of thousand of years, that shrapnel from the exploding supernova gets mixed in with the gas between the stars, and that becomes the stuff which contracts under gravity to become new stars, new solar systems, and new planets. *When you pick up a rock, you have a piece of the universe that was formed five or seven billion years ago*. The silicon that makes up these bits of quartz were manufactured inside massive stars and blasted into the gas between the stars. But it's not just the rock. It's everything that you see in the Earth.

In the countryside of Himalayas you can see the beautiful mountains, which are all formed out of elements that were manufactured a long time ago from generations of stars that blew up five or seven billion years ago. Over hundreds of thousands of years ago, countless supernovas spread and mingle. This is what they become; immense clouds made from ancient hydrogen gas mixed with the remains of long-dead stars. *It's a stellar nursery, a place where new stars and new planets are born*. For example, there is a huge cloud of gas called *Eagle Nebula*; a vast cloud of debris, the remains of an ancient explosion. At its heart new stars and worlds are being created. These interstellar clouds are immense. Each one of the bright dots is a star; many of them much bigger than our own sun. It was in a place like this that our solar system was born. All the ingredients needed for the creation of everything are in here, it just takes a little time for them to come together.

It's a dance that lasts millions of years. It starts when the gas and dust form microscopic clumps and it ends with new worlds. As the clumps get bigger, they start to stick together, too. They form clumps of clumps, always bigger, always heavier all swirling around each other. And at the center of them all, a vast cloud of gas and dust takes shape; a whirling ball of matter, sucking in everything. It grows bigger and bigger, hotter and hotter until, and it explodes and a new generation of stars is born. *And our sun was born in this way.* The remaining gas and dust is blown away, leaving behind the planets. They keep growing. Smaller lumps of rock fall onto them for millions more years. And when it's over, a new world is revealed; our world, the Earth. But if that's how the Earth got here, then how did we get here? Eventually, water and atmosphere came. But there was one thing missing: life. Life could have started in the sea, or even in rock pools. But there is another possibility. Life could well have started in a, far-flung regions of the universe, and *hitched a ride here on the back of a comet.* It may be the most intriguing theory of them all.

Some scientists think life on Earth appeared so quickly, that maybe it came from somewhere else. *Comets may hold the answer.* Huge chunks of ice, kilometers across, if very simple life-forms could survive inside them, life could have spread throughout the universe. If the theory is right, we can imagine that moment, when life on Earth began. Hurling through space, the comet heads towards Earth. Conditions are perfect, rich seas and atmosphere. All that's needed is a spark. Crashing into the Earth, our alien ancestors are thrown in every direction, scattering across the globe. *And our once lifeless planet is transformed forever.* Everything that makes up our world and us came from the stars thousands of millions of years ago. So next time someone asks you where you came from, tell them this; you came from outer space, created in the heart of a star.

Our Place in the Cosmos

The Milky Way, the ribbon of stars stretching over the sky from north to south, is our galaxy, a system containing about a hundred billion stars, one of which is our sun, merely one of many stars at the rim of this disk-shaped galaxy. When we look at the ribbon of the Milky Way we are, in a manner of speaking, looking into disk, that is, along the plane on which the galaxy is spread out. Here the naked eye can make out some stars in the vicinity of the sun, stars that are still part of our galaxy. But behind that, there is nothing but intergalactic space. In the east, in the Andromeda constellation somewhat above the star, *Beta Andromeda*, we can see a small, diffuse speck of light, the *Andromeda nebula*. This phenomenon has already aroused the curiosity of the ancients. It is easily seen in southern climes, particularly in the desert regions. We now know that the Andromeda nebula is the only visible object in the northern sky that is not part of our galaxy, our Milky Way system. *What we are seeing is a "world island" akin to our own galaxy.*

Imagine yourself in a spaceship that is about to leave the solar system. Somewhere in space you see the glittering gas sphere of the sun surrounded by billions of stars, all of them part of our Milky Way system. You realize, that you are in a remarkable spot in the universe, namely inside this system, our galaxy. An observer somewhere in the depths of the universe will as a rule would not be fortunate enough to be near such a system. The cosmos is composed largely of empty space, galaxies are rare, precious structures, and observers “residing” in the vicinity of a galaxy can quite rightly consider themselves privileged. It is like a window seat in an airplane. *We are able to experience the starry sky only because our Earth is situated within the Milky Way.* Things will be altogether different if the Earth together with the solar system were situated somewhere in the universe remote from any galaxy. *We would not see single star in the sky.* Instead, we would be enveloped by the eternal night of intergalactic space, and only with the help of complex, powerful telescopes would we be able to see that somewhere far away there exist some faintly shining structures, remote galaxies. Then climate in the depth of intergalactic space is cold and unfriendly.

Every star visible to the naked eye belongs to our galaxy. Nonetheless it is not easy to gain a precise picture of our galaxy, because we are inside it. It would be useful to have a photograph of our galaxy taken from a point outside it. Unfortunately we are not able to send a spaceship equipped with a camera to such a point. If we want to acquaint ourselves with the structure of our galaxy, we must try to un-code the structure of the solar system step by step. We now know that our galaxy looks somewhat like the neighboring *Andromeda galaxy*. Our galaxy is disk shaped, and the sun is located at the rim of this disk. No one has ever counted the stars in the Milky Way. All we have is rough estimates. According to these figures, our sun has a hundred billion peers, many of them a hundred times more massive, and others smaller. The stars are not distributed equally in the galactic disk, but are concentrated in the so called arms, spiral like structures extending out from the center.

Our galaxy resembles a gigantic wagon wheel with spiral form spokes. *Therefore our galaxy and as well as the Andromeda galaxy are called a spiral galaxy.* The stars are not distributed homogeneously through out the sky, the reason for that is obvious. When we stand at the rim of the galaxy we are able either to look out into intergalactic space or look into the galaxy. In the first case, we see only those stars that are accidentally in the vicinity of the sun. In the latter case, we see the disk composed of almost a hundred billion stars, the ribbon of the Milky Way. If you happen to be looking at the Milky Way on a clear, moonless night, look toward the *constellation Sagittarius*. There you will find the center of our galaxy, a region of a vast number of stars, and a vast number of very old ones.

Compared to the distances we are used to on Earth, the vast distances between the stars in the galaxy defy the imagination. There is little point in

expressing astronomic distances in meters or kilometers. The unit of measurement we use is *the light-year*. Speed of light travels at 300,000 kilometers or 186,000 miles per second, (a distance roughly equivalent to the distance between the earth and the moon) in a vacuum and slower elsewhere. That's fixed, but as soon as light travels through a material, the interaction *between photons and the atoms of matter* around them slow the light down. In air, it's a bit slower than in space. We have to bear in mind that the speed of light isn't really constant. A message from mars at their average distance, takes four minutes to reach us. This is a lengthy delay that makes any real-time control near impossible. From the nearest star, other than our sun, any communication would take more than four years. And from the farthest reaches of the galaxy, it would be billions of years before a message could arrive.

The light of the sun takes 8 minutes to reach the earth. Thus the distance between the sun and the earth is 8 light-minutes. In one year light travels about 10,000,000,000,000 kilometers, an enormous distance and an ideal unit for measuring the distance between the sun and our neighboring stars. Thus it takes light about 10 years to travel from *Sirius*, one of the brightest stars in the sky, to Earth. *A light year is not a unit of time but of distance.* Everyone knows what is meant when the distance between two cities is given in driving time. An hour's driving time is not a unit of time but an indication of the distance a car will cover in an hour (80km). Astronomers use similar units of measurement, except that instead of a car, they use a far more rapid vehicle light. In the case of astronomical objects the time factor, the time it takes light to reach us, cannot be ignored.

When we are looking at a star, we are not seeing that star as it looks today but as it looked when it sent out the light we are receiving today. Thus the light from *Sirius* we are seeing now, in 2010, was emitted some years ago, during the papacy of Pope John Paul II. And it takes the light of the stars in the center of the Milky Way about 30,000 years to get down to us on earth. When that light began its long trek, people in Western Europe were still living in caves. When we look up into the Andromeda constellation, toward the faint glow of the Andromeda nebula, we are seeing light that left that galaxy almost 2 million years ago, at a time when the earth was still uninhabited by humans. The light of the new born stars from Andromeda, will not reach the earth for another 2 million years. About 2 million years ago, a star exploded in the Andromeda galaxy, near its center. It was what is now called a supernova explosion, a phenomenon in which vast quantities of electromagnetic radiation, much of it in the form of visible light, are sent out.

The light produced by this explosion took about 60,000 years to traverse the Andromeda galaxy, and almost 2 million years to travel across intergalactic space between the Andromeda galaxy and our own Milky Way systems. It reached the periphery of our galaxy sometime during the reign of *Ramses II*

of Egypt, and finally, on August 20, 1885, it arrived on Earth, where it was first seen by the astronomer *Ernst Hartwig*. The light or radio signals leaving our planet today will continue to travel through space for millions of years, and perhaps some day intelligent beings on some remote planet will observe them, at a time when both our solar system and civilization will no longer have ceased to exist. The advent of radio astronomy, which allowed us to examine the distribution of hydrogen in the Andromeda galaxy, figured significantly in the exploration of its internal structure. *We now know that our galaxy is very much like the Andromeda galaxy.* To hypothetical observers in outer space, our own galaxy and the Andromeda galaxy must look like twins.

Time before our Solar System

Scientists think that our solar system, and probably most others, began with the demise of a large *precursor star*, which itself may have had a family of planets. Our new solar system came into being in a spectacular death scene called *a supernova*. These dramatic, explosive exits are typical only of rather large stars, those about six to eight times the size of the sun. In its prime, such a star is capable of manufacturing not only light elements like carbon and oxygen, which are just a few fusion steps away from hydrogen and helium, which are also forged in our sun, but also elements massive as iron, nickel and chromium. In its supernova swan song, however, a large star completely outdoes itself with alchemical *pyrotechnics*. In a brilliant explosion that for a few weeks releases a million times as much energy as that produced by all the stars in an average galaxy like the Milky Way, a supernova event produces a panoply of new heavy elements, including lead, gold, uranium, and other metals that on Earth have shaped human history.

Many of the newly minted elements are ephemeral species, unstable isotope with short *half-lives*. These *isotopes* are simply variants of familiar elements, aluminum, for example, but their nuclear structure, with non standard numbers of neutrons, makes them prone to spontaneous breakdown or radioactive decay. These unstable progeny of the supernova will not themselves survive to become permanent parts of planets, but they will play a vital role in planetary construction. A supernova explosion is so forceful that most of the mass of the erstwhile star is ejected at supersonic velocities into space. The shock wave is powerful enough to squeeze clusters of carbon atoms into tiny diamond grains. For comparison, Earth is also in the diamond-making business, but our diamonds are assembled deep in the planet's interior, it takes the pressure of 100 miles of rock *ordinary carbon into a diamond*. In other words, a supernova is a very big blast, powerful enough to trigger processes that can form a new star and, if things go right, a brood of young planets.

Our solar system is probably a mixture of the spray from a supernova and older interstellar material that had been floating dreamily in space before

being jarred into motion by the violent death of *our progenitor star*. We know a surprising amount about the composition of this mix, the solar nebula, from a particular group of meteorites called *chondrites*, which represent the oldest accessible, unaltered material in the solar system. Earth itself does not remember this stage in its history, just as people have no memory of their conception of birth. Against great odds however, after eons of zinging through space, rare chunks of primitive solar nebula material have occasionally fallen to Earth. Against similar odds, some of these *meteoritic chunks* have been found by persons who recognized them as not merely extraordinary, but in fact extraterrestrial rocks.

Chondrites are named for the tiny spherical grains, called chondrules that give these meteorites a distinctive, pebbly structure very different from the interlocking igneous texture typical of other meteorites. *The chondrules and other constituents of the chondrites are older than the planets*, formed when the nebular star dust was still relatively homogeneous. This inference is based on the observation that the proportions of nongaseous elements in chondrites are virtually identical to the proportions of those elements in the sun, as inferred from detailed quantitative observations of the wavelengths of light the sun emits. The likelihood that such a match could occur by pure coincidence is comparable to the chance that two unrelated persons would have identical DNA. The most reasonable inference is that the chondrites and the sun both sampled the same mix before it started to separate into different components. *In a very literal sense, a chondrite meteorite is a piece of the sun.*

At the time that the chondrites were beginning to form, the solar nebula was still reeling from the supernova event. The gas dust mix began to swirl, flatten, and contract into a disk with a massive central lump that would become a sun. A fried egg cooked sunny side up is an apt mental image for the geometry of the nebula at this stage of its evolution. As the disk contracted, it rotated faster and faster, in accordance with the principle of conservation of *angular momentum*, a phenomenon explicated by Isaac Newton and exploited by figure skaters performing spins. The observation that most of the planets spin on their axes in the same direction that they orbit the sun, further supports the idea that the solar system formed from eddying whorls of primitive matter all rotating in the same direction. Everything changed when the amount of matter at the center of the disk reached the critical mass at which *nuclear fusion* could begin and our sun attained stardom. As the new star ignited, the major sorting process began, with temperature that is distance from the sun, as the organizing principle.

From a geologic perspective, the pace of events in this earliest chapter of the solar system is breathtaking. If we could peer back 4 or 5 million years into Earth's more recent past, the continents would lie in approximately their present positions and the flora and fauna would be nearly modern,

although a certain lineage of bipedal apes would be living only in small enclaves in east Africa. So to go from the death throes of one star to the creation of another in the same amount of time is astounding. Only the chondrites, which opted out of planet-hood, remember those giddy days when the solar system was young. The next step in planetary construction was to sweep the chemically sorted materials of the planetary disk into clumps. The sweeping process was a self-initiating and self-perpetuating dance.

The chondrule-like grains of condensed nebular matter, still pirouetting at manic speed around the photo-planetary dance floor, began to stick together. As soon as many clusters formed, the gravitational pull of these objects attracted still more material, creating objects with still larger gravitational fields. Ultimately however, gravitational tidying-up won out over the destructive acts of rogue rocks, and the inner solar system became a safe place for young planets. We probably have Jupiter to thank for this its massive gravity field efficiently cleared the area near the sun of dangerous space junk. *Even today, Jupiter vigilantly holds sixteen moons and thousands of asteroids in gravitational check.* Some astronomers and ex-biologists argue that a Jupiter sized body, and it would almost have to be a gas giant, based on the universal scarcity of elements needed to build rocky planets, is a prerequisite for life on neighboring planets, since without such a body to act as a gravitational sweeper, an inner planet would be subject to constant, debilitating impacts. Earth had a huge near fatal crash in its history with an enormous body.

The current theory for the origin of the moon is that just when the early Earth had finished separating into *core and mantle*, the planet was struck in a glancing collision by a Mars-sized planet that was at a similar point in its development. The core of the colliding moon was largely subsumed into to the Earth's mantle, was sprayed into space just far enough that the molten matter coalesced again into a satellite rather than form a planetary ring. Yet again, we see how Earth's path to planet-hood involved cycles of mixing and sorting. This rather alarming scenario for the birth of the moon, while impossible to prove, is consistent with many puzzling characteristics of the moon and is embraced by most planetary scientists as the best available working hypothesis.

Black Holes

A black hole is the *ultimate warpage*, according to Einstein's equations: it is made wholly and solely from that warpage. Its enormous warpage is produced by an enormous amount of highly compacted energy; energy that resides not in matter but in the warpage itself. *Warpage begets warpage without the aid of matter. That is the essence of a black hole.* What is warpage? When spacetime is not flat, there is a way of quantifying how curved it is. In the case of a two-dimensional surface, curvature is quantified

with two numbers, the maximum and minimum radii of curvature of the surface. The smaller these radii are, the more curved the surface is. The details are more complicated for higher dimensions, but the general picture of quantification remains valid. In discussing the future of gravitational wave astronomy, Kip Thorne uses “warpage” to refer to the general magnitude of curvature in the highly curved space-time just outside a black hole, a region that can be probed with gravitational waves. Consider a simple analogy. Take a rubber sheet 10 feet long and 10 feet wide. Stretch it out between the tops of four high poles and then, place a heavy rock at its center. The rock will bend the rubber downward.

This example is a rather accurate depiction of a black hole. Besides the bending of space and the slowing and down-flow of time, there is a third aspect of a black hole’s space-time warpage: a tornado-like whirl of space and time around and around the black hole’s horizon. Just as the whirl of air is very slow far from a *tornado’s core*, so the whirl of space-time is very slow far from the black hole’s horizon. Closer to the core or horizon, the whirl is faster. And near the *event horizon*, the whirl of space-time is so fast and strong that it drags all objects that venture there into a whirling orbital motion. No matter how hard a spaceship may blast its engines, once near the horizon it cannot resist the whirl. It is dragged, by the forward flow of time, around and around inexorably; and once inside the horizon, it is also dragged downward by the forward by the forward flow of time, toward the gaping singularity at the black hole’s core. The whirl of space-time around a black hole was discovered in 1963, by Roy Kerr, a mathematical physicist from Christchurch, New Zealand.

Black holes are the monsters of the galaxies. We go about our lives unaware that in the depths of space lurk invisible monsters; destroyers powerful enough to tear apart our sun; and leave our earth a shattered, burned out ruin. We are about to enter the world of the *universe’s ultimate killer*. We will be there when the monster is created; in the heart of a dying star. We will search for its telltale signs in the darkness of deep space. This is the story of the power that may one day destroy us all; the black hole. There’s an old saying; what goes up must come down. Thing is, it’s not always true. If you throw something hard enough it might never come down. If something goes up fast enough it can escape the earth altogether. Faster still, and it can escape the immense pull of our sun, the force that holds the planets in place. In fact, travel fast enough, and you can even escape the pull of the billions of stars that make up our galaxy; the Milky Way.

But, black hole’s pull is so powerful you can never escape, no matter how fast you go, not even if you travel at the speed of light. It can tear apart a star that has strayed too close; anything that comes near is destroyed. It’s hard to believe anything is powerful enough to destroy a planet or a star, but it’s true. On this scale, our earth would be no bigger than a pebble. We

wouldn't stand a chance. The shocking thing is how small the black hole is. The black hole itself is right at the center of the disc. It's tiny. It is a million times smaller than the star. But imagine what it can do? What is about a black hole that makes it so powerful? *The answer is gravity.* It's the force that keeps us all stuck to the surface of our planet. If something is heavy enough, it pulls you towards it. And planet earth is heavy; so heavy, in fact, that to get off it, you have to use rockets. All of this, just to escape from our tiny globe. And if earth's gravity seems strong, imagine the pull of the sun. Our sun is a million kilometers across. This is the real heavyweight of the solar system. But if you think our sun is big, think again.

There are stars that are thousand times bigger than our own sun. Their gravity is mind-boggling. But compared to a black hole, even this star is a weakling. A black hole weighs as much as a massive star, but it's crammed into an area smaller than a pea. *A black hole is gravity gone mad.* Nothing can ever escape. What could create such a monster, something so heavy and yet unimaginably small? An event powerful enough to create a black hole should be visible right across the universe. And recently, we might actually have witnessed one as it happened. A team in Australia, headed by Professor Brian Boyle, that spotted it. The first clue that led to his discovery came in the form of radiation; *gamma rays, that are invisible to the human eye.* The night sky that we can see with our own eyes is only part of the picture. Light comes to us in many different forms, from low-energy radio waves to the highest energy form of light; the gamma rays, the form of light that packs the biggest punch. Every night, in the gamma ray sky, is fireworks night. We've been detecting violent bursts of gamma rays for decades, but we've never actually seen what causes them. It has to be a violent event, but what kind? The problem is gamma ray bursts only last a few seconds. And to make things harder, the best way to detect them is from space.

During the routine observation, the Gamma Ray Observatory detected an enormous blast of energy going off in deep space. What had triggered it? Brian Boyle's team, guided by the space observatory, turned their ground based optical telescopes on to the blast in the hope of seeing it before it faded. What they found that they never expected; that this light was actually coming from a supernova. What they'd seen with their telescope was an exploding star. But explosion was far larger than anyone had ever witnessed before. And in the heart of that cataclysmic explosion, the researchers realized that something astonishing and terrifying had happened. *As the massive star died, a monster had been born. What they witnessed was the birth of a black hole. What Boyle's team had seen was the death of a star so heavy, that when it exploded, its mass collapsed inwards instead of blasting outwards into space.* This star is absolutely huge. It's hundred times bigger than our sun and thousands of times brighter. But it doesn't just explode. As its surface layer blasts upwards, its core is smashed inwards.

The center of the star collapses in on itself, billions and billions of tones of star stuff crushed smaller and smaller, until the whole star is squeezed to a single microscopic point. And from the remains of the dying star, a black hole is born.

In our galaxy, a massive star explodes and creates a new black hole every 1,000 years, which may not sound like a lot, until you remember that the galaxy has been here a very long time. Speeding up its history, you can see that stars have been going off like firecrackers. *And when a black hole is born, it never dies. Every black hole that was ever created is still out there, so there should be around ten million of them, somewhere.* The question is where? Until recently, black holes remained unseen in the depths of space. But something as deadly as a black hole, can't remain hidden forever. Like most predators, they leave a trail of destruction. And scientists are now beginning to recognize these telltale signs. Even though black holes are dark and invisible, it doesn't mean they have no effects. They're extremely strong vortices and pull matter in these swirling winds around them, a lot like *a tornado*. And just like a tornado, you might not see it until the debris gets sucked up. Suddenly you can see the presence of this *vortex*, this strong swirling wind. It isn't the wind of a tornado you see; it's the havoc it creates. That's how we detect black holes; by the damage they do.

Tornados are incredibly powerful, but we don't see them until they suck stuff into them, until you see them pulling up houses and cars, and gas and smoke and clouds. It's the same with black holes. You don't see them until they pull in the matter around them. This is what astronomers look for; not the black hole itself, but stars caught in the black hole's incredible gravitational pull. They can tear apart a star which comes close. A feeding black hole is anything but black. The whole star is wrenched out of shape as the monster tugs at it. Gas, from the star, whirls around the hole. It forms a super hot disc of star debris, 100,000 km across. It's a deadly embrace that will last millions of years. And what the black hole can't swallow, it belches out. Huge jets of uneaten star are spat out into space. Some of the spectacular black holes we've seen are so powerful and spinning so rapidly that they create these huge jets, these powerful funnels of material. They're thin but incredibly long, incredibly vast. And the jets themselves can cross an entire galaxy. They're absolutely huge. The damage of black hole inflicts on a star can be seen clear across the universe. I don't want to see a black hole.

Matter – Choreographer of Cosmic Dance

The basic premise is most of physics is that elementary particles constitute the building blocks of matter. Peel away the layers, and inside you will always ultimately find elementary particles. Particle physicists study a universe in which these objects are the smallest elements. It might be difficult to believe that everything is composed of particles; they certainly are not evident to

the naked eye. Elementary particles are the elementary building blocks of matter. Just as the images on your computer or TV are composed of tiny dots, even though they present images that appear to be continuous, matter is composed of atoms, which are in turn composed of elementary particles. Physical objects around us appear to be continuous and uniform, but in reality they are not. *We know that all matter is made up of atoms, which combine through chemical processes into molecules.* Atoms are very small, about an angstrom, or one-hundredth of a millionth of a centimeter in size. But atoms are not fundamental; they consist of a central, positively charged nucleus which is surrounded by negatively charged electrons. The proton and neutron contain substructure, more fundamental ingredients known as quarks. The proton contains two up quarks and one down quark, while the neutron contains two down quarks and one up quark. These quarks are bound together through a nuclear force known as the strong force. The electron cannot be divided into smaller particles and contains no substructure within.

The Nobel Prize-winning physicist Stephen Weinberg coined the term “*Standard Model*” to label the well-established particle physics theory that describes the interactions of these fundamental building blocks of matter. The Standard Model also describes three of the four forces through which the elementary particles interact: electromagnetism, the weak force, and the strong force. (It usually omits gravity). When studying elementary particles, gravity is important only in certain extensions of the Standard Model. Those weak and strong forces act on fundamental particles and are important for nuclear processes. They permit quarks to bind together and nuclei to decay. *Matter comes in four states; solids, liquids, gases and plasma.* In the beginning there was nothing, neither time, nor space, neither stars, nor planets, neither rocks, nor plants, neither animals nor human beings. Everything came out of void. It all began with space and time and the very hot plasma composed of quarks, electrons, and their particles. This plasma cooled off rapidly, protons, neutrons, atomic particles, atoms, stars, galaxies, and planets formed. Finally life sprang up in many solar systems of the Universe, in one case, on a planet of a most ordinary star, situated on a spiral arm of a galaxy, at the rim of a large cluster of galaxies.

There, in the course of 4.5 billion years, plants and animals, eventually human beings, developed out of the simple organisms. Originally human beings thought that they stood in the center of the Universe that the *world was made for them alone.* They invented gods and divine schemes, that they believed, governed the world. The world of human beings was small. The firmament enveloped the world like a protective skin. Five hundred years ago, about 15 billion years after the birth of the Universe, after the big bang, we human beings began a systematic exploration of our environment and ourselves. Toward the beginning of the millennium, we began to see the

diversity of the world can indeed be explained. *All matter in the Universe, including ourselves, is composed of two types of minute building blocks, quarks and the particles of the atomic shell, electrons.* We have come to understand, that we are not the center of the Universe, that we merely live inside a rather unremarkable galaxy. We still not made contact with other inhabitants of the Universe in other solar systems, but we sense that *we may not be alone.* We have also learned that we are the product of a complex yet rationally comprehensible process of development, determined by both history and the interplay of chance and necessity. We have come to realize that we alone are responsible for our fate. We have begun to sense that the Universe does not hold all the answers to questions about meaning of life that it is up to us to find the answers.

The beginning of the third millennium is ushering in what may well be the most important period of human civilization. We have begun to realize that the meaning of our existence lies *“in our very living,”* and in our constant search for the answers to questions for which no universally valid answers exist. Our civilization dates back tens of thousands of years, but only comparatively recently, within the last few hundred years, have scientists, along with the engineers and technicians, embarked on a systematic study of nature and the natural processes that occur in it. The application of their findings has brought about profound changes in all our lives. Modern physics, astrophysics, chemistry, and biology offer us deep insights into the structure of the universe. In recent years physicists, and astrophysicists in particular, with the help of gigantic accelerators and telescopes, Hubble telescope in particular, have gained understanding of the process that took place some 15 billion years ago, at the birth of our Cosmos. *Yet only few among them realized, that something remarkable is taking place today, namely that we are in the process of developing a unified picture of the entire Universe.*

We now know far more about the development of the universe, including the origin of life, than would have been thought possible only yesterday. There is no denying that the great strides in science and technology have brought unprecedented material well being to many. New insights into the structure of matter and the universe gained by elementary particle physics and astrophysics in particular indicate that the structure of the cosmos is in fact quite simple. *A comprehensive view of the universe lies within the realm of the possible.* Five hundred years ago, a map of the world showing all the oceans and continents was heralded as a major accomplishment. Now, thanks to modern science, we can draw a map of the entire Universe. Like the first maps of the world in the days of *Christopher Columbus*, this one is, of course very rough and not without flaws. Continents may still be missing. But the fact, that we are able to draw such a map at all is remarkable and is certain to bear on the future. Today the entire cosmos lies before us.

The fogs that enshrouded it are lifting. Like hikers climbing the mountain early in the morning, we now for the first time are able to see exactly where we stand. Where we are, and why? Are we on a journey from nowhere to nowhere or does the universe hold out a meaning?

One thing, however, is certain, even if we succeed in solving all the riddles of nature we will not have touched on the human problems. Who sets the values without which life would have no meaning? Does religion still make sense in the face of a science, which is able to explain the creation without divine intercession, or is it all God's work? One of the most significant contributions of modern science is the realization that each one of us, enmeshed in the web of natural processes, matters. *We are a part of a whole, not separate from the rest of the Universe.* At the same time, we are the product of a long history, and also the makers of history. It is my belief that this awareness should fill us not only with modesty but also with pride and self-understanding, and that, armed with the awareness we will better be able to develop the values essential to our society. Most people, on hearing the words "science and technology," think of more or less boring lectures in school. We still tend to think of physics as a science of dealing with falling or rolling balls, with electricity and steam engines.

Almost no one in school learns that modern physics, be in quantum mechanics, elementary particle physics, astrophysics or biophysics, is in the process of transmitting to us a new view of the world, and that the survival of life on this planet probably depends on an understanding of this world view. The bold idea of modern times since *Newton* lay in the vision that we could learn to understand the cosmos through thought and the active observation and exploration of nature. The assumption has proved correct, and the past fifty years have seen a significant evolution of thought. Today, many problems that once were considered the *domain of religion or philosophy* are being answered, or at least investigated, by modern science. Modern physics examines the structure of matter at minute distance, which is more than a billion times as small as the diameter of an atom. Astronomers and astrophysicists penetrate more and more deeply into the universe and may perhaps have advanced to the limits, to the boundaries of space and time.

Questions about the structure of the universe, about the origin of matter, about the beginning and the possible end of the world, *today are not only questions of religion but also of science.* Modern biology, biochemistry, and biophysics are concerned with the question of the origin of life, and thus ultimately with the problem of our own origin. Sentient human beings have been asking questions about our origins, about the purpose and meaning of life, since time immemorial. They have sought to find answers in legends, in myths of creation. Every culture created its own myths. Thus all the stories of creation, deal with the Earth, the heavens, and mankind. Since all these myths of creation were thought up by the people with very limited views of

the processes of nature, that is not surprising. Seen from today's perspective, these myths explain too little. The picture of the world they present mirrors the ideas of the creators of these legends, but it has nothing to do with scientific reality.

The picture of the origin of the world that modern science has given us differs substantially from the myths of creation. Our universe is not only much larger than these myths assumed it is also far more dynamic; *the universe is full of movement, activity*. The seeming constancy of the stars in the sky is often linked to stability, permanence. Philosophers such as Aristotle saw this as proof of the eternity of the cosmos, which stood in contrast to the everyday existence of human beings, to the hectic activity and constant changes in our lives. Science found out that this is static, eternal cosmos does not exist, never has existed, and never will exist. Like life on our planet, the universe too is full of activity, subject to constant changes. The stars too are not there for eternity, but will disappear some day. New stars are constantly being formed in the universe out of gas and dust clouds, and some end their life in a gigantic explosion. Some among us may be disappointed to learn that the night sky, that symbol of eternity and stability, was not created for all eternity, that it is only a part of the universe's long evolutionary process of development. *I find this new, important insight very satisfying, for it demonstrates that our own existence does not stand in contradiction to the world of stars and galaxies. Just like the galaxies, stars, and planets, we ourselves are part of the process of Cosmo-genesis.*

Human beings behaved like little children who believe that the world is created solely for them. In the course of the past hundred years scientific progress and technological development have produced gradual and mostly unnoticed changes in our thinking. In the past most people had a very simple concept of the world, in its center stood the Earth and mankind. The fate of the world lay in the hands of God who resided nearby and was intimately concerned with the problems of every individual. We have had to relinquish this simplistic picture of the world. We no longer stand in its center. Scientific research has taught us that we are living at the edge of our galaxy, one among more than a hundred billion galaxies in the universe. All matter, ourselves, included as modern physics has shown us, consists of three elementary building blocks, *two quarks and the electron*. But even these objects had not been created for eternity. Either the quarks, and with them all atomic nuclei, will disappear in the course of time, or the cosmos will end its life in a gigantic implosion, a reverse of the big bang.

Life on Earth, modern biology tells us, developed spontaneously, through the constant *interplay of chance and necessity*. We ourselves are the result of an immense chain of chance developments and events in the dawn of history. We are the result of that history, but we, all of us, are simultaneously

the makers of history, enmeshed as we are in the constant stream of events. The world is an entity, and we ourselves are a minute part of this entity. I see the emerging new view of the world beginning to take shape on the horizon somewhat like this: after centuries of scientific research the fog is beginning to lift. Contours are becoming visible, the entire cosmos lies spread out before us. Many details are still unclear, but today, as we are exploring, we have enough reason to believe that we understand the essential features of our universe. *As Victor Weisskopf says, "nature, in the form of man, begins to recognize itself."* Insight and wisdom can assure us that we are on the right path. Without such confidence, we cannot long survive on Earth.

The story of matter is nearly as old as the Universe itself. In the period just before *Nucleo-synthesis*, a period that began about a millionth of a second after the big bang and lasted for a few seconds, the universe was filled with protons and neutrons that they were moving so fast that they could not stick together. These particles, relatively heavy for subatomic particles, are known as "*baryons*" (*In Greek baryon means heavy, leptos means small, mesos means middle*). Almost all the matter we encounter in everyday life, the stuff that makes up objects on Earth, is mostly *baryonic*, because it is pretty much made up of protons and neutrons, (the light electrons contribute very little to the overall mass of stuff on Earth). A few seconds after the big bang, the universe cooled enough so that the protons and neutrons could stick to one another. *Nucleo-synthesis* began, some of the protons and neutrons collided and stuck together, forming elements heavier than hydrogen, such as helium.

The nucleus of every atom is made up of protons and neutrons, though the nucleus of the simplest atom, hydrogen, is a proton all by itself. *The proton is extremely stable, so it can sit by itself for all eternity without breaking apart.* The neutron, on the other hand, is not nearly as stable. Left to its own devices, it will decay in about fifteen minutes, turning itself into a slightly lighter proton and spitting out an electron. If neutrons created shortly after the big bang had not occasionally slammed into a wayward proton or two, there would be no neutrons at all the baryons in the universe would be protons. Consequently, all the baryonic matter created in the moments after the big bang, *the "primordial" baryonic matter, would be hydrogen.* But this is not the case. About 25 percent of the primordial baryonic matter in the universe seems to be helium. *Nucleo-synthesis* saved neutrons from extinction. When a neutron smacked into a proton, the two stuck together, forming a heavier nucleus, *deuterium*.

Though deuterium is rather fragile, unlike a lone neutron it does not spontaneously decay. Because deuterium is stable, *some of the deuterium formed in the era of Nucleo-synthesis is still around today.* Thus, there was deuterium in the primordial baryonic matter as well as hydrogen, but the story of *Nucleo-synthesis* does not end there. Elements like helium 3

and helium 4 and many other elements were created in the era of Nucleo-synthesis, the time when the universe was hot and dense enough to sustain fusion. But a few minutes after the big bang, the universe expanded and cooled and the furnace shut down. *The era of big bang Nucleo-synthesis is over. The primordial baryonic matter in the Universe was fixed forever.* Most of it, about 75 percent, was hydrogen, almost all the rest was helium, with a few other trace elements. Baryonic matter is the ordinary matter that we're all used to, stuff of atoms, stars, and galaxies, the stuff that shines brightly, is all baryonic matter.

There is also unseen matter in the Universe. Scientists call it as "*dark matter.*" The idea that most matter in the universe is dark, that is, invisible to telescopes, is naturally a disturbing one. How can you spot an invisible object? Yet scientists have seen it. To find dark matter, instead of looking for it directly, they look for what it does. They look for its gravitational attraction, the mutual pull between two objects that have mass. Physicists have understood gravity pretty well since the seventeenth century. In 1687, Isaac Newton's magnum opus, *the "principia"*, described the law of universal gravitation. Beginning of the twentieth century, Einstein's theory of relativity extended Newton's theory. They work beautifully for our solar system. If you know the mass and position of the objects in the solar system, you can calculate the direction and the strength of the pull of gravity on any given object, and how it will move.

The Earth is about 93 million miles from the sun, so that tells us how strongly the sun *pulls on the Earth, and how fast it must move in its orbit around the sun, about 20 miles a second, perfectly in accord with observation.* Jupiter, at a much more distant 483 million miles from the sun, feels less pull and orbits the sun at only about 8 miles a second. Neptune, at more than 3 billion miles from the center of solar system, feels less pull still pokes along at a mere 4 miles per second, taking nearly 165 years to complete one orbit around the sun. The farther away an object is from the sun, the less pull it feels. The less pull it feels, the slower it moves around the center of the solar system. *Cosmologists and astronomers are forced to accept the existence of some form of invisible matter to help hold galaxies and galaxy clusters together.* As distasteful as it might be to believe in something that is invisible and, so far, undetectable, it is the best alternative.

Our own galaxy, as well as Andromeda and nearby galaxies, *is part of the Virgo super-cluster*, so named because the center of the group is located in the direction of the constellation Virgo. All the matter in the universe, *all the matter that scientists have encountered, anyhow, is made up either of quarks or of leptons.* The exotic matter in the universe cannot be made up of quarks, so we must turn our attention to the leptons to solve the mystery of the missing matter. However the three leptons we have met so far cannot

account for all the exotic matter in the universe. *Muons and tau* particles are unstable, the muon decays in a millionth of a second, the tau is less than a trillionth of a second, so they can't hang around long enough to account for much of the missing matter. Even the electron, as stable as it is, cannot account for that much of the exotic matter, the charge it carries would give it away if it were floating about in space, and scientists have no indication that an enormous number of unbound electrons are zooming about the universe.

By the process of elimination, suspicion naturally falls upon the three remaining leptons, the neutrinos. But neutrinos are, by far, the most misunderstood and elusive of all the particles in the menagerie. Until few years ago, nobody knew how much the neutrino weighed, or even if they weighed anything at all. The neutrino was almost undetectable, so scientists could not measure even its most basic properties. Nobody knew whether the neutrinos had mass or whether they traveled at the speed of light. In the past few years, the fog that surrounds the neutrinos has fully begun to clear. Scientists are weighing the neutrino and cataloging its properties. Neutrino astronomers are even using them to analyze objects in the sky, just as ordinary astronomers use *particles of light, photons*, to do the same thing.

The age of the neutrino has arrived. With its arrival, cosmologists are finally beginning to learn about the mysterious exotic substance that, totaled up, outweighs the baryonic matter in the universe as dramatically as an automobile outweighs a person. *The first half of the story of mass had to do with quarks and gluons, the creatures of the strong force. The second half of this story switches from quarks to leptons and from the strong force to the weak force.* These are the final components in the standard model, the overarching theory that guides scientists in their quest to understand the matter in the universe, and where all the missing matter is. Before cosmologists can understand the vastness of the universe, the particle physicists must teach them what cosmos consists of. *Right now, the hottest topic in particle physics is neutrino.* If you accept the existence of dark matter, then it makes perfect sense that the astronomers who counted galaxies came up short when trying to estimate the mass of the universe. After all, when you count all the visible galaxies, by definition you are only counting what you see. If there is a significant proportion of *dark matter* in the universe, as the galaxy rotation curves lead scientists to believe, then the galaxy counting method will vastly underestimate the amount of baryonic matter in the universe. *About one tenth of the baryonic matter in the universe shines with a light that we can see, and nine tenth is dark matter. It all fits together.*

The Living Universe

Many ancient cultures believed that the universe was a living organism. Aristotle, who had a deep interest in biology, was impressed by the way that

living things seem to be motivated by purpose, their actions forming part of a plan directed toward some predetermined goal. When we see a bird building a nest, for example, it is clear that its behavior is related to the concept of laying eggs and caring for its young. Whether the bird has any conscious awareness of what it is doing is more contentious, but its activities are certainly not random, and can be properly explained only by taking into account the end product. *It is tempting to generalize from the biological realm and to bestow a purpose on all of nature.* The idea of matter, being an active agent rather than an entity that is, passively pushed and pulled by blind forces appeals to something, deep in our makeup.

According to Aristotle, the entire universe resembles a gigantic organism, and is directed toward some final cosmic goal. *The idea that physical processes can be determined by, or drawn toward, a predetermined end state is known as teleology.* With the rise of modern science and in particular the Newtonian mechanistic paradigm, teleology was abandoned and replaced by the concept of the cosmic clockwork. And yet, in these supposedly mechanistic and rational times, one of the few ideas to emerge from science and reach out to strike a chord with a wide cross section of ordinary people in recent decades has been *the concept Gaia*, the hypothesis that the Earth itself may, in some sense, be regarded as a single living organism.

According to the mechanistic point of view, living organisms are just machines, albeit complicated and wonderful machines. The evolution of life on Earth is likewise seen as a mechanistic affair, but a creative element is introduced through the random variations. Most biologists accept that random mutations and natural selection alone can satisfactorily account for the form of all living organisms, once life had got started. The origin of life is regarded as just one step along the path of the progressive complexity and organization of matter. If matter and energy possess an innate tendency to self-organize, then one would expect to find life arising again and again, given the right conditions. In that case we might expect there to exist other planets with life and possibly even intelligent beings. The discovery of life elsewhere in the universe would thus lend powerful support to the *post-mechanistic paradigm*, that it could be shown that the “alien” life had indeed arisen independently. Recently, advances in space technology have permitted the first rudimentary systematic *search for extraterrestrial life*. The issues involved are fundamental in shaping our perspective of ourselves and our place in the natural world, as well as having a direct bearing on the need for a new paradigm. But before we can begin to search for extraterrestrial life, we must have a clear idea of exactly what we are looking for. What, in fact, is life?

We have no difficulty in recognizing life when we encounter it on Earth. Men, mice, mushrooms and microbes are all undeniably living. Yet what essential features do these systems display in common? Frequently cited

properties of life are the ability to reproduce, response to external stimuli, and growth (*consumption, reproduction and adaption*). *Most of the life is found in the biosphere*. It is doubtful if any particular organism could survive in isolation on Earth; only the total intricate network is viable. *This brings us, by a different route, to the controversial concept of the various forms of life on Earth as components of one living organism, which is the basis of the Gaia hypothesis*. Jim Lovelock has pioneered the idea, which has stirred fierce debate among biologists and ecologists, but has become very fashionable in some quarters, often with embellishments that Lovelock himself disowns. We do not have space to digress into a detailed discussion of that debate here, but we do wish to point out that the concept of Gaia fits naturally into the *new paradigm of self-organizational complexity*. Not only that. If the living forms on Earth are seen as components of a single more complex system, whether it be called “the biosphere” or “Gaia,” it is reasonable to conjecture that during the long future evolution of the universe the growth of complexity may develop to embrace not just individual planets but entire star systems and ultimately, if there is time enough, whole galaxies, in a living cosmic web of interdependence.

But all that lies in the very far future; we are more concerned at present with the past, the other end of the chain. How did life on Earth begin? Since Darwin, biological thinking has been dominated by the concept of gradual evolution. From the fossil record one may infer that the present condition of the Earth’s biosphere is the product of an immense number of successive steps toward ever greater complexity, adaption and sophistication. For example, 500 million years ago there were no living things on the land. The oldest rocks of all, dating from around 3.8 billion years in the past, contain traces of only the most elementary microscopic life forms. Given this progression from simplicity to complexity, together with the existence of viruses that seem to bridge the gap between the living and the nonliving, it is tempting to conjecture that the origin of life on Earth was simply another step in a general evolutionary sequence, part of the pattern of cosmic self-organization. So can living matter be created unaided out of inanimate chemicals?

A realistic attempt to investigate the generation of life on Earth was carried out by *Stanley Miller and Harold Urey* at the University of Chicago in 1953, in an experiment that is now regarded as a classic of its kind. Miller and Urey hit upon the idea that if the conditions believed to have prevailed on the primeval Earth were reproduced in the laboratory, the first steps toward the chemical synthesis of living material might be induced to recur. In accordance with current ideas of the time, they filled a flask with *methane, hydrogen, ammonia and water*; thought to represent the composition of the Earth’s atmosphere in the remote past. The experiment, which lasted several days, involved passing an electric spark through the chemical mixture,

simulating the energy input from thunderstorms in the atmosphere of the primitive Earth. The liquid slowly turned red, and when it was analyzed it was found to contain substantial quantities of organic molecules known as “*amino acids*.”

Amino acids are not living molecules themselves, but they are the building blocks of proteins, which are essential components of living things on Earth. Inside the cells of your body, coded messages in *the DNA (deoxyribonucleic acid) are translated by RNA (ribonucleic acid)* into working molecules of protein, which carry out the functions of life. *All Earth life is ultimately dependent on these two groups of chemicals, nucleic acids and proteins.* Both are made mainly from carbon, hydrogen and oxygen, together with small quantities of other elements such as sulfur and phosphorus. Proteins are built out of about twenty different types of amino acids in different combinations. Proteins have a dual role, as structural elements and as catalysts known as *enzymes* that gradually enhance the rate of crucial chemical processes. Without enzymes, life would simply grind to a halt.

Nucleic acids are responsible for storing and transmitting all the information required to build the organism and make it function; *the genetic code*. The code includes instructions for the manufacture of specific enzymes and specific structural proteins. One type of nucleic acid, *DNA* takes the form of the now familiar long-chain molecules wound into a double helix. *The double helix is where the information needed to replicate and operate the organism is encoded.* Was this how life began on Earth? That is what many scientists claim. If they are correct, then it seems that the spontaneous generation of life from simple inanimate chemicals occurs far more easily than its stunning complexity would suggest. It seems that no sooner did the Earth become habitable, than primitive life appeared. To some scientists this promptness has suggested that life is an automatic and inevitable consequence of appropriate physical conditions. If they are right, then it is clear that, far from being miraculous, life is a rather *common feature throughout the universe*.

The Earth, at four and half billion years old, is only about one third of the age of the Galaxy, and it has taken about 4 billion years the Earth life to evolve from primitive microorganisms to our modern technological society. If life developed this rapidly on the planets that formed early in the history of the Galaxy, there could have been technological communities well established before the Earth even existed. The capabilities of a technology that has lasted for thousands of years, let alone millions, or even thousands of millions of years are incalculable. A little matter like signaling every star system in the Galaxy might well be trivial for such an advanced civilization.

Staying Alive-Life is a Jeopardy

If you're a gambler, this is the planet to live on, because just by being here we're all taking a risk. And the odds are stacked against us. We human

beings are lucky to be here, because the universe keeps trying to wipe us out, trying and failing. We've survived every disaster the universe has ever thrown at us; so far. But our run of luck won't last forever. When it ends, our planet and *our entire species will cease to exist*, unless we can do something about it. Could our whole planet really be in danger? What could threaten a globe 13,000 km across, or 6.5 billion people? The planet Earth, billions of years ago, at the very beginning of its life was under attack, by asteroids, rocks left over from the creation of the planets themselves. Some of them were vast, and one of them was on a collision course with Earth. This collision nearly smashed our Earth to pieces. We were hit by a ball of molten rock the size of Mars traveling at colossal speed. The impact ripped huge chunks out of our planet. Somehow it survived. *Later it came to be known as moon*. Smaller chunks of rock are still flying around our solar system today. We call them asteroids, and they could put an end to human civilization.

Asteroids range in size from pebbles to mountains or even bigger and they're dangerous. They're flying around at incredible speeds. To get an idea of the damage they can do, just take a trip to the moon. In 1969, the first time ever, human beings walked on the surface of another world; the moon, and what a world it was; airless, barren, hostile, and bearing the disturbing evidence of a terrifying threat. The moon is scarred with craters, the marks of countless asteroids that have slammed into it. The moon is under attack, and traveling through space, alongside the moon, is another planet, the one we call home. So why aren't we taking the same pounding? There's a simple answer to that; we're. Some 49000 years ago Earth was hit by an asteroid. It's almost 1.2 kilometers in diameter. It's almost 200 meters deep. It was caused by an asteroid about 40 meters in diameter. It came in with a velocity of about 25km/second, and it exploded with the force of a 15 megaton hydrogen bomb. *This is Meteor crater in Arizona*. Geologist Jeff Wynn thinks what happened here could happen again soon. Geologists are discovering more and more evidence of asteroid impacts here on Earth. Meteor craters would be hard to miss. The Earth is being pounded all the time.

Siberia, 1908, an entire forest was flattened. There was an impact in Saudi Arabia in 1933. Amazingly no one was hurt. But even if an asteroid doesn't hit us it could do something even more dangerous. It could hit the sea. If an asteroid smashes into the ocean, it could create a huge deadly wave that could wipe out entire cities. All cities could be obliterated from space. There are things out there which could wipe all life from the face of the planet. Space contains dangers that make asteroids seem utterly insignificant. Our telescopes have captured images of truly colossal disasters. We would never survive near a supernova explosion or near a black hole. Luck plays a big role in the existence of life on the planet Earth. We have to

realize that the galaxy is a very violent place. If we get unlucky, that could put an end to complex life on the planet. Here's the problem. We don't notice it, but planet Earth is on the move. While we get on with our lives the world is *hurtling around our galaxy at 230 kilometers a second*. And high speed means high risk; some you win some you lose. We may not realize it, but we're on the ride of our lives.

Think of the Earth's orbit as a kind of cosmic roller-coaster ride. As we move in this orbit we're moving past gas clouds. We can come close to a black hole. We can get close to stars. We can come close to supernova explosions. Any of these objects could cause catastrophes on the earth. Life on Earth has been all but eradicated on 20 separate occasions, and to make matters worse, it's going to happen again. After all, remember what happened to the dinosaurs. Flying through space is a dangerous business. It's not just we're moving, it's where we're going. Planet Earth regularly flies through some of the most dangerous areas of the galaxy. We go around the galaxy about every 250 million years. But also we go through the densest part of the galaxy every 30 million years. That's the dangerous zone.

Every 30 million years, planet Earth travels through a region heavily packed with stars. And it so happens that it's every 30 million years or so that life on Earth comes close to being wiped out. Our galaxy is composed of a huge flat pancake of 400,000 million stars, all whirling around. There are some areas where the stars are most tightly packed. These are the danger zones. When our sun goes around these bright stars, it doesn't just go round and round the galaxy. *It also goes up and down*. And where the sun goes, the Earth goes. So, regular as clockwork, we plunge through the danger zone. And every time we do so, the odds are stacked against us. Here's how it works. As our sun bobs up and down through the galaxy, we're passing them by the million. And where the stars are densest, the danger is greatest. The reason those other stars are dangerous is the powerful effect of their gravity on our solar system. Fly outwards from the sun, away from the Earth and the other planets, and eventually you encounter these chunks of ice, trillions of them, a vast cloud in space. If another star comes too close, its gravity disturbs the cloud, and catapults ice chunks in towards the sun.

More than ten km across, traveling at 40 km a second, it begins its million year journey into the heart of our solar system. We know these huge snowballs by another name; *the comet*. As it plunges towards the sun, it warms up and belches out a haze of gas and dust. An immense cloud trails through space behind it; the comet's tail. But this comet doesn't hit the sun. It skims round it and out. It drifts past Mercury, and the planet's gravity swings it onto a new path. Finally it shoots past the moon and on to a collision course with Earth. This is what happened to the dinosaurs 65 million years ago. How much time we've got? So far we've been lucky. If you look at the history of life on Earth, the average lifetime of a species is just a few million

years. Human beings have been around for a million years. It doesn't bode well for the future of the existence of human beings on the Earth. We last passed through the danger zone one million years ago. But that doesn't mean we're safe yet. Because, a million years is how long, it takes for comets to enter our solar system. And in July 1994, one smashed straight into Jupiter, drawn in by its immense gravity. The devastation covered an area bigger than our entire planet. If Jupiter hadn't intercepted that comet, if it had hit the Earth instead, it could have been the end of us.

We are lucky. It's not just that Jupiter saved us in 1994. It's saved us thousands of times. It's been doing so since the dawn of our solar system. Without Jupiter, life on earth would never even have got started. Remember all those asteroids in the early solar system? There were so many of them flying around that life couldn't even get started. What changed that was Jupiter. *Jupiter's powerful gravity sucks in anything that comes too close.* It's still catching asteroids today. But unfortunately for us, the number of asteroids out there is all but limitless. Sooner or later our luck will run out, just as it did for the dinosaurs. Jupiter can't catch them all. And one is all it takes. The question is what on Earth are we going to do about it? It seems we have a problem. Scientists have found an asteroid heading on our way. This asteroid is huge, 50 km across, 100 billion tones of rock surrounded by clouds of dust and debris. It's traveling at 40 km a second. And it's heading straight towards Earth. So what are we going to do about it? We're concerned about those large objects that penetrate the Earth's atmosphere. We can blast it by nuclear bomb or move away the course of the asteroid. So far we've survived, but what about the future? We should be acting out now. One day our luck will run out, simply a matter of time. We must develop the technology to defend ourselves. Because, if we're not prepared, the odds are, that one day the human race ceases to exist.

The Secret of Life on Earth

Every form of life on Earth depends on the ability of plants, to capture the sun's energy and transform it into food. Sea birds feed on fish, and bigger fish eat smaller fish. But somewhere their food chain began with plants. Every food chain is started by a vegetarian. The great African herds of wildebeest feed on grass, and in their turn, they become food for predators such as lions. It is plants, and plants alone, which generate all the food we have on Earth. Without them, ours would be a dead planet, and four billion years ago, that's just what it was, dead, a forbidding, hostile place, bombarded by ultraviolet radiation, the planet's surface sealed with poisonous gasses. Yet in such conditions, strange carbon compounds formed, with power to reproduce themselves. From them appeared the first primitive cells of life. Drawing energy from the sun, they began to make their own food, some combining water with a chemical we know as *chlorophyll*, and this produced an important byproduct, bubbles of oxygen.

An atmosphere was being created in which, you and I would eventually be able to breathe and live. Two billion years ago, this was the scene where land and sea met. In the next billion years, the oxygen was gradually accumulating, some of it forming a *shield of ozone* in the upper layers of the atmosphere. At last the stage was set for life in many forms, and true plants swarmed in prehistoric waters. Now, filter feeding animals such as barnacles could flourish in the oxygenated water. *The secret of life was formed in an unwritten contract, binding plants and animals together, the green contract. Some animals might live by eating other animals, but every food chain must start with animals eating plants. That is the essence of the green contract.* By the time fish had evolved, another stage in the story of life was beginning, the teeming life of the oceans reached out to the dead land.

About 400 million years ago, the first plants came ashore, tiny growths clinging to rocks and mud. In time, they took a firmer hold on land, they developed roots. Plants also developed woody vessels within their stems which made them rigid, and enabled them to grow tall and competition with other plants compelled them to grow taller still. *With this dynamic lift off, the first forests were born. Plants had successfully invaded the land.* Their roots broke the Earth's surface and held together the topsoil, and the atmosphere they'd created made life on land possible for many animals, among them, insects. Wings meant that insects could follow the plants upwards into the sky. The first land plants had swimming sex cells, and could therefore thrive only in moist places. But by degrees, plants developed new methods of reproduction. The conifers' male sex cells could be carried on the wind as pollen to female cones, which produced seeds. Because they reproduced in this way, the trees could move into new dryer territories. Like an advancing army, they swarmed the foothills and occupied the mountainsides, a far cry from the shoreline of the ocean.

Today, one third of all the world's forests are *conifers (cone bearing)*. These trees, they are surely among the most magnificent of all living things. Some of the largest organisms on Earth, dwarfing all others and these are the tallest of them all. The deciduous and coniferous woodlands that grow the seasonal parts of our planet are the most extensive forests on Earth. Their sheer extent stuns the imagination. Looking at the barren snows of the Arctic, a thousand miles from the North Pole and heading south, one could see the very first place that trees can grow. To begin with, the conifers are sparse but soon they dominate the land. *This is the taiga forest.* It is a silent world where little stirs. Creatures are scarce because few can eat conifer needles. Growth is so difficult that conifers protect their precious leaves by filling them with resin. That reduces water loss, but also makes them very distasteful. At least the conifer's seeds are edible, but they're protected within armor-plated cones and it takes a specialist like squirrels, to reach

them. But there are occasional signs of life, stories written in the snow. Some animals are so difficult to glimpse that they're like spirits. There are as many trees here as in all the world's rainforests combined. The taiga circles the globe and contains a third of all the trees on Earth. *It produces so much oxygen that it refreshes the atmosphere of the entire planet.*

The Pacific coast of North America, it is the land of hemlock, Douglas and giant redwood. Here water is never locked up in ice, and even if rains fail, the needles can extract moisture from the fogs that roll in from the sea. The sun's energy powers these forests not for one month as it does in the taiga, but for half the year. These conifers grow ten times at the rate of those near the Arctic and they live for thousands of years. One grove of redwoods in California contains three of the tallest trees on Earth. *These are over 100 meters high, the size of a 30 story building. These forests were growing here long before humans walked the Earth.* They were in their prime 20 million years ago and existed before the Swiss Alps (Europe) or the Rocky Mountains (USA) were even raised. The American conifer forests may not be the richest in animal life, but their trees are extraordinary. There are also *giant sequoias*, relative of the redwoods and these are the largest living things on Earth. *The sequoia is known as General Sherman and it's the weight of ten Blue Whales (largest organism on Earth).* Higher up in the nearby mountains there are *bristlecone pines*, the oldest organisms of the planet. Some have been here for 5,000 years. They were alive before the pyramids were built and were already 3,000 years old when Christ was born. Among them, the largest living organisms, the giant redwoods, capable of growing to the height of a 35 story building, a remarkable development, but there was an even more spectacular one still to come.

The plant's male and female parts were combined in a single marvelous device; *the flower*. The planet had already been covered in vegetation for millions of years. The first flower appeared probably 120 million years ago and did not survive for long, and flowers must have remained rare and isolated phenomena, since conditions were most likely not yet favorable for a widespread flowering to occur. One day, however, a critical threshold was reached, and suddenly there would have been an explosion of color and scent all over the planet. Much later, flowers provided inspiration to countless artists, poets, and mystics. Jesus tells us to contemplate the flowers and learn from them how to live. Flower pollen is an attractive source of food for insects, and they carry some of it on their bodies as they move from flower to flower, and in that way, the flower's eggs may be fertilized. Many flowers produce nectar, which attracts insects with guidelines to help them find it.

Some flowers favor particular insects, *the wild arum (a plant) has a spike with a fetid odor, which attracts small mosquitoes.* Many slide to

the bottom, where the female parts are located. They remain trapped overnight, but next day, the male parts exude pollen. Now, the bristles wilt and clear the way for the mosquitoes to escape, well coated with a dusting of pollen that they carry to the next arum. Again, temporary prisoners, they pollinate their captor before escaping once more. The size and shape of certain flowers match the bills of particular types of birds. Members of the parrot family, like the rainbow lorikeet (a bird), have adapted to eat certain flowers, and so, have become their chief pollinator. Other flowers await pollination at night. In Australia, small nocturnal *marsupials* (like *Koala*, *Kangaroo*) called honey possums, visit banksias flowers for the sake of their nectar, and by chance, they carry pollen on their fur as they move from flower to flower. The regular traffic to the flowers that feed them is an open invitation to the secret hunters.

Some predatory mantes can disguise themselves as flower petals to fool their victims, the killer, poised to strike. Life in the new world of flowers became complicated with many variations on the theme of “*predator meets prey*.” In the new relationships linking plants and animals, it was not always the plant which was the passive partner, in some cases, the plants themselves became the killers. Growing on poor soil, the sundew plant gets the nitrogen it needs digesting the insects, caught in its sticky leaves. The leaves of another flesh eating plant form an even more ingenious trap, the *Venus flytrap* (a plant), press the button, bang goes the trap even so the plant has no guarantee of success, “win some and lose some” is always nature’s rule. Each hair is a trigger, touch it twice and the trap shuts. Once it has secured its prey, the plant digests it. *In all these subcontracts written into the green contract, there’s a delicate balance maintained between killer and victim.* Individuals will perish, but each species will survive. In the tropical forest of India, there is the richest variety of trees like teak, silver-oak and Maua (tree of red flowers). Teak is the most prized timber tree of India. It is one of the most hardwoods of the world. It can be grown in all the rainforests. But for the creatures of these forests, summer is a desperate time. But salvation is at hand. The Maua tree is about to bloom. Its flowers are full of liquid, making them irresistible for all sorts of animals who depend on them. The Maua is an oasis in a hot, dry desert. Those that fly or climb are not the only ones to get a share. Chital deer follow the Languor monkeys, collecting the flowers that fall. Indian rainforests are filled with these great trees.

In Madagascar, the wet season is the time of plenty. It’s now that *the baobab trees* (roots up bizarre looking) re-grow their leaves and collect water to store in their huge trunks ready for the dry season ahead. The prehistoric shape of these trees is rightly famous, but few have ever witnessed the baobab’s real magic. For that happens at night and high in the tree tops. Fresh with water, the baobab prepares itself for an unforgettable display. Once started, the foot-long flowers can open fully in less than a minute.

Liquid oozes from the flower's center and trickles down the petals. The giant hawk moths are the drinkers and as they sip, moving from one tree to tree, so they transform pollen and fertilize the flowers. As the alteration of wet and dry seasons brings change to some tropical forests, so the progression of summer to winter dictates life in more temperate regions. Whether trees have needles or broad leaves, it is their ability to survive annual change that has enabled them to cover such vast areas of the Earth and made the seasonal forests the greatest forests of all.

Rain forests are the magic of *biodiversity*. The success of flowering plants shows here more so dramatically that anywhere else, they've an ideal climate with warmth, and continuous moisture. It's the variety of plants that provides such an abundance of food and living conditions suit even to a greater number of animal species. Over two thirds of all flowering plant species in the world are found in tropical forests. Eat and be eaten, so the food chain goes on. Body color that matches the background can be a good defense. Slow movers often rely on camouflage. It's a strange fact that this wealth of life thrives on the poorest of soils. The plant survives, because scarce minerals are constantly recycled. Decay, helped by insects and fungi returns everything to the soil, ready to be taken up again by new life forces in plant and animal. There's one more relationship between the flowering plants and animals can be found here, after pollination, the flowers are transformed into fruits, succulent and often colorful, they have evolved to be eaten. For example, wild figs attract large fruit eating mammals known as flying foxes. While the fruit's fleshy part is digested, the seeds will pass through the animal's body to be dispersed at random, and germinate where they fall. This is a very effective method for dispersing seeds, and so creating and regenerating forests. Each seedling will struggle to become a fruit tree and compete for a place in the sunlight. Fruits and berries were an important survival food for our early ancestors.

But even more crucial to human development, were the seeds of another special group of flowering plants, which provided the staple food of grazing animals, *the grasses*. Grass generally describes a monocotyledonous green plant in the *family Poaceae*, botanically regarded as true grasses. However, there are many plants outside the Poaceae family that have similar appearances to grass, with leaves rising vertically from the ground, and which are commonly called "grasses," or have "grass" as part of their name. By contrast, there are a number of plants in the family Poaceae, such as rice, wheat, maize, bamboo, and sugarcane, which do not resemble plants that lay persons commonly think of as grasses. Many plants that look like grasses are actually in other families *like rushes (Juncaceae) and sedges (Cyperaceae)*. Grasses and grass-like plants have long had significance in human society, having been cultivated as food sources for domesticated animals for up to 10,000 years, and has been used to make paper since at

least as early as 2400 BC. Grass includes cannabis, commonly known as marijuana, China grass, Goosegrass, Lemongrass, Mondo grass, Nutgrass, Pepper grass, Sawgrass, Scurvy-grass, Seagrass and Sleeping grass. Grasses and grass-like plants are among the most versatile of life forms, thriving on every continent except Antarctica. They have existed for millions of years, providing fodder for Cretaceous dinosaurs, whose fossilized dung contains *phytoliths of a variety of grasses* that include the ancestors of rice and bamboo. Grasses have adapted to conditions in lush rain forests, dry deserts, and cold mountain steppes.

Most plants grow from the tip, but grass leaves grow from the base. So after they have been cropped by grazing animals, the grass will continue to grow and make more food. All the grasses and sedges are flowering plants. Grass pollen is carried by the wind. When the seeds are set, they contain a nutritious substance which gives them a good start. Grind it up, and it becomes flour, a basic human food that can be stored for months. *The wild grasses that we know as rice, oats, barley and wheat, were the key to the growth of human civilization.* What drives the combine harvesters, like tractor or harvest machine, is energy from the sun, that was processed and stored, in the remain in billions of microscopic marine plants in prehistoric times as oil, one of the so called fossil fuels. *So plants help tractor to run and tractor helps grass to grow.* Another fossil fuel is coal, the carbonized remains of some of the earliest forests. It provides more than 40% of the world's industrial energy. And it takes energy to operate the great thrust into depths, where the prized black seam lies. Fossil fuels, coal and oil contain energy which can be released so easily by fire. In 1991, the Gulf war focused our attention on what happens, when nature is wantonly put into reverse.

Originally, when plants first gathered this energy from the sun, carbon dioxide was used and oxygen given off to enrich the atmosphere. Now, fire uses up oxygen, while carbon gasses pour back into the air. Less violently, it goes on in peacetime too. Modern transport relies on the burning of oil. The carbon gasses discharged by city traffic and industry build up in the atmosphere and prevent the release of heat by radiation, thereby causing a greenhouse effect. Other harmful chemical attacks, the ozone layer, which, shields us, from ultraviolet rays, damaging to human skin, and also to the plant's life of the oceans. Trash, garbage, litter, the dead end of life, what is biodegradable is transformed into a new life cycle, but mankind has introduced the non bio-gradable, the junk outside nature's regeneration, which poisons land and sea. *For the first time, a single species, the human species, is threatening the life support systems. We have broken the green contract.* But we are at last learning to be less wasteful.

As the world's resources shrink, we are recycling more and more. Today, factory already uses 30% waste-paper soon it will recycle 60% waste, into new paper. We are also learning to capture energy, without burning fossil

fuels or timber. Besides nuclear energy, there is tidal power, solar panels, wind- power. We can harness the elements. Our space age technology can monitor the damage we are inflicting. Satellites report the frightening speed of loss of vegetation, particularly in the rainforests. The stretch of forest in Brazil about 100 miles across, forest clearance and roads are clearly inflicting the damage. Every year rate of clearance becomes larger, and amounts to the faster rate of destruction. Time is running out for those research scientists at work in the canopy of a threatened forest. Locked away in the chemistry of the rare plants and insects the scientists find many secrets, perhaps of medical cures still to be discovered.

Our heritage is a pool of genetic material beyond price. *Periwinkle* is a plant comes from the forests of Madagascar, not very important, we might think, but now it is cultivated and harvested, to make a drug used to treat leukemia in children. *Aspirin* is so familiar that you don't even notice it in the medicine cabinet until you have a headache. This wonder drug is made from the bark of the willow tree. *Any species we exterminate may be an opportunity lost, lost forever.* Scientists are trying to find new medicines from the rain forests. *Amazon is one of the best and the biggest source for these medicines.* The Amazon rain forest is a moist broadleaf forest in the Amazon Basin of South America. The area, also known as Amazonia encompasses seven million square kilometers (1.2 billion acres), though the forest itself occupies some 5.5 million square kilometers, located within nine nations: Brazil (with 60% of the rainforest), Colombia, Peru, Venezuela, Ecuador, Bolivia, Guyana, Suriname, and French Guiana.

The Amazon represents over half of the planet's remaining rainforests and comprises the largest and most species-rich tract of tropical rainforest in the world. By discovering how plants and animals relate to each other, we can enrich our own understanding of life. Today 40% of the medicines come from Amazon rainforest. *The rainforest shows us that true life sustains itself within the available resources that it can recycle perpetually.* Living in harmony with nature instead of abusing and degrading it, may demand a change in our habits, but it will bring new benefits. Our world has developed over many millions of years. What gave it stability and increasing variety was *an unwritten contract between plants and animals, acknowledging their interdependence on each other;* within a system nourished entirely by the sun. But we no longer take for granted the age old rhythms of nature. The growth of human knowledge has given us a decisive influence everywhere, from the depth of oceans to the sky's final delicate skin of our atmosphere it is our actions which will change the world for good or for evil. In the sheer joy of our existence we must love and cherish those delicately balanced forces of nature enshrined in the green contract. They formed the rules of the created world, before we joined the long march of evolution. They hold the secret of our life on Earth.

Sacred Planet- Everything is built on Relationships

In the beginning humans lived in small groups that collected food by hunting and gathering, taking only what they needed to survive. Today only few humans still dwell in the depths of nature, in some of the last pristine places on Earth. They continue a traditional way of life that has been practiced almost unchanged for thousands of years, *a way of life that stood the test of time and allowed them to live in harmony with their natural surroundings*. These may be some of the last remaining people to live a traditional lifestyle, based on the wisdom passed down through countless generations. Many people have never heard their voices, now it may be time to listen. I've been always been taught by my parents and grandparents, the same message they received from their grandparents for many generations that we treat Earth as our mother. When we respect the Earth Mother, then she provides for us, and all the things that we see along the way the four legged animals, the organisms in the ocean, even the hills and the boulders, they're our relatives.

Everything is built on relationship. By then learning that we're all related, we also learn the responsibility to keep our planet alive. As a young boy, when I stood next to a great tree, a big, full grown tree, I felt very small, I felt that I still had a place, that here's this great tree bigger than me, been on the Earth longer and I feel one with it. The way my ancestors were able to maintain a unity within the natural environment, was to see all things sacred, meaning there was spirit in everything. We always respected our elders. We admire them for coming so far in life. My grandfather was a wonderful teacher and a great storyteller. It seemed as if, as he spoke he also healed and I wanted to learn that. What my grandfather told me is that when I speak, I will touch the hearts of many people. I know now what he meant there is a healing in the story, there's power in the word and that's how we built the power of our communities, and that's how we taught our children to be great leaders, to be great medicine people, through the stories.

The most basic balance that is important to our traditional way of life is to have enough food to eat, to have water to drink and to have a shelter to keep ourselves warm. The land provides us with our basic needs, so we are completely dependent on nature. Without these things, we cannot survive. Lessons can be learned from other cultures, but we'll also learn from their mistakes. If the people continue to treat the Earth with no respect, our traditional way of life will come to an end. When we kill an animal, the remains will be shared between the people. The skin will be used for clothes for our blankets. If it's a big animal, the meat will be sun-dried to be eaten later, and all the meat will be eaten up. Sharing is a very important thing in our culture. If you don't share with other people, they will not share with you. Sharing is just a natural way of life. The most important message I

would teach the children is they must not forget about our land and our culture. Ancient teachings have been passed down through generations of our people, and these teachings say all life forms are interconnected. Everything is part of one whole and living organism, *and each part is vital the survival of the whole*. My ancestors believed that the Earth is one big living being. The end of any one life form will lead to hardship of another, and if there are too many hardships, the whole may suffer beyond healing.

I was taught that the most important thing is to have a peaceful heart. When we are content with, who we are, we treat other life forms with compassion and kindness. Nature will always contain mysteries we don't need to solve them all. We just need to be open and let it fill us. *The energy of nature moves through the cycle of birth, death and rebirth, and it continues on and on, moving from one form of life to another*. Long before humans were able to communicate through modern means, cultures separated by vast oceans were sharing the same values. They speak in many languages, yet their message continues to echo one another across the globe. I think I was 8 years old when I saw the *mighty sea (Bay of Bengal) for the first time in my life*. It was a school trip from A.Kattupadi (my village near Vellore), organized by the congregation of St. Anne's Sisters of Madavaram, India. That was the most exciting moment in my life ever. It was a feeling of finding something that I was searching for. I was never overwhelmed like that until today in my entire life. Perhaps, I encountered the primordial mother from whom life evolved. Somehow we are called back to that place where it all began. When there're things alive in the sea, then the sea becomes beautiful. When there're animals and creatures on the Earth, then Mother Earth becomes beautiful. *We also want our children to have a good future we also want to have this land intact for our grandchildren. We are nothing without the animals we are nothing without the forest. This is what we hope to hand over to the younger generation.*

Natural order is plainly shown in the wondrous cycle of birth, growth, death and rebirth. The individual populations of the species of plants and animals that live together here form an ecological community, and the many species are linked together in mutual relationships, each with its unique environmental role. Every plant species, in its own way, manufactures food and liberates oxygen by *photosynthesis*. Part of the energy, stored chemically from sunlight, is carried in falling leaves and other litter to the humans below. Browsing deer feed on foliage, bark, twigs, and buds, insects, slugs, and snails feed on plant juices and gnaw leaves and roots. Squirrels and mice collect acorns and seeds, many of which buried in the ground for safe keeping and are then frequently forgotten to sprout later in the spring. Predator dogs, cats, and hawks eat the plant-eaters. When plants and animals die and are consumed by scavengers, the cycle is completed, always with a

tremendous loss in energy and bulk at each successive level in the *food pyramid*. Nutrients are returned to the soil where they are again available to the plants. The decaying litter is churned into the ground and mixed with mineral grains by frost, birds, rodents, spiders, insects, and worms, a continuous tilling of the soil, while decomposition by the weather, bacteria, fungi, beetles, ants, and termites, is in full swing. From the surface of the ground downward to a depth of several meters there exists a concealed world of organisms, ranging from small to microscopic, living in burrows and throughout the aerated soil.

Many of the principal groups of animals that live above ground are also represented here along with the soil making and nitrogen fixing microbes. The crucial importance of the soil community becomes apparent if we note that it supplies nutrients on a vast scale for the organisms above ground and the adjacent marine habitats of the continental margins. In both temperate and tropical soils organisms can be as diverse and abundant as the surface life a *handful of humus may contain billions* of individuals from hundreds of species. The life of the forest pulsates with a rhythm of activity and change. Each organism makes its own contribution to the transmission of energy from sunlight and its distribution throughout the biosphere. Here is neither chaos nor perfect order. What order there is seems to be maintained by interactions, a *symbiosis* between organisms and their particular surroundings, a continuous recycling of materials and chemical energy among the organisms and their *environmental reservoirs* kept recharged by sunlight.

Nothing is static here, yesterday things were different and the changes that we see taking place guarantee that tomorrow will not be like today. Relationships and configurations change with time and cannot be exactly repeated. This seems to be the normal course of the history of life. What is the source of this machinelike impersonal activity? Studies by many generations of experts in field and laboratory indicate that *biological systems are products of the interdependence* and adjustments that result in a delicate balance between organisms and their environments. The flexibility with which, accommodations are made to changes, lies in the marked tendency of life forms to vary, and through their variation they are able to take advantage of opportunities to reduce stress. When the biological accommodations become fixed in heredity, we say that evolution has taken place.

Paleontology, the study of fossils, is an evolutionary science that concerns itself with answering questions about the remains of past life entombed in the rocks. What was that organism? How old is it? Where and how did it live and die? Who were its ancestors and descendants? What does it tell us about past environments and the history of life? Geology and biology, linked with paleontology, provide perspective and understanding of the origins and history of both man and his Earth. These sciences are readily understandable and perhaps more rewarding to the non-technical person

than the more frequently studied physics and chemistry. Expert paleontologists read chronological sequences of fossils on a worldwide scale much the same way that musicians read a musical score. To carry the analogy further, paleontologists also identify separate divisions and passages of the standard geological organizations, oceanographic institutions, and petroleum companies employ teams of paleontologists for this activity. They read the fossil record from top to bottom through thousands of meters of crustal strata and they know from the accumulated experience of nearly two centuries that the standard time sequence *of fossils is approximately the same the world over*. In paleontology and geology even the most elementary understanding of scientific evidence opens doors to exciting trips of exploration through time, both real and vicarious. For many paleontologists the interpretation of fossils is infinitely fascinating, and the world of fossils provides adventures of the spirit comparable to the enjoyment of fine literature, art, and music.

In a sense, the Earth system owes its stability to being a big, endlessly repeating bundle of contradictions. The physical size of the Earth has allowed enough time for the emergence of an elegance, self-choreographed dance in which everything moves in circles and every tendency has its counterpoint. Each entity or action, gains energy from an opposition, the individual from the collective, competition from cooperation, innovation from conservation, mixing from sorting. *Over geologic time, the specific rhythms and idioms change slowly, but the essential rules of the dance remain the same*, on the part of organisms, interaction, reincarnation, and on the part of God, incarnation, salvation and redemption. These rhythms of nature shape all the organisms that evolved under their influence. It is folly to think, that we can sit out the dance or make our own rules. It's rather like skipping school we only hurt ourselves in the long run. Our bones evolved in the constant presence of gravity, and without this force to challenge them, they lose their strength. In the same way, without this force field of scarcity, a constant in our evolutionary past, we lose something of our full potential. Once we have enough to survive, we crave limits, the discipline of the dance.

We understand deep in our bones that unchecked consumption and unchallenged political power are violations of ancient earth-laws. The only uncertainty is what the penalties are. One consequence is that the once vast Earth has been shrinking, at least in a relative sense. The magnitude of human actions on the Earth now matches those of natural agents. We are changing the underlying beat of the global dance. We quite casually, double or treble local rates of erosion. We have increased global phosphorus fluxes by 10 percent. Human contributions to atmospheric carbon dioxide from the burning of fossil fuels, deforestation, and concrete manufacturing, amount to about 8 billion tons per year, more than sixteen times the total annual emissions from the Earth's volcanoes, and four times faster than the precipitation of carbonate rocks from seawater.

The Earth orchestra might obligingly increase the tempo of the dance in response to our activities, but since there is no conductor, communicating this to all players and sections could take many human lifetimes. The Earth might also take the opportunity, as it has in the past, to experiment unpredictably with other cadences for a few millennia before settling into a new riff, which we may or may not find to our taste, if we are still around to try it. The stability of physical and biological systems on Earth requires countervailing forces that limit growth or define an optimum size. If every dandelion seed or salmon egg grew to maturity, the resources needed for future generations would be decimated. *So scarcity acts both to encourage fertility and to limit population.* Hunger, famine, no water play their role in the better evil of limiting the speciation. Over time, organisms “calculate” their odds for survival and invest just enough in reproduction, which is energetically costly for individuals, to assure a viable population in the next generation. Unlike the size of a biological population, Earth’s size is of course fixed, but it fortuitously represents an optimum for thermal stability.

If Earth were significantly larger, heat production would exceed heat loss and the planet might never have developed the crispy outer crust necessary for a *self-sustaining plate tectonic system*. The balances of forces, governing other physical processes on Earth is equally remarkable. For example, mountains on Earth self destruct at nearly the same rate that they are built. Two processes, erosion and gravitational collapse, act to keep peaks becoming too lofty. Erosion, achieved mainly by water and glacial ice, is most effective where slopes are the steepest. Gravitational collapse occurs because the sheer weight of mountains exceeds the long term strength of the rocks that form them. The tallest mountains spread and flatten the fastest, creating an upper limit to topographic relief on Earth. The highest Himalayan peaks and Hawaiian volcanoes, both 5.5 miles in elevation, above the sea level, probably represent the upper limit. Mountains meet their match in erosion and finite rock strength. Atmospheric carbon dioxide exhaled by volcanoes, a critical factor in global climate, is kept at a remarkably constant level by the concomitant precipitation of carbonate rocks, limestone, in the oceans.

Among the rocky planets, Earth alone has developed these habits of self-control. Venus and Mars are in some ways opposite extremes, they reached those extremes for the same reason, the lack of “*feedback mechanisms,*” to modulate surface conditions. Feedback in the colloquial sense simply means a reaction or response. In scientific contexts, the word is used to describe a particular type of reciprocal interaction, a repeating process, or loop, in which the *output (effect) on one stage becomes the input (cause) of the next.* Feedback can take two different forms, positive or amplifying, and negative, or damping. Positive feedback processes are self-perpetuating and can have either good or bad results. If praising a child for good schoolwork causes the child to be even more studious, that is a positive feedback process with a positive result. On the other hand, criticizing

a child for poor work may further diminish the youngster's motivation, an example of a positive feedback process with negative results. Negative feedback, in contrast, acts to minimize change and dampen oscillations. Good health is maintained by innumerable negative feedback processes, body temperature, blood sugar, immunity, and appetite, for example, are all controlled by processes that detect and correct for changes in the body.

Physiologists use the word "*homeostasis*" to describe such biological maintenance of constant internal conditions. Failure of these homeostatic systems can cause debilitating or life-threatening conditions, such as hypothermia, diabetes, severe allergies, and eating disorders. At its best, positive feedback leads to self-perpetuating progress, like success, economic stability at its worst it produces self-amplifying volatility, like nervous breakdown, hyperinflation and arms races. Without them, conditions at Earth's surface would vary capriciously, and life might have found it difficult to evolve apace. Interestingly however, life itself is an integral part of many of these control systems. For example, about half of the carbon dioxide that is now sequestered in limestone was extracted from the air over time by tiny marine organisms that incorporated the carbon in to their shells. When these minute organisms died, their shells rained onto the seafloor. Over time, as sedimentation continued, the pressure of the overlying layers helped compact this shell material into limestone.

Earth somehow acquired water, by the degassing of Earth's interior. Some water must have been imported from elsewhere, and the most likely supplier would have been comets on long sojourns far from their homes on the frigid outer margins of the solar system. Most comets have highly eccentric and elliptical orbits, and over time, many have taken one way trips into the inner solar system, unable to resist the gravitational charm of the planets. This was the fate of comet Shoemaker-Levy, which in 1994 was inexorable drawn toward Jupiter in a spectacular display of celestial mingling. Incredible as it may seem, as much as half of Earth's water may have been delivered in this way, although the proportion that is imported versus domestic is a controversial issue among geochemists. Whatever its origin, Earth's water is implicated in virtually every geologic process both at and below the planet's surface.

The importance of water to life is obvious. *In fact, water is considered the sine qua non in the search for extraterrestrial life.* But the roles of water in the workings of the solid Earth are equally profound and more surprising. Often functioning as a subversive via underground channels, water alters the physical and chemical properties of rock in ways that radically affect, and in fact define, Earth's plate tectonic system. For example, water is directly responsible for the generation of continental crust, the buoyant granite distillate unique to Earth. Today new continental crust forms at ocean crust recycling centers better known as *subduction zones*. These zones

occur where old, water-saturated seafloor, produced long before at a mid-ocean volcanic ridge, has become cold and dense enough to sink back into the mantle. Subduction is occurring today off the west coast of South America, at the deep ocean trenches flanking the Indonesian and Philippine Islands, and in the seas adjacent to nearly all of the world's most dangerous volcanoes. As a subducting slab experiences progressively higher temperatures and pressure, it releases water from *amphiboles* (*rocky minerals*) and other hydrous minerals such as clays, which are formed when water interacts with igneous minerals at Earth's surface.

This water acts as a flux. Which like carbon added to iron in steel making, lowers the melting temperature of the otherwise solid overlying wedge of mantle rock. This low temperature *magma* (*lava or liquid amber*) is quite different in composition from the bulk mantle rock from which it comes, because fractional melting produces a liquid that has relatively high concentrations of the elements that are the most eager to escape from the crystals in which they occur. These elements, which geochemists call incompatible, are typically rather large ions that would prefer to have more space than the rigid structure of a mineral lattice provides. The incompatible elements happen to include potassium, rubidium, and uranium, all of which come in radioactive varieties. As a result, the continental crust is not only different in bulk composition but also hotter, in the radioactive sense, than its progenitor, the mantle. On a planet made of stuff that is very rare in the solar system, the continental crust is made of rarer stuff still. No other planet has managed to produce such a concentrate. Earth's secret to scavenging these comparatively rare elements is to mix surface water back into the planet's interior.

Carbon, water, sulfur, phosphorus, and nitrogen are in constant motion at and near the Earth's surface, reincarnated again and again as minerals in rocks, gases in the atmosphere, ions in the ocean, schools of fish, leaves on trees. Each year, for example, even in the absence of human activities, about 440 million tons of carbon is transferred from one form to another, with about 45 percent of this carbon "remanufactured" and shipped by biological processes. Similarly, 5.8 billion tons of nitrogen and 740 billion kilograms of phosphorus change hands in a year. Organisms are involved in 87 percent of the nitrogen trades and more than 99 percent of the phosphorus transactions. *Recycling is ubiquitous and obligatory on Earth*. Even the Earth's crust, when it is old, is returned to the factory by the process of subduction, in which cold and dense rock sinks back into Earth's mantle. There is no natural equivalent of a landfill. Nothing is unusable waste, and nothing will last forever, at least not in any particular form. *Matter resides temporarily in various lodging places then moves on in new guises*.

Each place, or reservoir, within a particular system as water, carbon, etc, *has a characteristic residence time*, the typical duration of stay by its

tenants. Resident times vary hugely even within a given biogeochemical system. A carbon atom may spend only a second in a human lung then stay tens on millions of years in a layer of limestone. Water taken into the atmosphere by evaporation generally checks out again after just a week, whereas water in the deep polar oceans is content to abide there for millennia. Ocean crust can expect to reside at the surface for 150 million years or so before returning to the forge. *Eventually, though, everything passes through the system.* Earth's surface and subsurface, like our own skin and organs, are in a constant state of renovation, the overall architecture preserved even as the constituent parts are incrementally replaced. Nothing is permanent, and yet because of this, everything is eternal.

Nowhere could be seen, that everything is built on relationships, than in the food web. A food web is a complicated system of relationships between plants, animals, and energy. Understanding their connection is very important in helping to understand any ecosystem. *Food webs are actually made up of smaller food chains which are interconnected.* A food chain, explains what an organism might eat, and what might eat it in a specific scenario. There are usually hundreds of different possible food chains for an organism. For example, a food chain could look like this: The microscopic bug world is known as "*detritus.*" These important organisms recycle everything which has decayed. Without the "detritus" this world would be a stinking place. These "*detritivores*" turn the inorganic matter into organic for plants. Plants convert sun's energy into food through a process called photosynthesis. Photosynthesis is a process which uses water, carbon dioxide, and sunlight energy to make sugars. Plants do this in special cells called *chloroplasts*. These are usually green because of a pigment called *chlorophyll*. Most photosynthesis happens in a plant's leaves, which is why they are green. Plants are known as the *primary producers or autotrophs*. All green plants are autotrophs. Green plants absorb between 20% and 30% of the sunlight which reaches the Earth. Only 2% of the energy from the sunlight which reaches green plants is stored in the body of the plant. When energy from the sun is converted into chemical energy by the producers, it is passed on to the consumers. The organisms which gain their energy by feeding on other organisms are called *heterotrophs*.

Heterotrophs are *either herbivores or carnivores or omnivores*. Movement of energy from one organism to another is called *energy flow*. As the energy flows from one organism to another a food chain is established. Food chains may involve more than three organisms. The secondary consumer may become the prey of a tertiary (third) consumer, and so on. The last carnivore in the food chain is called the top carnivore. Food chains are usually short; the fourth or fifth consumer is normally the top carnivore. Some of the animals in an ecosystem gain their energy by feeding on the primary producers. *These animals are the herbivores.* Some herbivores

eat the green leaves of plants and others eat the fruits and seeds. A few herbivores, such as the elephant and the termite, eat the woody parts of trees and shrubs. Ecologists call the herbivores the *primary consumers* because they gain their energy directly by eating the plants which have trapped and converted the sun's energy.

The herbivore will use this energy for movement and other body activities, such as reproduction and movement. Some parts of the plant which was eaten cannot be digested by the herbivore; the energy in these parts of the plant passes out of the herbivore's body as waste. Some of the energy, however, is used for growth and remains as organic matter in the herbivore's body. It is this energy which can be eaten by the secondary consumer. Only about 10% of the energy which the plant used for growth is taken into the body of *the carnivore*. The second consumer uses some of this energy for its own body activities and some of the energy will be wasted. Therefore, the amount of energy available for the tertiary consumer is only 1% of the energy which the primary consumer gained from the plant. As the energy is passed along the food chain much of it is either used or lost. The primary consumers are the food of the secondary consumers. These carnivores are predators which are adapted to catch and kill their prey. The secondary consumers feed on the bodies of the primary consumers. In this way energy is transferred from the primary to the secondary consumer. *An omnivore like human* can eat leaves and as well as cow. In a food chain, you can see that you lose energy as you go along the chain. So that is why there are so many plants than animals, and more producers than herbivores and carnivores.

It may be difficult to imagine that your body is made of spinning protons, neutrons, and electrons, but this is indeed the case. It's slightly easier, however, to picture forms of matter in levels that increase in complexity. *For example, subatomic particles can be organized into atoms, which are the components of molecules, and molecules can be organized into macromolecules, such as DNA and proteins, which can be built into cells. Cells can then be organized into tissues, which form organs, and organs can be grouped into organ systems, which are built into entire organisms, including humans like you. Organisms are units that can form populations, community, ecosystems, biome, and then biospheres, which go on to make up even greater levels of complexity (society, nation, world, Universe).* As this example illustrates, units of matter are organized and integrated into levels of increasing complexity; this is a concept referred to as integrative levels of organization. Integrative levels of organization allow researchers to describe the evolution from the inanimate to the animate and social worlds. *This is what I call "Matter into Mind."*

New Earth

Mahatma Gandhi said "*Be the change you want to see in the world.*" The revelation of God both in nature and in salvation history, does not lead

us to believe that we should return to some prelapsarian garden in the Earth's distant past, angels with flaming swords block that way forever (Gen. 3:24). *Pope John Paul II* has pointed out ecological responsibility "cannot base itself on the rejection of the modern world or on the vague wish for a return to a lost paradise." Human dominion over nature is not necessarily evil; yet our task lies before us. We must always on against a two-fold temptation that is repeatedly denounced by God; first, making idols of nature or creatures that, in so doing, exalts them above our primary duties toward God; and, second, neglecting the needs of our human neighbor. We are awaiting the New Jerusalem, a city to be given to us at the end of time out of God's free bounty, which will descend upon a New Heaven and a New Earth. In the meantime, we must combat the evil in ourselves and in our world. We must seek better ways to love God by keeping his commandments and loving our neighbor as ourselves. In a sense, the love for our neighbor can be extended to the non human world. The new commandment of Jesus "*love of neighbor*" stretches from humans to animals, plants, lithosphere, atmosphere, hydrosphere, ecosphere, *noosphere (realm of spirit)*, and finally theosphere. It can be rightly called "the Kingdom of God." However, we will have to make prudential judgments about many complex questions and expect inescapable tradeoffs along the way since "one can love animals" but should not "direct to them the affection due only to persons," whenever there is an unavoidable choice between people and nature, we must, like God, put people, the summit of his creation, first.

You may have heard of the "*new earth*" in spiritual discussion groups, metaphysical books, online forums, personal growth lectures, new age stores, etc... *A New Earth is simply another level of consciousness*, just like the physical reality that you experience. It is the world that must be created in order to end humanity's current path of self-destruction. The vibration level for the New Earth is already within you. A simple alignment with this vibration level is all that is necessary to move into the New Earth. The last book in the Bible, the Book of revelation reads, "*Then I saw a new heaven and a new Earth, for the first heaven and the first Earth had passed away, and there was no longer any sea. I saw the Holy City, the New Jerusalem, coming down out of heaven from God, prepared as a bride beautifully dressed for her husband. And I heard a loud voice from the throne saying, "Now the dwelling of God is with men, and he will live with them. They will be his people, and God is himself will be with them and be their God. He will wipe away every tear from their eyes. There will be no more death or mourning or crying or pain, for the old order of things has passed away"* (21:1-5). *The foundation for a new earth is a new heaven; the awakened consciousness.*

Now, as the Earth begins her ascension or toward complexity process, the New Energy begins to surround the planet. The new energy begins to permeate the entire planet. You must recognize that the New Earth is your

choice. You must create it, or you will not enter into the new energy. First of all open up to the infinite and begin to let go of the limited ideas and principles that you may be holding on to. *The New Earth is a state of infinite possibilities.* The closer you get to this infinite New Earth mindset, the more in alignment you are with it. To experience the New Earth all you must do is *raise your personal vibration level*, which means that you must start perceiving and approaching the Earth with a positive outlook. *Alignment with the Earth is basically living in harmony with the existence (Vortex).*

New Earth can enhance your present moment with knowledge and insights about your future, can help you to create peace within, can help you to maintain your connection with the source, can prepare you for your future, putting an end of constant worrying about the future, can allow you to experience whatever it is that you want; health, wealth and happiness, can allow you to let go of your ego and give you access to infinite knowledge, can increase your personal power and thus make you feel complete and can give you true freedom. *Finally, we should always have faith that God never abandons his people.* Our talents were given to us for a reason; to enable us to love God and our neighbor in Christian freedom.

We may be confident that God will also provide us with the gifts and graces that are needed to care for both nature and ourselves. There is much bad and much good in our world, but the persistence of evil should not discourage us. Until the Lord comes in glory, total perfection for us as a species and perfect harmony within nature are beyond our reach at least for now, but we know that someday he will come. In the meantime, we seek salvation and our human future amid great uncertainties, but also in joyful hope that the *Creator who brought this world and the human race into being is certainly still at work in it and in us as well.* I don't know how many generations we can count on before the Lord returns, whatever it is we have to manage with a skill to leave the resources needed for future generations. A new heaven and a new earth are arising within you at this moment.

THE FATE OF THE UNIVERSE-BIG CRUNCH, BIG CHILL

We're all worried about what will happen at the end of our lives? We see other living things die, and we know it will happen to us. Because it's inevitable, we worry about when, where and how it will happen? Many of us wonder about the fate of the Earth and the universe. Will it be a hospitable blue ball forever, or will it eventually be consumed by the sun as it swells from a medium-sized yellow star to a red giant? Or perhaps we'll poison our planet, and it will float, cold and desolate, through space. If such a thing were to happen, how long would it take? A hundred years? A thousand years? A million years? The cosmologists ask similar questions about the universe. No discussion of the "matter" is complete without discussing the ultimate

future, the fate of the universe itself. Using the laws of physics, we can narrow down the potential futures that lie ahead of us in the next hundred or so billion years.

Our bubble has been expanding for about 15 billion years, but scientists are not sure how long this expansion can last. It is not yet clear, if the universe will ultimately die in fire or in ice. If the density of the universe is above a certain critical point, this may create gravity powerful enough *to reverse the cosmic expansion*. The current red shift of starlight that we see in the heavens will gradually become a blue shift as gravity halts the expansion of the galaxies and even reverses the direction. As the contraction takes place, temperatures in the universe gradually start to soar. Billions more years into the future, the oceans will boil, the planets will melt, and the stars and galaxies will be compressed into a gigantic primordial storm. In this scenario, eventually the universe will collapse to a *Big Crunch*, and the universe dies in fire.

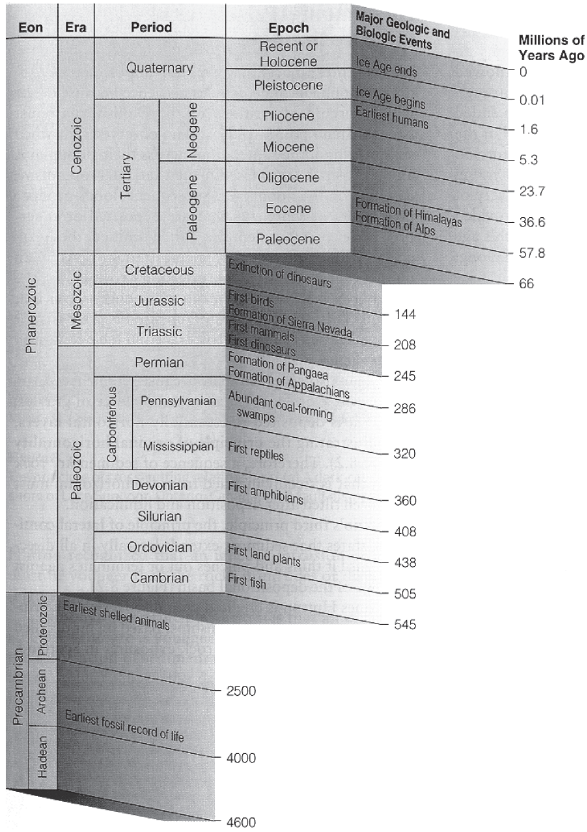
On the other hand, if there is not enough matter, then the universe may expand forever, until it gradually gets colder and colder, the inevitable consequence of the *second law of thermodynamics*. The second law of thermodynamics states that “the entropy of a closed system shall never decrease, and shall increase whenever possible.” The entropy of the universe tends toward a maximum. In simple terms, *entropy is a measure of disorder*. In this scenario, eventually the universe will consist of dead stars and black holes, as temperatures drop to near absolute zero. Trillions upon trillions of years into the future, even the black holes will evaporate and the universe will decay into a gas of electrons and neutrinos.

The end is called the *Big Chill* or entropy death, the universe dies in ice. At present, scientists are not sure which scenario is the correct one. The amount of visible matter in the universe is not enough to reverse the expansion, so astrophysicists have long thought that the universe will expand forever. Recently, however, astronomers have been *convinced that perhaps 90% of the matter in the universe is in the form of non-luminous “dark matter.”* This mysterious dark matter, which no one has ever seen, has mass but is invisible. According to this new picture, dark matter surrounds the galaxies and prevents them from flying apart as they rotate. Since we don’t know precisely how much dark matter there is in the universe, we cannot say for sure if there is enough to reverse the cosmic expansion. Either way, however, the universe will eventually die, and all intelligent life with it.

.Book of Joel in the Bible, recalls the end, “*I will display portents in heaven and on Earth, blood and fire and columns of smoke. The sun will be turned into darkness, and the moon into blood, before the day of Yahweh (name of God) dawns, that great and terrible day.*” (Joel 3:3-5).⁹⁹

Chapter - Three

God of Cosmic-Geologic Time Scale: God of the Big Bang



The Holy Scripture reads, *“He parted the heavens and came down; dark clouds were under his feet. He mounted the Cherubim and flew; he soared on the wings of the wind. He made darkness his covering, his canopy around him, the dark rain clouds of the sky. Out of the brightness of his presence clouds advanced, with hailstones and bolts of lightning. The Lord thundered from heavens; the voice of the Most High resounded. He shot his arrows and scattered the enemies, great bolts of lightning and routed them. The valleys of the sea were exposed and the foundations of the Earth laid bare at your rebuke, O Lord, at the blast of breath from your nostrils.”* Psalm 18:9-15

Before you start reading, please refer to the Geologic Time Scale picture given at the beginning of this chapter. Of all the beliefs we hold about life, the Universe and everything; spiritual beliefs are the most challenging and enigmatic to study. With the growing accumulation of scientific evidence explaining human nature and cosmological evolution, one might expect that spiritual and theological perspectives would be on the decline. But this is not the case. Religion is flourishing even among scientists. God simply will not go away.

When thinking about time, most of us think in terms of hours, days, and years. This concept is often regarded as individual or personal time. When talking about human evolution or evolution in general, it is necessary to switch gears and think about time in spans of many hundreds, and even millions of years. This can be difficult at first to many people to think of time on this large scale. In scientific fields a different concept of time, known as Cosmic and Geologic Time, is necessary to put Universe and Earth history into context and for the study of Paleoanthropology. Cosmic time covers the vast scale of 15 billion years, from the beginning of the Universe to the present. Geologic time covers the history of Earth from its initial formation to the present. It puts the different Periods, Eras, and Eons in a sequence according to chronology and duration. Geologic time places human evolution in a context in which it can be correlated with other happenings, such as environmental changes or mass extinctions and *better understand God's interactions of incarnation, redemption and salvation*. Most importantly, it allows us to grasp, that modern humans and our ancestors have been around for only a very short period of time compared to the vast history of life on our planet and the universe.

Precambrian Eon and Phanerozoic Eon

The history of the Earth is divided into three Eons. Two of these, the Archean Eon and Proterozoic Eon, are collectively referred to as the Precambrian. The Phanerozoic (the third and present Eon), began approximately 550 million years ago. The Phanerozoic comprises less than 20% of the history of the Earth, which spans an impressive 4.5 billion years. "*Phanerozoic*" means "*visible life*," since it was believed that the start of this Eon marked the first signs of life. We now know that life originated in the Precambrian, however, the Phanerozoic still marks the prolific spread of life. Phanerozoic Eon is further subdivided into three Eras: *the Paleozoic Era, Mesozoic Era, and Cenozoic Era*. These subdivisions were devised on the basis of fossil and geologic evidence of global change. The Earth has changed dramatically during the Phanerozoic.

At the start of the Phanerozoic, Earth was covered with partially submerged continental fragments, due to extremely high sea levels. During this time, the first shelled organisms were evolving. Over the past 550 million

years, the continents have moved together to form supercontinents, drifted apart again, and formed some of the most prominent mountain ranges that are found around the world. Catastrophic events have caused several mass extinctions and new life forms have evolved (*PDR Code- abbreviation for passion, death and resurrection: PDR could be seen in violent events like Big Bang, Supernova which lead to the birth of a new world in the Universe (physical world) and also seen in extinction of species which lead to a new speciation on planet Earth (natural world). PDR Code could be applied to everything in the Universe to draw the inbuilt spiritual nature. In short, PDR permeates everything in the Universe).*

Paleozoic Era

The Paleozoic is the earliest Era of the Phanerozoic. It started around 550 million years ago and lasted approximately 300 million years. The name *Paleozoic means “ancient life”*, since it was during this Era that Earth’s environment became conducive to the spread of new, complex life forms. *The Era consists of six Periods; the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian.* During the Cambrian Period, a vast majority of Earth’s crust was submerged under water and new nutrients were being added to the atmosphere. These were the conditions in which new species evolved. Organisms, *the best known being the trilobites*, filled the seas. The transition to the Ordovician period was marked by lower sea levels and the evolution of new predators and prey that were more specialized and complex. At the end of this Period the first land plants evolved.

During the Silurian and the Devonian the expansion of marine life continued. Early land animals and the first true forests, consisting of mosses and ferns, were also manifested during these two periods. Primitive insects and arachnids have been dated back to the Silurian and in the late Devonian, *amphibians evolved as species of fish made their way out of the water and onto land.* During the late Paleozoic, the slow, constant movement of continents against one another created the supercontinent Pangaea. During the *Carboniferous* the first land vertebrates evolved. Some of these animals were the predecessors to the dinosaurs that roamed Earth in the Mesozoic. In the Permian the forests spread and seed-bearing trees and other plants evolved. The end of Permian, which is the last period of the Paleozoic, was marked by a mass extinction brought about by a combination of events. The extinction was not sudden. It is hypothesized to have lasted approximately 8 million years. By the end of it, over 95% of Permian marine species had become extinct (PDR Code).

Mesozoic Era

Mesozoic, or Era of *“middle life”*, started 245 million years ago and lasted about 180 million years. During this Era, the supercontinent known as Pangaea, which formed in the Paleozoic, began to break up into smaller

continents. It was also during the Mesozoic that the dinosaurs evolved and dominated, causing the Era to be known as the *age of reptiles*. *The Mesozoic is divided into three parts: the Triassic, Jurassic, and the Cretaceous*. The start of this Era, at the beginning of the Triassic Period, was marked by a mass extinction that changed marine life drastically. 95% of the marine species of the Paleozoic disappeared, allowing new species to evolve in the Triassic (PDR Code). These new marine species were similar to those that currently exist, making life on the ocean floor similar to what it is today. On land, new species were also evolving. The *synapsid reptiles or proto-mammals* were flourishing, and they diversified into a variety of plant and meat eating species. But they disappeared in the late Triassic, leaving behind their mammal descendants. These early mammals were not prevalent until the Cretaceous, and even then they were small creatures that survived by hiding from predatory reptilian species.

In the late Triassic, the synapsid reptiles were replaced by the ancestors of dinosaurs. By the end of the Triassic, dinosaurs had spread rapidly through the land ecosystems on Earth. Dinosaurs diversified greatly during the following Geologic Period, the Jurassic. It was during the Jurassic that many of the most famous dinosaur species evolved. The fossil record indicates that the first birds also evolved during this Period. In the Cretaceous mammals began to diversify and flowering plants evolved. Flowering plants led to the origin of new species of pollinating insects, which greatly enlarged the diversity of Mesozoic life on land. Tectonic activity during the Cretaceous resulted in the formation of high oceanic ridges, which further separated the continents and caused sea levels to rise. At the end of the Mesozoic we see another mass extinction. Unlike the one marking the start of the Era, this one was very sudden. It is believed that a combination of volcanic activity and an asteroid impact around 65 million years ago caused the extinction of the dinosaurs and many other species that were thriving in the Mesozoic.

Cenozoic Era

The Cenozoic is Earth's current Geologic Era. It started approximately sixty five million years before the present. The name means "*recent life*" and it is during this Era that most mammalian species evolved. *The Cenozoic is divided into two Periods, the Tertiary and Quaternary*. The boundary between the two periods was thought to mark the onset of glaciation, although it's now known that glaciation took place both before and after the start of the Quaternary. *Scientists have divided the Tertiary Period into two main parts – the Paleocene (ancient born) and Neogene (new born)*, based on a major change in fauna. You may be more familiar with a different way of dividing the *Tertiary*, into five Epochs: *Paleocene, Eocene, Oligocene, Miocene and Pliocene*. The *Quaternary* is divided into two Epochs; the *Pleistocene and Holocene*. The start of the Era is marked by a catastrophic event that caused global mass extinction of the dinosaurs and

many marine species, new species eventually evolved and repopulated the planet (PDR Code). It was around the start of the Cenozoic that the first primates and other mammals evolved, hence the era's nickname, *the Age of Mammals*.

During the Cenozoic the breakup of the Pangaea supercontinent was completed, bringing the continents into their present relative positions. Continental drift and *plate tectonics* influenced Earth's oceans, climate, and atmosphere, and affected the migration of animals and the spread of plants. By studying fossil plant and animal remains, researchers have an idea of what Earth looked like throughout the Cenozoic. Near the start of the Era P- that is, during the Paleocene and early Eocene – mammalian life diversified into an amazing array of species that had spent approximately 150 million years subordinate to the reptiles were exposed to new ecological opportunities, primarily in warm, subtropical conditions that emerged after the extinction event. Yet one of the most influential events occurred around the middle of the Eocene, when Earth underwent a dramatic climate change. During that time of global cooling, dense forests were replaced with open forests and grasslands and the polar icecaps began their formation.

Psalm 90, the sacred text reads "*Lord, you have been our refuge in every generation. Before the mountains were born or you brought forth the earth and the world from everlasting to everlasting you are God.*" God has been present from the first moment of creation and he will be with us until the end of times. We feel God's presence in the Big Bang to Big Crunch and God's presence was found not only in all the life forms but also in all the extinctions. God suffered with the natural world through seven or eight extinctions and experienced resurrection in the evolution of new species from one cell to all the way to humans. Creation, preservation and destruction are the three phases of ceaseless activity going on in nature. *These terms may be termed the triple purpose of cosmos*. It has to be admitted that nature is an extensive slaughter-house. Relentlessly she whips out the unwanted ones. In Hinduism these triple purpose of Cosmos is carried out by three Gods (Brahma, Shiva and Vishnu).

This chapter is an attempt to explain about the God's intervention with Cosmos over Eons, Eras, Epochs, Ages and Periods. Surprisingly, Hindu theology was aware of *deep time*. Christian theology is well developed and its Christology as God of history is superb. But when it comes to the deep time concept, Christian theology is not adequate enough. Christian theology is good for little over six thousand years. So, the question arises: What was God doing before six thousand years? What was the God of history doing for about fifteen billion years? As St. Augustine would answer that God was busy preparing hell for those who dare to ask these kinds of questions. This haunting question in my mind is the reason why I write this book? In this chapter I attempt to decipher the actions of God of history through scientific

mediums, through revelation from the Bible and through incarnations of Vishnu.

Das Avatars or Ten Incarnations

The Sanskrit word “*avataras*” or *incarnations of Vishnu* are, according to the most popular classification, ten. The ten chief incarnations, however, are of a more special type, for in them the full essence of the god is believed to have taken flesh to save the world from imminent danger of total extinction. Today we know that there were 8 or 9 mass extinctions followed successively by 8 or 9 evolutions or speciation by natural selection in 4.5 billion years. Fish could understand God if God was a fish. Amphibians could understand God if God was an amphibian. Reptiles could understand God if God was a reptilian. Mammals could understand God if God was a mammal. We understand God as a human, because we are humans.

These are the incarnations of Vishnu in geologic time: *The fish (Matsya) was Vishnu's first incarnation.* This fish was rescued by *Manu* from being eaten by a larger fish. *Manu* looked after it while it grew, then, released it to the ocean. In return, the fish warned *Manu* of a catastrophic flood. It helped him build a boat on which he could save seeds and animals to repopulate the world, and towed the boat to safety. The fish also saved the *Vedas* from the flood. Science tells us that it was fish that first to evolve. First extinction destroyed the 85% of the fish species. But *Matsya* could save 15% of the fish and those ones gave rise to new species, later we know as amphibians. The fish legend first appears in the *Brahmanas*, and the Noah's Ark theme suggests Semitic influence. *The second was the Tortoise (Kurma).* Many divine treasures were lost in the flood, including the ambrosia, the elixir of immortality (in Sans Grit-amrita) with which the gods preserved their youth. Vishnu became a great tortoise, and dove to the bottom of the cosmic ocean. On his back the gods placed Mount Mandara, and, twining the divine snake Vasuki around the mountain, churned the ocean in the manner in which an Indian dairyman churns butter, twirling the mountain by pulling the snake. From the churned ocean emerged the ambrosia and various other treasures, including the goddess Lakshimi. This could be attributed to the Plate Tectonic activity of the Earth, resulted in catastrophic events that killed 90% of the amphibians. However *Kurma* incarnation saved the 10% of the amphibians that gave rise later to a new species of organisms known as reptiles.

The third incarnation was the Boar (Varaha). A demon, Hiranyaksha, cast the Earth once more into the depth of the cosmic ocean. Vishnu took the form of an enormous boar, plunged into the ocean and killed the demon, and then he found the Earth in the form of a beautiful woman, whom he carried back up to the surface on his tusks. The legend looks back to the *Brahmanas*, but probably developed through a primitive non-Aryan cult of a sacred pig. The cult of the Boar incarnation was important in some parts of

India in Gupta times. The extinction of the reptiles was a very sad story, ending almost 95% of all species on Earth. The destruction came in a form of asteroid slamming into the Earth. However, Varaha incarnation could save only 5% of the organisms which later gave rise to birds. *The fourth incarnation was the Man-Lion (Narashimha)*. Another demon, Hiranyakashipu, had obtained a boon from Brahma ensuring that he could not be killed either by day or night by god, man or beast. Hiranyakashipu, the twin brother of Hiranyaksha, dethroned the God Indra and proclaimed himself king of the universe. Thus safeguarded he persecuted gods and men, including his own pious son Prahlada. When Prahlada called on Vishnu for help the god burst from a pillar of the demon's palace at sunset, when it was neither night nor day, in a form half man and half lion, and slew Hiranyakashipu. Narashimha was worshipped as their special divinity (ishatadevatha) by a small sect, and was often depicted in sculpture (sculpture in Hampi). Birds suffered extinction of 75% due to the excessive activity of volcanoes, but Varaha incarnation saved 25% of species that gave rise later as mammals.

The fifth incarnation was the Dwarf (Vamana). A demon named Bali gained control of the world, and commenced a course of asceticism, by which his supernatural power so increased that he menaced even the gods. Vishnu appeared before him in the form of a dwarf, and asked as a boon as much space as he could cover in three strides. When the boon was granted the god became a giant, and in two strides covered earth, heaven and the middle air. Magnanimously he refrained from taking his third stride, and left the infernal regions to the demon. The three steps of Vishnu are as old as Rig Veda, but other popular elements were incorporated into the story. Mammals suffered 55% of extinction in the last Ice Age, but Vamana incarnation saved 45% of the mammals which gave rise later to Hominoids. *The sixth incarnation was Parasurama (Rama with the Axe)*. Vishnu took human form as the son of a brahman Jamadagni. When his father was robbed by the wicked king Kartavirya, Parasurama killed the latter. Jamadagni was in turn killed by the sons of Kartavirya, after which the enraged Parasurama destroyed all the males of the Ksatriya (rulers) class twenty-one times in succession. Parasurama incarnation saved hominoids from another Plate Tectonic activity and gave rise to Hominids.

The seventh incarnation was Rama, prince of Ayodhya (place in North India) and hero of the Ramayana (Holy Book). Vishnu incarnated himself in this form to save the world from the oppressions of the demon Ravana, the evil ruler of Lanka (the island of Sri Lanka). Rama son of Ayodhya, won his wife, Sita, by bending and breaking Shiva's unbendable bow. He was banished by his stepmother for 14 years to the forest, where Sita was abducted by Ravana. After many adventures, Rama killed Ravana, won Sita back, returned to his kingdom and reigned for 1000 years. This was the time of great apes, Australopithecus boisei which suffered extinction

from another powerful enemy. However, Rama incarnation saved the species which gave rise to Homo erectus. To one who is not a Hindu his story is rather a matter of literature than of religion. Rama is usually depicted as of dark hue, often bearing a bow and arrow. He is attended by his faithful queen Sita, the personification of wifely devotion. To his devotees Rama combines the ideals of the gentle, faithful husband, the leader brave in hardships, and the just and benevolent king.

The eighth incarnation was Krishna, which is undoubtedly the most important of the incarnations of Vishnu, who is the hero of the great Indian epic Mahabharata. Krishna appears as the constant friend and advisor of the five Pandavas (5 brothers) and he preached the great sermon of the Bhagavad Gita (Holy Book) to Arjuna before the battle which is the centre of the epic story. Krishna was brought up in obscurity among a community of cowherds. After killing a succession of demons, including Vatsasura, who come in the guise of a calf, Krishna killed demon Kamsa. He assisted the hero Arjuna in the great battle of Kurukshetra (Old Delhi) disguised as his charioteer. After seeing the Pandavas safely installed in the Kuru land, Krishna returned to Dwaraka (his Capitol city). Here Yadavas (cow tribe) chiefs quarreled among themselves. For all his divinity, Krishna could do nothing. His son Pradyumna was killed before his eyes and his faithful brother Balarama wounded to death. Krishna dejectedly wandered in a forest. A hunter spied him through the undergrowth and mistook him for a deer. An arrow pierced his heel, which like that of *Achilles of Homer's Iliad* was his one vulnerable spot and he died. The city of Dwaraka was then swallowed by the sea. Krishna's incarnation ushered the Homo erectus into a new Homo sapiens.

The ninth incarnation was Buddha (Gautama Buddha). Vishnu's ninth incarnation was not identified until the third or fourth century AD. In the earliest accounts of it, Vishnu was said to have assumed this avatar in order to convert demons to Buddhist beliefs, with the intention of weakening them in their war against the gods, or to mislead sinful mortals so that they would receive their just punishment. Later, a more positive reason was suggested. According to most theologians the god became Buddha in order to delude the wicked, lead them to deny the Vedas, and thus ensure their damnation. Jayadeva's Gita Govinda (sacred writings) however, which contains one of the earliest lists of incarnations, states that Vishnu became Buddha out of compassion for animals, in order to put an end to bloody sacrifice. Buddha incarnation tries to bring out Homo sapiens in humans and still continues desperately, the struggle between the man and the natural world.

The tenth and the final incarnation would be Kalkin and is still to come, and Vishnu will appear at the end of the present age, the Kali Yuga, which began in 3102 BC and will last 432,000 years. In its final years, humanity will face a breakdown of civilization and a loss of spiritual and

moral values. At the end of this Dark Age Vishnu will appear in the form of a man mounted on a white horse, with a flaming sword in his hand. He will judge the wicked, reward the good, and restore the age of gold. It is said that many simple Hindus take the Kalkin very seriously, and long for his arrival just as old-fashioned Christians look forward to the second coming of Christ (Parousia). Christian parallels have been found, especially with the *horseman of the Book of Revelation*, but the main inspiration of the Kalkin may have come from Buddhism, which taught the coming of Maitreya Buddha long before the Vaishnavites devised the Kalkin. Zoroastrian ideas may also have helped in the formation of the myth.

Vishnu's status as the universal god, of whom all other gods are aspects or emanations, appears as early as the Bhagavad-Gita. The sacred text reads: *"I'm the beginning, the middle, the end, of all creation. I am the source of all that is to be. I am the glory of the glorious. I'm the victory. I'm the courage. There's nothing that can exist without me. There is no end to my holy powers. And whatever is mighty, fortunate, strong, springs from the portion of my glory."* The earliest version of this doctrine is contained in the Bhagavad-Gita, wherein Krishna reveals himself as the ever active godhead incarnate. *"In essence I am never born, I never alter. I am the lord of all things and the full master of my own nature, yet of my own power I come to be. Whenever the sacred law fails, and evil raises its head, I take embodied birth. To guard the righteous, to root out sinners, and to establish the sacred law, I am born from age to age."*

God Years

When it comes to *time in Cosmology*, we follow God's clock. In psalm 90:4, we read, *"For a thousand years in your sight are like a day that has just gone by, or like a watch in the night."* Monday morning, 15 billion years ago, God commands something remarkable, "Let there be light" (Gen 1:3). The Big Bang, the biggest Violent Cosmic Explosion, released an enormous amount of energy which could be later, seen as organized universe, new stars are born. Hundreds and thousands of dark and dense cosmic gases violently fusing together and God created the gift of space and time, matter, gravity, strong and weak nuclear forces, electromagnetic force and science. *Teilhard de Chardin is right when he writes that, "The cosmos is fundamentally and primarily living... Christ, through his Incarnation, is internal to the world... rooted in the world, even in the very heart of the tiniest atom... Nothing seems to me more vital, from the point of view of human energy, than the appearance and eventually, the systematic cultivation of such a cosmic sense."* Now, star clusters are visible and 5 billion years have passed and it was Monday evening for God and God saw it was good.

Tuesday morning, 10 billion years ago, God continues to expand the organized space and matter. God calls the expansion “the sky” (Gen 1:8). Star clusters congregate and new galaxies are born. Gravity is pushed to the extreme, stars go out of fuel, crushed by their own gravity, they go supernova. These occur at the end of a star’s lifetime when its fuel is exhausted and it is no longer supported by the release of nuclear energy. Vast amount of gas and debris, which is known as stardust (stellar nebula) is visible across the universe. Death of a previous star provides matter to a second generation star. Our star in the Milky Way Galaxy a *second generation star*; perhaps formed from the remains of a previous supernova as there’s high abundance of heavy elements such as iron, gold, and even uranium in the Solar System. Ten billion years have passed and it was Tuesday evening for God. God was pleased with the progress. He saw it was good.

Wednesday morning, 5 billion years ago, God created our Solar System, our planet Earth, sun and moon, seas, algae and the first plants. Planets are from the planetary nebulae formed from a shell of gas which was ejected from a newly born hot star. Our solar system began forming in a concentration of interstellar dust and hydrogen gas called a molecular cloud. The Earth formed simultaneously with the other solar system planets and the central sun. Accretion of planetesimals produced a large body which assumed a spherical shape. Probably cool at the outset, this proto-Earth rapidly heated up, formed its metallic core within 100 million years and was subjected to continuous impact bombardments of asteroids, comets, and meteorites. After millions of years, Earth cooled down and it rained millions of years to form oceans and life was inevitable (PDR). Twelve and half billion years have passed and it was Wednesday evening. God saw it was good.

Thursday morning, 2.5 billion years ago, the first organisms faced extinction. Some of the organisms were *stromatolites*, algae and one celled organisms. Most of them were the building blocks of life. Eighty five percent of the primitive life forms perished. God redesigned the Earth by creating Ozone Layer, protecting Earth from ultra violet rays from the sun, creating atmosphere rich in oxygen, eliminating the poison gases and giving ability to plants to photosynthesize the sun’s energy. *God was preparing Earth for more special and complex life*. “I’ve selected you in your mother’s womb”. Fourteen and half billion years have passed and it was Thursday evening for God and God found it was good.

Friday morning, 500 million years ago, planet cools down and also has plenty of oxygen and life proliferates abundantly on our planet. There are fish, vertebrates and invertebrates, reptiles, birds, mammals, livestock. Scientists called this abundance of species as “*Cambrian Explosion*”. Scientists agree that the Cambrian explosion is one of the most significant events in the history of life. It is marked by a series of biological changes that took place a relatively short period of geologic time during the early

Cambrian, 543 to 520 million years ago. First and foremost, the Cambrian explosion is marked by the global appearance of organisms with skeletal structures were simple in design, such as minute cylindrical tubes, tiny cones, and rudimentary jaw-like appendages. However, they evolved rapidly into larger and more elaborate structures comparable to the exoskeletons of many living invertebrate groups. These early skeletons were constructed from a diverse array of materials that form the building blocks of skeletons to this day, including calcium carbonate, calcium phosphate, and silica. Another 496 millions have passed, it was Friday evening for God and he saw everything was good.

Saturday morning, 4 million years ago, something extraordinary is going to happen. The book of Genesis 1:27 read “So God created man in his own image, in the image of God he created him, male and female he created them”. The history of Ethiopia begins with Lucy. Lucy was a female hominid that lived in what is now called the Awash Valley in Hadar some 3.5 million years ago. When her skeletons were discovered in 1974, Ethiopia then claimed that it was the first dwelling of mankind. Lucy’s scientific name is “Australopithecus afarensis.” The first word “Australopithecus” means “Southern Ape” and the second word “afarensis” means she was discovered in the Afar region. Ethiopians refer to her as “Dinqesh.” Lucy is kept preserved at the national museum in Addis Ababa and an exact plaster replica is also displayed next to her. She probably did not live more than 20 years and weighed around 60 pounds and stood three and a half feet. It was Saturday evening for God and whatever he had created, was very good.

The sacred text reads, “The heavens declare the glory of God; the skies proclaim the work of his hands. Day after day they pour forth speech; night after night they display knowledge. There is no speech or language where their voice is heard. Their voice goes out into all the Earth, their words to the ends of the world. In the heavens he has pitched a tent for the sun, which is like a bridegroom coming forth from his pavilion, like a champion rejoicing to run his course. It rises at one end of the heavens and makes its circuit to the other. Nothing is hidden from its heart.” Psalm 19:1-6

God’s Eye

From all these stories we’re forced to marvel at the actions of God in cosmological time scale and we are able to understand to a certain extent about the wisdom of God who prepared the place for humans. We do not have any evidence besides Holy Scripture and some fossils. But we can’t go beyond Precambrian 4.5 billion years backwards. However, a recent technology allows us to peer into past, taking us back in time to the very first moment of creation. Astronomers had long dreamed of a telescope placed

above Earth's atmosphere. Such an instrument would never be bothered by clouds, its sky would always be dark, there would be no rough air to blur images, and wavelengths outside the range of visible light; ultraviolet and infrared in particular, would not be blocked. The collected data could lead to understanding of what God was doing beyond 4.5 billion years ago. However, until the advent of the space age, such aspirations remained mere dreams.

Named after American astronomer Edwin P. Hubble, *the Hubble Space Telescope* was launched on April 24, 1990. The HST makes observations in the visible, infrared, and ultraviolet regions of the electromagnetic spectrum. The primary mirror of the HST has a diameter of 94.5 inches (240 cm). It had produced images of astronomical bodies ranging from our planetary neighbors to far-flung galaxies, pictures marked by unprecedented detail that fully justified the hopes of astronomers, engineers, and spaceflight enthusiasts had placed in the orbiting eye in the sky. Hubble telescope, the scientific marvel with a powerful eye mounted on this giant, *can peer through the deep time itself*, unraveling great wonders, created by God. Some scientists would like to call this telescope as *God's Eye*. We are able to see remarkable new worlds, stars, clusters, constellations, galaxies, black holes, solar systems, and planets and they are hundreds and thousands of light years away.

The collected data could then be used to calculate the age of the universe. In June 1994 a team of American scientists announced that the HST had provided the first convincing evidence of the existence of a black hole. The acceleration of gases around the center of *the galaxy M87* indicates the presence of an object with a mass 2.5 billion to 3.5 billion times greater than that of the Sun. The Hubble telescope revealed light emitted by galaxies more than 12 billion light-years away. These galaxies are farther away and their light is older than any before seen. Astronomers used this information to increase the estimate of the number of galaxies in the observable universe to 125 billion, up from the previous estimate of 80 billion. Since God has revealed himself to us in Bible, we know for sure that God follows a Code or a pattern in creation, incarnation, redemption and salvation. The life of Jesus is an unmistakable testament for this pattern. I would like to call it a *PDR Code (passion, death and resurrection)*.

There is permanency, stability, consistency, and infallibility in the PDR Code. We could call it a divine rule by which the Trinitarian God was acting in the Cosmological timescale through violent Big Bang and the birth of a new universe, violent death of stars (supernova) and birth of new stars, violent death of galaxies into a black-hole and birth of new galaxies. This phenomenon repeatedly happened in a course of deep time which could be 15 billion years. This Hubble telescope is like a giant theologian who sees God in the act of creation and passes this knowledge to curious creatures like humans. The telescope captures the *PDR code in action*. PDR could

be seen in the Big Bang (passion and death) and the transformation of a new Universe (resurrection). In the Old Testament there are number of references to this kind of violent nature. In the imaginative philosophy of the Hebrews, thunder was regarded as the voice of Yahweh (Job 37:2-5, Ps 18:13, Ps 29:3-9). Yahweh was in the violent cloud of fire, burning bush, (Ex 3:2) and thunder and lightning. In the New Testament baptism of Christ in the river Jordan provoked a lightning and thunder from which God spoke. In the Acts of the Apostles, we see the same violent nature in the coming down of the Holy Spirit on the apostles with tongues of fire, followed by strong wind.

Psalm 29 says, *“The God of glory thunders, the Lord thunders over the mighty waters. The voice of the Lord strikes with flashes of lightning. The voice of the Lord shakes the desert; the Lord shakes the desert of Kadesh. The voice of the Lord twists the oaks and strips the forests bare.”*

PDR Code

Violence could be seen in the death of stars (passion and death), followed by a birth of new stars and galaxies (resurrection). Prior to the age of science it might have been possible to assert that the universe, if not the earth itself, had always existed. The recurrence of seasons, the changeless patterns of stars, the ebb and flow of cycles in nature all suggested stability, eternal and pervasive. Time itself, the most fundamental of all variables, might have seemed to be infinite, flowing seamlessly from an endless past into an eternal future. In 1929, Edwin Hubble extended the notion of a beginning to the universe itself. Light reaching the earth from distant galaxies has a slightly different color than the red region of the spectrum. The most sensible explanation for this shift, as Hubble realized, is that the distant galaxies are moving away from the earth at great speeds. The greater the red shift, the faster the galaxy is moving, just like a speeding locomotive whose whistle deepens in pitch as it moves away from an observer. To Hubble’s initial amazement, the most distant galaxies are moving faster; almost as though everything in the universe had been blown apart from a great initial explosion at a single point in space and time, an explosion known popularly as the big bang.

So, what caused the big bang? What set the fuse? What existed prior to the great explosion? Stephen Hawking’s popular book “A Brief History of Time” was an ambitious attempt to answer these and other questions on the initial state of the universe. Its technical density notwithstanding, it became a best-seller, which is unusual for any science book and demonstrates the intensity of public interest in such subjects. The universe inflates and expands from the moment of the big bang. To

understand how we can have inflation, let us note that Einstein's general theory of relativity tells us that the rate of the universe's expansion is directly related to the density of matter and radiation in it, and since mass and energy are equivalent ($E=mc^2$), this means that the universe's expansion is related to energy density; the higher the universe's energy density, the higher its rate of expansion; and lower the energy density, the lower the rate of expansion.

We go backwards in time to the moment just before the big bang one must imagine inconceivable amounts of mass and energy concentrated at a single point in space. One of the most remarkable findings of cosmological science is that the universe did have a beginning, and a spectacular beginning. It placed a wall at the beginning of time, closing to inquiry all events that might have occurred before that cosmic explosion. In the view of many scientists, the big bang casts a distinctly theological light on the origin of the universe. According to the big bang theory, the primordial high-density-high temperature plasma should have filled the universe with a sea of radiation corresponding to its temperature. The high temperatures would make radiation of extremely short wavelengths. Early universe would have been hot enough that nuclear reactions would have occurred everywhere, and that the products of these nuclear reactions might also still be around today.

For example: "*deuterium.*" Deuterium was made only in trace amounts in the big bang, and it turns out that that trace is a very steep function of the density of the newly born universe. At higher densities, all the deuterium is destroyed and converted to helium 4; at low densities, lesser amounts of deuterium are destroyed by nuclear collisions, leaving some deuterium to remain to the present day. *Any deuterium seen today is directly traceable to pristine material from the big bang.* One of the major mysteries of modern cosmology is how the smooth early universe was able to fragment and break up into the system that we see today with clumps of galaxies, stars, and people. In Bible we read that before God created humans, they were dust (technically stardust). Clearly, some seeds for the formations of these clumps had to have existed in the early universe. The origin of those seeds is thought to be related to particle phenomena in the early universe. This is again one of the potential connections between cosmology and particle physics.

Galaxy formation occurred relatively early in the history of the universe. Because light takes a finite amount of time to travel long distances, by looking at objects from great distances, we see not how the objects are now but how they were in early times. There is also the interesting fact that all the different arguments about the universe's age give approximately the same result. The dynamics of the universe using the Hubble age gives an estimate of about 10 to 25 billion years. The ages of the oldest stars range from 12 to 18 billion years, as does the age implied from radioactive dating of the heavy

elements. All this evidence is completely consistent at around 15 billion years, given the accuracies of the different techniques. *These totally independent methods all give the same age.* All of these confirmations of the big bang tell us that the early universe was, indeed, hot and dense. By extrapolation, it is clear that matter was once so hot that it was decomposed into its most primordial constituents, quarks and leptons. Thus, the physics of high energy dominated the very early universe, and perhaps the only way to explore the fundamental physics of this early universe in a controlled way is in particle accelerators.

The observations done with optical telescopes to establish the universe's expansion, those with radio and microwave telescopes to find the background radiation, those with satellite-carried telescopes, even those with the Apollo Moon mission to establish the abundances of the elements, as well as the various age arguments, all confirm that the big bang idea seems to be right. *Accelerators* are now checking these ideas by verifying the number of elementary particles to see whether the big bang predictions were correct. The two fields have become quite symbiotic. Predictions help explain mysteries and paradoxes in the interrelated fields. Here is how astrophysicist Robert Jastrow puts it: "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 sitting there for centuries." Jastrow's theologians, of course, were sitting there telling the scientists, "We told you so!" what was really happening was more complex. Either there is God and the big bang dates the moment of His creation of the universe, *or there is a tendency of matter to create itself from nothingness.* If that is the case, the big bang merely marks the moment of that self-creation or the latest oscillation in a grand series of cosmic cycles; big bang followed by big crunch, followed by yet another big bang.

What we do know is that the universe, our planet, and life itself all had distinct origins, their own beginnings, and so did we. This does not prove that the ultimate beginning must be attributed to the divine, but neither does it provide any scientific basis for ruling God out. The world has many religions but just one science, and that tells us something about both. The first common belief is the primacy of God in the universe. Most religions like Judaism, Christianity, and Islam all believe in a genuine, personal God who created the universe and everything within it by an act of His own volition. Their God is eternal, but the world He has created has a distinctive beginning and may eventually come to an end. Second, we exist as the direct result of God's will. *We are the intentional creations of God,* creatures with physical bodies but immortal spiritual souls. He has endowed with us with free will,

allowing us to choose good or evil, to love God or reject him. Third, God has revealed Himself to us. God has spoken through the prophets or by the words of Jesus, or through Muhammad, and by direct, personal contact with individuals of faith. *In each age He finds a way to bring His message directly to us.*

Each of these great faiths believes that God is active in the world in a personal sense through cosmological time scale. Their God is who answers prayers; sometimes not to answer them. Their God provides hope and inspiration, performs miracles, and provides the resources needed for individual salvation. Let there be no doubt about it: the God of Adam and Eve and the God of Abraham and God of Moses is the same. God of Big Bang and God of Supernovas is the same. God of extinctions and God of speciation is the same. Most readers of this book, whether they believe in Him or not, will recognize Him immediately. God of Babel and God of London is the same. God of death and God of life is the same. We mean that God is love, or God is the universe itself, or, being a scientists, may be we mean that God is the laws of nature. Well, we don't. Such views, however carefully stated, dilute religion to point of meaninglessness. As Carl Sagan noted, such a God would be "emotionally unsatisfying...it does not make much sense to pray to the laws of gravity." Such Gods aren't Gods at all; they are just clever and disingenuous restatements of empirical science contrived to wrap an appearance of religion around them, and they have neither, religious or scientific significance.

We are interested in a traditional view of God; the one described by the great Western monotheistic religions. That's the God that believers wonder about, that's the one they pray to, and that's the one who seems to be threatened by evolution. And that is the God whose actions, intentions, and existence I wish to consider in this chapter. We want a God who is active now and active then. So does any believer. If we believe in an active and present God, a God who can work His will in the present in ways consistent with scientific materialism, then why couldn't that same God have worked His will in exactly those ways in the past? The real, actual, working world that we see around us is one that is ruled by chemistry and physics. Life works according to laws.

Actions of Cosmic God

If God is real, this is the world He has to work in. Therefore any effort to view God's work in light of modern science must find a way to understand how His will, could be accommodated at all times, in a special way in the past, when He created the universe and acted all through the cosmological time scale. In the traditional view of God's power held by all Western religions, God's presence and His power are part of the continuing truth of existence. What this means, in plain and simple terms, is

that ordinary processes, rooted in the genuine materialism of science, ought to be sufficient to allow for God's work, yesterday, today, and tomorrow. Every event in time, no matter how big or small, exerts some influence on the future of history. If some of those events are inherently unpredictable, then the course of history is going to be just as unpredictable. The natural history of evolution is unrepeatable because the nature of matter made it unpredictable in the first place. We have progressed so much in self-awareness and understanding that we now know there is a boundary around our ability to grasp reality. And we cannot say why it is there? But what does not make the boundary any less real, or any less consistent with the idea that it was the necessary handiwork of a Creator who fashioned it to allow us the freedom and independence necessary to make our acceptance or rejection of His love a genuinely free choice.

Molecular biology has succeeded in finding in which DNA-coded instructions are executed in development; providing ever more detailed glimpses into the drama by which a single cell grows into an adult organism. The anti-evolutionists have, in essence, treated the origins of species as a kind of unexplained solar fire in which the inability of science to provide immediate explanation becomes proof for the existence of God. God, therefore, becomes the default explanation, their refuge of choice, for any event in natural history we cannot yet explain. The success of scientific materialism, especially in biology, have led the anti-evolutionists to propose that the only feasible way for the Creator to have interacted with living organisms was to have made them, sometime in the distant and unobservable past. Hence their insistence that the origin of species, the appearance of the first cells, and even the biochemical design of the flagellum must be the direct and miraculous work of a designer.

Strong scientific evidence exists to show that evolution can account for the natural history of life. No doubt we have a great deal yet to learn, but we really do understand the essence of the sun's fire, and we really do understand the forces that brought our species into existence. There is no point in pretending that we don't. Indeed, Christianity, Judaism, and Islam regard the *continued personal activity of God* to be an essential element of belief. As a matter of unshakable faith, they believe that God can act in the world at the present time. If he could act now, he could act in future, not mentioning he acted in the past. And that, presumably, He can work His will in any way He likes; with power or with subtlety, by works of nature, or by the individual actions of His creatures. The very same people, bowing to the explanatory power of molecular biology and biochemistry, would also agree that life today can be understood as a wholly material phenomenon. None that we know of would reject the proposition that a single fertilized egg cell; the classic specimen of developmental biology contains the full and complete set of instructions to transform itself into a complex multi-cellular organism.

Miracles aren't required; complexities of molecular biology will do just fine.

This means that the biological world of today, which we can test and study, analyze and dissect, is one in which believers as a matter of faith, accept sincerely the tenet that God can and does work His will. Obviously, they do not see any conflict in the idea that God can carry out the work He chooses to in a way that is consistent with the fully materialist view of biology. Curiously, they somehow regard those very same mechanisms; adequate to explain God's power in the present, as inadequate to explain His agency in the past. For some reason, God acted in the past in ways that He does not act in the present, despite the fact that we assume in the present that he can do anything and everything, *and nothing is impossible for God. All these happen in God's eternal present. For us it is past but for God it is present.*

If humankind evolved by Darwinian natural selection, genetic chance and environmental necessity made the species. Deity can still be sought in the origin of the ultimate units of matter, in quarks and electron shells but not in the origin of species. We call him God of quarks. *Pantheism is wrong, but Panentheism is right when it defines, "God in all and all in God."* God was present in that early form of matter which Bible talks about it in chapter 1:2 "God was hovering over." In another words God is in the quarks, atoms, cosmic dust, stars, clusters, galaxies, constellations, supernovas, black-holes, pulsars, quasars, plasmas, liquids, solids, gases, rocks, trees, mountains, bugs, animals, cells, organelles and humans. Religious impulse is a universal aspect of human nature. We certainly agree, and so would most sociologists and anthropologists. Hans Kung was right when he asked the atheists why there is something instead of nothing.

Religions lost when it came to the definition of the structure of the Earth. Here we sit having one thought ourselves the center of the universe, only to learn that we occupy a tiny planet swinging around a star of below average intensity, at the periphery of a nondescript galaxy dwarfed by thousands of other larger and more magnificent than our own. If there is a God, and if He created this universe just for us, He seems to have waited billions of years to get around to us, and when He did, He stuck us off in an insignificant cosmic backwater. The scale of the universe might argue that we are insignificant, but the physical structure of the very same universe seems to say something quite different. Gravity is a good example. The value of the gravitational *constant is just right for the existence of life.* A little bigger, and the universe would have collapsed before we could evolve; a little smaller, and the planet upon which we stand would never have formed. The gravitational constant has just the right value to permit the evolution of life. Our luck didn't stop there. Gravity is one of four fundamental forces in the universe. If the strong nuclear force were just a little weaker, no elements

other than hydrogen would have been formed following the big bang. If it were just a little stronger, all of the hydrogen in the universe would be gone by now, converted into helium and heavier elements.

Without hydrogen there is no sun, no stars, no water, and no life. If another fundamental force, electromagnetism, were just a little stronger, electrons would be so tightly bound to atoms that the formation of chemical compounds would be impossible. A little weaker, and atoms would disintegrate at room temperature. If the resonance level of electrons in the carbon atom were just four percent lower, carbon atoms themselves would never have formed in the interiors of stars. No carbon, no life as we understand it. It almost seems, not to put too fine an edge on it that the details of the physical universe have been chosen in such a way as to make life possible. Recognition of this has led to the formulation of what is known as the “*anthropic principle*.” The physical constants of the universe in which we live have to be favorable to human life, because if they were not, nobody would be around to observe them. In other words, the very fact that we are here to make a fuss means that the physical constants of the universe were set up in a way that made our existence possible.

We have no way of knowing for sure how those constants were determined, whether or not they might be different in another universe, whether they were fixed by the conditions of the big bang itself, or whether they reflect an unchanging physical reality that predated the big bang and the origin of our universe. Stephen Hawking says, “The odds against a universe like ours emerging out of something like the Big Bang are enormous. *I think there are clearly religious implications.* We also have to keep our minds open to the possibility that future advances in physics may one day explain the apparent coincidences that seem to link many of these constants. Naturally the notion that we might be here, as the result of an intentional choice of the constants that govern physical laws is a little too much for nonbelievers to swallow. The western Deity, God of the Jews, the Christians, and the Muslims, has always been regarded more as the architect of the universe than the magician of nature. In a way, that places Him above much of the materialistic fray. This very Western idea of God as supreme lawgiver and cosmic planner helped to give the scientific enterprise its start.

Many Eastern religions take the view that reality is entirely subjective and that man can never separate himself from the nature he wishes to understand. Ancient eastern feeling is that the workings of nature might reflect the glories of the Lord. Hindu philosophers were left to contemplate Shiva’s ever-changing dance of life and time. *The story of the universe is the same as the story of God.* It is the same busy God who was in the first quark who led the atoms to fuse, creating energy, eventually into formation of the stars, galaxies and universe. God’s ceaseless activity continues. Cosmos was regarded as proof of the wisdom and skill and care of that

great architect. The heavens in all their regularity reflected the grandeur of the Lord. The sacred text reads, *“The heavens declare the glory of God; the skies proclaim the work of his hands.”* And scientific investigation was regarded as a fine and appropriate way to get closer to the Creator’s ways. According to Newton, *“This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an Intelligent and powerful Being.”* The human role could involve nothing more than watching the pages of history turn inflexibly towards a preordained future. We remember the Psalm 33:6, *“By the word of the Lord were the heavens made, their starry host by the breath of his mouth.”*

God of Geological Time Scale

Psalm 33 continues, *“He gathers the waters of the sea into jars, he puts the deep into storehouses. Let all the Earth fear the Lord; let all the people of the world revere him. For he spoke, and it came to be; he commanded, and it stood firm. The Lord foils the plans of the nations; he thwarts the purposes of the peoples. But the plans of the Lord stand firm forever, the purposes of the peoples. But the plans of the Lord stand firm for ever, the purposes of his heart through all generations.”*

The earth had a beginning, it was only few billion years ago, and the date of that beginning is written like a signature into the very ground upon which we stand. The vague notion of an energetic beginning became much more specific with the discovery of radioactivity. The persistence of radioactive disintegration deep within the earth suddenly explained why our planet’s core refused to cool; but it also placed an upper limit on the planet’s age. As I’ve pointed out at the beginning of this chapter, the Hindu God Vishnu was fully involved in the past, for at least 5 billion years. It is amazing that the modern notion of deep time came to be known only in the early part of the 20th century. But Hinduism had the notion of deep time from Vedic time. Geologists talk about Periods and Epochs, Eras, Eons and Zones, Stages and Series, the arcane subdivisions of what is known as the geological timescale. All are defined by death. For geologists, death becomes the ticking of the geological clock. The geological timescale presents a time line spanning the entire history of the Earth to which geological and evolutionary events can be tied. The quantity of time elapsed since the formation of the Earth is near-unimaginable. With inputs from understanding rock sequences and relationships, identifying the presence and absence of fossil faunas and the science of radiometric age dating, the geological timescale is very fundamental to understanding of the history of the Earth.

Hadean age or Pre-geologic Eon-4600 million years ago, planet had begun as a molten sphere-God was fire, breathing fire in his nostrils-shaping the landscape, which will be too splendid to look later on with human eye. During Hadean time, the Earth and Solar System formed by coagulation and

gravitational compaction from a large cloud of gas and dust around the Sun, *called an accretion disc*. The Sun formed the nucleus, shrinking in on itself by gravitational compaction until it reached a stage where it ignited with nuclear fusion and give off light and heat. The surrounding particles within this cloud coalesced into planetisimals which then aggregated to form micro-planets. The energy of the collisions between the larger micro-planets, as well as interior radioactive and gravitational heating, generated a huge amount of heat, and the Earth and other planets would have been initially molten (passion and death). The heavier molten iron sank to the down to become the core, while lighter elements gradually rose to the surface. The lightest of all became the crust as a sort of “scum” on the surface. There was also an out-gassing of molecules such as water, methane, ammonia, hydrogen, nitrogen, and carbon dioxide. An initial steam atmosphere formed of water from comets and hydrated minerals.

Genesis reports in chapter 2, “*steams came up from the earth and watered the whole surface of the ground.*” Rain fell to form ocean 4.3 to 4.4 billion years ago. Once most of the planetisimals were gone the planetary bombardment stopped, and a stable rocky crust formed on the Earth. This is the oldest rocks of Earth and also of moon rocks. Atmospheric water condensed into oceans and proto-life formed in the soup of *primordial organic molecules*, either in the early oceans or in clay or rocks within the crust itself (resurrection). This is the period during which the Earth’s crust was formed. This crust melted and reformed numerous times, because it was continuously broken up by gigantic magma currents that erupted from the depths of the planet, tore the thin crust, and then cooled off on the surface before sinking again into the heart of the Earth. Earth covered by molten lava, had turbulent landscape, constantly gases rising into atmosphere. God’s presence was seen in shaping of the planet. God is present in violent forces of nature and through violent activity, emerges a new creation. New Lithosphere is born.

The Archaen Period marks the beginning of Earth’s proper geologic history. It is during this period from 3.8 billion to 2.5 billion years ago that the earliest documented rock formations were created on Earth’s crust. Also during this early Eon in Earth’s history, continents and oceans began to form, and life had begun the long saga of evolution in the primordial stew of elements of Earth’s oceans. Although much cooler than the supposed fiery hell of the Hadean Period, the beginning of the Archaen Period saw a heat flow on Earth that was three times higher than it is today. Much of this had to do with the fact that Earth was still accreting, or forming, and the molten iron core was pumping out considerable heat. Furthermore, radioactive decay as well as a preponderance of volcanic activity on the surface helped to contribute to this stifling heat. At this tectonic and volcanic activity might have been too great for continents to form. It wasn’t until the end of the

Archaen Period that proto-continental masses began to form actual continents. About 70% of the continental masses we know today were formed during the late Archaen Period.

During the Archaen, asteroids were becoming less common in the Solar System and Earth was not being bombarded as much. This helped reduce the heat of the surface and allow for cooling of the young planet Earth. At this point in earth's history, it seems unlikely that there was any free gaseous oxygen in the atmosphere. In fact, it was a very toxic mix of methane, ammonia, and other gases inhospitable for life on the surface. However, liquid water must have been on the planet due to the presence of sedimentary rocks and the fact that the sun's diameter was smaller than its present-day size. This would allow for temperatures cool enough for water to be present without evaporating off the hot surface of the earth. Giant cloud formations would have dumped huge quantities of rain onto the cooling surface, thus forming giant oceans.

God of Ancient Life

Proterozoic Period marks the time when complex organisms began to make their first real foothold on Earth. It lasted from 2.5 billion to 543 million years ago, and is divided into three parts from earliest to latest: *the paleoproterozoic*, *the mezoproterozoic*, and *the neoproterozoic*. In terms of geology, there is a much better geological record to study than the one in the Archaen Period. By this period, Earth's continents had largely coalesced, although not in the form we know them today. It would take hundreds of millions of years for the phenomenon of continental drift to move the continents into their present configurations. The most striking feature of the Proterozoic Period, and one that would have a significant effect on the course of life on Earth, was the buildup of oxygen in the atmosphere. Prior to the Proterozoic, Earth's atmosphere was composed largely of toxic elements such as hydrogen, ammonia, and methane.

The buildup of oxygen can be attributed to the increase in photosynthetic organisms such as algae that converted the sun's light energy and carbon dioxide into sugars and oxygen. This process helped to reduce the greenhouse effect that was heating the planet (much like it does to Venus even today) and also pumped oxygen out into the atmosphere. By understanding of our geology, we can understand the actions, and interactions of God in the history of geological time scale. We get to insert more matter to the revelation of God. We understand that God of geological time scale is full of activity: volcanoes, earthquakes, meteorite impacts, comet impacts and full of movement, *plate tectonic activity* and constant change. And God was living in the proximity to the garden and he was talking and interacting with every individual in the garden. God is part of our existence and he is present in every second of our geological time scale. As Hinduism

puts it, “God is present in pillar and also he is present in every particle of pillar.”

The Cambrian Period lasted for nearly 53 million years, from about 543 million years ago until 490 million years ago. The Cambrian Period marks the beginning of the Paleozoic Era. This period gets its name from a place in Wales in England, where the first examples of this type of ancient life was found. The climate at the beginning of this period was cold, but over time the climate in all parts of the Earth grew warmer. This made the seas a good place for many species to live. The continents were still forming. They were mostly barren rocks. The land had no plant or animal life on it yet. *During the Cambrian Period there was an explosion of life forms.* Most of these were in the water. Many animals with no backbones lived in the shallow seas. These animals were invertebrates.

One species was so plentiful and had such great numbers and so many species that it is sometimes called the ruling species of the period. This species is called “*Trilobite.*” The trilobite was an arthropod with a tough outer skin. It got its name from the three lobes in the hard skin. The trilobite was also one of the animals to have eyesight. During the Cambrian there were more than 100 types of trilobites. There were plenty of other species; mollusks, worms, sponges and echinoderms filled the Cambrian seas. The plants of the Cambrian were mostly simple, one-celled algae. The single cells often grew together to form large colonies. The colonies looked like one large plant. The Cambrian Period began with an explosion of life forms. It ended in a mass extinction, perhaps Vishnu’s Matsya incarnation happened in this Period (PDR Code). Advancing glaciers would have lowered the temperature of the shallow seas where so many species lived. Changes in the temperature and the amount of oxygen in the water would have meant the end for any species that could not adapt.

During the Ordovician Period (490 to 440 million years), life expanded in diversity tremendously (resurrection). There were extensive reef complexes in the tropics. The early Ordovician thought to be quite warm, at least in the tropics. Despite the tremendous expansion of life during Ordovician Period there was a devastating mass extinction of organisms at the end of the Ordovician. Perhaps, Vishnu’s Kurma incarnation happened in this time. *This extinction was perhaps the greatest mass extinction ever recorded in Earth’s history (PDR Code).* The more likely cause is that the earth cooled. The greatest extinctions occurred in the tropical oceans. This makes sense since if the oceans cooled because of the development of a large ice sheet over the south polar region, the organisms adapted to warm tropical conditions would have had no where to migrate to. There would be no regions warm enough for them to migrate to. This tends to support the idea that cooling led to many of the extinctions.

There were two main landmasses during the Silurian Period (440 to 417 million years). *The southern continent of Gondwanaland consisted of South America, Africa, Madagascar, India, Australia and Antarctica. The northern continent Laurasia consisted of North America, Greenland, Europe and most of Asia.* The seas of the Silurian period were warm, shallow and teeming with life. The climate was very warm and humid, but layers of broken shells (called coquina) are evidence of a climate dominated by storms. Many of the animals either lived anchored to the sea floor or buried in the mud and silt below. Some, such as trilobites and gastropods, crawled on the sea floor to scavenge food, while others, such as nautiloids, swam as predators. Most of the animals that lived on or in the sea floor filtered the water to feed on microscopic plants and animals. Brachiopods are the most common hard-shelled organisms, making up 80% of the total species. The most important evolutionary of this Period was that of the first true terrestrial ecosystem. The first fossil records of vascular plants, that is, land plants with tissue that carries food, appeared in the Silurian Period. By the middle Silurian, a very simple early terrestrial community with simple plant producers, millipede herbivores, centipede and arachnid carnivores, worm detritivores, and fungal decomposers had developed. The mid-late Silurian terrestrial biota included small plants along the water's edge, and arthropods such as trigonotarbid and myriapods.

While lacking large animals, the landscapes of the Devonian Period (417 to 360), saw incredible changes in plant life. *Green color is added to once barren land for the first time.* Any plant whose structure promoted capillary attraction or other means to pull moisture and minerals from the moist soil could survive inland, away from rivers. Plants with root-like systems evolved rapidly. Also quick to appear were so called vascular systems: systems of cells that transmit moisture up the stalk of the plant. The more surface area exposed to the sun, the more photosynthesis occurred. Evolution favored specialized organs to expose surface area to the sun: leaves. Plants need sunlight. The taller the plant is, the better the chance of getting out of the shade of other plants. Taller plants needed stronger stems.

The earliest stiff-stalked and woody plants appeared around 400 million years ago. Stiffness enabled plants to grow vertically and stand taller in the air. Many Devonian plants were seedless. Ferns bear interesting traces of their origins. They produce no seeds but rather spore cells that fall to the soil and grow into a peculiar intergeneration plant that is not a leafy fern but a specialized fungus like form that produces egg cells and sperm cells. Propelled by its whip-like tail, the sperm must swim a short distance through the water of moist soil to fertilize an egg cell from a neighboring plant. The fertilized egg then grows into a mature fern that produces more spores (in the brownish spots on the underside of fern leaves). *Ferns are one type of seedless plant that has survived since the Devonian.* The giant tree fern is still

common in tropical regions such as the prehistoric-looking landscapes of Hawaii Volcanoes National Park.

Carboniferous Period comprises of Mississippian and Pennsylvanian periods (360 to 290). Less than 100 million years after the first mass extinction, another occurs around 365 million years ago, perhaps Vishnu's Varaha incarnation happened in this Period. As before, it seems related to climate change and reduces the number of species by half. It took another 30 million years to recover the loss (PDR Code). Earth again grew warmer. Handy mosses and horsetails that survived to this day, joined with evolving tree ferns, and cordites to form subtropical forests. *It is called the Carboniferous period because, over millions of years, succeeding generations of these extensive forests loaded themselves with carbon extracted from the atmosphere. They were gradually pressed into the ground and fossilized as coal and oil.* Carboniferous forests beside shallow lakes swarmed with life. Living and rotting vegetation provided food for insects, spiders, crustaceans, and many other invertebrates. There were giant dragonflies with 28 inches wingspan and their descendants still survive today. All the fossil fuels come from this Period.

Ninety percent of marine life was lost during a world's largest mass extinction at the end of the Permian Period. Perhaps, Vishnu's Narashima incarnation happened in this Period (360 to 250 million years). New evidence suggests that volcanoes, not an asteroid, are to blame (PDR Code). The scientists did find evidence of high levels of carbon dioxide, likely caused by volcanic activity. Near the end of the Permian Period, tension in the Earth's crust in present day Siberia led to massive volcanic activity in the region. Emissions from those volcanoes could have caused changes in the atmosphere and ocean circulation, leading to mass extinction. *Trilobites and many other groups of organisms became extinct. This was a period of transition.* The early Permian saw the continuation of the Carboniferous biomes, with *polar tundra* regions and warm wet tropical swamp forests. The old tropical coal swamps declined and disappeared with the drier and cooler climate, surviving only in China and in high latitudes of Pangaea. Plant life consisted mainly of ferns and seed-ferns, with new plants like conifers and ginkgos coming into prominence. *This is also a time that the land mass joined together forming one continent called "Pangaea."* The movements of crust might have been a partial cause for the mass extinction.

God of Middle Life

The Triassic Period (250 million to 205) is the first geological period of the Mesozoic Era or *Age of Reptiles*. It was during this time that Archosauromorph (ruling) reptiles achieved dominance on land, and many types of marine reptiles flourished in the seas. The Triassic saw the single vast supercontinent of Pangaea straddling the equator. All around Pangaea

was a huge ocean, *Panthalassa*. The climate was warm but for the most part dry, and the middle Pangaea was very arid. During this time, the ectothermic (cold-blooded) archosauromorphs attained prominence over the endothermic (warm-blooded) therapsids or mammal-like reptiles. Towards the end of Triassic, several new and more advanced archosaur groups evolved from the earlier forms. These were the giant snakes, crocodiles, dinosaurs and the pterosaurs. The first true mammals also appeared at very end of this Period. The mammals were to remain insignificant throughout the whole of the Mesozoic Era and only come into their own after the extinction of the dinosaurs.

The second of the three divisions that make up Mesozoic Era, the Jurassic Period (205 millions to 160) saw warm tropical greenhouse conditions worldwide, shallow continental seas, the break-up of Pangaea, cosmopolitan flora and fauna, and the triumph of the majestic dinosaurs and the great sea reptiles. Recently, the word Jurassic has become a household word with the success of Spielberg's rather absurd movie about genetically resurrected dinosaurs, Jurassic Park. Ironically most of the dinosaurs featured in Jurassic Park actually lived during the following, Cretaceous Period. Jurassic saw disintegration of Pangaea that began in the Triassic continuing apace. The Jurassic sea level rose and flooded large portions of the continent. These warm shallow seas were home to a rich diversity of life. Some of the known animals evolved in this period, snails, millipedes, scorpions, spiders and mites. As for the vertebrates, modern shark groups begin to appear. Dinosaurs were diverse and abundant. The plant eaters were kept in check by a variety of carnivorous (theropod) dinosaurs. Some of the smaller carnivores developed feathers and took to the air. These were the proto-bird Archaeornithes.

The Cretaceous (160 million to 65) saw the lengthening and widening of Atlantic Ocean, which especially spread further south, while Alps were formed in Europe. India broke free of Gondwanaland and became an island continent, much like Australia is now. Africa and South America split apart, Africa moving north and closing the gap that was once *the Tethys Sea (name of the sea at the time of Pangaea)*. The continents began to take on their modern form. *Cretaceous Period was the best time of Dinosaurs*. The Cretaceous life was the time period of 135 to 65 million years ago. This was the last of the dinosaur evolution chain. For reasons unknown all dinosaurs became extinct at the end of this Era. There is a lot more dinosaur species in the Cretaceous Era than the other two dinosaur times. The fossil discoveries typically are in much better quality than the other two prehistoric time lines and due to evolution there was many more species. The most famous dinosaurs known are the Cretaceous Era like the *massive Tyrannosaurus* (featured in Jurassic Park) and the fearsome Velociraptor.

Dinosaurs lived and evolved for over 185 million years and suddenly mysteriously disappeared. What caused the demise of this ubiquitous group

of reptiles which included some of the largest animals to ever walk the planet? One of the great mysteries in science is the extinction of the dinosaurs at the end of the Mesozoic Era some 65 million years ago. Perhaps, Vishnu's Vamana incarnation happened in this Period. One of the most well-known and intriguing theories suggested for dinosaur extinction is the asteroid theory. In 1980's the father-son team of Luis and Walter Alvarez discovered a *layer of iridium in the K-T boundary*. Iridium is rare on earth, but abundant in meteorites. The Alverezs' suggested that a huge asteroid or comet, perhaps miles in diameter, hit the earth at that time. The result of such an impact would be an enormous explosion that would throw dust clouds into the sky darkening the planet. Massive forest fires, triggered by the hit, would add smoke to the sky. This would cool the planet causing the climatic changes observed. A crater, now worn down and partly under ocean, was found along the Mexican Yucatan Peninsula and its creation coincides nicely with the K-T boundary. NASA scientists estimate that the *asteroid that made Chicxulub Crater*, as it is now known, would have been about 6 to 12 miles in diameter. The crater is about 130 miles across.

God of Recent Life

The Paleocene Epoch (ancient recent life – 65 million to 50) marks the beginning of the Paleogene Period and the Cenozoic Era. The sea level fell to expose dry land in much of inland North America, Africa and Australia. South America moreover was cut adrift with its own unique evolving of birds, mammals, and reptiles. On land, many new types of mammals appear in a dramatic evolutionary radiation, filling the ecological roles vacated by the dinosaurs. But compared to the majestic Cretaceous mega-fauna, these animals were puny. No Paleocene mammal exceeded the size of a small modern bear and most were a lot smaller. They were all short-legged and plantigrade (walking on the soles of their feet), and they had five toes on each foot, a primitive feature. Most or all have forty-four low crowned teeth, another primitive feature. Almost all of them had slim heads with narrow muzzles and small brain cavities. Among fishes, sharks seem to have been particularly plentiful. Other Paleocene groups included Cretaceous survivors such as the multituberculates (creatures with venom), the marsupials (Kangaroo, Koala) and several groups of the insectivores and a group of squirrel-like animals more or less transitional between insectivores and primates.

The Eocene is the second Epoch of the Cenozoic Era. The Eocene started approximately 56 million years ago, and lasted roughly 20 million years (55 million to 35). During this Epoch the first primates that resemble living species evolved. *By the end of this Epoch most of the modern orders of mammals had evolved.* In addition to these modern looking species, a great deal of archaic species still roamed the landscape. The continents continued to move. *The large island that was to become India met the continental mass of*

Asia, and created what would become the Himalayan range. The Eocene is regarded as the warmest Epoch of the Tertiary. Subtropical conditions could be found up to the Arctic Circle at the start of the Epoch. Toward the end of this Epoch the climate began to deteriorate, and temperatures began dropping significantly. Increasingly warm conditions at the start of the Eocene caused the extinction of some prominent species of this Epoch. Perhaps, Vishnu's Parasurama incarnation happened in this Epoch. But, overall, land mammals flourished as new species diversified and adapted (PDR Code). In particular, mammals with a keen sense of smell thrived in the dense forests and warm conditions, even around the Arctic Circle, which enabled these species to migrate between North America and Europe via Iceland and Greenland.

Primates from this Epoch had evolved all the characteristic features of the order. And so it appears that these animals lived a different sort of life from that of their Paleocene ancestors. These primates had grasping hands and feet that had nails rather than claws. One of the most influential developments is the primate reliance on sight rather than smell that evolved around fifty-five million years ago. These primates were abundant on several continents, but were evidently absent from South America and Antarctica. Both of the modern suborders of primates originated in the Eocene, or possibly in the late Paleocene. One suborder includes lemurs and lorises (strepsirhines). The descendants of these species still thrive in the tropical forests of Africa, Madagascar, and Asia. The other suborder (haplorhines) includes the higher primates, such as monkeys, apes, and humans, which are often referred to as "*anthropoid primates*". These primates come from Asia, Arabia and Africa and still inhabit these areas.

Monkeys, apes and humans are the living descendants of the first anthropoids, which evolved in the Eocene. Anthropoids diversified greatly during the late Eocene and the Oligocene. The boundary between the two Epochs is marked by a 10 million year long fluctuation in climate and environment. One of the environmental results was the shrinking of the subtropical and tropical forests. These forests, which had fostered the adaptive radiation of species, started their retreat to the modern tropical zones. *As a result of these changes, grasses evolved, which greatly influenced the evolutionary history of the mammals.* At the end of the Eocene the primates of the Northern hemisphere nearly disappeared, many primate species took refuge in Africa and Arabia. It was in this refuge area where the ancestors of Old World monkeys and apes evolved in the Oligocene.

The Oligocene is the third Epoch of the Cenozoic. It started approximately 35 million years before the present and lasted a little more than ten million years (35 million to 25). Global cooling marked the start of the Oligocene, an environmental shift that led to changes in the flora and fauna. During this epoch archaic species of the early Cenozoic were replaced by modern

herbivores, such as horses, camels and deer, and carnivores such as cats and dogs. During the Oligocene global temperature dropped as much as 10 Celsius, shrinking forests and introducing the grassy plains that would come to dominate in the Miocene. Herbivorous species adapted to eating grass and carnivores adapted to hunting out in the open. Both groups evolved better eyesight to see predators and prey as well as elongated limbs to increase speed over open terrain. The earliest South American primates are known from this epoch. A site in Bolivia dates the arrival of primates in South America to approximately 30 million years before the present. Given the fact that South America was an island for much of the Cenozoic, colliding with North America not until the middle Pliocene, it is entirely clear how these species arrived on the continent and where they came from. Primate species traveling from either continent would have had to cross major bodies of water. Global cooling, which dropped the sea level, would have shortened some of the gap between the continents, but at no point did it create a land bridge.

The South American species resemble African primates more than they do the North American ones, which lead many to believe in an African origin on the New World primates. *Primate evolution in the Oligocene involved increases in brain and body size, sexual dimorphism, and possibly social complexity.* Environmental changes caused the near extinction of primates in the Northern Hemisphere (PDR Code). In Asia and Africa, anthropoid primates (the higher primates) seem to have thrived. On the basis of analysis of the fossil remains, these primates are thought to have been arboreal quadrupeds (four feet) that fed on fruit and leaves. These species are the ancestors to the apes of the Miocene. At the end of the Epoch woodland and grassland-living animals had evolved that were similar to species that populate those types of habitats today. Temperatures cooled throughout the Oligocene, and an icecap formed for the first time over Antarctica, which melted at the start of the next Epoch, the Miocene.

Miocene is the fourth Epoch of the Cenozoic. It started approximately 23 million years before the present and lasted eighteen million years. It is during this Epoch that we see the first true apes and Old World monkeys. The Miocene was a time of great mammalian diversity, and many species originated and became extinct in response to environmental change (PDR Code). The Miocene started out warmer than the preceding Epoch. The warmth melted the polar ice cap that had formed over Antarctica. Fluctuating climate, which was characteristic of this Epoch, caused a majority of the woodland environments to be replaced by *savanna grasslands*. These grasslands were home to a diverse fauna. In North America, species of rhino roamed the countryside alongside as many as a dozen horse species. Volcanic activity increased during the Miocene. Africa became more arid during this Epoch, and *India's collision with Asian mainland continued*

to form the Himalayas. As South America moved north, the passageway between the continent and Antarctica opened up. The resulting circulation of cold waters around Antarctica led to the formation of deep, cold bottom waters in Earth's oceans.

Primates of the Miocene were diverse, not only in species but also in size, *locomotor patterns*, and social structures. Primates moved into most of the locomotor and dietary *niches* they now occupy. In the early Miocene, ape species evolved and diversified in Africa and by about 16 million years ago, apes spread to Eurasia and began to diversify there as well. The variety of species creates a very complex picture of ape evolution. These apes exhibit a greater range of sizes than is found amongst modern apes, in fact, the largest two species are thought to have been leaf-eaters (foliovores). Analysis of the fossil remains shows that many of the species had a combination of primitive and derived features which make it hard to tell which ones were ancestors of modern apes, orangutans, gibbons and humans. While the apes of Africa and Eurasia had their greatest diversity during the early Miocene, relatively few species of Old World monkeys are known from this time span. Monkeys underwent a major radiation in the late Miocene and throughout the Pliocene. During the late Miocene, the diversity of large apes began to decline as tropical and subtropical habitats of Europe and Asia began to contract and become concentrated closer to the equator. At the end of this Epoch we see yet another cooling event, related to the expansion of the ice sheet that covered Antarctica. Ocean levels dropped in response to the formation of ice on land, which resulted repeatedly in the drying and catastrophic refilling of the Mediterranean Sea.

The Pliocene is the fifth Epoch of the Cenozoic. The Epoch started around 5 million years ago and lasted almost three and half million years. It is during the *Pliocene that the first bipedal ancestors of humans* are known to have evolved. Dramatic cooling and a drop in sea level impacted both marine and terrestrial life at the start of the Epoch. During the early Pliocene the Mediterranean was undergoing repeated drying and refilling, which had started in the previous Epoch. This refilling and consequent evaporation represented a series of catastrophic events. As the dam blocking the entrance of oceanic waters would give way, a waterfall thousands of times bigger than any modern waterfall pumped water into the Mediterranean basin. The repeated flooding of the Mediterranean caused changes in climate and species extinctions (PDR Code). By about 3 million years ago, the Panamanian land bridge formed due to the movement of the South American continental plate into North America. This land bridge blocked the passage of water between the Atlantic and Pacific oceans and allowed terrestrial species to migrate between the two continents.

The resulting interaction and competition for resources resulted in the extinction of numerous South American species (PDR Code). Primate

evolution during the Pliocene is characterized by two major developments. Monkeys, which were relatively few and geographically restricted in the Miocene, spread throughout the Old World. The other event is the evolution during the Pliocene, all from a common ancestor that lived in Africa at least 4.5 million years ago. All of these Pliocene species of early humans also lived in Africa. During this Epoch, more than one species of early human flourished at once and sometimes coexisted in the same geographical area. By contrast, in modern times, there is only one hominid species, *Homo sapiens*. The middle of the Pliocene was marked by the onset of glaciers. The glacial ice sheet that now covers the Arctic Circle formed during this Epoch, and it was during the following Epoch, the Pleistocene, that the sheet spread far south of where it is found today.

The Pleistocene started approximately 1.8 million years ago and ended 11,000 years ago. Due to the recent start and end of this Epoch, a great deal is known about its geologic, climate, and evolutionary history. During this Epoch the polar ice sheets expanded and contracted - the reason why the Pleistocene is commonly known as the *Ice Age*. Modern humans evolved and spread throughout the world during the Pleistocene. Although it's known as the Ice Age, this Epoch was marked by glacial advances and retreats, and includes periods that were warmer than the present. Between about 1.8 and 1.0 million years ago, a complete cycle of glacial advance and melting took about 40,000 years. During much of the past one million years, the cycle was longer, completed about every 100,000 years. These dramatic oscillations in climate had severe impact on all forms of life. With glacial advances, sea levels dropped and land bridges were created. During retreats, these bridges were once again submerged. The so called *Pleistocene "mega-fauna"*, such as the woolly mammoth and saber-toothed cats, evolved during these climatic fluctuations.

Environmental fluctuations happened during the Pleistocene which was apparently conducive to human evolution, which is characterized by an increase in the adaptability of the human lineage the robust *Australopiths (ape-man)* suffered extinction in the early part of the Pleistocene. Due to glaciation more than 70% of the apes perished. Perhaps, Vishnu's Rama incarnation took place in this Epoch (remember in Ramayana, a great ape Hanuman). This Epoch is known for the radiation of early human species out of Africa, a trend that started in the late Pliocene. The end of this Epoch is marked by the onset of the current interglacial. Most researchers consider this interglacial to be a new Epoch, the Holocene.

Life Here and Now

The Holocene is our current Epoch. Some researchers argue that it is merely an extension of the Pleistocene, though most recognize it as a separate geologic entity. To get an idea of Holocene environments and habitation

simply take a look around you. The Holocene started with the glacial retreat approximately 10,000 years before the present resulting in the current interglacial period. Temperatures are warmer now that they were at the end of the Pleistocene, making northern areas more hospitable. The Epoch is marked by the spread of civilization, the creation of city-states, written languages and all things associated with complex culture. By the start of the Holocene humans had migrated to all the areas in which they currently reside. Excavations of sites around the world have shed light on what life was like at the start of Epoch. It was around the start of the Epoch that the domestication of plants and animals occurred, allowing for a more settled lifestyle. Perhaps Holocene witnessed the two incarnations of Vishnu, Krishna and Buddha. *Judaism, Christianity and Islam consider Holocene Epoch as very important. It is in this Epoch that Jesus Christ took form of a human and lived on planet Earth.* The sacred text reads, “In the fullness of time... God sent his only Son.”

Psalm 24 reminds, “*The Earth is the Lord’s, and everything in it, the world, and all who live in it; for he founded it upon the seas and established it upon the waters.*”

Earth is a very pleasant planet and, according to her stone diaries, has been so for millions of millennia. It is easy to forget just how remarkable this condition is, in the same way that we tend to be unaware of good health until becoming sick. For at least four billion years, through meteorite impacts, climate change, and continental reorganizations, liquid water has remained stable at Earth’s surface, and life has thrived for nearly as long. Earth is a super-system of countless smaller, interconnected systems involving rock, water, air, and life. These systems operate at special scales from microscopic to planetary, over time periods from seconds to millions of years. Anyone who has ever struggled with diabetes, depression, or debt knows how hard it is to achieve and sustain his or her own physiological, emotional, or financial equilibrium. Little by little, we earthlings are beginning to understand some aspects of how this most peculiar planet works, what makes it so robust and resilient.

Some of the key characteristics of Earth’s systems are redundancy, recycling, and the capacity for self-correction. These attributes are common to the solid Earth, the oceans and atmosphere, and the biosphere. *Over geologic time, the specific rhythms and idioms change slowly, but the essential rules of the dance remain the same* on the part of organisms, interaction, restraint, reincarnation, and on the part of God, incarnation, salvation, and redemption. Fortunately, Earth has kept a good record of what has happened in the past, when biogeochemical upheavals have occurred. To read it, we need to speak the language of the rocks and the ice.

Generations of geologists have sat in much the same place and contemplated the same panorama, but what they have seen and understood

their very perception of land and sea has changed with the knowledge and prejudices of the times. The fundamental rocks that were once so incomprehensible have been picked apart and placed in their proper place in the history of the Earth. Supercontinents have come and gone, but the speckled gneisses endure. These gneisses have seen it all, achieved a kind of repose. The assault by the sea today is no more than a postscript to a history that has seen these rocks gliding around the world, roast in a deep furnace, witness silently the transformation of the atmosphere, and the rise of those presumptuous new comers, animals. The rocks will still be here when the last organism has vanished from a parched earth. Those that the world considers insignificant and inferior, God redeems by choosing them to be his very own, and God chooses only the best, and God has a very good taste for selection, never trash. Jesus spent lots of time in the desert and talked very often about rocks.

First Corinthians 1:27 reads, “*God chose the foolish of the world to shame the wise.*” But they are chosen not to overthrow the powerful by their own ways and weapons but by ushering in new ways, values, and ideas so as to build a more human society for everyone. Out of their own suffering, they are called to create a society where no one will have to suffer. Their suffering is the basis of their call, not to canonize suffering as if it was something good in itself but to struggle to eliminate the very root causes of the suffering. The pattern of choosing the rejected of this world to begin the new creation is consistent not only throughout the Hebrew Scriptures, but *comes to a high point in Jesus the Galilean, Son of Mary*, and continues today through the apparitions of Mary, to a peasant girl Bernadette, and the peasant children of Fatima, and an Indian Juan Diego of Mexico, and the peasant folks in Vailankanny, India (Mary’s shrine).

In the biological realm too, the size and productivity of the biosphere is the secret of its success. Darwin’s theory of the survival of the fittest was based on the *Malthusian premise* that population growth leads to struggle for resources. Darwin knew that most plants and animals produce far more offspring than can survive, and he recognized that this *super-fecundity (plenty of chances to survive)* could be the driving force for evolution by natural selection. Individuals die but species persist, adapt, and thrive. The redundancy built into the system, the seemingly profligate seed production by a sunflower, the enormous number of eggs by a frog, makes a biological community robust. Conversely, once the population of a species dwindles below some critical threshold, its reserves are too thin to allow it to keep pace with the processes that winnow individuals, disease, poaching and environmental change. When the survival of a species hangs on the lives of a few individuals, extinction is nearly inevitable. Earth’s equipoise is perhaps its most remarkable character trait.

While Earth's sister planet, Venus, has simply grown hotter and hotter over time. Earth's brother, Mars, has slipped into a deep, cold sleep, our home planet remained both awake and equable. The earliest entries in the rock record, a handful of Australian zircon crystals dated at 4.4 billion years, as well as all the subsequent volumes, *clearly indicate that liquid water has been stable at Earth's surface from the very beginning of the planet's history*. Earth has had chills but has suffered no malady so extreme that its climatic immune system could not ultimately overcome it. This is because Earth has high and low tech strategies for mitigating crises, an ancient and astonishing system of checks and balances that involves the oceans, atmosphere, biosphere, and solid Earth. The lessons we can draw from Earth's story are not merely metaphorical, rather, they are design archetypes that we should emulate in our economic and social systems if we wish to avoid irreparable instability. Earth can teach and humans can learn. *Brihad-aranyaka Upanishad, the timeless sacred text reads, "Do not stay in illusion, Go to the eternal reality. Do not remain in darkness, approach the light. Do not remain in this place of death, become immortal."*

In writing about nature, we should diligently avoid the anthropomorphization of the phenomena under study, suppressing the natural tendency to see ourselves in everything we look at. But it should not be surprising that we recognize ourselves in the Earth, since we are its progeny. *Our mistake is forgetting that we are simply the youngest children in generations in the old dynasty*. Narcissistic fascination with our own short biographies blinds us to the far richer and deeper family saga. In reading the rock record, we may perhaps anthropomorphize the Earth a little if we also "geomorphize," ourselves, rediscovering the history of the Earth imprinted on us. *Once you have found a rock in its natural habitat, it is essential to identify a lingua franca shared with these survivors from ancient and unfamiliar times*. How can we presume to understand objects that formed unimaginably long ago, when the very geography of the Earth was different?

The first and most fundamental tenet of geology is the principle of "uniformitarianism" which, in sound bite form, is the idea that the present is the key to the past. That is, we can use our understanding of processes occurring on Earth today to interpret rocks, the records of times in the past. While the concept of uniformitarianism may seem almost too obvious to warrant discussion, the articulation of the principle in the late eighteenth century was an intellectual revolution of the first order. And the idea is subtler than it first appears the overzealous application of uniformitarian logic has sometimes blinkered geologists' vision. *James Hutton, a Scottish gentleman farmer and physician was lucky enough to be on the fringes of the gifted group sometimes called the Edinburgh Enlightenment, his circle included economist Adam Smith, philosopher David Hume, Erasmus*

Darwin, the grandfather of Charles Darwin, and James Watt, inventor of the steam engine. As a landowner in a wet climate, Hutton was aware of how much soil was lost to the sea by erosion each year, and as a religious man, he was troubled by the thought that God would allow the continents simply to be worn progressively away. He therefore began to seek evidence could be found only in rocks.

He recognized that the rocks exposed on the seaside cliffs of eastern Scotland were formed from sediment that had been derived from older continental rocks. And in this single insight, the Scottish farmer simultaneously articulated the central precept of geology and made a compelling argument for an Earth that was far older than the 6,000 years allotted to it by the church. In his one great treatise, “The Theory of the Earth,” published in 1788, he showed remarkable understanding of modern geologic principles: “The ruins of an older world are visible in the present structure of our planet, and the strata which now compose our continents have been once beneath the sea, and were formed out of the waste of pre-existing continents. The same forces are still destroying, by chemical decomposition or mechanical violence, even the hardest rocks, and transporting these materials to the sea, where they are spread out, and form strata analogous to those of more ancient date.”

The concept of our God will be understood in future by our descendants more perfectly, in accordance with the scriptures and revelations. Sometimes science can be seen as an anticipation of knowledge and understanding which could be potentially possible for humans in 10 or 20 million years. On this pursuit science can make hundreds of mistakes in attempting to arrive at truth, it is a frustrating job to do, demanding more patience and perseverance, perhaps helping religions to make their missions more helpful and meaningful, transcending much beyond the efforts taken by religions themselves. Religions should have more faith in sciences, it is like adding more respect and faith to humanity, celebrating our new findings, encouragement in our failures could accelerate our achievements. Our belief is that all sciences should point toward the ultimate and permanent reality that calls for a culmination of knowledge and wisdom in fullness. Would science and faith ever come together? We may not be much enthusiastic about this project but on the other hand, our species will live up to see this project come to completion. Future generations of humans would be faster, smarter, stronger, and wiser than our generation. Imagine 5000 years of our history had so much exciting information to offer in the realms of science and religion. As hunters and gatherers early hominids invented the use of fire, made hunting tools out of stones, perhaps the biggest achievements in science and expressed their esthetic appeal in cave paintings.

God of History—Goal of our Existence

Religions played an important role in shaping human history. Religion was busy with Gods rather God was busy with man. In a short time of 5000

years, God has communicated with humans with frequent interactions. In Christianity the interactions are very frequent and no other religions report frequent revelations or interactions from their Gods in this short period of time. All those interactions of their Gods with other religions were happened in the vast period of geological time scale. Some five thousand years ago, the Christian God was a Father figure called Yahweh, who called Abraham from the Ur of Chaldeans, given him a project of making a nation who will be known in time as Jews and another sect people later known as Christians. Almost two thousand years of actions and interactions of Yahweh with the Abraham's descendants (Jews), carefully, painstakingly and elaborately recorded in the Holy Book of Torah the Jewish Law; and also recorded in the Christian version of Torah the Old Testament.

The books of the Old Testament are loaded with interesting information about Yahweh, describing the personality and character, which could be deciphered in his interactions with the people. However, there is an insatiable ethereal aspect in these writings that drives the reader in relentless pursuit of truth. Two thousand years of Yahweh are the everlasting chronicles of God of history. However, he uses garden of Eden to launch his creation story, finds his image in man, expects co-operation in Abraham, triumphs in Moses as a liberator, cares for his people in judges, protects his nation in kings, moralizes the stiffed necked in prophets and leaves his presence for ever in the followers. The next two thousand years will never be the same with the coming of Jesus Christ the Son of God. All his words and actions are recorded in the four gospels in the New Testament. The apostles of Jesus wrote that they ate and drank with him, touched him, talked to him, I would like to think of another few thousand years, if not millions or billions: religions have in store for plenty of revelations, redemptions and new salvation stories.

Our generation has acquired enormous amount of information about God, about life and about our destiny through revelation. Christianity with the authority of teaching on dogmas (the Magisterium of the church) can define 100 per cent with infallibility some of the truths which science could never even think off, like one God and Three persons, Heaven, Hell, Purgatory; however, even big minds like St. Augustine and St. Thomas Aquinas expressed limitedness of their capability of arriving to conclusions in these matters. Many people do not have any problems with the teachings of the church. "In Credendum" the faithful become infallible with the *Magisterium*. Our leap of faith allows us to make these teachings into realities. After all who knows? Faith assures us of objective truth beyond any doubt, on the matter of dogmas, transporting us to a highest realm of soul, where we can see for ourselves. Man at present can see the reality of God only through faith. Sometimes, today's faith is tomorrow's reality. Today's wrong is tomorrow's right. However, after 10,000 years as Homo sapiens' head becomes bigger

and more intelligent, more wise, and more neuron cells added to the brain and he is ready for further more complex revelations; Scriptures would get bigger. *As long as human history lasts, the revelations and redemptions are inevitable.* Frequent revelations in Christianity perhaps have to do with the human evolution and the biogenesis of the human brain; depend on the complexity of the brain, thus, revelations compatible with the brain, capable of understanding and accepting.

Psalm 65 states, *“you care for the land and water it; you enrich it abundantly. The streams of God are filled with water to provide the people with grain, so you have ordained it. You drench its furrows and level its ridges; you soften it with showers and bless its crops. You crown the year with your bounty, and your carts overflow with abundance. The grasslands of the desert overflow; the hills are clothed with gladness. The meadows are covered with flocks and the valleys are mantled with grain.”*

As times go by, scientific and religious meetings on these issues are filled with argument and disagreement, and that’s good thing. Intellectual conflict, even on a personal level, is good for science and theology because it motivates individuals to test their ideas and those of their competitors in the crucibles of experiment and observation. Both have a well-defined, consistent, and productive set of explanations. So, religious beliefs may not be concerned about detection of flaws or inadequacies in sciences like, cosmology, geology, ecology and anthropology, and in theories on evolution and theories on astronomy. Our prime objection to these theories did not derive from a careful analysis of the scientific evidence, pro and con. It came from a deep emotional commitment to the idea that *nature alone could not be the source of human nature.*

At its core, evolution threatens the sense of special-ness we enjoy in a world where we have come to view ourselves as the centerpiece of creation. No matter how hard we probe, the peculiar quantum nature of reality does not allow us to predict the behavior of even a single electron with certainty. And this uncertainty, which theory suggests we can never overcome, prevents science from ever attaining a complete understanding of nature. However, science and religion eventually, without no doubt in our mind, would meet and make peace with each other, realizing their genuine intention and good will in all those years in the past to see this moment coming, and this is an aspect of *a New Heaven and New Earth*; we can be definitive on this. Our limitations in science and religion in understanding nature, should allow us to be bound in everything, including evolution, into a worldview in which science and religion are partners, not rivals, in extending human understanding a step beyond the bounds of mere materialism.

It would be nice to pretend, as many of the scientists do, that the study of evolution can be carried out without having any effect on religion. In their

own way, they might envy other scientific fields, for example, organic chemistry or oceanography, that seem to barrel ahead at full speed without ever being cast into the arena to grapple with the Almighty. However one might hope that to be the case, and much of the scientific establishment surely wishes it were, the clash between evolution and religion is not about to go away anytime soon. The heart of the matter is that evolution is, by definition, a story of origins. This means, however powerful its scientific support, it really does supercede another creation story; in particular, the creation story at the very core of Judeo-Christian narrative. The conflict between these two versions of our history is real, and do not doubt for a second that it needs to be addressed. Evolutionary biology successfully provides material explanations for the origins of species and the history of life leads to triumphant excess. Even though philosophical conclusions about meaning and purpose are generally thought to lie outside science, any number of self-assured scientist display no hesitation in claiming that evolutionary biology is capable of making a powerful and profound statement on the ultimate meaning of things. Evolutionary biology could tell us about the nature of God himself. Whatever the God implied by evolutionary theory and the data of natural history, he is a loving God who cares about his productions. He is an awful God portrayed in the book of Job.

The God of the Galapagos was careful, caring and benevolent. He is certainly the sort of God to whom anyone would be inclined to pray. My ancestors knew the gods, and so did yours. For thousands of generations, these men and women, mothers and fathers of all our families, huddled in fear each time the sun god dipped below the earth's cold horizon. They prayed as children, asking mercy from the gods of darkness, the demons of the night, imploring favors from the moon and stars. Our gods did the magic. They did the work of nature, and they ruled the lives of man. They warned us some days, and on others they made us shiver. They healed us when they wished, and other times they struck us down with sickness and death. Most of all, they filled a need that all men have, a need to see the world as sensible and complete. Gods filled the voids in nature we could not explain, and they made the world seem whole. Then something happened, something wonderful. A few of our ancestors began to learn the rules by which nature worked, and after a while, we no longer needed "Surya" (Hindu sun god) or Apollo to pull the sun's chariot across the sky. We no longer asked Ceres to waken seeds from winter sleep. The movements of the sun and moon became part of a mechanism, a celestial machine in which each motion could be calculated and explained. The boldest among us, having weighed the sun and moon and plotted the orbits of the planets, took inventory of the substances of the earth. They harnessed the fearsome power of the thunderbolt, drew fuel from the ground itself, and built machines that turned nighttime into day. The gods had lost their power.

Gradually, humans took up the greatest challenge of all; we sought to understand life. We learned the causes of sickness, and with such knowledge conquered the very diseases that had slain so many and produced such fear. We discovered the units of life itself, learned to read and understand the language of inheritance, and even began to edit and change the code of life. How did we do all this? What changed a minor species of bipedal primates into the masters of the planet? In a word, we learned to explore nature in the systematic way we now call science. To be sure, the gods of our ancestors left stories, and from such treasures we fashion the literature and art that adorn a hundred human cultures. We should always be grateful for those riches, but the gods themselves are gone, and we are no longer subject to their tyranny. We live in a world where the real dangers come not from demons and spirits, but from the awful *consequences of our own excess as a species*. And serious thought they are, very few of us would be so foolish as to change those worries for a regression to the abject darkness of the past.

Whether you look at human history as an optimist or a pessimist, whether you greet a new century with dread or with enthusiasm, there is no denying the transforming reach of science and technology on human affairs. The more profound effects of science have been to change the ways in which we view the world around us. As humans began to find material explanations for ordinary events, the gods broke into retreat. Trying science makes sense because science comes with a track record. Science works because it is based on causality. Once you understand a process, even a complex one, you can reduce it to the mechanistic sum of its parts. Then, everything that happens becomes an obligatory outcome of how those components interact. It's just something happens. No longer magic, but just a simple predictable outcome.

Each of the great western monotheistic traditions sees God as truth, love, and knowledge. Each and every increase in our understanding of the natural world should be a step towards God, and not, as many people assume, a step away, *if faith and reason are both gifts from God, then they should play complementary, not conflicting, roles in our struggle to understand the world around us*. Understanding evolution and its description of the processes that gave rise to modern world is an important part of knowing and appreciating God. True knowledge comes only from a combination of faith and reason. A nonbeliever, of course, puts his trust in science and finds no value in faith. Science allows believer and nonbeliever alike to investigate the natural world through a common lens of observation, experiment, and theory. The ability of science to transcend cultural, political, and even religious differences is part of its genius, part of its value as a way of knowing. What science cannot do is to assign either meaning or purpose to the world it explores. This leads some to conclude that the world as seen by science is

devoid of meaning and absent of purpose. It is not. What it does mean is that our human tendencies to assign meaning and value must transcend science, and ultimately must come from outside of it. The science is enriched and informed from its contact with the values and principles of faith. The God of Abraham does not tell us which proteins control the cell cycle. But He does give us a reason to care, a reason to cherish that understanding, and above all a reason to prefer the light of knowledge over the darkness of ignorance.

As more than one scientist has said, the truly remarkable thing about the world is that it actually does make sense. The parts fit, the molecules interact, the darn thing works. *To people of faith, what evolution says is that nature is complete.* God fashioned a material world in which truly free, truly independent beings could evolve. He got it right the very first time. In obvious ways, the various objections to evolution take a narrow view of the capabilities of life; but they take an even narrower view of the capabilities of the Creator. They hobble His genius by demanding that the material of His creation ought not to be capable of generating complexity. They demean the breadth of His vision by ridiculing the notion that the materials of His world could have evolved into beings with intelligence and self-awareness. And they compel Him to descend from heaven onto the factory floor by conscripting His labor into the design of each detail of each organism that graces the surface of our living planet. Sadly, none of this is necessary. If we can accept that the day-to-day actions of living organisms are direct consequences of the molecules that make them up, why should it be any more difficult to see that similar principles are behind the evolution of those; organisms.

Genesis 1:26, “Let us make man in our image, after our likeness,” tell us something very different. We are assured that our efforts to understand nature are valid, because our hearts and minds are fashioned in the likeness of God. Our senses, the ultimate sources of knowledge, are imperfect, but they are not deceitful. Nature does not give up her secrets easily, and our first explanations of reason and the power of the human mind, the world will yield its secrets; and so it has. The God in whom believers put their trust may surpass our understanding, but the assurance that we are made in His image means that He and His world are accessible to our best efforts. The world actually does make sense.

It had shown us that nature was organized in a systematic, logical way. Science had shown that material mechanisms, not spirits, were behind the reality of nature. It had found that each level of analysis was to ones above and below in the same way that the function of a clock is connected to the gears and shafts and springs within. And it had given mankind a new vision, viewing ourselves as material beings. The vastness of the universe itself gives a hint that this was exactly God’s approach. If a Creator were to fashion a world in which the constants of matter and energy made the evolution

of life possible, then by forming millions of galaxies and billions of stars with planets, he would have made its appearance certain. With the sample size of only one, we can hardly look at earth's natural history and be assured that *the evolution of intelligence and consciousness is the unavoidable outcome of life here or anywhere else*. But given the size of the universe, it is easy to imagine that there may be many such experiments in progress. For all we know, God has revealed Himself to us, according to our many religious traditions, because we were the first of these experiments to be ready; or because we were merely the latest of His many encounters with creation.

The oldest text from Shvetashvatara Upanishad reads, *“Time, space, chance, matter, primal energy, intelligence; none of these, nor a combination of these, can be the final cause of the Universe, for they are effects, and exist to serve the soul. Nor can the individual self be the cause, for, being subject to the law of happiness and misery, it is not free.”*

Chapter - Four

Hominoids to Imagio Dei (The Image of God)

Holy Scripture reads, “From one man he made every nation of men, that they should inhabit the whole Earth; and he determined the times set for them and the exact places where they should live.” (Acts 17:26)

In recent times the terms hominoids and hominids have become synonymous with one another. I prefer to separate them and use hominid to classify humans only. Hominoids, on the other hand, I would designate as upright walking primates, which are “*human like*”, only in the respect that they walk upright. That is the only real parallel we have with them. Everything else about them, from an anatomical stand point, is a light year separation in morphology. Today, the hominoids are represented by only five genera: gibbons, orangutans, gorillas, chimpanzees and our own species, *Homo sapiens*. In the Miocene Epoch, between 20 and 6 million years ago, this was a much more diverse group, as demonstrated by the numerous fossil genera that have been discovered in Africa, Asia and Europe. The most ancient hominoids lived around 20 million years ago in Africa. Outside Africa, the first hominoids date from around 16 million years ago, but many different forms are known to have lived in Europe and Asia 12 million years ago. Within the next 10 to 15 million years ago we have *Dryopithecus* with very ape like features. *15 million years ago Ramapithecus*, was showing much more hominid characteristics.

Dryopithecus means tree-ape and fossil species of this prolific genus have been found in Africa, Europe and India, Sri Lanka, one species in particular. *Dryopithecus africanus* appears to be a close relative, possibly an ancestor of modern chimpanzees. *Ramapithecus brevirostris* was first discovered by G.E.Lewis in India in 1932 and is named after the Indian God Rama. Since then a number of other fossil teeth and bits of jaw bones have been found that are also considered to from *Ramapithecus*, some from South Africa. Subsequently, the group declined in diversity, probably due to climate changes. Already we have a fine collection of hominoids and hominids teeth and jaws at 3.5 million years among the oldest indisputable evidence in the world. “Descended from the Apes!” exclaimed the Pope to the Cardinal. “Your Eminence, let us hope that it is not true, but if it is let us pray that it will not become generally known,” remarked the Pope.

The origin of humanity can be linked to Africa. Time travel would make everything so much easier. Imagine that you could drop down by an African lake some 7 million years ago and watch the parade of aardvarks, antelopes, and elephants pass by until, sooner or later, you caught sight of a group of apes. They’d probably look something like chimpanzees; about the same height, with the same coat of hair, but their flat faces and the other odd

proportions of their bodies would indicate that they belong to a different species. Perhaps they would turn your way and look you in the eye; *a gaze from your most distant hominid ancestors*; the first primates to split off from other apes and begin the family that produced us. If the earliest hominids were anything like chimps, bonobos, and other living apes, each species may have numbered in the hundreds of thousands, even millions. But few left fossils behind. Most of their bones were scavenged and scattered by hyenas or other animals, and what little remained rotted. When it comes to early hominids, paleoanthropologists have to make do with a few teeth or skull fragments. Yet paleoanthropologists are learning a lot about our origins.

The early humans of the genus *Australopithecus* appear sometime before 4 million years ago in Africa. There are several species of *Australopithecus*, all of which walk upright on two legs, and stand from 1.1 to 1.5 (3.5 to 5ft) tall. *Australopithecus aferensis*, one of the earliest human species lived between 4 and 3 million years ago. *Australopithecus aferensis* was a scavenger. *Australopithecus afarensis*, walked the savannas of East Africa 3.6 million years ago and is best known from one well-preserved female skeleton found in Ethiopia in 1974 and nicknamed Lucy. Through carbon dating Lucy's fossils have been dated to be as old as 3.6 million years. *Australopithecus aferensis* was a carnivore. Lucy is believed to have stood at about three and half feet tall, and weighed about 60 to 65 pounds when she died. A group of archaeologists found Lucy while searching for fossils in Ethiopia. The two scientists were hard at work that day, so when they took a shortcut back to their safari vehicle, they surveyed a gully and found bones hidden beneath the moist land. She was given her peculiar name when the song "Lucy in the sky with Diamonds" by the Beatles was playing during a celebration for the finding of her fossils.

Their small canine teeth and bipedal stance distinguish them from apes. Because of this, *Australopithecine* (apes) is believed to have been a nomad, never staying in on one place as they looked for food on the African savannas. But the downside of being a scavenger was that *aferensis* did not develop the ability to hunt which ultimately caused them to become extinct. *Australopithecus aferensis* lived during a "cross-road" of the evolutionary timeline. This was a time when *Australopithecus* was not the only genus of the hominid branch to walk the Earth. *Paranthropus boisei* the vegetarian and *Homo habilis* the hunter were also competitors in the evolutionary race. Because *aferensis* were not able to adapt to meet the demands of a changing landscape, food became scarce and the end of the *Australopithecine* was inevitable. There is one species of hominid on the planet today: *modern humans* or "*Homo sapiens*."

About 3.5 million years ago, at least 11 hominid species lived in Africa. Many of them were members of the genus *Australopithecus*. The ages of the most of the African hominids were pretty well known through potassium-

argon dating. From *A. africanus* it took two lineages; *Australopithecus boisei* (South African) and the contemporary *Homo habilis*, (Northeast African, Ethiopia). *Habilis*, meanwhile, continued on to *Homo erectus* and eventually *Homo sapiens*. We know now that *Homo erectus* brains were significantly bigger than those of *habilis*; and now it seemed evident that their bodies were qualitatively different too. That *Homo erectus* put that larger brain to good use is evident throughout the archaeological record. Its material symbol is the beautiful, biface Acheulean hand axe (East African), an enormous technical advance over the rough cobbles associated with *Homo habilis*.

Hindu Scripture tells, “*His eyes are everywhere, His faces everywhere, His arms everywhere, everywhere his feet. He it is who endows men with arms, birds with feet and wings and men likewise with feet. Having produced heaven and earth, He remains as their non-dual Manifest*” (Svetasvatara Upanishad).

The discoveries of *Homo erectus* fossils all over the old world testify to the species’ ability to solve the complexities of living in colder climates; arid steppes, temperate woodlands, high altitude plateaus. *According to some investigators, the species knew the use of fire, perhaps even language.* Indisputably, it was the first hominid species to venture out of Africa; not just to dip a toe into neighboring regions of Europe and the Middle East, but to fling its presence northward and eastward into modern Hungary, Germany, and the far northwestern regions of China. The significance of this vast radiation cannot be underestimated. *If Homo habilis was a local success, Homo erectus was an international phenomenon.* We now know that a very primitive creature, from the neck down, little more than a walking ape; was practically rubbing shoulders in the early Pleistocene with a much more modern looking descendant. Such a profound evolutionary acceleration does not occur without reason. Whatever the cause, an unprecedented evolutionary event had taken place, one that would hold ultimate consequence for the entire subsequent history of the planet.

Early Homo species were hunters and gatherers. Since hunters and gatherers did not practice agriculture, however, their habits especially as they pertained to procuring food; it might reveal something about the principles governing the lives of ancient hunters as well. One principle that seemed to be universal among hunter-gatherers was a distinct division of labor between sexes. *The males did most of the hunting, while the females took care of the bulk of the gathering.* This division of labor, completely unknown among the other primates, formed the central post of the hunting hypothesis. Hunting and butchering require efficient cooperation among males; something rarely found in nonhuman primates. Unlike their ape relatives, human hunters also had to maintain large territories, which would put a premium on learning and on a rising capacity to store knowledge of the environment. Increasing brain

growth, more sophisticated weapon making and communication skills, the sharing of food, the origin of monogamous pair bonding and everything essentially human could be traced back to hunters and gatherers. Leaning on sheer versatility, they eked out a living where none was there to be found, borrowing a little from the fringes of one species' niche, taking the crumbs that fell from the mouth of another.

Homo erectus to Homo sapiens

Australopithecus aferensis was evolved into Australopithecus boisei. Australopithecus boisei evolved into Homo habilis. Homo habilis evolved into Homo erectus. Homo erectus evolved into Homo sapiens. Homo erectus is the best known of the early hominids, they stood 150 to 170cm (5 to 5.5 feet) tall and had low foreheads, strong brow-ridges practically no chin. They stood erect and were good walkers on their long straight legs. They used a variety of stone and bone tools for hunting, wrapped themselves in animal skins to survive the cold, used caves and quite possibly built simple wooden shelters. They perhaps lived in small social groups of 20 to 50 people. The size and shape of their brain indicate they probably communicated with a simple language. Java man and Peking man are now considered to be different races of Homo erectus. Although "H.erectus" was spread out across thousands of miles, each population continued to keep at least some contact with its neighbors. As men and women from these scattered bands mated, the genes of "H.erectus" flowed across its entire range. No group became isolated enough to fragment into a new species of its own. Some populations may have taken on a distinctive look here and there as they adapted to local conditions.

In Europe, for example, where humans had to cope with harsh ice ages, the people we now call "*Neanderthals*" had stocky bodies and thick, low-browed skulls. Homo neanderthalensis is commonly known as Neanderthal Man. H.neanderthalensis first occurs in the fossil record about 200,000 years ago and they died out about 28,000 years ago. The latest scientific evidence suggests that Neanderthal man was poorly adapted to the cold and that their populations in Europe migrated back and forth as the ice ages came and went. It appears that Europe was the last refuge of Neanderthal man, and that it was his inability to adapt the cold, combined with competition with H.sapiens, that finally finished him off. Scientists initially believed that *Neanderthals then evolved into modern Europeans*. But the earliest Europeans were known as "*Cro-Magnons*." They still had large faces with forward projecting jaws and brow ridges, however in some groups the brow ridges were disappearing and the back of the skull was becoming more rounded. *Cro-Magnons used exquisitely crafted tools* made of many different materials, such as fishhooks made of antlers and bones or spear-throwers with detachable fore shafts. Cro-Magnons buried their dead in elaborate rituals and wore necklaces and other ornaments.

Around this time, a new group of humans, *called the Gravettians started* to appear in Eastern Europe. During this time, “*Homo sapiens*” was evolving from older hominids back in Africa. At some point, “*Homo sapiens*” migrated to Asia and Europe. The cave paintings of Chauvet in France, as well as the jewelry, weapons, clothing, and other artifacts that turn up in the fossil record, were all made by “*Homo sapiens*,” who left them behind. It is believed that modern humans like you and I first originated on the Earth around 50,000 years ago in Africa. *These modern humans are referred to by historians as Homo sapiens.* Within just a few thousand years these modern humans had spread to every continent across the entire planet, and onto many islands. As *Homo sapiens* migrated outward from Africa, it is believed that they wiped out Neanderthals either by absorbing them through intermarriage, or by destroying them through war and competition. The development of a new skill, or tool often took thousands of years. With the arrival of *Homo sapiens* this all changed. The speed of advancements increased dramatically. Instead of thousands of years, great progress was made in hundreds or even dozens of years.

There are millions of questions, but we have few answers. We need to know about the environments that our ancestors lived in. we need more knowledge on the intelligence of living primates, and how it is shaped by social conditions. We need to better understand the structures of the human mind, the roots of consciousness, the origins and evolution of language. We must have more information about human group sizes and population densities on the ancient landscapes. We have to comprehend more about the genetics of behavior, and the way evolution proceeds in a species struggling free of *the mechanisms of natural selection* that bind all others to their habitats. Above everything else, as a prerequisite to progress, we need more fossils; fossils that can tell us more about what our ancestors really looked like and how they might have behaved. We need new revelations from God describing more about the mysteries of humanity and about future evolutions in another 4.5 billion years. If natural selection brought 6 or 7 species in the past 4.5 billion years, it is right to believe that the same natural selection could bring 6 or 7 new species in the future. Every specimen we have in hand is like a brushstroke on a canvas that has been bleached out, pulled to pieces, and scattered by the wind. We need to find more of the canvas and re-create its original colors. We need to know more. We need to know.

Homo sapiens to Homo sentiens

Many scientists feel that *Homo sapiens* is transforming into *Homo sentiens* (man of feelings). The root of the word “emotion” is the Latin “*emovere*,” which connotes inner turbulence. Emotions have an identifiable core that can carry a label such as love or fear, but each is layered. Efforts to pin them are as doomed as locating the edge of a fog. Besides, emotions often are masked, pretending to be what they are not. What appears to be arrogance

may be insecurity, and a humble, apologetic person may be full of contempt. Humans unfold into emotional maturity, by a process of spontaneous branching that no one yet understands. Examinations of the nature of each, unique emotional tree has fascinated sages and scientists since the beginning of time. Philosophers, deists and other intrigued by inner space have sought without success to learn why one person behaves wisely and other kills. The invention of theology is one response to the riddle; psychology is another.

Many emotions are accompanied by distinct physical changes; entire careers have been spent studying the physiology of emotion. The species could not have survived in the wild from which it sprang without having systems that could react explosively in an emergency. *Muscles tense, the mouth dries and the heart pounds as the frantic organism prepares itself either "to fight or to flight."* Emotions have been producing startling alterations in the human body since the time of hominids. From the beginning of the human species, fear, anger and hatred have caused hearts to step up their blood input by as much as two-thirds. In an emergency, livers release a flood of sugar which converts instantly to energy the alimentary organs seize or else have an urge to empty adrenaline sends power into the muscles and the brain circuitry approaches overload. Such preparations for mortal combat are useful when someone faces a charging carnivore in a primeval swamp.

In recent years investigation of emotions has become a major field of research for behavioral scientists. The experts speculate on the origin and composition of such emotions as love and fear but they cannot agree even on what they are. Twentieth century, empowered by the insights of Freud, his followers and his detractors, is obsessed with introspection and analysis. Because there is more understanding of the chemical composition of emotion and where they arise in the brain, there is fresh excitement that neuroscientists will be able to unravel the puzzle of personality, and even rebuild a personality to order. *Some hope, and others fear, that comprehension of human emotion will lead to chemical engineering of behavior.* The insights of the importance of early environment on emotional development have been known for half a century without making much impression on society. The enlightened radicals of the eighteenth century believed that happiness was accessible to all citizens of the democracy. In the present Age of Anxiety, people will settle for a smaller hero: a capacity for well-being.

Scientists currently are interested in what they have been learning about the brain's peculiar chemistry and the pathways that neuroelectricity carves in the brain's meat. Neurobiologists and neurochemists contemplate the gray three-pound pudding of the human brain and see where it can be tickled to produce a grin on the face or here it can be laced with a chemical that will cause it to explode with rage. More than 100 chemicals found in the brain's stew and there are an estimated 30,000 genes which occur nowhere else in

the body except the cranial cavity. Much work is being done to harness this information to the treatment of such disorders as schizophrenia, Parkinson's disease, multiple sclerosis, drug addiction, Alzheimer's disease and melancholia, but for thousands of other researchers the goal of interpreting the brain better is to be able to rearrange personality.

More recent work has led to the conviction that there is an orderly progression to emotional development. It is confounding those who believe in the doctrine of original sin that it appears to be true that *human experience joy before sadness*. Envy, ambition and social confidence all occur later, at a higher level of development. There is no agreement on the precise time at which each emotion is supposed to flower. Babies as young as three months feel sadness, if they are abused or neglected by their parents. By ten months their range of emotions includes joy, anger, misery, surprise and fear. *A biological clock seems to be governing the emotions*. Emotional growth is tied to the intellect, each level of intelligence providing the setting for another group of increasingly more subtle and complex emotions. Shadings come along as regularly as lunar eclipses. Shame develops at about eighteen months, and by the age of four, children are capable of the *adult experience of worry*. The ages of five and six are believed by some to be periods of major emotional development because children are gaining perspective on their physical and emotional separateness from everyone else in the world. They are ready to begin to compare themselves with others and to conform where they can and dig in where they can't. This brings forth such conflicting emotions as pride and humility, insecurity and confidence envy and contempt.

No one is certain if the brain of a fetus is sufficiently developed in the final few months before delivery for the unborn person to be storing memories of the amniotic state and the trauma of birth. *Many people, particularly those who undergo hypnosis, believe that they can remember details of their birth*. The literature is rich in such stories as the one about a man whose left arm hurt excruciatingly when he remembered being born. On inquiry he learned for the first time that the obstetrician indeed had hauled him through the final stages of delivery by grasping his left arm. Numerous experiments have established that a fetus is listening and that the fetal brain is collecting and storing information. Some scientists believe that patterns which will control behavior for a lifetime are established before birth. They are convinced that chemical alterations in the mother, such as occur if she undergoes long periods in the grip of fear or anger, or if she sustains a high level of anxiety, will carry their toxicity across the placental barriers to flood the fetus.

The suspicion is that the irritable nature of some babies, the hypertension and colic which exhaust the infants and distress their parents, are the consequences of a pregnancy marked by emotional anguish. Emotional growth is like bone growth, moving in spurts and then

settling down for periods of consolidation. Unlike bones, however, emotions can regress abruptly and spill even stable adults into *childhood tantrums*. Much of a lifetime is spent on emotional plateaus between levels of development, the person washed forward and backward between confidence and anxiety. Since the natural tendency of the human organism is to improve and grow, the normal thrust of emotional development is always toward betterment.

Anxiety is the emotion which seems to have the strongest influence on emotional development. A nervous, tense person is off-balance, requiring more support and reassurances than others, seeing the world differently, coming to conclusions on the basis of perceptions which are warped by apprehension. Anxious people are less willing to change, to venture into a new experience, to trust a relationship; they have less curiosity, enthusiasm, and energy. They simply are too exhausted by internal stress. Anxiety is vivid and has a focus. Fear disappears when the threat is over, but anxiety is endless. Anxiety isn't a single emotion but a cluster of several emotions, only one of which is fear.

Anxiety is a curry, a mixture which guilt may dominate in one person and distress or shame in another. Fearful, anxious children never seem to get enough love and attention. No matter how much comforting and praise they receive, they are placated only briefly. Consequently they are difficult, angry, jealous little people who are hard to like. Their own conviction that no one cares about them can become true. Before anyone appreciated the contradictions within emotions, the prevailing view was that emotions came in separate boxes, one per package, pure and undiluted. Rene Decartes mapped six primary emotions, which he chose to call love, hate, astonishment, desire, joy and sorrow. Immanuel Kant, the great German philosopher of the eighteenth century, described five feelings: love, hope, modesty, joy and sorrow. William James, who brilliantly wrote "Principles of Psychology" in 1890, is a founding document for Psychologists, and there were only four major emotions: love, fear, grief and rage.

The study of the relationship between emotions and health has a name, psychoneuroimmunology. Specialists in this new branch of science are advising people who live under great stress to protect themselves against such collapses as lung cancer or heart disease by changing their attitude or their environment. Emotions can play a role on one's physical health. The psychosomatic basis of ulcers and asthma were among the first to be accepted, but in recent years doctors have agreed that emotions can make one susceptible to diseases ranging from sniffles to cancer. People can "image" their white blood cells fighting the tumor until they succeed in driving the cancer away. It is possible that eventually people will be able to train their bodies to resist allergy-stimulating environments, for instance, or to block out pain naturally. As researchers see science unfolding, people will

be able to give chemical instructions to their brains in order to keep their bodies healthy and their emotions pleasant. *Pleasure is carried by the neurotransmitter dopamine*, which sparkles through the brain's networks, blocking off receptors of dull or worrisome news, giving the brain a good time. Appreciation of art, the contentment of a scuba diver cruising on a coral reef, the urge to learn a craft, all derive from a network of nerve fibers in the brain which seek to be pleased. Some seem driven to find an ever-stronger stimulus, a drug or an activity such as gambling or satyriasis. Whatever gives the brain pleasure will be absorbed along the capering, supple convectors, and the brain will crave more of the same.

Recently a new technique for measuring emotion has been attracting attention. It is the work of two men, Paul Ekman and Wallace Friesen at the University of California, who have developed a way of reading people's *feelings by observing movements of the eighty facial muscles*. They believe that each emotion has a unique "signature" which is written on the face. These facial expressions, when examined beside such physiological changes as stepped-up heartbeat, give what they believe to be an accurate readout of emotional content. The suspicion is growing that every emotion is learned in the brain, in the sense that the neural transmitters become practiced at handling that emotion, and that a different set of nerve fibers is trained for each emotion. Accordingly, neuroscientists are now trying to locate each of the tracks that carry the freight trains of emotion. *It is believed that negative emotions activate the right frontal area of the brain's cortex and that positive emotions are on the left. Where is the place in the brain that emotions are produced? Experiments show conclusively that happiness is the chemical stew in the left hemisphere and misery in the right.*

The brain operates on at least three levels, possibly four. The first is *normal consciousness*, in which people think they know what they are feeling. Below that is *the unconscious*, which Freud plumbed, where powerful grievances lie suppressed. And below that is *the collective conscious*, which Jung explored, where the specters of cave people sleep fitfully. Under that is something else. It may be a "*some flickering lamp of the spirit*" which we may designate the real "*me*" the spark of reality which the religions call the soul. Emotions, like every other aspect of the person, mature naturally, without effort. Given a modest diet of stability and friendship, people drift from self-preoccupation and insecurity to steadiness and outward-looking. The matchless neurons bustle about, day and night, putting together cause and effect, working out rules of conduct and justice, calibrating the worth content of behavior.

Love is the highest emotional development that humans can attain. It is an enigma: love is learnt, bit by bit, from the chrysalis of an infant's gratitude for being fed, amused, made comfortable, and yet so natural and so right that people capable of loving are healthier than others. Their outlooks are as

relaxed as their nervous system; they are at one with the universe. From the beginnings of life to its end, love is the only emotion which matters. Mostly, when people speak about love, they mean getting it, not giving it. *Love, the experts say, is the person's victory over the negative emotions that bloom early, self-doubt, guilt, anxiety.* Most of the working in the field of human emotions has come to believe that the basic nature of newborns is friendly and cooperative; their inclinations are sociable. As proof, they cite the evidence that the cluster of emotions associated with love and contentment produce good health, while such emotions as depression and anger are harmful to organs and cognitive development. The first love is always self-love. Unless there is self-love, existence is a poignant search for flattery.

The dynamic of love is easier to study in its manifestation in theology than in person-to-person relationship. Freud declared that religion is a neurosis that afflicts humans who cannot tolerate being alone. Religion is also used as a device for coping with fear or death, or as reinforcement of controls to keep the inner demons from escaping. *As the human race evolves, the gods change.* Religion caters the emotional needs of a particular society in a particular time. The Old Testament describes a wrathful, punitive God who sets hard tasks, while the God of the New Testament is sociable and compassionate. Faith follows a growth curve which begins in a Father God, moves to a Mother God and then passes through a God Rejection phase, not unlike an adolescent's rebellion against parents, to culminate in God within. This highest placement of God is esteemed in all religions, however outer-directed, for the spirituality that it projects. The merging of self and God in oneness is revered as a private experience by Hindus and Buddhists and interpreted by Christians and Jews as holiness and social obligation.

The Social Roots of Human Evolution

The social roots of human evolution attempts to explore the underlying properties of social interaction viewed from across many disciplines, and examines their origins in infant development and in human evolution. The most obvious way to distinguish us humans from the millions of other species on earth is by looking at the things we make. Even from thousands of miles away, our creations would be obvious to an alien naturalist passing by on an interstellar spacecraft: the swarm of satellites, space stations, and bits of space junk orbiting the planets; the signs we leave on Earth's face, from the Great Wall of China to the constellation of city lights glowing at night; the stream of transmissions, phone calls, cartoon shows, and the rest of our telecommunication babble, beaming out into space. Technology may be an obvious hallmark of humanity, but it's not the only one. *Compared to other animals, we are a supremely social species.* We live in a global network of nations, alliances, tribes, clubs, friendships, corporations, leagues, unions, and secret societies. Our social nature would be much harder for our passing alien naturalist to detect, and yet the invisible links that bind us together are

no less important to human nature than the highways or cities we may build for ourselves.

When we look back through time at the evolution of our own species, we are in the same plight as the alien naturalist. We can see vestiges of the technology of our ancestors; we can even touch them. As early as 2.5 million years ago, our ancestors were chipping away at stones to create blades for cutting the flesh from carcasses. By 1.5 million years ago, they were making powerful stone hand axes that they may have used not just for flesh-cutting, but for crafting other tools, like digging sticks. By 400,000 years ago, the oldest spears appear, and the technological record becomes more and more, dense as it approaches the present day. No other animal has left behind signs of technology in the 4 billion years of life's history on Earth. But while you can wrap your fingers around a million-year-old hand axe, you cannot touch the society of the person who crafted it or the experience he or she had living in it.

Yet as difficult as it is to glimpse the social evolution of humans, scientists suspect that it was a crucial factor in the rise of our species. Our chimplike ancestors had chimplike social lives, but 5 million years ago they branched away from other apes and began to explore a new ecological niche on the savannas of East Africa where their social lives became far more complex. Much of what makes humans special, our big ability to use tools, may have evolved as a result. At the same time, the competition for mates and the struggle for reproductive success among these hominid ancestors of ours may have left their mark on our psychology, shaping our capacity for love, jealousy, and all our other emotions. The study of these sorts of phenomena holds the key to understanding the foundation of human social life. Our unique brand of social interaction is at the root of what makes us human.

Darwin's African Guess

As Darwin was putting together *his theory of natural selection*, he couldn't help but wonder how humans had come to be. There were no million-year-old hand axes yet known for him to examine; in fact, before the late 1850s there were no recognized fossils of ancient humans whatsoever. He sometimes jotted his thoughts in a notebook, but he did not dare make them public. In 1857, two years before Darwin published "Origin of Species," Wallace asked him in a letter if he would discuss the origin of mankind in the book. Darwin replied, "I think I shall avoid the whole subject". *His silence was purely strategic. Humans must have evolved, like any other animal.* But Darwin didn't delve into that ramification of his theory, hoping that he could get a fair hearing. Yet as cautious as Darwin was in writing "Origin of Species," many of his readers immediately wondered where humans fit into his theory. Making the question all the more pressing, explorers were returning from the jungles of Africa at the time with chimpanzees and gorillas. Huxley

and other biologists examined them and showed that they were even more like humans than orangutans were. In 1860, Darwin wrote to Wallace to say that he had changed his mind; he would write an essay on man.

It would take Darwin 11 years to finish it. In the interim he was bogged down by new editions of “Origin of Species” and his book on orchids; a book on the domestication of animals and plants exploded into a two-volume monster; he fell sick for months at a stretch. But through all those distractions, the pressure to speak about human evolution only grew. How could natural selection spontaneously produce human beings in all their wonder, with their ability to speak and reason, to love and explore? Wallace wrote that, the *creation of humans must, he concluded, be the work of divine intervention*. By the time Darwin got around to writing “The Descent of Man,” only a few hints of our antiquity had emerged, and they were ambiguous ones at that. In 1856 a miner in the Neander Valley in Germany unearthed pieces of a skeleton, which was dubbed *Neanderthal Man*. Its brow was massive and low, which raised the question of whether it was a separate species or, as Huxley claimed, was at one extreme of human variation. Other scientists had found not fossils but tools, flints and stone scrapers, alongside the fossils of extinct hyenas in England and France.

They spoke of humanity’s antiquity but could say little more. Because the fossils and tools shed so little light on human evolution, Darwin instead compared humans to great apes. Bone for bone, they are almost identical. As human embryos develop, they pass through virtually identical stages as gorillas or chimps. Only relatively late in their development do they start to diverge, taking on different proportions. These similarities, Darwin argued, were signs that apes and humans descended from some ancient common ancestor. After our ancestors diverged to a branch of their own, they gradually evolved all the traits that make us uniquely human. Since humans are so similar to gorillas and chimpanzees, and gorillas and chimpanzees both live in Africa, Darwin made a guess as to the land of origin: “It is somewhat more probable that our early progenitors lived on the African continent than elsewhere.”

In 1871 Darwin’s readers may have thought he was firing a scientific shot in the dark. But 130 years later he has been vindicated by a wealth of evidence. Researchers now know that the similarity between the genes of humans and African apes is just as striking as their anatomy. In 1999 an international group of scientists offered an evolutionary tree of humans based on the most extensive study of our genes to date. Humanity forms a little tuft nestled alongside the chimpanzee lineages. Their tree demonstrates that, genetically speaking, we are practically a subspecies of chimp. By gauging the rate at which our genes mutate, scientists estimate that the last common ancestor of chimpanzees and humans lived 5 million years ago. Since Darwin’s day, paleoanthropologists have discovered many fossils of ancient humans,

as well as a dozen other human-like species, *known as Hominids*. These fossils show that human evolution was marked by *five great transitions*. *The first*, which began about 5 million years ago, gradually pushed our ancestors out onto the African savannas. *The second* saw the invention of the first stone tools about 2.5 million years ago, *and the third* came a million years later, as crude blades were transformed into massive hand axes. Half a million years ago, our ancestors went through a *fourth transition*, mastering fire and becoming more adept at making spears and other tools. *And finally*, 50,000 years ago, humans began leaving behind signs of truly modern minds, paintings on cave walls, carved jewelry, intricate weapons, and elaborate burials.

The oldest and most chimp-like fossil of a hominid was discovered in the early 1990s by a team of scientists working in Ethiopia. There they unearthed a collection of teeth, bits of a skull, and some arm bones dating back 4.4 million years. The fossils were apelike but had some features that were more like humans than chimps. When its mouth closed, some of the skull's upper and lower teeth fit together in a human-like way. Its spine contacted the bottom of its skull, as our spine does. In chimpanzees and other apes, the point of contact is closer to the back of the head. But at the same time, the Ethiopian creature had some distinctly chimpish traits. It had massive canine teeth, as chimps do, covered by only a thin layer of tooth enamel. It wouldn't have been able to eat much meat or tough plants; it presumably ate only soft fruits and tender leaves, as chimps do today. We have met this kind of strange mixing of traits before, in the walking whales, the fish with legs and toes, the invertebrates with glimmerings of the vertebrate brain. This Ethiopian creature, known as "*Ardipithecus ramidus*" (ape like hominid from 4.5 million years ago), is not a missing link between man and chimp, but it lies on a branch close to the split between our ancestors and theirs.

While "*Ardipithecus ramidus*" *remains the oldest known hominid*, other scientists have found fossils of several other hominid species dating back well over 3 million years, all of them in East Africa. On the shores of Lake Turkana in Kenya, paleoanthropologist Maeve Leakey discovered a 4.2 million-year-old *hominid (named Turkana Boy)*, which she dubbed "*Australopithecus anamensis*." Other fragments of ancient hominids have also been found in the same region of East Africa, and may turn out to be species in their own right. These early hominids lived during tumultuous times. A cooling global climate was turning the wide carpet of jungles across sub-Saharan Africa into a ragged quilt of patchy forests and open woodlands. Chimpanzees and hominids appear to have adapted to the change in very different ways. The chimps clung to the dense forests that survived the climate change in central and western Africa. The hominids, meanwhile, adapted to the more open habitats of East Africa.

As the climate cooled, the bodies of our ancestors changed. Their toes became less like fingers. Their legs grew longer. They held their heads and

backs more upright. Kevin Hunt of Indiana University has proposed that these changes occurred as hominids shifted to a new sort of diet. Earlier hominids may have climbed into trees in their jungle home to find food, much as chimps do today. But as their forest habitat became less dense, Hunt proposes that our ancestors began to gather the fruit that hung from low trees. By standing on two legs, an early hominid could brace itself but holding on to a branch with one arm as it grabbed fruit with the other. *These changes in diet also altered the way hominids walked.* The first hominids probably walked slowly on all fours, using the knuckles of their hands to support their weight as chimps still do. But with longer legs, hominids began to move around bipedally without the help of knuckles.

Walking upright was one of the biggest changes that our ancestors underwent, but the first bipedal hominids could hardly stroll as we do today. An average human walking at a comfortable pace travels about 3 miles per hour. With their short legs, early hominids would have had to run to match that speed. They were forced to walk more slowly, and as a result they covered only a short distance each day. Early hominids may have walked only from one tree to the next, sometimes picking the lowest fruit while standing on the ground, and sometimes climbing into the trees using their long arms and curved fingers to grip the branches. They probably also scrambled off the ground from time to time to get away from saber-toothed cats and other predators.

As one millennium followed another, hominids spread out across a broader range. New hominid species emerged, leaving their fossils as far north as Chad and as far south as South Africa. And by 2.5 million years ago, they were leaving behind something altogether new in the fossil record: *stone tools.* Hominids made tools by banging rocks together to chip off their edges. In the process, they created simple blades, which they could use to chop or scrape. Hominids are not the only apes that made and used tools. Orangutans will strip off branches to probe for honey or termites inside trees. Chimps are even more versatile; they can use sticks as probes; they can also place nuts on a rock and smash them with a second rock, like a blacksmith pounding on an anvil. They can use leaves like sponges to soak up water, or as umbrellas in the rain, or as a dry seat on mud. But the tools that hominids invented 2.5 million years ago were beyond the abilities of their ape relatives. When the oldest stone tools were first chipped, there were at least four species of hominids alive in Africa. The most likely candidates for the original toolmakers were the first members of our genus, “Homo.” The earliest known “Homo” first appears in the fossil record about 2.5 million years ago, around the age of the oldest known stone tools. They’re different from other hominids in some striking ways. They have opposable thumbs, and big brains. Judging from the cavities in their skulls, the brains of early “Homo” were 50 percent bigger than the earliest hominids, relative to their body size.

With stone tools, hominids could add much more meat to their diet, even if they didn't have the jaws of a hyena or the claws of a lion. The evolution of big brains raced on, and in a few hundred thousand years, hominid brains were double the size of a chimp's, housed in a long-legged bodies that could reach 6 feet in height. All traces of tree climbing were now gone. These hominids, known as "*Homo ergaster*," (*Turkana Boy in Kenya*) were the first to warrant the title of human beings. Like modern humans, they had a wanderlust, and before long they had left Africa altogether. By 1.7 million years ago "*H.ergaster*" had reached what is now the Republic of Georgia near the Caspian Sea, where they left behind skulls and tools. The hominids in Africa took another technological leap around 1.5 million years ago, inventing hand axes. These new tools took far more skill to make than the earlier models. In order to make a hand axe, a hominid had to flake a rock on both sides, giving it a much sharper edge. Whoever made them didn't just bang rocks until they could be used to cut. They had a particular tool in mind. Hominids evolution may have become a feedback loop of ever-increasing social intelligence, producing our ever-expanding brains. Ultimately, this evolutionary spiral transformed hominid society itself. It eventually became too hard for a dominant male to enforce a hierarchy in his band because his subordinates had become too clever. Hominid society shifted from a *chimp-like hierarchy to an egalitarian structure*. Each individual used his or her theory of mind to keep track of everyone else, making sure no one cheated the group or tried to dominate it.

Only when hominids began to live in an egalitarian society, naturalist Whiten argues, could they fully take advantage of the hunter-gatherer way of life. Men could work together to plan a hunt, and they could leave the women and children behind without being paralyzed by suspicion. Likewise, women could organize expeditions of their own to find tubers and other plants. *With tools and cooperation, hominids carved themselves a new ecological niche in the savanna*. The glacial monotony of hominid life began to break up about half a million years ago. The tools humans left behind started to show signs of change. Instead of hacking a stone into a single axe, humans learned how to make a number of blades from a single rock. Starting 500,000 years ago, regional styles emerged. New sorts of technology became more common. Humans learned how to make javelin-like spears, and they learned how to make reliable fires. And as in the past, the rise of new tools was reflected in the expansion of human brains. For about the next 400,000 years, human brains would grow at an extraordinary rate, until 100,000 years ago, when they reached their present size.

According to Robin Dunbar's work on primate brains, this expansion must have occurred as humans lived in bigger and bigger social groups. Judging from the fossil skulls, Dunbar estimates that the earliest hominids, such as "*Australopithecus afarensis*" 3 million years ago, formed groups of

around 55. Early species of “Homo” living 2 million years ago would have hung together in bands of 80 individuals. By a million years ago, “Homo erectus” groups had cracked 100, by 100,000 years ago, when human brains had reached *our own neocortex size*, they were congregating in gaggles of 150. The average size of the human neocortex hasn’t changed since then, and Dunbar sees a lot of evidence that our biggest significant social groups have remained at 150 people. The Hutterites, a group of fundamentalist Christians who live communally on farms, limit the size of their farming communities to 150, forming new ones if the group gets too big. Around the world, the average size of an army company is 150. “I think on average there are 150 people that each of us knows well and knows warmly,” Dunbar claims. “We understand how they tick. We know about their history and how they relate to us.”

As hominids bands expanded, their complexity grew as well. And once they crossed a certain threshold, Dunbar argues, the old ways in which primates interacted no longer worked. One of the most important ways that primate allies show their affection to each other is by grooming. *Grooming not only gets rid of lice and other skin parasites, but it also is soothing. Primates turn grooming into a social currency that they can use to buy the favor of other primates.* But grooming takes a lot of time, and the larger the group size, the more time primates spend grooming one another. *Gelada baboons*, for example, live on the savannas of Ethiopia in groups that average 110 and they have to spend 20 percent of their day grooming one another. The size of the hominid brains suggests that their group size reached 150 by 100,000 years ago, and at that point grooming became an impractical tool. Hominids needed a better way to bond. *Dunbar thinks that better way was language.* Working out the origin of language remains one of the biggest challenges in evolutionary biology. Speech cannot turn to stone, so it leaves no direct record of its existence. Before the 1960s, most linguists didn’t even think that language was, strictly speaking, a product of evolution. They thought that it was just a cultural artifact that humans invented at some point in their history, just as they invented canoes or musical drums.

A strong candidate for complexity, as Robin Dunbar and other scientists have tried to prove, was the evolving social life of hominids. But even if hominids a million years ago had something to say, they might not have had the anatomy for saying it. We modern humans use a very peculiar sort of anatomy in order to speak, an anatomy unlike any other living mammal. Other mammals, including chimpanzees, have a voice box that rides high in their throats. This arrangements lets them breathe while they drink or eat, because the air passageway and the esophagus are divided. But it also creates a very small vocal tract between the voice box and the mouth. With so little room, the tongue cannot move around enough to make complex noises. At some point in hominid evolution, the larynx must have dropped down to the

low position that it takes in the human throat. This sort of anatomy comes with risks, because food or water can slip into our windpipes more easily than in other mammals and make us choke. But it also created enough room for our tongues to flick around and create the repertoire of sounds that a spoken language demands. That's not to say that language couldn't have gotten its start before the voice box was in place. Hominids might have made signs with their hands, which were already capable of fine movements, judging from the tools they were making 2.5 million years ago. They might have combined these signs with simple sounds and movements to create protolanguage.

With such a system in place, evolution might have favored a bigger brain to handle more complex symbol processing and a more human-like throat to make more sophisticated speech possible. No one knows the exact chronology of this evolution, because language leaves precious few traces on the human skeleton. Robin Dunbar has proposed that language started only 150,000 years ago. He argues that only then were our ancestors living in groups that were too large for grooming to work as a social tool. *People would have had to have substituted language for grooming and other primitive ways of interacting in order for hominid society to hold together.* With language, for example, you can keep tabs on what other people are doing and on what they're saying about you. You can manipulate other people with words as well and hold on to your place in a large society. Even today language still functions mainly as gossip. Dunbar has eavesdropped on people on trains and in cafeterias, and he consistently finds *that two-thirds of their conversations are about other people.* Language: grooming by other means.

Yet other researchers think that even Dunbar's figure of 150,000 years is too old for the origin of language. They are convinced that full-blown language may have appeared only as recently as 50,000 years ago. It is only then that the human fossils record documents a spectacular mental explosion, in which people understand themselves and the world around them in ways that their ancestors never could have imagined. It was then that the modern mind was born, and language could well have been a crucial ingredient in its birth. Most of the great transformations in evolution, such as the origin of life or the Cambrian explosion, took place hundreds of millions, or even billions of years ago. In comparison, this human transformation happened only yesterday. But it is just as significant. Modern humans have become the world's dominant species, able to live just about anywhere on the planet. Our success is so staggering, in fact, that it threatens to destroy many other species. Human species faces a new form of evolution: the evolution of culture.

Homo sentiens to Imagio Dei - Kingdom of God

The ancient holy text reads, *"As oil exists in sesame seeds, butter in milk, water in river beds and fire in wood, so the Self is realized as existing*

within the self, when a man looks for it by means of truthfulness and austerity. When he looks for the Self, which pervades all things as butter pervades milk and whose roots are Self-knowledge and austerity. That is the Brahman taught by Upanishad” (Svetasvatara Upanishad).

Genesis 1:27 recalls, “So God created man in his own Image, in the Image of God he created him.” God gave man everything and made him pure from the beginning. Man was just, holy, pure and perfect exactly like God himself. We were made for God by God. Out of love God made us. God is love. That is his essential nature. Bible from the beginning to the end is a love story. Creation of man is the profession of God’s love for you and me. Did God create man as part of the chain of reproduction, to be a cog in a machine, and to be counted only as an automaton? Was man created only for his own enjoyment? Was he created only to amass as much wealth as possible through any means, direct or devious, so as to satisfy his material wants? Is there no greater idea behind his creation? A large number of people regard only man’s material aspect and neglect the other side of the coin, because they have not understood the profundity of the nature of man, or because they have not correctly evaluated it. *Men of great understanding have ascribed three dimensions to man: individual material life, social life and the world of the spirit and insight.* Those who give importance only to the first dimension, and believe in absolute freedom for man, even though it is harmful for him, overlook the profound character of man and they have forgotten the other two important dimensions. Those who land importance to the first and second dimensions, but neglect the third, only succeed in creating an environment, which lacks spiritual and moral values. We know that man lost his image of God by sin.

Arnold Toynbee, the great British historian, in a long interview with the American magazine, “Life”, said that man had submitted himself to materialism, and that from that point of view we do not lack anything. However, he said, we have become bankrupt on the spiritual side of things. However, I think it is still time, he continued, to leave this incorrect view of things and return to religion. The third dimension gives man the power to evaluate his entrances and exits on the stage of personal and social life. This is the correct way of living. Man must reach his perfection by making his way through various dimensions, and he must find this way, for he is created for this purpose. The personal, social and spiritual perfection of man is one of the aims of creation, which drives man toward the lost image of man. *The purpose of human life is to become the Image of God.* Man can never find rest until he finds back the Image of God which he lost to sin. It might take thousands or millions or billions of years for man to arrive to Image of God. However, he will make it definitely one day as everything in cosmos is moving toward higher order.

When we reach a state of desperation, we exercise our faith; otherwise, Spirit is the distant dream. The other way we relate to the Divine is through death. When someone we know passes from this Earth, we imagine a heaven where they reside in a bodiless state, but similar to life as we know it. Who can say what truth is? On the other hand, we rarely consider the possibility of a Divine life on Earth. For millennia, we related to Spirit as something “up there”, or “out there”, or beyond the beyond; a release into an eternity, or as the ancient sages experienced, a merging into the transcendence. *The possibility that it is “right here” was taught by Jesus in the parables of the Kingdom of God.* Now we know the Kingdom of God is right here and if we want to experience the Grace and Power, we have ample opportunity to practice it while fully engaging in the details of our lives. All we have to do is open to it. In fact, more and more we are compelled to do so because the human mind alone can no longer resolve the ever more complex problems of the world. Spirit can however because it is capable of moving in multiple directions simultaneously attracting instantaneous positive results, abridging space and time, and defying normal causality and possibility. In that way, Spirit is the ultimate problem solver. *The end result of this movement is that we are all moving to a new stage of human development and consciousness.*

First, we have arrived at the first great point in our ascent; to mentality and rationality, which is an enormous development and sign of human progress. This has particularly been the case in the last 50 years. Then we move higher to the next pinnacle of consciousness and discover and utilize the power of the spiritual force that is there in the atmosphere, especially so in recent decades. We then apply that power to the details of life perfecting and divinizing it. As more and more individuals take to this approach, we see the first signs of a new type of existence emerging; a first glimmer of a new spirit-influenced and oriented society: *the Kingdom of God. It is the ultimate destination in our ascent to the Heights as a human species.* This is indeed a radical departure in spiritual history. It is no longer a life apart from life, or eternal life after death, but the emerging of Divine Life right here on Earth, leading to the culmination in Heaven. In the interim, we are taking intermediary steps to raise our consciousness and arrive at the realization of our image of God. Higher attitudes, purifying and perfecting our behavior, emerging higher personal values, a mind that embraces all sides of an issue, and the ability to open to the spiritual force are several of the bridging steps to the collective emergence of the Holy Spirit.

Eventually, these individuals can become the ultimate evolutionary personality and being. These become the transformed Gnostic individuals, filled with the Divine aspects and powers, living life for a Divine Purpose and unfolding in creation. They act with a spiritual orientation and purpose, bringing this Spirit to bear in all activities in life. He is infinitely creative,

dynamic, releasing the infinite potential of life into every moment by bringing the Being, the Spirit into the becoming of every moment of our existence. *If a number of such divine-like humans (Image of God) emerge, then there is the possibility of the development of a community of such individuals, living within the greater community of society. Such individuals may come together to help from a new social and collective order and existence, culminating in the possibility of the emergence of a divine life on Earth (the Kingdom of God).*

The Kingdom of God is the great theme of the scriptures. God is the eternal King who rules now and shall rule in the future. It is in the Kingdom of God that the purposes of God are fulfilled. And since the term “Kingdom of God” is an important concept, it is important to define the term and note the distinct ways it is used in the scriptures. To get a clear picture of the Kingdom of God, a large number of scripture verses needs to be studied. When we speak of a “Kingdom” certain elements are included in our understanding of the term. *The normal use of the term kingdom expresses a dominion or physical sphere of a rule involving a ruler, a people who are ruled, and a physical territory where the rule takes place.* As it is used in the scriptures, the term “Kingdom of God” refers to the rule of the sovereign God over his creation. In both the general concept of a kingdom and in the biblical idea of the Kingdom of God, three essential elements are found. In a Kingdom of God on Earth, the old ways of life would disappear, such as mental idols, constructed principles and systems, religions and conflicting ideals. There would be an end of war, political strife and all the negatives that issues from it. Jesus came to Earth to establish his Kingdom, the Kingdom of God. The Kingdom of God is what the Bible is all about. Notice that Jesus mentions it here in Mk 1:14-15, at the start of his ministry.

Psalm 95:3-7 read, *“For the Lord is the Great God, the great King above all Gods. In his hand are the depths of the Earth, and the mountain peaks belong to him. The sea is his, for he made it and his hands formed the dry land.”* In the gospel of Mathew, the Kingdom is mentioned 55 times and it is a revolutionary teaching brought by Jesus, “Repent, for the Kingdom of God is at hand,” announces the Baptist, and repeats Jesus (Mat 3:3, 4:17). The Kingdom is never defined in the Gospel rather they present it as “riddle.” It is something “so big” that the whole world can enter into it...each one of us has to enter into it (Jn 3:3-5, Matt 18:3). But it is “so small” that he enters into each one of us, it is within us (Lk 17:21, Matt 6:10). *It is so big, that it is the “mystical body of Christ,” his Church... and it is something so small, that it is the same Jesus in our hearts. The “Kingdom” and the “Church” are considered the same thing in Mat 16:17-18...* and this is why the apostles never mentioned the Kingdom after the Gospels, because when they mentioned the Church, or simply Jesus Christ, they were preaching the Kingdom, their task (Matt

10:7, Lk 9:2). Jesus is the King and the Kingdom. Jesus not only came to show us the Way, but he himself is “the Way” (Jn 14:6). The Kingdom of God is sanctified from the outer world of existence. Entrance into the Kingdom is through the love of God, through detachment, through holiness and chastity, through truthfulness, purity, steadfastness, faithfulness and the sacrifice of life.

According to Hindu tradition the human soul can leave lasting mark on humanity. “The soul is indestructible. It cannot be harmed by any weapon, burnt by any fire or touched by water”: this verse of the Shrimad Bhagwat Geeta is an extremely beautiful manifestation of the divine wisdom. It marks the eternity of the soul and among its many interpretations, most potently highlights the eternal power of the self on humanity, manifested as the soul within. *Self is the biggest truth of all human existence. Self is the core of all forces. Self is the purest manifestation of the divine.* Self-realization is the best form of prayer. However, in the present era of materialism, the realization of the self and its infinite power has been lost in the pace and struggle of the modern world. Humans in the struggle for survival and existence, constantly and often unconsciously engage in a process of falsification of our own selves. We change our identities, our beliefs, our values and our real self to suit the perception of others. In the process, we lose sight of our own self, our own soul. We find reasons and justifications to prove our own instincts and beliefs. Shifting identities might fetch us immediate rewards in the material world. However, the personality costs that we have to pay in the long run extremely high. A constant suppression of our real self results in discontentment and stress, which nags us either consciously or unconsciously. What worsens the situation further is the fact that most of us are unaware of the reason behind our stressful existence.

Listening to our inner voice enables us to lead a guilt free life. It liberates us from the constant stress of not being to fulfill the expectation of the others. It awakens us to the fact any satisfaction given to others at the cost of our own personality is temporary. We will be able to serve everyone who matters in our lives better, if we are true to our own selves. Most of the times, subscribing to the morality of others does more harm than benefit, even if that other is our own family or spouse. Our morality might not be perfect. But it is our own. Realization of self is the key to respect our own being as a loving creation of God. We do not need to be perfect. *We only need to be ourselves to justify our existence and realize the purpose for which we were created.* Realization of self does not mean absence of compromises or adjustments. Compromises are essential for our harmonious social, professional and personal lives. However, such compromises should be conscious and should be made being awake to our own real self. True self realization does not prevent us from compromising. It enables us to make harmonious adjustments without losing sight of our inner voice.

Self is not a symbol of ego. It is the manifestation of an individual's inner force. It is a force, which is unique and pervasive. It is a force, which if harnessed, can tackle any difficulty of an individual's life. However, we neglect and suppress this very force that is our own and divert our energies outwards. Identifying and strengthening the self is the best way of reducing stress because it not only liberates us from the compulsion of living the perception of others, but also helps us find the best solution to our problems. Our inner self, our instinct is the best judge of our situation and hence is best equipped to take decisions for our lives. Living by instinct might not be a foolproof way of dealing with life's situations, but it is definitely much more productive, satisfying and stress free.

Someday humans will reach their final stage of evolution: Image of God and the verse from Genesis chapter 1:27 will come to pass. Until then, religions have to patiently wait until we reach that climax ecosystem where man reaches his full potential. The Cretaceous dinosaurs were much bigger and better than Triassic dinosaurs. It took almost 180 million years for dinosaurs to reach their "Golden Age." *All species reach their "Golden Age" at some point in time.* We do understand that the religions would like to see the "Golden Age" in the Homo sapiens right now but faced with frustrations and disappointment. Human beings are still-evolving creatures and religions have to realize that. Religions have to believe in the words of Jesus, *"I came to give life and I came to give life more abundantly (John 10:10)."* Here comes the importance of protection and conservation of species, giving more attention to the fragile environment, making way to a smooth transition in a next few million years, waiting eagerly to see the "Golden Age" of human species, culminating in Image of God.

Hence the greatest commandment, "love of God and love of neighbor", perhaps exhorts to the transcendence nature of neighbor, specially showing respect to the species yet to be evolved. Therefore our human activity in the natural world directly blocks the smooth transition in biological evolution. In short we are telling God, "We don't need you anymore!" Time is the key to human's progress into more complex species. The Holy Bible has something to tell to all religions. It is a quote from Ecclesiastes, *"There is time for everything and a season for every activity under heaven: a time to be born and a time to die, a time to plant and a time to heal, a time to tear down and a time to build, a time to weep and a time to laugh, a time to mourn and a time to dance, a time to scatter stones and a time to gather them, a time to embrace and a time to refrain, a time to search and a time to give up, a time to keep and a time to throw away, a time to tear and a time to mend, a time to be silent and a time to speak, a time to love and a time to hate, a time for war and a time for Peace."*

Until the arrival of Imagio Dei, perhaps after millions of years, religions have to sit and wait in disappointment and after the decent of Imagio Dei,

get more frustrated to learn that they are not needed anymore. However, religions have played remarkably an important role to bring Imagio Dei to its completion. In Imagio Dei we are able to live in an equalitarian society and no hierarchy can inflict their fetters on you. As we go forward, all authority will be outdated. Humans will not be taking orders from anybody and all the hierarchy based religions will have to end at this point. As we become the image of God we don't need ego, race, language, religion, nation, or relationship. When you have God himself in your heart, why do you need any more religion? "If God is for us, who can be against us?" exclaims St.Paul. Now and in this stage of our journey, we are beginning to put the cosmic pieces of our puzzle together to form a cohesive and structured pathway that will lead us to the infinite expansion of our inner most dwelling, the Image of God. Strong sense of divinity will propel the living toward their final destiny.

Earth-based Psychology and Path Awareness

"Though we are God's sons and daughters, we do not realize it yet,"
Meister Eckhart.

Human evolution has unveiled an enormous amount of capabilities and potentialities and still evolving. All these gifts are at work and drive the human species toward one goal; Image of God. The question motivating this subject is this: What inexplicable forces govern or direct our lives? What moves us to take one direction one day, and another direction on the next day? Is the answer chance? Is it psychology, physics, or Shamanism? Is it Genetics, your dreams, outer events in the human world, or the cosmos? To answer these questions, we liberally borrow from physics, psychology and from our personal experience with earth-based, aboriginal beliefs and Shamanism. Earth-based Psychology defines, explores, and applies a relatively new and fundamental concept: path awareness. To explain, experience, and understand our inherent direction-finding ability, we had to cross the conventional borders of various disciplines. Physics focuses mainly upon material experimental proof and is just beginning to explore subjective experience. Shamanism is mainly concerned with altered states of consciousness and community. The practice of psychology deals mainly with the emotional and functional problems of human life. We shall move into thinking and feeling, using the rational mind as well as altered states of consciousness that sense the Earth. Our goal is to develop directional consciousness or path awareness, show that it is basic to an earth-based psychology, and apply it to the solution of personal problems, and relationships, organizational, and world issues.

There is before you and each soul on Earth, a path to awakening to the pure potential of Christ's light that resides within your heart-space. This light is most notable in those who are beginning to awaken during this most

chaotic time period on Earth. (You are the Light of the World-Jesus) What this means is that those who are on Earth at this time to recognize their divinity are here for good reason, for they hold the light packets and the infinity codes within *their DNA and genetic wiring for complete transmutation of lower vibrations. The dormant aspects of your current biology offer you the ability to step outside of your limited perceptions of self and the life around you to realize the beauty of interconnectivity and oneness that surrounds you.* This is why you are on Earth at this special time. This is why you have chosen to awaken at this particular stage of Earth's evolutionary journey. Your purpose on this Earth is none other than to awaken to the beautiful splendor of who you really are (Image of God) and that which expresses the joy of creation. Stepping into this role is one that requires a shedding of the old and outworn paradigms of life to begin to realize that there is more than the human eye can see and the human heart can dream. This space is one that you have implanted within before your incarnation here and it is the work of your soul to guide you to this remembering. In this time in Earth's history there is the potential for a complete and total resurrection of the body of this planet and therefore, the inhabitants upon it. Stipule talking about Baptism comments, "We die and rise to new life." So then, what is your special part? What we would like to provide you with is an understanding of how the genetic aspects of human construction, works to assist in awakening the human consciousness.

There, in the space of what you call the Earth dimensions are frequencies or codes that are written into geometric grid systems of light and intelligence and connect each human to a level of understanding of perceptual reality. This grid system works to incorporate all the levels of cosmic and stellar activity within the physical embodiment of a soul. The purpose then, of these grid systems is to allow for each individual to grasp the information and consciousness of a particular field for the purpose of individual and collective awareness and experience the tangible dimensions of Earth. *Your role then in this grid system is to connect with and incorporate the light that is emanating from these electromagnetic fields as they relate to you, to restore, rebalance and re-calibrate your human form (a new creation).* When this has been achieved, those who are ready to walk into the new and higher vibrations on Earth will be prepared and well suited as they will have been guided by these unseen forces to their destiny. *This is the genetic and energetic perspective.*

The spiritual or perspective of awareness is that one must be in a state of complete clarity and harmonic balance to achieve the level of trust and knowingness necessary to employ the missions of the soul. This state of clarity is one that is achieved by the letting go of preconceived notions of what is, what was, and what will be, to allow for the truth to become. This path is one that was set into motion by you and therefore only you can take

yourself to the infinite. Taking yourself to infinite is merely a process of allowing yourself the greatness of who you are. *We say surrender as a form of allowing, yet surrender is often an active pursuit. Jesus surrendered himself to the will of the Father.* To surrender one must be in an active role of participation with the soul, and in complete faith. Faith is the only pathway to the truth of who you are is not to be found in your thoughts, but in the experiences of the heart. The state of mind that humans created with thoughts of separation is actually the state of mind that must be transcended to affirm the before mentioned truth. Once this state of mind has been realized, you are then in a position to understand, with clarity and by visceral experience, the truth of your being. This is the space to not only realize your innermost desires and passion, but to begin to put them in motion. The questions that reside in the human heart are there for good reason, *to remind you that you are more than you "think" you are.*

Allowing this light of truth to descend upon you is paramount to your fulfillment. Those who honor these questions of the heart are those who courageously step on the path and claim their true power as conscious co-creators, capable of divine fulfillment and infinite joy. The version of yourself is what will bring you into total harmony and balance through experience, and will allow for you to express that which is unexpressed. You will come to know what you long for as you allow life to lead you. Most often this requires a mere shift in consciousness, for one cannot think their way to salvation. Experience is neither good nor bad, it is only what you perceive it to be, so allow for experience to alter you and you will benefit greatly. A human life has the potential for ultimate peace, love and joy, but to achieve this, one must be the blend of such balance. This balance is especially important in relationships for relationships require that one give and receive equally. *In order to give, one must have; in order to receive, one must allow.* This balance is a natural by product of intimate relationships especially, and is achieved through the before mentioned experiences of the heart.

When one allows for the light to enter the heart-space, you are the energy pack. This allowing is what manifesting is made of, synchronicities that form as a basis to living a life with ease. Often, the human ego will block these miracles by interjecting with thoughts of doubt and feelings of powerlessness as a result of a hardened heart which blocks the love that already surrounds you. Heal your heart of all that no longer serves your vision of life and the love that is already yours will come into plain view. *The human being was designed to create.* So then, what will you create with your infinite power? What will you attract with your limitless potential through the formless substance of creation? We say, uncover and be who you are in truth and you will attract all that you are by default and truth will set you free. Blessings and miracles are bestowed upon you always, but only if you allow for them. You can feel safe to let go, many are waiting to escort you to your destiny.

These soul-mates will appear when you are ready to allow and receive them.

Path awareness is actually an ancient concept. Linked to the universe, our bodies sense direction in ways that merge our personal psychology with the real and imaginary nature of the earth around us. Aboriginal peoples have spoken about path of awareness in terms of the gods of the four directions and the geometry of sand paintings. Einstein spoke of the mind of God and the geometry of space-time. Psychology too, will soon speak, more about the directional wisdom of the earth. Our psychology is intimately linked not only to disembodied dreams and feelings, but also to the nature of space and to the manner in which our bodies relate to this magical planet. *In a way, psychology is an aspect of cosmology. Earth-based psychology will show how our deepest feelings can be expressed as mathematical patterns linked to earth-based directions. Path awareness is the natural inheritance, the birthright of every human being. Path awareness is an updated form of earth-based spiritual paradigms.*

All of our aboriginal peoples speak about moving according to the directions of a living planet, a sentient earth. To find the magical paths of heart and of least action, we must develop our awareness, must become a better observer of what happens inside and outside. The purpose of earth-based psychology is to help us find and experience what has been before us, why we have come into being, and where our lives are flowing. Three thousand years ago the ancient Chinese Taoists may have been more at ease speaking of the ungraspable. They did not speak about awareness, consciousness, self-reflection, but rather of *a Tao, or Way*, that could be described, and another Tao that could not be described. According to the basic Tao Te Ching, a sage simply knew the way, the Tao: she simply had the kind of path awareness that could not be said, that was pre-verbal.

At some primal level we all are aware of directions before we can explain what they mean for us. We feel motivated to move in a certain direction before we know exactly why. We feel best in certain spots and less well in others. Without knowing how, we are sentimentally aware of tendencies to move before we even move. In a way, the direction that we take, the path that we can describe, is not the entire path. The real path was preceded by sentient awareness of the earth, an awareness we can barely speak of. In reality we are located in our bodies. But at the same time, we are also located, though non-locally, at other places on earth and in the universe. In a way, we are the directions. We are the area around ourselves. *In a sense we are the earth; we are the universe looking at itself.* There is definitely something widespread, something non-local, about our most sentient awareness. In other words, what we call our awareness may not be entirely located in our own bodies.

This non-locality of awareness may be why researchers cannot find consciousness located in the brain. From the view point of our experience, awareness is non-local; it is everywhere. Our awareness is not ours alone. Non-local awareness may have been better developed in our ancestors. Needing to find their way around at night without maps or street lamps, they depended upon an awareness that they sensed was not located only in their bodies. *Our ancestors felt that the earth is a gigantic sentient being subjected to the same forces we are. The very earth possesses awareness; this very earth is a living being of which we are a part (Gaia Theory).* By moving with the sentient awareness, we align ourselves with the direction it intends for us. Our sentient awareness belongs at the same time to the entire earth, to the universe in which we live.

It is awareness that makes us look up at the night sky. Then the non-locality of awareness breaks into parts as we stare at the universe. It is as if the universe looks through us at its own taint. When we look up at the sky, we are looking backward in time, at our tail, for it takes starlight a long time to reach us. When we look at the night sky, then, we look backward in time; we look at the history of the universe. Sentient awareness is a kind of intelligence, knowingness, *a quantum mind. Sentient awareness is physical and spiritual, gravitational and psychological. Like aboriginal myths, the Bible also shows a kind of sentient awareness appearing in the form of a God who created the world through reflecting himself in human beings.*

Frescoed by Michaelangelo on the ceiling of Rome's Sistine Chapel, the creation of Adam shows a God emerging from the heavens and, with a touch, giving a human being life. Among other things, *Michaelangelo's painting symbolizes how sentient body awareness, god's subtle touch that comes from the universe's awareness reflects and creates human existence.* Sentient awareness gives us our first principle of human functioning: all experiences arise out of or is preceded by sentient awareness. From sentience also come other methods, skills, and principles, the experience of wonder and curiosity, for instance, and the ideas of process as teacher and the path awareness. How you formulate these derived terms depends upon who you are, your culture, your state of mind, the times you live in. Some use cultural or religious frameworks; others, biology, sociology, or physics.

Enlightenment-Awakening – A Renewed Humanity

“Only the human person, created in the image and likeness of God, is capable of raising a hymn of praise and thanksgiving to the Creator. The Earth, with all its creatures, and the entire universe call on man to be their voice.” Pope John Paul II.

Awareness brings us to the next stage in human evolution: *Enlightenment.* I'm not interested here about the age of Enlightenment which refers to the

18th century in European philosophy, art, poetry and is often thought of as part of a larger period which includes the age of reason. What does it mean to experience, “Enlightenment”? *Enlightenment is a continuous realization that you are an eternal being who will never die.* It comes from a deeper knowing that you are beyond body and behind the mind. It is celebrating every moment of the day with the feeling of being intimately connected to the entire Universe, as if it is a living, breathing, conscious intelligence that loves you unconditionally. It is surrendering to this truth everywhere you are.

Enlightenment is a process of peeling back the many layers of the ego to experience your true radiant infinite Self. It is a process of opening to your innermost being, and as result to the entire Universe! Reaching towards the center of “you” you may find a spiritual cyclone (like Energy from the Planet’s Core). Yet, keep diving, beyond that there is a deep stillness. In the very essence of your being is where your true spiritual knowledge resides. This is the source of your reality and Universe. As you continuously rest deeper into the quiet peaceful still center in the heart of your being, *you will eventually awaken to the Divine being you truly are: Image of God (Imagio Dei).* The longer you can abide in this center, the faster you’ll find yourself manifesting a rich life, full of depth, meaning, clarity, love and abundant with bliss. Look inside at your Infinite Nature. There exists a divine energy inside you that is connected to the Infinite Source of the Universe. This source is always available to you, if you are open to it. *The moment you have a tiny glance of your infinite nature, you see that you are the image of God.* You are the source of love itself. There is nothing greater than knowing this.

The Universe is a conscious field of energy that is constantly supporting you in awakening to knowing the truth. Nothing that happens is by accident. Even your decision to read this is not an accident. Each experience you have in life is the “right” experience. Every lesson you are here to learn is being provided to you through these experiences. The Universe is constantly giving us assistance. In a single moment, in one stroke, you can become enlightened. It is not a gradual process, *because enlightenment is not something that you have to invent. It is something that you have to discover. It is already there. It is not something that you have to manufacture. Close your eyes and see it there. Be silent and have a taste of it. Your very nature is what I call enlightenment. It is not something alien, outside you. It is not somewhere else in time and space. It is you, your very core.* Your problems and issues in life are like particles of sand between our toes, depending how you move through life they either grind or massage your feet. Your problems are your greatest teachers in disguise.

Explore your life with a childlike curiosity. Life has a greater wisdom for you than you can conceive of because the entire world is designed to awaken,

enlighten, heal and empower you. Everything is connected to a cosmic intelligent web of energy, love and information in between every atom in this Universe. An exponentially increasing flow of amazing enlightening insights will happen to you the moment you let go and dive deeper into trusting this infinite source of intelligence. When you do, you'll notice your body becomes very relaxed, empty, soft and open to almost every possibility that comes its way. Supreme states of bliss are happening to people all over this planet right now.

As society opens to the Holy Spirit she will enable possibilities undreamed of even by science and technology. A new spirit-based society based on the profound experiences of pioneers of consciousness is a real possibility. Newly evolved individuals centered in the Spirit will usher in a Spirit-based life on Earth. Human progress in consciousness can usher in a new divine life on Earth. *When we discover our higher nature we take an essential step to creating the Spirit-Based Societies on Earth.* As humans evolve beyond their higher mental capacities they enter the plane of the Spirit (Image of God).

If enough individuals gain the skills, knowledge, and powers of the spiritual plane, then there is also the possibility of a new Spiritual-Based Society. When a number of spiritualized evolutionary individuals appear, they can come together and form a collective existence: that is the beginning of what *the book of Revelation* calls “a New Heaven and a New Earth” (Rev 21:1). *There is a new world emerging from the old world. There is a new consciousness being born on Earth that has never existed before.* People are en masse becoming aware of the subtle unfolding of life. Many are coming to understand the phenomena in Natural World. They express the fact that we can instantly change the conditions of life around ourselves from within. E.g., you change an attitude, or aspire for something intensely, and then within days, hours, minutes, even seconds good fortune arrives on its own. This is being accompanied by other propensities, as we embrace higher human values, we begin to change and evolve our nature.

Then there are the pioneers who are opening to the spiritual force, which brings the conditions of life under control, while evoking results that are dynamically creative and unprecedented in quality. All of these are steps on the road to enlightenment, the spiritual awakening of humanity. It is the promise of a New World emerging from the turbulent old world (PDR Code). The source teachings of the great religions of the world are available to each of us without having to follow that teacher exclusively. Jesus brought love to the world, but we can follow the path of true Self-Giving without following Christianity. We can perceive that attachment and possessiveness, ignorance, and ego are essential causes of suffering, something Buddha professed, without having to follow the religion that arose after his passing. We can surrender to the True Self within and the Divine Reality above in the

activities of life without having to follow Krishna who professed that profound teaching in his time and are several of the central precepts of Hinduism. *We can embrace the fact that evolution is constantly occurring in life without exclusively becoming proponents of the works and principles of Darwin.* Thus in the modern era, we have made great advances in our mentality in the past hundred years or so, we are able to perceive the variety of truths from all time and traditions, as well as new, modern insights, and integrate them in new holistic and uniquely perceptive integral views of reality. That is one reason that the current era is referred to as “The New Age.”

It is a dynamic period in which we are able to develop a fresh, new perspective of existence, including the knowledge gleaned from multiple cultures; the various paths of wisdoms from a variety of traditions; the vast array of material, psychological, and spiritual insights from around the world and meld them into a comprehensive view of existence. There are many signs that we are moving towards the new integral view of life. We see nations forging closer political and economic ties and alliances; we see the embracing of one another’s cultures; we see the communications of a plethora of beliefs and spiritual teachings over the internet; we see a society more open to new ideas that go beyond one’s traditional culture. This cross-pollination of wisdom and personal experience is enriching the world and every individual in it. It is surely a sign of humanity’s progress, which I believe is in fact *a New Awakening; the Vatican Document on the Constitution on the Church, “Lumen Gentium” calls this reality as “Unity in Diversity.”* How does the Church, the Body of Christ grow and continue to survive? The Second Vatican council in its document the Light of the Peoples recalls “as often as the sacrifice of the Cross is celebrated on the altar, the work of redemption is carried out. At the same time in the sacrament of the Eucharistic bread, the Unity in Diversity of the faithful, who form one body in Christ, is expressed and brought about.”

Humanity’s Future – Hunt for a Perfect Human Being

Imagine you’re driving on a highway flowing with quiet, enjoyable water fueled cars. The air is so clean and fresh that you can stick your head out the window and find it’s truly enjoyable to breathe! The highways sound like a gentle loving hum of energy as these new water fueled cars run off of electricity and only emit water from their exhaust. There is no toxic pollution created at all. The air you breathe will be pure and free carbon monoxide, and you’ll be living in a green clean city free from any toxic brown clouds. We will build our Earth’s ozone layer and there will be no need for another war. There is plenty of water on the planet and an abundance of free reusable energy. This technology will provide our planet with a clean cheap and efficient way of powering our homes and fueling our cars. This awesome water fuel technology is the number one solution for our energy crisis and saving our planet. Environmentally friendly “green” technology is how we

will survive and thrive as a species. *Our future is only as bright as we can imagine and allow it to be.* It can truly be a bright and flawless society with implementing water fueled technology.

Human vibration, energy, thoughts, words, ideas and music, affect the molecular structure of water, the very same water that comprises over 70% of a mature human body and covers the same amount of our planet and 3.5 % salt in human body is also the same level in oceans. Water is the very source of all life on this planet, its quality and integrity is vitally important to all forms of life. *The body is very much like a sponge and is composed of trillions of chambers called cells that hold liquid. The quality of our life is directly connected to the quality of our water.* Water is a very malleable substance. Its physical shape easily adapts to whatever environment is present. But its physical appearance is not the only thing that changes; its molecular shape also changes. The energy or vibrations of the environment will change the molecular shape of water. In this sense water not only has the ability to visually reflect the environment but it also molecularly reflects the environment.

As we humans evolve, we increase our power over nature and our own destiny. The next step of human progress will be to inhabit, enhance, and eventually transform the Universe. Over the past few years, the rate of human achievements in all scientific fields has accelerated dramatically. We are transforming the human body; tinkering with our genetic arrangement to make ourselves smarter, faster, and healthier; and then developing ways to clone the final product. We enhance the functioning of the brain and implant that human brainpower into our machines. And we unify the human family by developing global communication systems, such as Internet. As our species extends our control over this planet, we simultaneously prepare ourselves for extraterrestrial habitation by shaping and transforming terrestrial landscapes.

We design a new generation of rockets that can transport us to distant spheres at one-third the speed of light. At the same time, we probe the innermost recesses of nature through such exotic fields as *nanotechnology*. We must examine the many ways such developments impact the individual, society, and the economy. And we must explore the underlying reasons why our species is feverishly working to advance the planet and ourselves and transform all we encounter. When we truly understand the depth and strength of man's overwhelming imperative to grow and progress, we can more clearly anticipate the future. At first blush, it would seem that there is little mystery about the impulses driving the human species in this quest: We engage in such productive activities merely to enhance our material condition. We invent technologies that will improve our standard of living and make our lives more pleasant and comfortable. Our species from the earliest periods of prehistory seems compelled not just to survive, but to grow, progress, and

enhance itself and its environment. At each new level of our development, we endeavor to master our environment as well as the physical dynamics governing our Universe.

Humanity's activities, including the entire scientific and technological enterprise, represent a unified attempt by the species "humanness" to everything we encounter. Over the centuries, we have labored to improve planet Earth, and we are now preparing to transform the universe into a dynamic entity filled with life. We will accomplish this by extending our consciousness, skills, intellect, and our very selves to other spheres. I would like to label the sum total of our species' endeavors to improve and change our planetary environment, and ultimately the Universe itself: *Vitalization*. Vitalization is a force that is conditioning human behavior. This drive to vitalize, to imbue our planet and eventually the cosmos with a consciousness and intelligence, is a primary motivation behind all human productive activity. Vitalization is the primary force shaping human behavior. However, in order to pursue vitalization successfully, the human species must master four other forces. What I label the "*building blocks of vitalization*." These four processes encompass the extraordinary advances in areas such as space, medicine, biogenesis, engineering, cybernetics, and energy:

1. *Dominionization*; control over physical forces, such as energy, our ability to manipulate matter, control fundamental aspects of the physical universe, such as atom and electromagnetism, nanotechnology.
2. *Species coalescence*; unity through built systems, such as transportation and communications, travel from Mumbai to New York in two hours, universal communication network of images, voice and data is made possible by satellites, fiber optics and other advanced technologies.
3. *Biogenesis*; improvement of the physical shell, such as through bioengineering, through genetic manipulation, cloning, creating a new and improved human, smarter, smaller, more adroit, more creative, nanomachines that cruise through patient's body and fight viruses like AIDS, Alzheimer's, cancer and cystic fibrosis.
4. *Cybergenesis*; interconnection with machines to advance human evolution, enhancing the brain's functioning, as a surrogate memory, visualizer, calculator and decision maker, computer implant in the brain to complement human memory and computational skills, enable the human brain to connect to a computer and download and upload data.

Our species is guided by a *sense of higher purpose*, a destiny, as it were, of which we are only now becoming aware. This new vision synthesizes

a century of scientific and theoretic research into the nature of the human species and our ultimate place and role in the evolving universe. *The emergence of human consciousness and human intelligence is a unique historical event, the human race's capacity to vitalize, bring life, order, creativity, and novelty to everything it touches, sets the world on a completely new evolutionary trajectory.* Moreover, the world now possesses an entity, the human species that could develop tools to save the Universe from the Big Chill or the Big Crunch, the demise augured by the Big Bang theory. Hence human will is the ultimate determinant of the shape and direction of the Universe. It will not be left to the Universe to determine its ultimate fate. It has no concept of where it is going. At best, it will settle into a moribund chaos, at worst it will teeter on the edge of dissolution and destruction. The human being has a different destiny in mind for the cosmos. We are actively engaged in creating a *Human-Universe* of our own. Such ruminations are hardly esoteric or philosophical.

Government and business leaders, if they are to make correct long and short term decisions regarding technological development and the economy, must understand the powerful role that the human species will play in the future. Indeed, speculation about such cosmic issues is becoming commonplace. Scientific discoveries by the Hubble Space Telescope and the Mars Pathfinder mission only fuel the debate over the place of man in the cosmos. Moreover, NASA has created an Astrobiology Program to study the origin, evolution, distribution, and purpose of life in the Universe. This new vision provides startling answers to the questions: Why us? Why here? Why now? We are entering a human future, in which the very shape and direction of all aspects of the universe will be deeply influenced by the actions of the human race and its descendants. For example, the proposed terraformation of Mars, the creation of an earthlike environment on the Red Planet encompasses more than a planetary facelift. It will be our destiny in space (IMAX movie). The vitalized future will be a human future, reflective of our core values, growth, progress, optimism, hope, and altruism. The very act of vitalization, the bringing of life to other worlds, implies that we are acting through exclusively human values, the desire to improve our surroundings, to enrich, embellish, *and make the world a better place.* While human imagination and energy will build this new world, our values will shape it.

Technologies and their uses should be limited and controlled by biblical ethics, not by our desires for more power or wealth. The unquestioned pursuit of technology could have unintended adverse consequences and should therefore be limited. Many enlightened voices warn of the dangers of three technologies: robotics, genetic engineering, and nanotechnology. Self-replicating nanotechnology could destroy all plant life. Genetic engineering could result in a race of super-humans, ushering in

a new era of inequality. The key to understanding these new risks is the fact that these technologies share one remarkable potential: *that is, self-replication.*

We will have intelligent Robots by 2030, Nano-replicators by 2020, and the Genetic Revolution is already upon us. We all have a picture of what an intelligent robot might look like. Hollywood has given us many stories of that kind of technology gone wrong. These technologies could destroy everything including humanity. History is filled with people who believed that they were racially superior to others; Nazi Germany and Vedic Indian caste system are some of the obvious examples. *An aspect of human uniqueness is the belief that all people are created equal and have rights endowed to them by their Creator that cannot easily be taken away.* But what if it became overtly obvious that people are not equal, that some, because they could afford new genetic therapy, could have children that were brighter, stronger, and generally more capable than anyone else? This is the question being asked by *Francis Fukuyama* in his book “*Our Post-human Future.*” The answer he comes up with is not comforting. He contends that technology is at hand to separate humans into distinct genetic camps and that we will not hesitate to use it.

Fukuyama gives us three possible scenarios for the near future. *First, he points to the rapid acceptance and widespread use of psychotropic drugs* like Prozac and Ritalin as an indication that future mind altering drugs will find a receptive market. What if neuro-pharmacology continues to advance to the point where psychotropic drugs can be tailored to an individual’s genetic makeup in order to make everyone happy, without the side effects of the current drugs? It might even become possible to adopt different personalities on different days, extroverted and gregarious on Friday, reserved and contemplative for classes or work on Monday. *Next, advances in stem cell research might soon allow us to regenerate any tissue in the body.* The immediate result would be to dramatically extend normal human life expectancy, which could have a number of unpleasant social and economic implications. *Finally, the feasibility of wealthy parents* being able to screen embryos before they are placed in the womb is almost upon us. It would be hard to imagine parents denying their offspring the benefit of genetically enhanced intelligence, or the prospect of living longer lives free from genetic disease.

What will happen to civil rights within democratic nations if these predictions come true? Will we end up with a society split into subspecies with different native abilities and opportunities? What if Europe, for instance, is populated with relatively old, healthy, rich people and Africa continues to suffer economic deprivation with a far younger population ravaged by AIDS and other preventable diseases. Interestingly, *Fukuyama believes that the greatest reason not to employ some of these new technologies is that*

they would alter what it means to be human, and with that our notions of human dignity. The Christian basis for human dignity is the “Imagio Dei,” the image of God placed within us by our Creator. Many are questioning the wisdom of chemical and genetic manipulation of humanity, even if it seems like a good idea now.

There is a long tradition of looking at the surrounding world with suspicion. Recent advances in science and technology are not making this struggle any easier. In his work “The Abolition of Man,” C.S. Lewis argued that humanity’s so-called power over nature “turns out to be a power exercised by some men over other men with nature as its instrument.” His concern is that the modern omni-competent state combined with irresistible scientific techniques will result in Conditioners who have full control over the future of humankind. He feared that modernism and its ability to explain away everything but “nature” would leave us emptied of humanity. All that would be left is our animal instincts. *The choice we have is to see humanity as a complex combination of both material and spiritual components or else to be reduced to machines made of meat ruled by other machines with nothing other than natural impulses to guide them.*

Sociologist Jacques Ellul in his book “The Technological Society,” argues that as a society becomes more technological it also becomes less interested in human beings. As he puts it, the technical world is the world of material things. When it does show an interest in mankind, it does so by converting him into a material object. Ellul warns that as technological capabilities grow, they result in greater and greater means to accomplish tasks than ever before, and he believes that the line between good and evil slowly disappears as this power grows. Ellul worries that the more dependent we become on technology and technique, the more it conforms our behavior to its requirements rather than vice versa. Whether in corporate headquarters or on military bases much has been written about the *de-humanizing effect of the employment of modern technique*. Primarily, he fears that even the religions might become enamored with the results of technique. The result would be depending less on the power of God to work through Spirit-filled believers and more on our modern organization and technological skills.

Without a doubt, technology can help to make a society more productive, and growing productivity is a major predictor for future increases in standards of living. Likewise, technology results in greater opportunities to amass wealth both as a society and for individuals. Communication technology can help to unify a society as well as equalize access to information and thus promote social mobility. On the other hand, technology can cause harm to both the environment and individuals. *The Chernobyl nuclear power disaster in Russia and the Bhopal industrial gas tragedy in India resulted in thousands of deaths due to technological negligence.* The widespread access to pornography over the internet is damaging untold numbers of

marriages and relationships. Terrorists have a growing number of inexpensive technologies available to use against civilians including anthrax and so-called radioactive dirty bombs that depend on recent technological advances.

However, it must be said that most Christians do not view technology itself as evil. Technology has remarkable potential for expanding the outreach of ministries and individuals. Probe's, a Christian organization's website is accessed by close to 100,000 people every month from over one hundred different countries. Modern communications technology makes it possible to broadcast the Gospel to virtually any place on the planet around the clock. However, in our use of technology, Christians need to keep two principles in mind. First, we cannot give in to the modern tendency to define every problem and solution in scientific or technological terms. Since the enlightenment, there has been a temptation to think naturalistically, reducing human nature and the rest of creation to its materialistic component.

The Bible speaks clearly of an unseen spiritual world and that we fight against these unseen forces when we work to build God's kingdom on Earth. *Ephesians* tells us "our struggle is not against flesh and blood, but against the rulers, against the authorities, against the powers of this dark world and against the spiritual forces of evil in the heavenly realms." *Scientific techniques alone will not further God's kingdom.* We must acknowledge that prayer and the spiritual disciplines are necessary to counter the adversary. Second, we need to remember the power that sin has to tempt us and to mar our thinking. *We are to have dominion over the earth as God's stewards, not as autonomous tyrants seeking greater pleasure and comfort.* Parents should be allowed to make reasonable genetic enhancement in their children, claims Ronald Bailey in the following viewpoint. Such enhancements will allow people to live longer, healthier, and more successful lives, he contends. Once the safety of genetic engineering is established, applying the "reasonable-person standard," asking whether a reasonable person would consent to the genetic enhancement, will prevent parental abuse of the technology.

We are on the cusp of profound biological change, poised to transcend our current form and character on a journey to destinations of new imagination. Let's assume that cheap, reliable genetic interventions will be available to parents in the next couple of decades. One such technology might involve inserting artificial chromosomes carrying genes selected by parents into an embryo at the one-cell stage. Once the artificial chromosomes have been incorporated into the embryo's genome, the selected genes would spread normally so that they would be in every cell of the enhanced child's body when he or she is born. So what type of genetic enhancements would be morally acceptable? Again, applying a reasonable-person standard, consent can be presumed for general capacities that anyone would want, e.g., genes that tend to increase intelligence, strengthen immune systems, and lengthen lives.

After all, these are capacities that many other people already have naturally, so it's hard to see a moral reason for denying them to others who will be able to obtain them safely by means of genetic engineering. Opponents of genetic enhancement try to frighten the public by trivializing the choices that parents might make. They suggest that some parents will want to genetically engineer piano prodigies or professional soccer players. Others insinuate *Nazi Eugenics* by hinting that some parents will choose to endow their children with dark hair and blue eyes. Some have even suggested that black parents might choose to endow their children so that they will have white skin in order for them to avoid the pain of racism.

Although human beings are not perfect, they are good enough and do not need enhancement. *Human imperfection is what makes us human.* Moreover, using genetic enhancement to make us smarter more attractive and immortal would appeal to humanity's superficial desires. Genetically enhancing children will leave humans as robots. Hopes of enhancement and immortality are widely and superficially appealing, drawing on the overpowering love we feel for our children and on our weakness for technological consumerism. Advanced Cell Technology has predicted that scientists soon will be able to add 20 or 30 IQ points to an embryo. But the human mind may nonetheless be the apex of thinking machinery simply because it is able to hold things in balance, to understand that more can be too much and that are thresholds we don't need to cross. All these reflect the shallowest idea about human life, the sense that more is always better.

In fact, it is in our limitations that we find our meaning. An eternal robot might be nifty, but it wouldn't be human. *If we are to stay on the human side of the future, we also need a new understanding, one at least as revolutionary as the double helix (structure of DNA), the understanding that as a species we are good enough. Not perfect, but not in need of drastic redesign. We need to accept certain imperfections in ourselves in return for certain satisfactions.* Across the sweep of history, we've managed to make our societies gradually but steadily more humane, more caring. As individuals, at least in the Western world, we've managed to build long lives of general ease and comfort. We don't need to go post-human, to fast-forward our evolution, to change ourselves in the thoroughgoing ways that the apostles of these new technologies demand. We need not ban stem-cell research, but we should regulate it so that it doesn't raise the possibility of designer babies. *A species smart enough to discover the double helix should be wise enough to leave it more or less alone.*

In future, Earth will even be more beautiful than it is today. The water will be pure and deep, reflecting within itself the sunlight which gave life to all the creatures beneath the waves. The Earth will be greener with many kinds of trees and plants. These will give food and shelter to

the birds, the animals, and to all mankind and to all yet to evolve. At night the air will be so clear that the starlight gives a glow almost as bright as the moon. The people of the Earth will live close to nature. They understand and honor it and never take more than what they need from it. The people will live in peace so they prosper and begin to build many nations all around the world according to nature's climate. The whole creation will rejoice and celebrate with the evolution of new species on the Earth, where life proliferates so abundantly on our planet.

St. Paul recalls in Ephesians 4:4-6, “*You are a chosen race, a royal priesthood, a holy nation, a people set apart that you may proclaim the praises of Him who called you out of darkness into His wonderful light.*” Humans can’t get better than this. Our prayer at this point is: “May this statement, someday come to pass in future humans.”

Chapter - Five

Weather and Climate – Source of Life and Death

Before the era of modern science, most people interpreted disasters as God's will, and some people still hold to this view. Plagues, floods, tempests, earth quakes, and volcanic eruptions were considered to be acts of an angry deity or evil spirits. The importance of such events was measured not by geologic changes in the landscape, but by the level of terror, damage, injuries and deaths. Even today natural disasters are sometimes known as "*Acts of God,*" a phrase still used in legal and insurance documents. Many violent natural events are recurrent and are therefore relatively well understood, having natural causes they are relatively predictable. Whether or not they are considered rare or frequent is a matter of viewpoint and the time scale employed, commonly the life span or memory of eyewitnesses. A volcano that erupts only once or twice in a century would not be regarded as an imminent threat by a local villager, but it would be considered a frequent and dependable performer by a geologist. Predictions of the timing and violence of a natural cataclysm usually must be only approximations, since such events are governed by complex and rapidly changing factors.

Satellite photography, seismometers, laser recorders, and high speed computers are aiding immeasurably in watching changes that are likely to become human hazards. *Many violent geological processes are rhythmic because they are influenced by the motions of our planet.* These motions produce the march of seasons and the consequent cycle of weather irregularities, droughts, floods, storms, avalanches, and tides. They can even trigger earthquakes and volcanic activity. Such events tend to be local, not of great moment in the history of the Earth. However, small changes accumulate over long periods of time and produce large results. Geological time runs slowly, viewed at that speed episodic changes tend to run together in an apparent continuum, much as the individual frames of a moving picture provide an illusion of smooth continuity. Astronomic accidents, such as collisions of the Earth with large meteors or even comets, dear to the hearts of some fiction writers, could and probably have, produced worldwide geological result.

Extinction and Speciation- Life Ends and Life Begins

Mostly weather and climate played an important role on the biological changes on our planet. Darwin didn't think all that much of extinction. He certainly knew about the work of naturalists like Georges Cuvier from France, who argued that catastrophes resulted from weather and climate change, had punctuated life's history, each one clearing the world for a new set of creatures to take its place. For Darwin, extinction was simply the exit that losers took out of the evolutionary arena. They did not leave in great

stampedes; they only trickled away, as individual species were gradually out-competed to oblivion. The fossil record might suggest that many species had gone extinct at once, but with countless fossils still undiscovered, it could well be misleading. Darwin was sure that these seeming catastrophes would dissolve into a smooth, gentle continuum of extinctions.

Paleontologists since Darwin's time have indeed found many more fossils, as he would have hoped, and they've even been able to pin down their ages with great precision. Catastrophic waves of extinctions are a reality. They have ripped through the fabric of life, destroying as many as 90 percent of all species on Earth in a geological instant. The suspects behind these mass extinctions are weather and climate, including volcanoes, asteroids, and sudden changes to the oceans and the atmosphere. All of these culprits seem to have put life under worldwide stress; once that stress passes a certain threshold, entire ecosystems collapse like a house of cards. And once mass extinctions strike, it takes millions of years for life to recover its former diversity. In the wake of mass extinctions life can change for good. They can wipe out old dominant forms and let new ones take their place. *In fact, we may owe our own success to such shifts of fortune.*

It also looks as if we are now entering another period of mass extinctions. But for the first time in the history of the planet, a single species ourselves is an agent of destruction. The overture of this extinction began thousands of years ago as humans arrived in Australia, North America and other continents for the first time and hunted down the biggest native animals. But in the past few centuries the tempo of extinctions has been accelerating as humans have come to dominate the planet, destroying tropical forests and introducing alien invaders that are out-competing native life. In the coming century, humans may even raise the temperature of the planet, putting more stress on species that are already on the brink of extinction. *According to some estimates, more than half of the world's species will disappear in the next 100 years.* Mass extinctions remain one of evolution's mysteries, and from the hills of northern Italy to the deserts of South Africa paleontologists are struggling to understand their role in the history of life. Their work is not merely academic. It may be able to show the direction in which humanity is steering the course of evolution. And that knowledge makes this period of mass extinctions different from past ones in another way; not only is this extinction pulse being caused by a single species, but by a species that is capable of understanding and controlling its own fate.

The rough outlines of the history of extinctions became clear by the 1840s. As geologists surveyed formations, they often found that a given fossil species was limited to a particular layer of rock. Hundreds of miles away, the same fossils appeared in another span of rock layers. *The geologists began to tie the rocks of the world into a single stratigraphy; a unified grand history of life.* In the 1840s an English naturalist named

John Phillips recognized that the fossils documented three great Eras; the Paleozoic, the Mesozoic, and the Cenozoic (ancient life, middle life, early life, respectively). According to Phillips these three Eras were divided by great extinctions. He drew his argument on a piece of paper. The diversity of life rose from nothing at the beginning of the Paleozoic, dipping and rising from time to time before plunging at the end of the Era. As the Mesozoic Era began, life took another steep climb and then plummeted again at the boundary with the Cenozoic. The dominant life forms of each Era dwindled during the extinctions, a new menagerie appearing in their wake. As we know already that geologists have unified the world's exposed rocks into single record. They have found cliffs and outcrops where they can touch the place where the rocks of one Era give way to the rocks of the next. They have looked at the atomic clocks ticking away inside those cliffs and outcrops and can put precise dates on their ages. They've loaded computers with vast database of the planet's fossils.

Over much of the past 600 million years, life experienced a steady low level, extinctions. These background extinctions correspond to the gradual disappearance of species. Most species lie between 1 and 10 million years, and new species come into existence at roughly the same rate as older species disappear. *In normal times the diversity of life is like a field full of fireflies, each flash representing a species. At any moment some fireflies are starting their flashes, while others are winking out. Yet the overall number of flashes holds roughly steady. Now imagine that half of the fireflies in a field wink off at once. The field darkens, and the missing fireflies don't start glowing again for an hour. Something like this has happened a few times since the Cambrian period. Background extinctions have suddenly turned into mass extinctions. They have struck the ocean and land every few dozen million years, with five catastrophes standing out in particular. In each of these five mass extinctions, more than half of all species disappeared. Extinction is the dark counterpart to evolution's creativity.* Conditions of weather and climate on this planet can change so suddenly that natural selection cannot help a species adapt and survive. A pulse of extinctions can even reroute the history of life onto a new set of tracks.

Volcanic eruptions might have been able to do their damage in such a short period of time. The Siberian volcanoes may have released trillions of tons of carbon dioxide, which gradually would have absorbed heat and created global warming. The global climate appears to have heated up quickly, perhaps in only a few decades. The heat wave would have put enormous stress on a biosphere that was already crippled. According to Andrew Knoll of Harvard University and his colleagues, volcanic eruptions may have destroyed life in the ocean by upsetting its delicate chemical balance. There is evidence that 250 million years ago, the deep ocean had accumulated

poisonously high levels of carbon dioxide. The organic carbon that fell to the seafloor produced CO₂ gas, and thanks to a sluggish circulation of water in the ocean, the gas remained trapped in their depths. The volcanic eruptions liberated the CO₂ by altering the climate thereby stirring up the oceans. When the CO₂ reached the shallower waters, it acidified the blood of animals there, driving most of them to extinction.

Rebirth

“Through the ripening of the fruits of his actions he does not attain any rest, like a worm caught within a whirlpool. The desire for liberation arises in human beings at the end of many births, through the ripening of their past virtuous conduct.” (Shukla Yajur Veda: Paingala Upanishad).

It strains the human imagination to picture the world just after mass extinctions. We have nothing in our experience to compare it to. But the volcanoes that have erupted during human history can offer a glimpse of what life must have been like after the dying stopped 250 million years ago. *In the Sunda Strait, running between Java and Sumatra, there once was an island called Krakatau.* Before 1883, those who sailed past it could look up at the forested flanks of a quiet volcano. The Dutch set up a naval station on Krakatau in the 1600s, mined it for sulfur, and logged its trees. Indonesians lived in a few villages on the island, growing rice and pepper, until the 1800s. By 1883 Krakatau was uninhabited. In May of that year, the volcano began to rumble. A group of Dutch volcano watchers sailed to the island and claimed the rim of one of its craters, measuring 980 meters across. They saw steam, ash, and pumice fragments the size of baseballs shoot up into the air. Then for three months Krakatau became quite again, preparing for a climax.

On August 26, 1883 the island erupted, with explosions that could be heard hundreds of miles away. A column of ash rose 20 miles. Mud rained down from the dark sky. Clouds of vaporized rock glided over the strait at 300 miles an hour. When they hit land, they raced uphill, incinerating thousands of people. Tsunamis rolled out from Krakatau, washing away dozens of villages and then heading out across the globe. For months afterward, the ash from the eruptions floated in the sky, turning sunsets around the world blood-red. Nothing that had lived on Krakatau had survived, not even a fly. Nine months after a naturalist visiting the islands wrote, “I could find no sign of plant or animal life on the land, except a solitary very small spider; this strange pioneer of the renovation was in the process of spinning its web.”

Within a few years a thin coat of life was covering the islands again. Cynobacteria formed a gelatinous film over the ash, and later ferns, mosses, and a few flowering plants sprouted. By the 1890s, a savanna, with fig and coconut trees scattered across it, had grown on the islands. Along with the spiders lived beetles, butterflies, and even a monitor lizard. To cover the 27

miles from the mainland to the islands, plants and animals had to travel by the sea or air. Seeds of some plants could float on the currents of the Sunda Strait. The monitor lizard could swim, and other animals could ride on top of driftwood and rafts of plants. The spiders arrived on Krakatau by spinning silk balloons that carried them over the water. Birds and bats could fly to Krakatau, and bring in their stomachs the seeds of fruits they had eaten on the mainland. Yet life on Krakatau did not come back randomly.

The first to come were weedy, pioneering organisms well adapted to catastrophes. In time, other species arrived and created a succession of ecosystems, each opening the way for the next. A grassland ecosystem assembled itself first, and any animal that arrived on the islands had to be ready to survive on the food it had to offer. Emerald doves and savanna nightjars settled successfully. So did pythons and geckoes and foot-long centipedes. Many other species did not. Others had to wait as the grasslands gradually gave way to forests. As more species arrive, though, they have to compete for food or sunlight, and their numbers go down. As more predators arrive, they can drive down the numbers of their prey as well. If the population of a species on that island drops too low, a hurricane or a disease can wipe out the last few individuals. The arrival of new species, in other words, raises everyone's risk of extinction.

Mass extinctions put the normal rules of evolution on hold. *Extinctions bring short term liberation to species.* At the end of Cretaceous period, conditions suddenly became too harsh for almost any species to survive. As species disappeared, the ecological web they helped form collapsed, and other species went extinct. Some of the survivors might have had some intrinsic qualities that kept them from vanishing. Their ranges may have spanned an entire continent or ocean, raising the chances that a few individuals might have survived in some isolated refuge. They might have been able to tolerate low levels of oxygen in the ocean or a sudden rise of temperature on land. Through these remarkable survivors rebirth finds its place and the cycle begins again.

Once mass extinctions end, evolution returns to its normal rules. Competition between individuals and between species begins again, and natural selection invents new kinds of specialization. But a lineage that might do well playing by these normal rules can't win if it has been wiped out by a catastrophe. Extinctions also bring bursts of change in their wake. They can clear away dominant forms of life that under normal conditions would shut out any aspiring species that have the potential to compete with them. Without this overbearing competition, the survivors are free to explore new forms. Dinosaurs may have emerged only because the dominant synapsids were overthrown. Yet the liberation that extinctions bring to survivors isn't infinite. Again life is not immune from the threats like, Plate Tectonic activity, Global Conveyor Belt, asteroids.

Plate Tectonics – A Destructive Creator

Plate Tectonics is the theory that the Earth's continents are situated perpetually moving plates. There are about 12 plates and they are constantly moving due to the movement of the liquid rock of the Earth, the asthenosphere. Plate Tectonics impacted the formation of life on Earth. It accounts for the creation of life, speciation, and diversity. However Plate Tectonic activity is very violent causing natural disasters. Natural disasters leave an immediate impression defined only by loss that of precious lives and property. But, in time, can these disasters actually contribute something positive? Yes, they can and they do! The emotional impact of disasters aside, top researchers at one of the foremost agencies for these events, the U.S. Geological Survey or USGS are constantly looking at disasters past and present. They point to a wide range of productive, even needed, contributions made possible by wildfires, earthquakes, volcanic activity, tsunamis, hurricanes and other disasters caused by Plate Tectonic activity. *There is a lot of bad and ugly stuff in any disaster. But there's a significant amount of good, too.* You could argue that, without disasters, the Earth wouldn't "work right." Here are some of the catastrophes resulted from Plate Tectonic activity.

1. *Earthquakes – The bad and the ugly stuff:* Horrific images of the power of earthquakes are fresh in mind, given the Sichuan disaster in China, last May, in which at least 69,000 died. The deadliest known quake also happened in China: the 1556 Shaanxi quake, which killed more than 830,000. In US, the most legendary quake is the San Francisco disaster of April 1906, in which more than 3,000 were killed. In India on 26th January, 2001 in Bhuj, Gujarat a massive earthquake of 7.7 on the Richter scale turned out to be one of the worst seismic catastrophes in the last 50 years. The earthquake claimed a toll of 130,000 people. Five districts of Gujarat, namely Kutch, Ahmadabad, Rajkot, Jamnagar and Surendernagar took the brunt of the catastrophe with 99% of casualties and damage in these areas.

The Good stuff: A great deal of our fuel resources are made possible by the same forces that cause quakes. Miles underground, hydrocarbons are making oil and gas trapped underground. Picture these underground areas as a large carpet. Without quakes, this carpet is relatively flat, its valuable oils and gasses spread far and wide. When tectonic plates collide, however, causing the Earth to rumble, the carpet bends into folds, trapping those fuels in the tops of the folds and making the drilling process possible. *Earthquakes allow the economics of digging for resources.* And earthquakes create much of the natural beauty we value. Over time, they move the Earth and pave the way for mountains and other landscapes. Extreme events are the price we pay for living on a dynamic planet.

Over time, they've split continents, formed great ocean basins and built mountains like Himalayas, Alps and Andes. These are the incomparable rewards of our natural heritage.

2. *Volcanoes – The bad and the ugly stuff:* Like water in a boiling pot left on a stove, magma erupts through the surface of the Earth, sometimes with devastating results. On May 18, 1980, Mount St. Helen erupted less than 100 miles south of Seattle, shooting debris and smoke 12 miles high and killing 57 people. Herculaneum was a small township on the slopes of Vesuvius, not far from the Greek colony of Napoli. Myth attributed its foundation to Hercules. On the 5th of February 63 A.D an earthquake struck the area of Napoli, seriously damaging the buildings of many towns. Then, on the 24th of August 79 A.D the sudden and unexpected awakening of Vesuvius, which erupted violently literally obliterated every form of life from the slopes of the mountain. *Herculaneum was badly damaged in the earthquake, and fell victim to the eruption. Mount Vesuvius spewed rock and ash burying Pompeii alive.* The people who died in Pompeii were covered in gravel and ash, most died from suffocation. As time went on the ash became hard as rock. In Pompeii you witness the tales of life and death. Prior to the rule of Greeks, another great civilization flourished in Mediterranean, *in the island of Crete. These people were known as the Minoans.* For centuries the Minoans were lost to history, and were believed to be nothing more than an ancient myth. It is now known that the Minoans flourished from around 2500 B.C until about 1400 B.C. This civilization was both powerful and advanced. Their might allowed them to control the Aegean Sea, keeping it free from criminals and pirates. Just as this city was growing and seeing great success, it suddenly disappeared. Many archeologists believe that it was destroyed by a giant volcano. The Minoan eruption of Thera or Santorini in the Bronze Age, dated via radiocarbon dating of one sample to 1630-1600 B.C. According to Egyptian chronology, this eruption became the most famous single event in the Aegean Sea before the fall of Troy.

The Good stuff: Volcanoes are responsible for the existence of places like the Hawaiian Islands, the Galapagos and Iceland. More volcanic activity occurs underwater than on the Earth's surface, and eruptions can provide the foundation for eventual landmasses. And much of what these volcanoes transport is "good stuff" that helps civilizations to survive, with heat and gases from magma beneath volcanoes forming deposits of lead, zinc, silver and gold. As decades pass, volcanic ash falling on the surrounding ground creates fertile soil for crops. It's difficult to imagine the Earth without

volcanic activity. Volcanic activity was essential to the development of life and continues to play a role in determining the environment. Another benefit is the ability to generate power. In Scandinavian countries, energy companies have developed *geothermal power plants* that capture volcanic steam and use it as a power resource. It's simple and non-polluting.

3. *Landslides – The bad and the ugly stuff*: Landslides is a general term used for a variety of landscape processes including slumps, rockfalls, avalanches, debris flows, mudflows, and lahars. An avalanche is like a landslide or a rockfall except the majority of the material is snow and ice. Avalanches sometimes reach velocities over 500 km. Avalanches occur in high mountain terrains that receive winter precipitation as snow. A slump is the downward slipping of a mass of rock or unconsolidated material, moving as a unit, usually with backward rotation on a more or less horizontal axis parallel to a slope or cliff from which it descends. In a slump, the earth moves as a great block or series of blocks. Lahars are landslide consisting of volcanic pyroclastic material, water, and possibly lava and other debris that discharges down the flank of a volcano. Lahars occur as a result of volcanic eruptions, earthquakes, or the gravitational collapse of volcano or summit glaciers. The word lahar applies both to the process or deposits formed after the landslide event. Rockfall is relatively free falling or precipitous movement of a newly detached segment of bedrock of any size from a cliff or very steep slope. It is most frequent in mountainous areas during spring when there is repeated freezing and thawing of water in cracks of rock. Movement may be straight down or in a series of leaps and bounds. *Many scientists believe an ancient civilization known as Incas and their city Machu Picchu might have been a victim of sudden landslides.*

The Good stuff: Like earthquakes, landslides serve an aesthetic purpose. Without them, gorgeous outcroppings such as those along the South's Blue Ridge Parkway wouldn't exist. The Parkway meanders 700 km between Shenandoah and Great Smoky Mountains in US. Landslides also create habitats in streams, which allow fish to thrive. True, landslides sometimes choke aquatic life by pilling sediment into the water. But, in time, such landslides also will break up stream flow, as rocks act like a railroad switch on a track. The boulders slow the flow of the stream, creating pools that allow trout and other species to build habitats. Thus new ecosystems are born, bringing in rich biodiversity.

4. *Cyclones, Tsunamis and Hurricanes – The bad and the ugly stuff*: This decade has seen a slew of deadly hurricanes, most

significantly Katrina in August 2005, which ripped through the Gulf Coast, breaching a levee system and destroying much of New Orleans in US and the surrounding region. About 1,000 people were killed in Louisiana alone. On December 26, 2004, the Indian Ocean tsunami hit Thailand, Indonesia, Sri Lanka, India and a few other places. The tsunami killed about 350,000 people. It was the worst tsunami in recorded history. *Ancient civilizations like Lemuria and Atlantis*, perhaps the victims of huge tsunamis. Lemuria is a modern name for what is historically called the Motherland of Mu (Mu' u). Stories of this Pacific continent, lost under the water, parallel the tales of Atlantis in many ways. According to Plato, Atlantis was an enormous empire the dimension of which exceeded Asia and Libya combined. The roofs of Atlantean temples were golden and mounted with brass the empire was tremendously wealthy and had vast mineral resources at its disposal. In their ancient writings, the Egyptians and other people in the Mediterranean area tell of a maritime nation that assaulted them several times. Whatever it is, the city of Atlantis was lost forever, perhaps tsunami, was the culprit. *Ancient cities of Dwarka (associated with Lord Krishna) and Mahabalipuram (Pallava Dynasty who ruled South India between 1st to 8th century AD).*

The Good stuff: Wetlands can be destroyed by hurricanes and tsunamis, but they also can benefit from them because the storms import good dirt. Flooding from the sea brings sediment that can nourish the marsh vegetation, while adding a protective element by building the land higher. The living things there need these nutrients and minerals.

Messengers from Space

There are other kinds of bad and ugly stuff, that are far more dangerous like asteroids, meteorites and comets. In northern Italy you can find a beautiful rosy limestone, called Scaglia rossa, which Italian builders like to use to construct their villas. Just north of the town of Gubbio, the 1,200 foot Bottaccione Gorge is walled with the stuff. Geologists have determined that the rock at the bottom of the gorge was laid down 100 million years ago, when placental mammals were just beginning to diverge into their living groups. Wedged between the rock from the Cretaceous period (65my) and the rock from the Paleocene (55my) period that followed is a strip of clay only a half-inch thick, like a smear of jelly in a sandwich. Below the strip, the rocks contain calcium carbonate skeletons of plankton; their bodies make up most of the rock. In the layer of pure clay, no plankton can be found; above it, the limestone starts again, but it lacks many of the old species of plankton. *In that half-inch strip our destiny may have been determined;* it marks a global catastrophe our ancestors survived but the giant dinosaurs did not.

Geologists, Walter Alvarez and Dale Russell did conduct excessive studies on the rocks of Scaglia rossa, the precise boundary between the Cretaceous and the Paleocene and assign a date to it. Their thoughts began to wonder if Earth had gotten a giant delivery of iridium from space at the end of the Cretaceous period. The dinosaurs had disappeared at the end of the Cretaceous, in a mass extinction that claimed an estimated 70 percent of all species, including giant marine reptiles and the pterosaurs that filled the skies. First they thought that iridium content in the rocks could suggest a nearby supernova that could release a flood of charged particles that would have raced through space and fallen into Earth's atmosphere, causing mutations and death. *But Alverezes found that in addition to iridium, exploding stars also produce plutonium 244, which ought to have left a mark in the Gubbio clay. The Alverezes found none.*

Their attention turned instead to the possibility of a giant comet or asteroid striking Earth. They suggested that the impact of a giant asteroid slammed into the ground, its debris flew back up into the air, along with the terrestrial rock gouged out by its crater. Together they formed a thick dark shroud around the planet. Without sun, plants withered and photosynthetic plankton in the ocean died. With nothing to eat, herbivores starved; the carnivore disappeared soon after. The meteorite, Alverezes calculated, had to have been about 10 kilometers across. *It would have been as if Mount Everest had been fired into the planet like a bullet.* Impacts of this scale were common during Earth's early years, but they tapered off 3.9 billion years ago. Since then, giant asteroids and comets have probably struck the planet only once every 100 million years. An impact at the end of the Cretaceous would have been a rare event, but not an unexpected one.

Alverezes published their impact hypothesis in 1980, and in the decade that followed, other geologists looked for more clues as to what happened at the end of the *Cretaceous period (known as the K-T boundary)*. They found more evidence that something huge hit the planet 65 million years ago. At more than 100 sites around the world geologists had found the layer of clay that marks the end of the Cretaceous, and iridium consistently appears in it. Researchers have also found bits of shocked quartz in the clay that could only have been created under intense pressures such as those created in an impact. For more than a decade, *however Alverezes were dogged by the absence of the crater that such an impact would have left.* It was possible that the impact had occurred in the ocean and was now covered over by seafloor sediments, or that plate tectonics had sucked it into Earth's mantle or that a volcano had covered it over. Some researchers argued that volcanoes, which are such a strong candidate for the Permian-Triassic extinction 250 million years ago, could have been the culprit at the K-T boundary. The same sort of volcanic activity that carpeted Siberia at the end of the Permian period also poured lava across India at the end of the

Cretaceous. These eruptions could have brought up iridium from the deep within the Earth, and could have created the intense pressures necessary for shocking quartz as well. Meanwhile in Haiti other geologists found K-T boundary rocks containing globules of glass, which were predicted to have been formed in the impact.

In the 1950, Mexican geologist had discovered the remnants of a giant circular structure dating from about the end of Cretaceous, buried off the coast of the Yucatan Peninsula. It had been pretty much forgotten, but with the new discoveries, it took on a new importance. When geologists revisited the site, *called Chicxulub after a nearby town*, they brought with them equipment that could detect buried rock formations by the subtle changes in the gravitational field they create. *The geologists mapped out two concentric circles that looked as if they had been traced by a heavenly compass. All signs pointed to a 100-mile-wide crater buried under the sediment.* Other researchers drilled into the rings and brought out rocks that they then dated. The age of the rocks, 65 million years old, matched the Alvarezes' iridium marker and the glassy globules in Haiti.

In 1998 a geologist named Frank Kyte from the University of California at Los Angeles found what may actually be a piece of the thing that hit the Yucatan. He was looking over a cylinder of rock drilled from the floor of the Pacific Ocean. The dark brown clay was loaded with iridium and shocked quartz, marking the K-T boundary.

Kyte sliced the clay at the boundary, and there he discovered a lone pebble, measuring 2 millimeters across. Its chemical composition was unlike anything on Earth, but exactly like that of many meteorites, here, *Kyte suggests, was a chip from a giant asteroid.* It had broken free during the impact at Chicxulub and flown high over the Yucatan, arcing through the stratosphere before plopping into the Pacific. As geologists have gotten a better sense of the asteroid that hit the planet 65 million years ago, other researchers have been looking for clues to its effect on life. At the end of Cretaceous, they've found, the Yucatan was covered by a shallow sea, less than 100 meters deep, its bottom made of rocks rich in sulfur and carbon. Giant seagoing lizards may have swum under the shadow the asteroid cast just before it struck. The asteroid entered our atmosphere at a speed somewhere between 20 and 70 kilometers a second, creating a giant shock wave that ignited a jet of flame in its path. The fiery tail leveled trees for thousands of kilometers.

Computer models suggest that when the asteroid hit the water, it may have sent a tsunami out across the oceans, rising as high as 300 meters. The waves roared onshore, and the rip tide dragged back asteroid struck the water, it hit the bottom of the sea and vaporized 100 cubic kilometers of rock. The impact sprayed rock and asteroid 100 kilometers into the sky,

above the stratosphere. *An earthquake 1000 times more powerful than anything in recorded history made the entire planet shiver.* Geologists drilling in the Atlantic have found evidence that it triggered undersea landslides along the eastern seaboard of North America as far north as Nova Scotia, flowing 1,200 kilometers out from shore. Meanwhile, a fireball emerged from the crater and spread out hundreds of kilometers. The blackened sky was probably filled with thousands of shooting stars, molten hunks of rock that soared over the planet, igniting more fires wherever they landed.

The world burned; smoke hid the sun. Plants and phytoplankton died in the prolonged darkness, and the ecosystems that were built on them collapsed. When the smoke cleared a few months later, the world may still have been dark and cold. The impact may have vaporized the sulfate deposits in the Yucatan rocks, which combined with oxygen to form droplets of sulfur dioxide. The hazy clouds they formed may have reflected sunlight away from Earth and could have lingered for a decade. But as the haze faded, the impact ravaged the planet in yet another way, by warming it. The carbon in the limestone that was heaved into the atmosphere turned to the greenhouse gas carbon dioxide; the asteroid also sprayed the air with water vapor, an even more powerful greenhouse gas. The heat, the cold, the fires, and the other disasters caused by the impact may have destroyed more than two-thirds of all species on Earth. It was the removal of the dinosaurs through mass extinction that allowed so many lineages of mammals to come about through the evolutionary process. In that sense, it's really a good thing. *There would not be humans here but for that mass extinction” (PDR Code). But the ones that survived inherited the Earth.*

For the past 50 million years the world's average temperature has been dropping, with occasional hiccups of warmth along the way. *We may have the Himalayas partly to blame. When India collided with Asia, the crash created the craggy mountain range.* The rains that fell on these fresh new slopes carried dissolved carbon dioxide; the gas reacted with the rock and formed compounds that were carried away by streams and rivers to be buried in the sea. The Himalayas may have withdrawn so much carbon dioxide from the atmosphere that the climate gradually cooled. At the same time, the collision also pushed up the Tibetan plateau warmed and rose from the ground, pulling in moist air from the oceans to take its place. This pattern created the monsoons of India and Bangladesh and brought more rain to the Himalayas.

The removal of carbon dioxide sped up even more, making the planet's greenhouse effect even weaker. Changes were taking place in the oceans as well. The jungle gave way to broad-leaved trees much like those alive today, interspersed with scrublands. As carbon dioxide levels continued to fall, new kinds of plants evolved that could absorb the gas more efficiently. *Among these new plants were grasses, which formed the first major*

grasslands about 8 million years ago. Grass is loaded with tough cellulose and sprinkled with bits of glasslike silica, making it far harder to eat than the soft fruits and leaves that were abundant when the planet was warmer. Some mammals, such as horses, managed to survive on this diet thanks to their high-crowned teeth, which could grind down the plants. The ancestors of cows and camels were also prepared for the tough grasses because they had altered their digestive system to let bacteria help them break down the tough plants. But many lineages couldn't adapt to the cooling climate and the shifting vegetation and went extinct. Geography also drove some mammals into oblivion.

Before 7 million years ago, North and South America were separated by ocean, but continental drift gradually drew them together. A snapshot of North America, taken just on the verge of the arrival of humans at the end of the last Ice Age, would have shown a landscape crowded with giant mammals, saber-toothed cats, jaguars, cheetahs, short-faced bears, dire wolves, and other carnivores now hunted for the grazing and browsing mammals. These included mammoths grazing on the grasslands, and mastodons wandering the forests and swamps, as well as camels, horses, rhinos, and ground sloth. The North American mammals were part of a global boom of biodiversity. Studies of the fossil record suggest that the number of species has been climbing over the past 100 million years. One reason for this rise, researchers suspect, *is that Pangaea has been disintegrating into smaller and smaller pieces.* On a united super-continent, there were fewer barriers to animals and plants, so versatile species could invade the territories of more specialized ones and out-compete them. As Pangaea split apart, it created more isolated habitats where more species could thrive and more coastlines where marine life could evolve. By the time modern humans evolved around 100,000 years ago, the world may have harbored the most diversity of life in its entire history. It is a rich legacy to inherit, and a terrible one to squander.

Global Conveyor Belt

Invisible to us creatures, an underwater current, circles the globe with a force 16 times as strong as all the rivers combined. This deep water current is known as the Global Conveyor Belt and is driven by density and is also known as *thermohaline circulation because water density depends on its temperature (thermo) and salinity (haline).* Density refers to an object's mass per unit volume, or how compact it is. A heavy, compact bowling ball is obviously going to be denser than an air-filled beach ball. With water, colder and saltier equals denser. At the Earth's poles, when water freezes, the salt doesn't necessarily freeze with it, so a large volume of dense cold, salt water is left behind. When this dense water sinks to the ocean floor, more water moves in to replace it, creating a current. The new water also gets cold and sinks, continuing the cycle. Incredibly this process drives a current of water around the globe.

The Global Conveyor Belt begins with the cold water near the North Pole and heads south between South America and Africa toward Antarctica, partly directed by the landmasses it encounters. In Antarctica it gets recharged with more cold water and then splits in two directions: one section heads to the Indian Ocean and the other to the Pacific Ocean. As the two sections near the equator, they warm up and rise to the surface in what you may remember as “*upwelling*.” When they can’t go any further, the two sections loop back to the South Atlantic Ocean and finally to the North Atlantic Ocean, where the cycle starts again.

The Global Conveyor Belt moves much more slowly than surface currents: a few centimeters per second, compared to tens or hundreds of centimeters per second. Scientists estimate that it takes one section of the belt 1,000 years to complete one full circuit of the globe. However slow it is, though, it moves a vast amount of water, more than 100 times the flow of the Amazon River. The Global Conveyor Belt is crucial to the base of the world’s food chain. As it transports water around the globe, it enriches carbon dioxide-poor, nutrient-depleted surface waters by carrying them through the ocean’s deeper layers where those elements are abundant. The nutrients and carbon dioxide from the bottom layers that are distributed through the upper layers enable the growth of algae and seaweed that ultimately support all forms of life.

The belt also helps to regulate temperatures. It brings warmth to Europe otherwise they would be locked in a permanent Ice Age. A well-known density-driven current occurs where the saltier Mediterranean Sea empties into the Atlantic Ocean. During World War II, submarines used this current to enter and leave the Mediterranean without even turning on their engines! *Many scientists fear that global warming could affect the Global Conveyor Belt.* If global warming leads to increased rain, as some believe it might, the added fresh water could decrease the salinity levels at the poles. Melting ice, another possibility of global warming would also decrease salinity levels. Regardless of the means, the end scenario is the same. Warmer, less dense water won’t be dense enough to sink, and the Global Conveyor Belt could stop and trigger Ice Age, having far-reaching and devastating consequences.

Global Climate Change

Although the term “Climate Change” can refer to any variation in climate, weather or atmospheric conditions, in recent times the term has taken on a more specific meaning. Now when people say “Climate Change” they are talking about changes in climate that are a direct result of human activity. *It is this human-introduced climate change* that is often meant by the term “Climate Change.” In the context of environmental policy, “Climate Change” is usually applied interchangeable with the terms “Global Warming” or “Greenhouse Effect” to refer to human-introduced changes in climate.

Human activities over the past one hundred and fifty years have been changing the delicate chemical balance of the Earth's atmosphere. Today, scientists are attempting to describe and quantify the effects of these activities on our climate, specifically as they relate to large changes in temperature and precipitation, the magnitude and frequency of extreme weather events, and changes in sea level, all of which will have countless unknown consequences on the planet. The development of life forms and human civilization would not have been possible without a complex climate system. To most people, climate seems a simple, intuitive process. *But the climate system involves many physical, chemical, and biological interactions, among air, water, ice, land surface, plants, and animals.* Although fully addressing these interactions would require several volumes, here we synthesize the important elements behind the science of climate and climate change. The complex nature of the earth's climate system presents a difficult scientific challenge. Researchers must identify the processes that drive the system, document past and current changes in climate, and project how natural variability and human activity may alter future climates.

Changes to any of these elements affect the balance of the entire system. Climate science is a rapidly evolving field where groundbreaking discoveries are made on a regular basis. Although scientists may never fully grasp every detail that comprises the climate system, we summarize here several key elements to give readers a background on climate science and climate change. *First, we distinguish the commonly misused terms of climate and weather. Second, we introduce the important components and interactions that drive the climate system.* Here we address the importance of the greenhouse effect and introduce the phenomenon of human-made changes in atmospheric greenhouse gases and aerosols (suspended solid and liquid particles).

Weather and Climate

Weather and Climate do not mean the same thing. Weather and climate are different concepts. Weather refers to atmospheric conditions for an individual event or time. For example, if someone asks you, "How's the weather?" you can simply go outside and answer this question easily. We are concerned with how meteorological conditions may affect us over the next week or so, and we refer to weather forecasts as a guide. Weather forecasting involves modeling the circulation of atmospheric conditions through time by employing a series of mathematical equations. *Weather is measured in terms of wind, speed, temperature, humidity, atmospheric pressure, cloudiness, and precipitation.* In most places, weather changes from hour to hour, day to day, and season to season. Although the accuracy of weather forecasts has improved over the past couple of decades because of advances in observation, analysis, and modeling, the current limit of weather forecast skill extends to about ten days.

Climate refers to an average of weather conditions over an extended period of time, months, years, or centuries. A place that doesn't get much rain over many years would have a dry climate. A place where it stays cold for most of the year would have a cold climate. Meteorological elements that characterize climate include temperature, precipitation, cloud cover, humidity, and wind patterns. *Climate ultimately influences human culture,* from the articles of clothing we wear and the recreational activities we engage in to more pressing issues such as our food, water, and energy basis, it truly dictates our way of life. Recorded climate variations have caused or contributed to ecological adaptations, migrations, catastrophes, and successes.

Weather is the day to day forecast and climate is the average over a long term. About ten thousand years ago, the most recent ice age ended, and the glaciers covering north of equator began to recede. Archaeologists note that the onset of this cooler and drier period coincided with the beginning of agriculture in northern Mesopotamia. Fluctuations in the climate likely had an adverse impact on the food supply of hunter-gatherers, creating an incentive for developing agriculture as a more stable and reliable food source. A couple of relatively minor climate variations during the last millennia, the Medieval Warm Period and the Little Ice Age, had dramatic impacts on the population of Europe.

During the Medieval Warm Period in the tenth to fourteenth centuries, a small increase in temperature was concentrated primarily over North Atlantic basin and allowed the Vikings to colonize Greenland. However, the onset of the Little Ice Age in the fifteenth to nineteenth centuries ushered in cooler temperatures, which resulted in the collapse of these colonies. In addition temperatures cooler than today across much of Europe significantly reduced agricultural productivity and led to increased rates of starvation and an overall deterioration in human health. *Some believe that these changes exacerbated the plague that ravaged Europe during this period.* On much shorter timescales, phenomena such as El Nino, Southern Oscillation and tropical volcanic eruptions have important but short-lived impacts on global climate.

El Nino, southern Oscillation is an atmosphere and ocean phenomena that channels inter-annual (year-to-year) fluctuations in ocean temperatures over the tropical east Pacific into global fluctuations in climate. For example, during winters when ocean surface temperatures off the coast of Peru are unusually warm, the Southern half of the U.S generally sees cooler and wetter than normal winters while the Northern half of the country from the great Lakes westward to the Pacific Northwest generally sees warmer than normal conditions. Volcanic eruptions have long been implicated with climate variations. Following an eruption, huge quantities of gases and aerosols are injected high into the atmosphere, where they form a cloud that effectively shields the Earth from the sun's rays and leads to a short-lived

global cooling. For example, it has been suggested that the eruption of Mt. Etna on the island of Sicily in 44 BC cooled the planet and led to crop failures and eventual famine in Rome and Egypt.

Earth's Climate System

The main elements of the climate system include the Sun, the source of heat energy, atmosphere, providing a protective blanket, oceans, helping to distribute heat through its currents, water, as rain, snow, or ice, and land, reflecting or absorbing energy from the Sun. *In short Earth's climate system can be thought of as an elaborate balancing act of energy, water, and chemistry involving the atmosphere, oceans, ice masses, biosphere, and land surface.* Although generated nearly 150 million kilometers away, radiation from the sun provides our planet with the energy that forms the basis of climate and makes life possible.

The sun's energy propagates toward the Earth as solar radiation. Solar radiation directed toward the Earth carries energy amounting to 342 watts for every square meter of the surface of the Earth. This is equivalent to six 60-watt light bulbs shining year-round for every square meter and represents nearly ten thousand times the energy consumed by humankind. However, not all the energy emitted from the sun actually reaches the Earth's surface. Roughly 30 percent of the incoming solar radiation is reflected back to space off of bright surfaces on the planet, including snow cover and sand, and bright surfaces in the atmosphere, including clouds. This reflection to space happens through the same phenomenon that keeps a white car, which readily reflects solar radiation, much cooler on a hot day than a black car, which readily absorbs solar radiation. The remaining two thirds of solar radiation that penetrates the atmosphere, and reaches the Earth's surface, which heats the land and oceans.

Just as the sun emits energy, so does the Earth. Emitted energy, or radiation, from both the sun and the Earth travels in the form of waves that are similar to the waves moving across the surface of a pond. However, the energies emitted by the Sun and Earth are different due to the large differences in temperature between the two bodies. They emit radiation at distinctly different wavelengths. While the hot Sun emits energy at short wavelengths (referred to as shortwave radiation), the much cooler Earth emits radiation at longer wavelengths (referred to as long-wave or thermal, radiation). If the Earth is to maintain a constant temperature, the amount of radiation received by the Earth from the Sun must be balanced by an equal amount of radiation emitted from the Earth back to space. Without an atmosphere, the only means by which the Earth's temperature could change would be through changes in solar input. According to simple energy balance calculations, the average temperature of the Earth should be minus 18 degree Celsius or 0 degree Fahrenheit.

Fortunately, the Earth has an atmosphere that acts like a blanket that traps much of the outgoing thermal radiation emitted by the Earth's surface but allows most of the solar radiation to pass through. *Certain trace gases in the Earth's atmosphere, called "greenhouse gases," selectively absorb and trap these longer wavelengths of energy emitted by the Earth and then reemit them back to the Earth's surface. This allows for a significant warming of the Earth's surface and its lower atmosphere.* Water vapor and clouds account for much of the natural greenhouse effect. The warming effect of clouds can be observed during winter nights. A cloudy winter night is often much warmer than a clear winter night, since clouds and water vapor trap the heat radiating from the surface and keep surface temperatures from dropping as much as they would on a clear night. Overall, the greenhouse effect allows the average surface temperature of the Earth to warm from a frigid minus 18 degree Celsius (0 degree F) to a more comfortable 15 degree Celsius (18 degree F). *Thus the chemical make up of the atmosphere is crucial in establishing a climate that is hospitable to life.*

Although all locales on the face of the Earth receive the same duration of sunlight over the course of a year, solar radiation is much more intense near the equator than near the poles. Due to the curvature of the Earth's surface and the tilt of the Earth's axis, the Sun's rays are directly overhead in tropical locales throughout the year. In contrast, the Sun is much lower on the horizon over the polar-regions. However, the rate at which Earth emits energy (radiation) to space, which depends on temperature, does not differ dramatically from the equator to the poles. To maintain a steady climate, the ocean and atmosphere must transport excess heat from the tropics to the heat deficient polar- regions. That heat is moved by the action of winds and ocean currents. Without a dynamic atmosphere and ocean system, there would be a precipitous cooling of the poles and a dramatic warming of the tropics.

The circulation of our atmosphere and oceans redistribute this energy imbalance in setting the Earth's climate, thus making life more habitable on much of the globe. The warmer air over land becomes less dense and begins to rise. As this air mass rises, the cooler air over the ocean flows inland to replace the rising warm air. As a result, the sea breeze cools inland locations in an attempt to offset temperature differences. Warm air in the tropics is forced to rise upward and eventually pole-ward. This redistributes energy around the globe, bringing warm air to higher latitudes and cool air to lower latitudes and ultimately defining climate as we know it. Oceans are a key component of the climate system. Oceans contain 97 percent of the planet's water and cover over 70 percent of the Earth's surface. Among the unique properties of water is its ability to store vast quantities of heat. As surface water in the tropics is heated, large-scale ocean currents, driven by atmospheric circulation patterns, transport heat pole-ward.

The northward-flowing Gulf Stream transports warm water from the Gulf of Mexico toward northern Europe. It is believed that the Gulf Stream is partially responsible for the relatively mild climates of northwestern Europe, although the large-scale atmospheric circulation likely plays a dominant role. The ocean also plays a role in determining the chemical composition of the atmosphere because it absorbs and releases gases. *The most recognized example is the evaporation and precipitation of water vapor through what is called the “hydrologic cycle.”* However, the ocean also emits and absorbs large quantities of atmospheric carbon dioxide (CO₂). The Cryosphere comprises all frozen water, including Greenland and Antarctic ice sheets, sea ice in the Arctic and Southern Oceans, and all other snow- and ice- covered surfaces. The Cryosphere represents only about 2 percent of the water on our planet, but it is important to the climate system because it reflects incoming solar radiation, allowing very little radiant energy to warm the surface. *Unfortunately due to greenhouse effect, greater amount of energy reaches to the Earth’s surface, accelerating the warming and the melting of the ice sheet.*

The land surface and the biosphere also contribute to the climate system. The large-scale configuration of the continents including altitude, proximity to the ocean, and prominent mountain ranges, alters atmospheric and oceanic circulation patterns. In addition, variations in land surface alter the exchange of both heat and water, thus affecting local and regional climates. The land surface and the biosphere both affect and are affected by atmospheric temperature and humidity and can alter the amount of solar radiation reflected back to space. Vegetation also plays a key role in the “*carbon Cycle,*” which is the exchange of carbon among atmosphere, ocean, and land. Plants are active participants in the carbon cycle as they absorb CO₂ through photosynthesis and expel oxygen through respiration. Changes in land use, such as deforestation and subsequent burning or decomposition of forest material, release an abundance of stored carbon into the atmosphere and obstruct processes that remove greenhouse gases and aerosols. Scientists call these removal processes “sinks”.

CO₂ – Blessing and Burden

CO₂ is a blessing for some organisms and a burden for some others. The notion of global warming as an enhanced greenhouse effect is best understood by using the following analogy. You try to stay warm at night by using a blanket to trap the heat that the Earth’s greenhouse gases do by reradiating heat back to the body of interest, to you in the former and to the earth’s surface in the latter. Just as a blanket must be the right thickness to keep you comfortable, the Earth’s greenhouse gases must be of the right type to keep the planet comfortable. And just as too many blankets may make you too warm, too many greenhouse gases may lead to a warming of the globe. Greenhouse gases are components of the atmosphere that

contribute to the greenhouse effect. Without the greenhouse effect the Earth would be uninhabitable. Greenhouse gases come from natural sources and human activity. In 1824, the French scientist Joseph Fourier hypothesized that the average temperature of the planet is warmer because of the existence of the Earth's atmosphere. He claimed that the warming effect of the atmosphere on the Earth's surface was similar to how a plant warms when it is encased in a house of glass. *Fourier called this phenomenon the "greenhouse effect."*

The composition of the Earth's atmosphere governs the climate of the planet and establishes conditions vital for life. Although the atmosphere is primarily composed of nitrogen (78 percent) and oxygen (21 percent), these gases do not interact with the long-wave thermal radiation emitted by the Earth. This task is left to the greenhouse gases, which account for less than 3 percent of the atmosphere. *Greenhouse gases, including CO₂, methane CH₄, nitrous oxide N₂O, halocarbons, ozone O₃, and water vapor H₂O, are very effective at absorbing thermal radiation expelled from the Earth's surface.* After greenhouse gases absorb thermal radiation emitted from the Earth's surface, they reradiate this energy back to the surface of the Earth, which warms the Earth in the same way that a blanket traps body heat on a cold night. While greenhouse gases absorb and emit thermal radiation, they are essentially transparent to solar radiation and allow additional heat into Earth's atmosphere, where it is trapped by the greenhouse gases. This system permits hospitable conditions for life on the Earth's surface. However, small changes in the concentrations of these gases can drastically alter the heat-trapping capabilities of our atmosphere, resulting in acute changes in climate with serious consequences for life on Earth.

The four planets that are closest to the sun are Mercury, Venus, Earth, and Mars. Earth's two neighboring planets, Venus and Mars, offer good examples of how changes in atmospheric composition can lead to changes in surface temperatures. Although Venus is closer than the Earth is to the Sun and thus receives a greater amount of incoming solar radiation, thick clouds engulf the planet and reflect nearly 75 percent of this radiation (compared to 30 percent for Earth). Venus is a searing desert. Its waterless surface crushed under a thick atmosphere almost 100 times the pressure of Earth's. The clouds that shroud the planet contain droplets of deadly sulfuric acid (Virga), not life-sustaining water. The atmosphere of Venus is rich in greenhouse gases, with carbon dioxide accounting for 97 percent of it. As a result, the thick Venusian atmosphere is highly effective at trapping thermal radiation from escaping to space. The large amounts of greenhouse gases in the atmosphere reradiate the trapped heat back to the surface of the planet, resulting in average surface temperatures of 470 degrees Celsius (878 degrees F), hot enough to melt lead. All known forms of life would be broiled alive. Yet, both Venus and Earth may have had similar climates shortly after they

formed. The big mystery Venus will help answer is how these two similar worlds ended up with such different outcomes. *Understanding the atmosphere of Venus will help scientists learn how a world that might have been a tropical Eden became instead a close approximation of Hell.*

In contrast, Mars has a very thin atmosphere with a minimal greenhouse effect. As a result, most of the heat radiated from the surface of Mars is about minus 60 degrees Celsius (minus 76 degrees F). The ability of greenhouse gases to warm the surface of the planet depends on three main factors: their efficiency in absorbing heat, their total atmospheric quantities, and their atmospheric lifetimes or the amount of time they remain in the atmosphere. By looking at the clouds of Mars, we learn about the seasonal and daily weather pattern of Mars. Scientists want to understand how water vapor is transported around the planet. For example, on the extremely cold red planet, surface ice warmed by sunlight can briefly turn to vapor that rises into the atmosphere and then quickly cools to form ice crystals again, either in clouds or back on the ground. Scientists also estimate wind speed and direction based on the movement of the clouds. It definitely gives you the sense of what it might feel like to sit back and watch clouds on Mars.

Efficiency, Quantity, Lifetime of Greenhouse Gases

Greenhouse gases are defined by their ability to absorb thermal radiation emitted by the Earth. Different molecular structure of the gases, lead to differences in their ability to absorb radiation. Scientists estimate the heat-trapping efficiency of the different greenhouse gases using an *index called the “high global warming potential” (HGWP)*. It is important that we discuss what is meant by HGWP? Global Warming Potentials (GWPs) are used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. Carbon dioxide (CO₂) is used as the base for all the calculations, so its global warming potential is 1. The higher the GWP, the more heat the specific gas can keep in the atmosphere. *So the more HGWP gases enter the atmosphere, the faster our climate will change.* This represents the ratio of energy reemitted to the Earth’s surface during a year for a given gas compared to that of the same mass of CO₂. As time passes the GWP of a greenhouse gas usually decreases, but as is the case with fluorinated gases since their global warming potential is already very high it takes a very long time for them to break down and lose their ability to trap heat.

What’s worse is that since these fluorinated gases are created exclusively by humans and are not normally found in nature, *there is no natural process or “sink” to remove these gases from the atmosphere slowly over time.* That small volume of fluorinated gases is responsible for 87% of the extra heat trapped on Earth, which has a huge impact on climate change. By

comparison, *methane has a GWP of 21*, meaning that a given mass of methane can heat the planet twenty-one times as much as the same mass of CO₂. Other greenhouse gases have even larger GWPs. Nitrous oxide and halocarbons have GWPs of 300 and over 5,000, respectively. So although carbon dioxide is notorious for its role in global warming, other less well-known greenhouse gases also play potent roles in the process. Carbon dioxide is a naturally occurring greenhouse gas which cycles through reservoirs in the land, ocean, atmosphere, and vegetation. Atmospheric CO₂ has been maintained between 180 and 280 ppm (lower during glacial periods and higher during interglacial periods) over the last 650,000 years. Anthropogenic, or human made, CO₂ began to be emitted to the atmosphere when people started to burn wood and fossil fuels.

Methane is produced naturally, but its atmospheric concentrations have been augmented by agricultural processes, such as, rice cultivation, use of fertilizers, and cattle farming and industrial activities. Similarly, the amount of nitrous oxide in the atmosphere has increased as a result of agricultural soil management, fossil-fuel burning, and biomass burning. Halocarbons are potent greenhouse gases that do not exist in nature. They are gases that are manufactured for use in refrigeration units and foaming agents. Alternative halocarbon compounds, *such as hydro fluorocarbons* were introduced as substitutes for *chlorofluorocarbons (CFCs)*, which are potent greenhouse gases that also destroy the ozone layer. CFCs act in a series of chemical reactions to destroy the natural shield of ozone high in the atmosphere, which protects life from the infiltration of dangerous ultraviolet rays. Those rays can harm human health, by leading to cataracts, suppressed immune systems, and some forms of skin cancer and destroy plant species, and oceanic plankton.

Because of the overwhelming worldwide effort to curtail the usage of CFCs since the Montreal Protocol of 1987, the Earth's ozone layer is slowly recovering. The success with CFCs provides hope that we are able to alter behavioral patterns to repair the damage we cause to Earth's atmosphere. Most greenhouse gases have lifetimes of decades to centuries. This means that a gaseous molecule may remain in the atmosphere for as long as two hundred years, mixing throughout the atmosphere. Lifetime of the gas is the primary factor in determining the overall warming effect of the gas. Carbon dioxide, for instance, which has an *atmospheric lifetime of about 120 years*, continues to contribute to radiative forcing, although with decreasing impact, for many decades. Like some CFCs that have long lifetimes, may contribute to global warming for many years. Water vapor with a short lifetime of a few days to the weeks is not well mixed in the atmosphere, and many locations have high humidity, cloud cover, and rainfall while other locales are dry and cloud free. Most other greenhouse gases have long lifetimes and continually accumulate in the atmosphere, leading to

important long-term implications for future climate changes.

Industry and Greenhouse Gases

Until a few centuries ago, the Earth's radiation equilibrium and climate were maintained by the natural greenhouse effect. Atmospheric levels of carbon dioxide were balanced by the carbon cycle, and there was equality between *sources and sinks*. Carbon cycled through photosynthesis and respiration by land and sea flora, through air-sea exchanges (fluxes), and through "slow-turnover" geologic processes. Over millions of years, oceanic carbon is buried, and deep-sea sediments are recycled into the Earth. Eventually, this carbon is reintroduced to the atmosphere, either violently by volcanic eruptions or mildly by the breakdown of exposed rocks. *Earth's largest reservoir for carbon is rock*. While important for the evolution of the atmosphere, the relatively slow pace of the geologic carbon cycle (millions of years) is important only in controlling long-term variations in levels of atmospheric carbon dioxide. Scientists can quantify the composition of the atmosphere prior to the historical record by examining ice cores.

Bubbles of air embedded within the ice cores that have been extracted from the Greenland and Antarctic ice sheets reveal a substantial amount of information on changes in climate. The cores tell us that from about 420,000 years ago until the beginning of the industrial revolution in the late 1700s, CO₂ varied from about 180 parts per million (ppm) to about 280 ppm. *As of March 2006, there were about 381 ppm of CO₂ in the atmosphere, with levels of CO₂ rising about 1.6 ppm per year since 1980*. Measurements confirm a high correlation between fluctuations in atmosphere CO₂ levels and global temperature. These observations are consistent with the radiative impact on surface temperatures from changes in the greenhouse effect. The question is: How will these high levels of CO₂ affect our climate?

The industrial revolution marked a turning point in the balance of energy in the Earth's climate system. The rise of industry and technology throughout the 1800s saw a massive increase in the burning of wood and coal, which released the greenhouse gases carbon dioxide, nitrous oxide, methane, and other halocarbons into the atmosphere. *The industrial activity thus altered the carbon cycle and the natural equilibrium of the Earth's climate system*. At the same time, deforestation further exacerbated the balance by removing a potential sink for carbon. Today, human activity is responsible for releasing approximately 7 billion metric tons of carbon per year into the atmosphere, and the oceans and land biosphere absorb approximately 3 billion metric tons of that carbon. Since CO₂ has a lifetime of over one hundred years, these emissions have been collecting for many years in the atmosphere. The atmospheric concentration of CO₂ has increased 36 percent from pre-industrial times and is expected to continue rising in the foreseeable future. Electricity generated by the burning of fossil fuels accounts for most

of the more than 5.5 billion tons of human made carbon dioxide released each year by the U.S. in contrast, other energy sources, including nuclear, solar, wind, hydroelectric, biomass, and geothermal energy sources, emit minimal, if any, greenhouse gases.

The transportation sector is the second biggest source of carbon dioxide emissions in the U.S. every gallon of gasoline consumed releases about 9 kilograms (20 pounds) of CO₂ into the atmosphere. Fuel economics of many automobiles have improved dramatically over the past few decades because of technological improvements, but the carbon dioxide emitted from vehicles in the U.S exceeds the total carbon dioxide emitted from India, even though the population of India is over four times that of U.S.A. In addition to CO₂ emissions in the electricity and transportation sectors, emissions of less notorious yet equally dangerous greenhouse gases are linked to climate change. About two thirds of present methane emissions are attributable to human activities, such as burning biomass, cultivating rice, creating landfills, and managing livestock. These methane releases from agricultural and natural sources are expected to be accelerated by changes in global mean temperature and moisture. For example, recent studies indicate that climate warming may melt high-latitude permafrost and thus accelerate releases of methane from peat bogs. The switch from CFCs to other halocarbons has limited the destruction of the ozone layer, but these halocarbons remain active in enhancing the greenhouse effect and potentially harmful climate change.

Aerosols

Aerosols are tiny particles suspended in the air. Some occur naturally, originating from volcanoes dust storms, forest and grassland fires, and sea spray. Human activities, such as the burning of fossil fuels and the alteration of natural surface cover, also generate aerosols. Averaged over the globe, aerosols made by human activities currently account for about 10 percent of the total amount of aerosols in our atmosphere. Most of that 10 percent is concentrated in the Northern Hemisphere, especially downwind of industrial sites, slash and burn agricultural regions and overgrazed grasslands. Scientists have much to learn about the way aerosols affect regional and global climate. We have yet to accurately quantify the relative impacts on climate of natural aerosols and those of human origin. Moreover, we do not know in what regions of the planet the amount of atmospheric aerosol is increasing, is diminishing, and is remaining roughly constant. We do not even know whether aerosols are warming or cooling our planet.

Why do we care about aerosols? Aerosols tend to cause cooling of the Earth's surface immediately below them. Because most aerosols reflect sunlight back into space, they have a "direct" cooling effect by reducing the amount of solar radiation that reaches the surface. The magnitude of this

cooling effect depends on the size and composition of the aerosol particles, as well as the reflective properties of the underlying surface. It is thought that aerosol cooling may partially offset expected global warming that is attributed to increases in the amount of carbon dioxide from human activity.

Aerosols are also believed to have an “indirect” effect on climate by changing the properties of clouds. Indeed, if there were no aerosols in the atmosphere, there would be no clouds. It is very difficult to form cloud droplets without small aerosol particles acting as “seeds” to start the formation of cloud droplets. As aerosol concentration increases within a cloud, the water in the cloud gets spread over many more particles, each of which is correspondingly smaller. Smaller particles fall more slowly in the atmosphere and decrease the amount of rainfall. In this way, changing aerosols in the atmosphere can change the frequency of cloud occurrence, cloud thickness, and rainfall amounts. If there are more aerosols, scientists expect more cloud drops to form. Since the total amount of condensed water in the cloud is not expected to change much, the average drop must become smaller. This has two consequences; clouds with smaller drops reflect more sunlight, and such clouds last longer, because it takes more time for small drops to coalesce into drops that are large enough to fall to the ground. Both effects increase the amount of sunlight that is reflected to space without reaching the surface.

What is the deal nowadays with aerosol spray cans? The aerosol spray can have a storied history. It was invented in the 1920s by the Department of Agriculture scientists to pressurize insect spray. American soldiers eventually used the technology to help ward off malaria in the South Pacific during World War II. Use of aerosol spray cans for consumer aerosol products made in the U.S. have not contained ozone-depleting chemicals; also known as chlorofluorocarbons (CFCs), since the late 1970s, first because companies voluntarily eliminated them, and later because of federal regulations. All consumer and most other aerosol products made or sold in the world now use propellants, such as hydrocarbons and compressed gases like nitrous oxide, that do not deplete the ozone layer. *Aerosol spray cans produced in some countries might still utilize CFCs. Now all countries should switch out ozone-depleting propellants with non-depleting forms because they signed 1987’s Montreal Protocol, a landmark international agreement signed by 191 countries with the goal of phasing out the production and use of CFCs and other ozone-depleting chemicals.*

Scientists report that the phase out of the chemicals is now about 90% complete. Of course, just because those deodorant and perfume sprays and shaving cream cans aren’t depleting the ozone layer doesn’t mean they are actually good for the environment. They still contain hydrocarbons and compressed gases notorious for their contribution to global warming. *Every time you hit the button, then, you are raising your carbon footprint,*

albeit ever so slightly. Modern day, CFC free aerosol sprays also emit volatile organic compounds (VOCs) that contribute to ground level ozone levels, a key component of asthma inducing smog. Apart from aerosol sprays, there are fingernail polish, mouthwashes, pump hair sprays, and roll on and stick deodorants, paints, solvents, plastics and many other goods. The principal sources of aerosols are fossil-fuel combustion, biomass burning, desert dust, volcanoes, and sea spray. The most straightforward climate effect of aerosols is their ability to alter the amount of incoming solar radiation that reaches the Earth's surface. Much like clouds, light-colored aerosols reflect incoming solar radiation, thereby decreasing the amount of energy that reaches the Earth's surface.

Past the Teacher & Future the Student

Traditionally, the atmospheric sciences have treated weather and climate separately. But now, we are moving towards a more unified study of these processes. We want to know how climate variations influence weather events and how weather patterns affect climate. We've already observed that weather events can shift the path of the jet stream and that changes in sea-surface temperatures influence hurricane intensity. By further studying these connections across time scales, our researchers hope to improve long-term weather-climate forecasting abilities, especially for extreme events like droughts, floods, wildfires, and hurricanes. Numerous natural and anthropogenic factors have produced today's climate. The study of past climates (in the field called paleoclimatology) and present-day climate helps to describe the evolution of the Earth's climate system and the forces that drive the Earth's natural climate variability. If we can thoroughly understand past variations in the climate records, then we might be able to foresee the evolution of future climate.

Natural variations in climate, including oscillations in large-scale wind patterns, changes in oceanic circulation, and periodic fluctuations in the Earth's orbit, occur on timescales ranging from years to decades to millennia. Several of these patterns are well accepted by the scientific community, but countless other modes of climate variability are not fully understood. Observations of climate change provide researchers with a mere sliver of Earth's climate record, but it is possible to reconstruct climate variability beyond what is observed by studying substitutes, *what are called "proxy indicators."* *Proxy data are essentially "natural" recording systems of past climate. They are found in sediments, ice cores, tree rings, and corals.* The chemical composition of the air, for example, can be documented in the bubbles of air imprisoned in glaciers on high mountain peaks and at the polar ice caps. Ice cores extracted from hundreds of meters below the surface reveal the chemical composition of the air as well as information on temperature, precipitation, and wind patterns from hundreds of thousands of years ago.

By examining the rings of old trees, paleoclimatologists can infer temperature and precipitation information across much of the world. In addition, scientists can use fossilized pollen samples and soil sediments to identify vegetation that flourished million of years ago. These techniques indicate that high levels of CO₂ correspond to warm periods. One of the largest warming events in the geologic record occurred during the Eocene epoch some 50 million years ago, when global temperatures are estimated to have been nearly 7 degrees Celsius (12 degrees F) warmer than present and levels of CO₂ are thought to have been three times their present concentrations. At those temperatures, palm trees could thrive in Alaska, and crocodiles could inhabit the Arctic. Climatologists generally place the climate record within a context of continuous change. Most simulations of future climate changes focus on a smooth transition from what scientists call one “equilibrium climate” to another equilibrium climate. The climate record in polar ice cores provides evidence that major climate change can occur in decades or even years, and Earth would suffer much fiercer consequences if a 2 degrees Celsius (4 degrees F) change occurs over a twenty-year period rather than over a two-hundred-year period. *According to general models of atmosphere and ocean circulation, such an abrupt change in climate could result in the shutting down of Oceanic Conveyer Belt.* Although most models do not depict the thermohaline circulation shutting down before 2100, some show a possible collapse after 2100, especially if climate change occurs abruptly.

Oceanic circulation is more apt to be maintained if any warming or cooling is of a gradual nature. Paleoclimatologists tell us that ocean-circulation patterns may have been disrupted about 8,200 years ago. One notion is that a melting ice sheet released a gigantic amount of fresh water into the North America. The influx of fresh water over portions of North Atlantic basin diluted the salinity and density of ocean waters, which subsequently inhibited ocean atmosphere circulation in the North Atlantic. This reduces atmospheric temperatures by 4 degrees Celsius (7 degrees F), producing a cold snap that lasted up to two hundred years. Climate models are able to replicate a slowing of the Gulf Stream and the consequent decrease in temperatures across the Northern Hemisphere. Scientists who study changes in the Earth system cannot follow classical experimental methods because we only have one Earth: we do not have a second one without elevated levels of greenhouse gases in its atmosphere to observe for comparison. Instead, our control standard for checking our hypotheses is a computer model that captures much of the complexity of the Earth system. Over the last two decades, improvements in observational and modeling techniques and in informational and computer sciences have led to a fuller understanding of the Earth’s climate system. Without the immense computing power now available and the vast infrastructure of widely available datasets, many advances in understanding could not have been realized. Today’s attempts to integrate

all available data into computer models are helping scientists to reconstruct variations in global climate over the last millennium and to predict future climate.

Overall Global Effects of Climate Change

The scientific consensus on current climate changes is that average global surface temperatures have risen 0.74 degree Celsius (1.33 degrees F) in the past century, with “most of the warming observed over the last fifty years” very likely due to the observed increase in anthropogenic greenhouse gas concentrations. According to the World Meteorological Organization, *the Earth’s ten warmest years on record occurred after 1990, and the warmest years in the observational record are 1998, and 2005*. The National Academy of Science’s 2001 report to the White House said that the global mean surface air temperature warmed in the twentieth century 0.4 degree to 0.8 degree Celsius (0.7 to 1.5 degrees F); that the oceans have warmed by about 0.05 degree Celsius (0.09 degree F) over the water layer extending down 10,000 feet since the 1950s; and that this warming occurred mainly in noncontiguous ways throughout the century. But the report also said that the atmosphere at altitudes of about 13 miles has cooled in the last thirty-five years.

In addition, the oceans are warming. Observations show that the uppermost 300 meters (1,000 feet) of the ocean have warmed 0.31 degree Celsius (0.67 degree F) since the 1950s. With carbon dioxide levels already at 385 parts per million (over 100 ppm higher today than they were before the industrial revolution), experts agree that levels will continue to rise to between 600 ppm and 1,000 ppm by 2100. In its Fourth Assessment in 2007, the Intergovernmental Panel on Climate Change (IPCC) predicted an increase in the global average surface temperature of 1.8 degrees to 4.0 degrees Celsius (3.24 degrees to 7.2 F). Other recent studies predict much higher global temperatures. Even the low end of the estimated increases should rule out the “negligible warming” of natural climate variability that is proposed by some global warming contrarians.

Significant increases in global mean temperature are projected to result in heightened health risks for much of the world’s population. Heat-related mortality increases significantly on days when the air temperature tops. By raising the baseline average temperature, heat waves will become more intense, and the number of days that exceed a given temperature will also grow. These changes will increase the number of heat-related deaths, especially among the elderly and the urban poor. The likelihood of heat waves, such as those that ravaged much of Europe in the summer of 2003 and resulted in over thirty thousand cases of heat prostration, is expected to increase a hundredfold over the next forty years as a result of anthropogenic climate change. *Scientists agree that the summer of 2003 was likely the*

warmest summer recorded in Europe over the past five hundred years and noted that increases in global temperature drastically increased the probability of the heat wave. Ironically, what today is classified as an extremely warm season, like the summer of 2003 across much of Europe, is expected to be classified as an extremely cool season by the end of the twenty-first century.

Each year, extreme weather events such as floods and heat waves are responsible for the loss of thousands of human lives, billions of dollars in damages, and irreversible environmental harms. Extreme events are the main channel where climate and social and economic systems interact, and they attract the most climate-related media reports. Ecosystems are able to cope with so-called normal climate conditions, but both ecosystems and human beings are vulnerable to extreme events such as droughts, heat waves, and floods. Thus, the harshest effects of climate change in the twenty-first century will be experienced through changes in extreme events. Extreme weather events contributed to over \$200 billion of damages worldwide in 2005.

Changes in extreme weather events are already apparent. The Intergovernmental Panel on Climate Change reported an increase in heat-wave frequency, intensity, and duration and a 2 to 4 percent increase in the number of heavy-precipitation events across the Northern Hemisphere during the twentieth century. However, present changes are benign compared to the anticipated changes in extreme events during the twenty-first century. Modeling studies have suggested that there will be a significant increase in the frequency of extreme precipitation events and heat waves in an enhanced greenhouse climate. Extreme weather events, including tropical storms, have been at the forefront of media attention after the summer of 2005. Tropical storm records for the Atlantic basin dropped like dominoes during 2005. There were twenty seven named storms. Fifteen of these storms became hurricanes, a tropical storm with winds exceeding 74mph, and four attained the most powerful category 5 status, winds exceeding 155mph, including Hurricane Wilma, the most powerful hurricane ever recorded in the Atlantic, with winds exceeding 175 mph. several of these powerful hurricanes, most notably *Hurricane Katrina*, made landfall across the U.S, Caribbean, and Central America, resulting in over 2,500 fatalities and over \$100 billion in damage. In the year 2006 season there were only nine named storms.

Warm surface ocean temperatures in the tropics provide the energy that fuels tropical storms, so a warming of the tropical ocean would be expected to lead to more powerful tropical storms. Theoretical results confirm these expectations by suggesting that tropical storm wind speeds increase 5 percent for every 1 degree Celsius (1.8 degrees F) increase in surface ocean temperatures. Winds from tropical storms are devastating in their own regard

and serve as a catalyst in producing storm surges. Although there appears to be no global trend in tropical storm frequency, the number of major hurricanes (categories 4 and 5 which are the most dangerous) has nearly doubled in the last thirty-five years. This observation is consistent with the 0.8 degree to 2.4 Celsius (1.4 degree to 4.3 F) increase in tropical surface ocean temperatures over the last fifty years. Additional evidence shows that maximum wind speeds in tropical storms have increased 15 percent over the last thirty years. These results suggest that tropical storms are getting stronger. Tropical surface ocean temperatures are expected to increase 1 degree to 2.5 Celsius (1.8 degree to 4.5 F) over the next one hundred years, and state-of-the art numerical models suggest that warmer waters will beget stronger and more devastating tropical storms in the coming century.

The effects of Global warming extend across all sectors of health, the economy, politics, and international relations. Increased humidity worsens urban air pollution; malaria and dengue are spread by vector-borne infections (and mosquito population increases with moisture); storms damage agricultural sectors and threaten food supplies; and potentially higher sea levels would displace millions of “climate refugees.” Natural ecosystems in the industrialized world also face the effects of climate change. Climate change may result in the loss of biodiversity, may increase extinction rates for vulnerable species, and may cause a decline in the viability of important ecosystems. Sea-level rise and the warming of the ocean will further harm coral reefs, which provide the greatest biodiversity of any marine ecosystem. The growing seasons in temperate regions will lengthen, and plant and animal ranges will shift pole-ward and move to higher elevations. Signs of spring will shift as well: trees will flower, insects will emerge, and birds will lay eggs earlier in the year. This is already happening: the spring bloom in the northeastern U.S is arriving four to eight days earlier today than it did during the 1960s. *Plant and animal species currently labeled as critically endangered will become extinct, and the majority of those labeled as “endangered or vulnerable” will come closer to extinction.* Given a slow enough change in climate, many species will be able to adapt to the changes, but rapid changes in climate severely limit adaptation strategies.

The bulk of the increase in sea-level rise today is a result of warming temperatures. Computer models predict that the thickness of Arctic sea ice will decline, the Greenland ice sheet will melt, and the area of ice-free seas will increase. The melting of large continental glaciers, such as those in Greenland and Antarctica, would add a huge amount of mass to the oceans. In addition, a majority of the world’s high altitude glaciers are currently eroding. For example, the glaciers in Himalayas and Alps are expected to melt completely within the next thirty years. Because the ocean has a large heat capacity, it takes a long time to translate changes in atmospheric

temperature to changes in oceanic temperature. Researchers conclude that even if the atmosphere stopped warming today, the global sea level would continue to rise for centuries before reaching a new equilibrium.

The IPCC models suggest a total rise in sea level up to 7 meters (23 feet) by the end of the 2100, if the Greenland ice sheet is eliminated. Sea-level rise is expected to cause increased levels of flooding, accelerated erosion into freshwater sources. Many of the people who live near present-day sea level will likely be displaced as waters inundate the land. Climate scientists also expected that the hydrologic cycle, the cycling of water among the atmosphere, land, and ocean through precipitation and evaporation, will intensify because of global warming. A warmer climate will lead to enhanced rates of evaporation and increased precipitation for the globe as a whole. Regional precipitation distributions may be drastically altered, leading to an increase in the intensity and frequency of rainfall in some regions and of drought-like conditions in other regions. With depleting snow peaks, rising sea levels, and increasingly severe deluges, floods will likely increase in number and severity. It is also generally believed that in a warmer world the atmospheric concentration of water vapor will increase and that increased water vapor, which is an important greenhouse gas, may further enhance the predicted warming.

Remember a quote from The Bible, Genesis Chapter 6:5-8, “The Lord saw how great man’s wickedness on the Earth had become, and that every inclination of the thoughts of his heart was only evil all the time. The Lord was grieved that he has made man on the Earth, and his heart was filled with pain. So the Lord said, “I will wipe mankind, whom I have created, from the face of the Earth; men and animals, and creatures that move along the ground, and birds of the air, for I am grieved that I have made them.”

Legacy of Calamities

New words crept into the popular lexicon, smog, acid rain, toxic waste. A new target is pollution. Earth Day was something new and vital, not an anachronistic notion. Republican administrations and bipartisan congresses created laws and agencies aimed at restoring air and water quality and protecting wildlife. And remarkably those laws began to work. Still, through the 1980s the prime environmental issues of the day, continued to revolve around iconic incidents that were catastrophic in nature. *First there was Love Canal*, quickly followed by Superfund cleanup laws. Residents of the Love Canal area in Niagara Falls were forced to evacuate when hazardous wastes leaking from a former disposal site threatened their health and homes in the late 1970s. One of the most notorious cases of toxic waste leakage, the crisis received attention on both local and national levels. Investigation spurred by public outrage revealed that many waste disposal sites like Love

Canal existed worldwide. *Love Canal is one of the first environmental disasters to provoke serious thought about the practice of energy consumption and how it affects humans.* The occurrence of the Love Canal disaster is a symbol of only one of the myriads affects of our culture of consumption. It is a vehicle in which industry, energy politics, human necessity and technology can be shown to have direct links to many aspects of life, including health, real estate, waste storage, environmental concern of toxic waste, the role of the government, and the ethical responsibility that industry has beyond the economic marker of cold cash.

Then there was Bhopal in India, which generated the first right-to-know laws granting communities information about the chemicals stored and emitted by nearby businesses. December 3, 2009 will mark the 25th anniversary of the catastrophe that took place in Bhopal, India around midnight in 1984, an event that has been described without hyperbole as the worst industrial disaster ever to befall a peacetime civilian population. It happened when a pesticide plant leaked some 27 tones of a toxic chemical, methyl isocyanine or MIC, over the sleeping city in the form of an asphyxiating cloud of toxic gas. The plant belonged to an Indian subsidiary of Union Carbide, an American multinational corporation. Somewhere between 10,000 to 12,000 residents died immediately. Nearly 80,000 people, by some accounts, have died in the intervening years since the catastrophe. According to the Indian Council for Medical Research (ICMR), more than 250,000 people continue to suffer from permanent disabilities and chronic ailments as the result of exposure to the poisonous gases on that night.

The International Commission for Medical Research on Bhopal has concluded that owing to chromosomal and genetic damage among the victims the wake of this unprecedented disaster will ripple through the next three to four generations in Bhopal in the form of spontaneous abortions and birth defects. Even 25 years after the disaster, Union Carbide refuses to face criminal charges and the Indian authorities, in breach of their obligation under international law, are unwilling and unable to act. The recent settlements are not satisfactory and that India could and should properly exercise its criminal jurisdiction over Union Carbide to prosecute these offences by issuing another summons to Union Carbide. On this 25th anniversary of the Bhopal disaster, the Indian government as well as civil society organizations and activist groups should work together to ensure that this historic crime does not go unpunished and that the victims' rights are not abandoned to their toxic fate without the remedy to which they are entitled under national and international law.

Chernobyl illustrated the perils that were only hinted at by Three Mile Island. On April 26, 1986, an accident occurred at Unit 4 of the *nuclear power station at Chernobyl, Ukraine, in the former USSR.* The accident, caused by a sudden surge of power, destroyed the reactor and released massive amounts of radioactive material into the environment. The Chernobyl

accident caused many severe radiation effects almost immediately. Among the approximately 600 workers present on the site at the time of the accident, 3 died within hours of the reactor explosion and 134 received high radiation doses and suffered from acute radiation sickness. Of these, twenty eight workers died in the first four months after the accident. Another 200,000 recovery workers involved in the initial cleanup work, received doses between 0.01 and 0.50 Gy. Further 600,000 workers were employed for more cleanups. Only a fraction of these workers were exposed to dangerous levels of radiation. Both groups of cleanup and recovery workers may become ill because of their radiation exposure, so their health is being monitored.

The grounding of the Exxon Valdez powerfully illustrated the ecological risks of extracting and shipping oil in pristine places. The Exxon Valdez was an oil tanker owned by the Exxon Corporation. The ship spilled its oil near Alaska, destroying the local environment and killing a great deal of the native wildlife. The gigantic oil spill is the largest ever in the history of the world. On March 24, 1989, the ship hit Bligh Reef near Alaska, opening a large hole on its hull. The ship was full of oil at the time, carrying a total of 1.2 million barrels (190 million liters). Quickly, huge amounts of oil spilled into the ocean. In total 42 million liters of oil was dumped, 22% of that present of the ship. Once out of the ship, the oil spread quickly. It ended up creating a 4,600 square kilometers spill and gave 5,100 kilometers of coastline an oily covering. The damage from the spill was tremendous. Between 100,000 and 600,000 birds, 5,500 sea otters, 30 seals, and 22 whales were killed. Many other animals likely died as well and were never found. Other animals, such as bald eagles, that ate the oil-poisoned fish from the spill area were also killed. Through public outrage eventually mounted, the reaction to the oil spill came slowly. The Alaska Oil Spill Team was slow to respond, and by the time that work on cleaning up the area began, massive amounts of oil had already spread to a large area surrounding the ship. The Exxon Corporation was forced to clean up the spill and fined heavily for the damage it had caused. The company spent \$2.2 billion for cleanup work, and the total costs will likely amount to over \$4 billion. A large amount of oil is spilt every year. In fact, the amount spilt by the Exxon Valdez amounts to only 5% of all that was spilt in 1989.

The Rhine river incident where one thousand tons of chemicals, including eight tons of pure mercury were spilled, the river where *St. Hildegard of Bingen and Meister Eckhart*, the two greatest creation mystics of Western Europe lived and preached their message of compassion and interconnectivity with creation. A Swiss government Official reports that “the Rhine is now dead. The whole ecosystem is destroyed due to the accident.” Today one out of two fish eaten in cities around the Mediterranean Sea are imported because that sea is poisoned. It seems that every month a new ecological disaster is produced by the two-legged ones. *Mother Earth*

is the victim. If this continues, eventually we and our children will pay the price. If we persist in poisoning the “mother of all,” then we will ultimately poison ourselves.

In the late 1980s, the world began to focus on the harm caused by burning in the Amazon and other tropical forests. Forest destruction was made personal and relevant to citizens of the industrialized world when the forests were portrayed as the “lungs of the world” or our “medicine chest”, not because scientists suddenly found a way to describe the extraordinary biological diversity of rain forests and the role they play in the global climate system. Indeed, the first sustained media coverage of global warming was spawned not by a growing recognition that long-lived emissions from industrial smokestacks and tailpipes could alter the climate. Instead, it began when the people experienced a record hot summer in 1988 just as satellites and the space shuttle were transmitting images of the thousands of fires burning across the Amazon basin. The burning season in the rain forests was unleashing torrents of carbon dioxide that were perceived as directly perilous to us, so we paid attention. These days, deforestation in the tropics is once again a distant regional issue and has faded to near obscurity.

An Ozone Hole over Antarctica

In the late 1980s, there was a sense of the new about the greenhouse effect, even though scientists had been positing since the 1890s that heat-trapping gases, particularly carbon dioxide released by burning coal and other fossil fuels could raise global temperatures. A combination of observations and computer stimulations seemed finally to be giving a face to theory, which made it easy to sell as a cover story in Time magazine or to Science Digest, Discover, the Washington Post, or the New York Times. At that time, there was also a newly perceived global atmospheric threat, the damage to the ozone layer from chlorofluorocarbons (CFCs) and other synthetic compounds and an international solution in a treaty that banned the chemicals. But eliminating a handful of chemicals produced by a handful of companies is a very different challenge than eliminating emissions from almost every activity of modern life, from turning on a lamp to driving a car.

Another difference between global warming and ozone damage was the iconic nature of the ozone problem. *It was an issue with an emblem, the stark, seasonal “hole” that was discovered in the protective atmospheric veil over Antarctica. If a picture is worth a thousand words, a satellite image of a giant purple bruise-like gap in the planet’s radiation shield must be worth 10,000.* Indeed, according to many surveys, the ozone hole still resonates in the popular imagination, incorrectly, as a cause of global warming simply because it is so memorable and has something to do with the changing atmosphere. The ozone hole also resonated with the public because it was directly linked with an issue that concerns everyone, their health, through the possible risk of increased rates of skin cancer.

The Ozone layer is a deep layer in the stratosphere, encircling the Earth that has large amounts of ozone in it. The layer shields the entire Earth from much of the harmful ultraviolet radiation that comes from the sun. Interestingly, it is also this ultraviolet radiation that forms the ozone in the first place. Ozone is a special form of oxygen, made up of three oxygen atoms rather than the usual two oxygen atoms. It usually forms when some type of radiation or electrical discharge separates the two atoms in an oxygen molecule (O₂), which can then individually recombine with other oxygen molecules to form ozone (O₃). The ozone layer became more widely appreciated when it was realized that certain chemicals mankind manufactures, called chlorofluorocarbons, find their way up into the stratosphere where, through a complex series of chemical reactions, they destroy some of the ozone.

As a result of this discovery, an international treaty was signed and the manufacture of these chemicals was stopped. The ozone layer has since begun to recover as a result of these efforts. *The stratospheric ozone, which protects us from the sun, is good. There is also ozone produced near the ground, from sunlight interacting with atmospheric pollution in cities that is bad.* It causes breathing problems for some people, and usually occurs in the summertime when the pollution over a city builds up during stagnant air conditions associated with high pressure areas. Still, human contributions to the greenhouse effect have remained a perennial issue. Specialized reporters have tracked the developments in climate science and the policy debated over the implications of that science.

Every five years or so, fresh hints emerge from the Intergovernmental Panel on Climate Change (IPCC), the United Nations scientific body charged with assessing the state of understanding of the problem. The group has sought to be as concrete as possible in its findings, giving quantitative weight to words and phrases such as “likely” and “very likely.” That metric has helped the media meaningfully explain the incremental improvements in scientific understanding of the causes and consequences of warming. The other vital component of the assessment process has been the use of scenario to depict how certain societal behaviors, particularly energy use, might affect the pace and extent of climate shifts over the course of the century. For the public, this practice provides boundaries for outcomes and a means of judging what kind of response is the most reasonable. But the incremental nature of climate research and its uncertain scenarios will continue to make the issue of global warming remain the antithesis of what is traditionally defined as news. Its intricacies, which often involve overlapping disciplines, confuse scientists, citizens, and reporters, even across time. Journalism craves the concrete, the known, the here and now and is repelled by conditionally, distance, and the future.

Human Activity and Extinctions

Through hunting, habitat destruction, and biological invasions, humans have driven many species to extinction and many more to its brink. But just how bad is today's extinction crisis and how bad will it get? Scientists don't even know how many species exist. But the best estimates are grim. We seem to be entering a period of mass extinction on a par with the great die-offs of the past 600 million years. Every year about 1000 new species are reported by a small cadre of zoologists and botanists. These scientists have identified about 1.5 million species so far, and they can only guess at how many wait to be found. *Based on the rate at which new species are being discovered, they estimate the total at 7 million species, although some argue the figure is as high as 14 million.* That means that at least four out of every five species on Earth haven't been discovered yet, and at the rate they are currently being discovered, it will take 500 years to find them all. For many, the discovery may not come in time. If you don't know that a species exists, you can't expect to know when its last number disappears.

According to the naturalist, Stuart Pimm's calculations, extinction rate is going to accelerate in the coming years. Two-thirds of all species live in tropical forests. Half of the world's tropical forests have now disappeared, and another million square kilometers are destroyed each decade. Much of the forest that still survives has been fragmented by burning and logging. Without some dramatic conservation, tropical forests will go on disappearing until the only regions left are the ones on protected reserves, about 5 percent of their original extent. That will take only 50 years. Applying the half-life formula to this scenario, Pimm calculates that the extinction rate will rise as much as tenfold. *In less than a century, Pimm estimates, half of the world's species will disappear.* Pimm's calculations, as stark as they may be, may actually underestimate the coming extinctions. He uses only deforestation in his estimates. With more planes and cargo ships shuttling between continents, for example, biological invasions are going to accelerate and cause even more extinctions. And even more species may go extinct as we alter the atmosphere. Most climatologists now agree that man-made greenhouse gases are responsible for most of the warming.

Scientists now are trying to estimate what the climate will be like in the next few decades? That answer depends in part on how much fuel humans continue burning? Will China stick with coal as its economy booms? Will electric cars become more than a publicity stunt? Adding to the uncertainty is how Earth might respond to rising temperatures. The circulation of the oceans might suddenly shift, unloading its hidden heat. The forests of the north might suck up much of the added carbon dioxide, storing away the greenhouse gases as wood. Or the Amazon might turn to a savanna. Or the melting permafrost in the Arctic might release frozen methane. The list of possibilities can fill a book. *But as best as researchers can estimate, the*

planet will warm between 1.5 and 5.5 degrees Celsius by 2100, with the most warming happening in the far north and south. There are already signs that life is changing as a result of global warming. The growing season in the Northern Hemisphere now starts a week earlier than it did in 1981. With more carbon dioxide available in the air, trees have been growing faster.

In North America and Europe, forests are climbing up the sides of mountains, the same is found also in Himalayas. A 1999 study of 35 species of non-migrating butterflies in North America and Europe found *that 63 percent of them shifted their ranges northward over the twentieth century. Even ticks are responding to the warmer winters and marching toward this pole.* But global warming won't merely rearrange nature's destiny. The plants and animals that live in cold climates, either in the far north or high in the mountains, have nowhere to shift their range to. Coral reefs, which are proving to be extremely vulnerable to warming in the ocean, cannot simply uproot themselves and head to cooler waters. As a result, global warming may help destroy most of the world's coral reefs in the next 20 years. Even the species that have enough room on the map to shift their range north or south may actually have trouble surviving. Many of them will be trying to colonize land that is now broken up into farms, suburbs, and cities. It is difficult enough to spare land for nature reserves where endangered plants and animals live today; setting aside new space for them in the decades to come may be even harder. But if we don't, they may simply shift themselves right off an evolutionary cliff.

If these predictions hold true, the next few centuries will see another bout of mass extinctions, with well over half of all species disappearing. Given that we may have inherited a planet at the height of its diversity, it could be the biggest of all in terms of the total number lost. In a few important ways, this extinction pulse will be different from past ones. An asteroid cannot change its own course, but humans can. *How big the extinctions become depends on what humans do in the next hundred years.* With habitats disappearing and fragmenting so quickly, conservation biologists have focused their attention on ways to save the most diversity with the least amount of effort. Diversity is not smoothly distributed over the globe, or even within the tropics. *A few places, such as Madagascar, India's Western Ghats, the Philippines, Brazil's Amazon, represent "biodiversity hot spots."* The top 25 hot spots contain 45 percent of the diversity of plants and 35 percent of vertebrates. They also comprise only 1.5 percent of Earth's land surface. They are going to disappear quickly if they aren't conserved. On average, 88 percent of the original area of the hot spots has already been destroyed, and their human population is growing fast.

These cradles of diversity demand our immediate attention and care. If extinctions continue to accelerate, the world will become, in a matter of centuries, a homogenized place. While the majority of species with limited

ranges continue to go extinct, a few rugged species will thrive. *Over 90 percent of the world's agriculture is based on only 20 species of plants and 6 species animals.* As the human population continues to rise, the misfortune of these species will go on rising with it. The destruction of forests and other habitats will harm most native species, but a few will prosper. In South American forests, as no predators on direct line, hylid frogs can lay eggs in potholes and other temporary ponds, while wolf spiders can spin their webs on weeds. In Western Ghats in India, as no predators on direct line, cobras can colonize the land. *"As long as humans are here and don't go extinct," says Ward, "that evolutionary faucet that you turn on after a mass extinction that creates new species, that'll never be turned on. As humans exist far into the future, I foresee a world in which biodiversity stays very low. And that to me is the tragedy."*

It is possible that we ourselves will not escape these mass extinctions. We depend on wetlands to filter our water, on bees to pollinate our crops, on plants to build soils. And these plants and animals depend, in turn, on healthy ecosystems to survive. Biologists have run experiments in which they've altered the diversity in simple ecosystems such as grassland plots. With few species, ecosystems become more susceptible to droughts and other catastrophes. *Humans may not be able to survive if the impoverished ecosystems we depend on collapse.* Of course, humans are the most resourceful species on the planet, so we may find ways to survive even beyond such a disaster. After past mass extinctions, life has recuperated and even rebounded. How it recovers from the current one depends partly on the destiny of the human race. Man-made global warming may end up being one of the most profound causes of extinction, but it cannot last forever. There is only so much oil and coal left, about 11 trillion tons.

James Kasting a climatologist at Penn State University estimates that burning this much fossil fuel would increase atmospheric levels of carbon dioxide to about three times today's levels, raising temperatures between 3 to 10 degrees Celsius. It would take only a few centuries to use up the reserves. It will take hundreds of thousands of years for Earth to draw down the carbon dioxide to the levels it was at before the Industrial Revolution. But long after the atmosphere recovers from its binge of carbon dioxide, and even after *Homo sapiens* is gone, the biological invaders we have sown around the world will keep regenerating keep controlling the ecosystems that surround them. They will continue to frustrate the evolution of other plants and animals. "Evolution has now entered a new mode," says Burney. "Something altogether new is happening, and it has to do with what humans do to the evolutionary process. And it's a very scary thing, because it's like we are taking evolution around a blind corner, something that nature hasn't dealt with before; species that can just hop a plane and wind up on the other side of the world; combinations of species that have never been combined before, it's a whole new ball game, and we don't know, really, where it will end."

Role of Religions on Climate Change

I think we need a change of heart. We need to see ourselves in another kind of context instead of seeing ourselves as fundamentally to use the old phrase brains on stalks, living in this artificial world in this bubble. We need to see ourselves as part of a system answerable to other parts of that system and I would say also of course, answerable to God. Now, that's something which doesn't come easily in the western world. I think it's absolutely imperative for anyone in a position of religious responsibility in the western world to hammer on that theme and loudly and consistently as they possibly can. In fact, two forces that have guided human social development through the ages have been *one is economic growth and the other, religion. I mean these are two engines* that have developed and forced us into where we are today, or shaped us into where we are today.

Religion is starting to play a bigger and more vocal role in talking about protecting God's Creation and we whole heartedly welcome that engagement. The way religion can contribute to environment is that it owns a lot of the planet to start with. We estimate that the eleven major religions we live and work with, they own about 7% to 8% of the habitable surface of the planet, forests, farms, urban cities. So, when we talk about religion, yes at one level, we can think about them preaching and teaching, because all the faiths have immensely profound statements and teachings about how we should treat nature. But they also are in the business of the environment. They actually buy, they sell, they own, they control and they influence, and not only that they carry authority. *If they say "Do this," they're going to be listened to in a way that no government and certainly no NGO, is going to be listened to.*

All it took was a plea by the Dalai Lama to make a dramatic change in the attitude of Tibetan Buddhists. *Dalai Lama* addressed the people in Katmandu, Nepal and said, "So, please take this message back to all the people in Tibet that it is not good to wear animal skins and furs, take these words from the Dalai Lama that if you wear leopard or tiger skins then I am sitting here ashamed." What happened is that tens of thousands of people in response to the Dalai Lama's message across Tibet, Bhutan, Nepal, India have ripped their furs off their robes burnt their fox hats, burnt fur blankets and these are extremely poor people. They have very little money. So, it is a bit like us setting fire to our cars, because we think it's wrong to drive cars in terms of financial value. And they are still doing it with a huge smile on their faces *and it is really seeing people at their very best.* They embraced the responsibility and I think their behavior really sets the standard for everybody else in the world. We have never seen anything like this happen before, it is absolutely staggering.

I'm intrigued to see the way now in which some of the world's major faiths and religions are beginning to understand that they have a serious

leadership role to use their teaching, their holy texts, their authority, infallibility and their inherent wisdom, to draw out better messages about the responsibility of humankind in terms of acting as stewards. Is it going to come in time? We don't know? We could be critical about looking back at how pathetically disengaged the world's major religions have been. They have just stood by and watched as our industrial juggernaut has laid waste on this astonishingly beautiful created world. We are glad to know that they are going to be out there, now raising their voices in defense of our planet, our home of God's Earth. Twenty five years ago as I remember very well, the World Wildlife Fund organized a big conference of multi-faiths of Judaism, Islam, Christianity and Buddhism. They got together and determined that all those religions carried within them the moral precept that they ought to care for the environment and the creatures with which we share the planet.

I suppose, in a way the problem is that the world by and large, has turned away from religions and they are having less effect than they did. I would hope that in relation to the whole question about the environment and ecology, I could help to keep open some of the really big questions, the question about what is human's nature in this! It is not just a practical problem about how do we avoid disaster, *but how do we imagine our humanity freshly and I think religion has a unique perspective to offer that.* Besides religions, we need to bring in the humanities, poetry, art, music, dance, everything and anything that will make a difference in how people view this problem. Because, we are in a problem: It matters to our lives. It matters to our hearts. It matters in everyway. Christianity has always expressed care and concern on natural world through social teachings.

Vatican Documents on the Environment

Gaudium et Spes (1965, Vatican II): For man and woman created to God's image, received a mandate to subject to themselves, the earth and all that it contains, and to govern the world with justice and holiness, a mandate to relate ourselves and the totality of things to him who was to be acknowledged as the Lord and Creator of all. Thus by the subjection of all things to man and woman, the name of God would be wonderful in all the earth (no, 12, 33, 34).

Papal Encyclicals – Octogesima Adveniens (1971, Pope Paul VI) – Man is suddenly becoming aware that by an ill-considered exploitation of nature he risks destroying it and becoming in his return the victim of this degradation. Not only is the material environment becoming a permanent menace; pollution and refuse, new illnesses and absolute destructive capacity; but the human framework is no longer under man's control, thus creating an environment for tomorrow which may well be intolerable. This is a wide ranging social problem which concerns the entire human family (no. 21).

Justitia in Mundo (1971, synod of Bishops) – Such is the demand for resources and energy by the richer nations, and such are the effects of dumping by them in the atmosphere and the sea that irreparable damage would be done to the essential elements of life on earth, such as air and water, if their high rates of consumption and pollution, which are constantly on the increase, were extended to the whole of mankind (no.11) . . .the richer nations should recognize the danger of destroying the very physical foundations of life on earth. Those who are already rich are bound to accept a less material way of life, with less waste, in order to avoid the destruction of the heritage which they are obliged to share (no.70).

Redemptor Hominis: (Redeemer of Man) - This is the first recent and first encyclical of Pope John Paul II, promulgated on March 4th, 1979. As with so many of his encyclicals, there was something here for everyone: a piercing criticism of contemporary culture, an emphasis on human rights, *on recognition of ecological responsibility*, on imperatives of ecumenism, evangelization, and much else. Here pope writes about redemption, whatever the ambiguities of our present mode of existence, envisages the renewal of the whole of creation. In and through Christ faith experiences; creation as brought to its fulfillment in a way that promises to include everything and everyone. Though the present form of the world “groans” with ambiguities and futility, Christ is its center, in living contact with that “inward mystery” that each of us is. He is there at the “heart” of our existence. Basically the document deals with redemption and the dignity of the human race.

Laborem Exercens – (On Human Work) - It was promulgated on September 14, 1981, on the ninetieth anniversary of *Rerum Novarum* a previous document on work and dignity of man, promulgated by Pope Leo the XIII. Through work man must earn his daily bread and contribute to the continual advance of science and technology and, above all, to elevating unceasingly the cultural and moral level of the society within which he lives in community with those who belong to the same family. Man is made to be in the visible universe an image and likeness of God himself and he is placed in it in order to subdue the Earth.

Sollicitudo Rei Socialis (1987, Pope John Paul II) – Among today’s positive signs, we must also mention a greater realization of the limits of available resources, and of the need to respect the integrity and the cycles of nature and to take them into account when planning for development, rather than sacrificing them to certain demagogic ideas about the latter. Today this is called ecological concern (no. 26, 34).

Centesimus Annus – (one hundredth year of Rerum Novarum) - It was promulgated on 1st of May 1991. *Centesimus Annus* opened up new horizons in the area of Catholic social teaching, and it’s insights into the political, economic, and cultural dilemmas confronting the modern world.

The document deals with the subjects like entrepreneurship, subsidiary and solidarity, the role of family in the free economy, globalization, and the environment. Equally worrying is the ecological question which accompanies the problem of consumerism and which is closely connected to it. In his desire to have and to enjoy rather than to be and to grow, man consumes the resources of the earth and his own life in an excessive and disordered way. At the root of the senseless destruction of the natural environment lies an anthropological error, which unfortunately is widespread in our day. Man, who discovers his capacity to transform and in a certain sense create the world through his own work, forgets that this is always based on God's prior and original gift of the things that are. Man thinks that he can make arbitrary use of the earth, subjecting it without restraint to his will, as if it did not have its own requisites and a prior God given purpose, which man can indeed develop but must not betray. Instead of carrying out his role as a cooperator with God in the work of creation, man sets himself up in place of God and thus ends up provoking a rebellion on the part of nature, which is more tyrannical than governed by him (no. 37, 38).

The Catholic Church has been unconsciously very environmental for the past 2000 years in her approach toward the "*human population.*" According to recent statistics issued by the secretary of Vatican State, there are 5000 bishops, 400,000 catholic priests and almost 950,000 Catholic nuns all over the world. All of these members are bound by the special three vows or promises that would bind them consciously throughout their lives. These three vows are; the vow of celibacy, vow of poverty and vow of obedience. *The first two vows are directly connected to the ecology and the environment.* By the vow of celibacy, a priest or a nun commit themselves to a life of consecrated celibacy and they can't marry for life. The spirit of the vow frees them to live out their vocation to love in a deeper personal union with Christ. By the vow of poverty, a priest or a nun freely renounce their natural right to the independent use of material goods. The spirit of poverty relieves them from personal material concerns and frees them to direct their hearts to the building up of God's kingdom.

In the time of Jesus, the known human population was 750,000 and at the turn of the 3rd millennium the population crossed 6 billion. Imagine the generations of people for the past 2000 years, if the catholic priests and nuns were married and their children putting pressure on the natural resources like water, food, oil, gas and air! They could have been depleted long time back. That would have been catastrophic. But for the vow of catholic celibacy, the world would have seen the 6 billion mark in 1800 itself. Thanks to Christianity for buying 200 years more and saving the natural resources for future generations. Further, the vow of poverty played an important role in consumerism, limiting them the use of scientific and technological innovation. Who can say that the Vatican is not green? *From, Pope Peter to Pope*

Benedict; they are all green and more environmental than any other religious and social leaders on Earth. As economy booms for one billion and one hundred fifty million souls, India needs a very urgent environmental plan from all religious leaders, before it is too late.

Pressure on Our Children

In public health Sector: Unclean water, along with poor sanitation, will kill 15 million people every year, most in developing countries. Air pollution will kill another 5 million people. Heavy metals, electronic waste and other contaminants will also cause widespread health problems and deaths.

In Food supply Sector: Will there be enough food to go around? In 64 of 105 developing countries studied by the UN, Food and Agriculture Organization, the population has been growing faster than food supplies. Population pressures have degraded some 2 billion hectares of arable land, an area the size of Canada and the US.

In Freshwater Sector: The supply of freshwater is finite, but demand is soaring as population grows and use per capita rises. By 2025, when world population is projected to be 8 billion, 48 countries containing 3 billion people will face shortages. China and India are the most vulnerable targets of this problem.

In Coastlines and Oceans Sector: Half of all coastal ecosystems are pressured by high population densities and urban development. Majority of human population lives along seashores. A tide of pollution is rising in the world's seas. Ocean fisheries are being exploited, and fish catches are down.

In Forests Sectors: Nearly half of the world's original forest cover has been lost, and each year another 16 million hectares are cut, bulldozed, or burned. Forests provide over US \$400 billion to the world economy annually and are vital to maintaining healthy ecosystems. Yet, current demand for forest products may exceed the limit of sustainable consumption by 25 percent.

In Biodiversity Sector: The Earth's biological diversity is crucial to the continued vitality of agriculture and medicine, and perhaps even to life on Earth itself. Yet human activities are pushing many thousands of plant and animal species into extinction. Two of every three species is estimated to be in decline.

In Global Climate Change Sector: The Earth's surface is warming due to greenhouse gas emissions, largely from burning fossil fuels. If the global temperature rises as projected, sea levels would rise by several meters, causing widespread flooding. People living on the coastline, face with destruction and replacement. Global warming also could cause droughts and disrupt agriculture. Recorded climate variations have caused or contributed to ecological adaptations, migrations, catastrophes, and successes.

Who is the Black Sheep?

In the current climate change discussions, China and India raise red flags everywhere. The general points are that they are the fastest growing developing countries and hence, their emissions need to be decreased or the growth of emissions needs to be decreased. *In fact, Australia and the US claim to not signing the Kyoto Protocol due to the lack of emission reduction targets on China and India.* China and India on the other hand claim their per capita emissions, their poverty and the need for economic development as the drivers for not accepting to targets for CO2 reduction. One common reason suggested for the worry is that China will eclipse the United States as the leading greenhouse gas emitter soon. The developed countries are looking into the future. However, if you look at the past, it is clear who bears the responsibility. A good way to understand this is the cumulative emissions of countries from 1900 to 2002. It does make sense to look at the sum of all CO2 in the atmosphere is between 50 to 200 years.

The current global warming is an effect of all greenhouse gases put in the atmosphere during the last 100 years, global warming is not just caused by the greenhouse gases emitted this year or last year! This is also one of the reasons why immediate action is required to reduce the emission of greenhouse gases like carbon dioxide, because the effects of the greenhouse gases will last for about 100 years. A better way to understand the issue is to concentrate on the top 10 producers of all time. US 41.17%, Russia 11.72%, China 10.98%, Germany 9.75%, UK 7.36%, Japan 5.93%, France 3.76%, Ukraine 3.14%, Canada 3.13%, India 3.07%. The US is responsible for 41% of all the emissions for the last hundred years produced by the top 10 countries. China is 11%. India is 3%. This puts things in perspective. The future is an opaque mirror, anyone who tries to look into it sees nothing, but the dim outlines of an old and worried face. I know not what future holds, but I know who holds the future!

The same weather and climate will destroy us and reshape the future world. The present world is the key to understanding what happened in the past and what will happen in the future. The same slow processes we see today have always been and will always be. We also find geologic evidence of unique catastrophes in the past, thick mud layers over continents, coal seams covering entire states, craters of super-volcanoes, canyons cut thousands of feet deep, miles of underground cave passages, and remnants of thick ice sheets that once moved our continents. So we have a reason to believe that the present can tell us about the past or the present can tell us about future. Based on God's word, we know that unique events are in store for the future. As stewards of God's Earth living in the present, we still have a responsibility to study the Earth's clues. Only by combining our knowledge of God's word and God's world can we better understand how to live in the

present and how to prepare for the future. The everlasting creator, who made all things in six days, sustains them now by his word. One day he will fulfill his glorious work by providing a new world, where he will dwell forever with his redeemed people.

Our struggle is to break out of our self containment. We are not to love the universe but, we are to love with the universe. We are not to despair of the universe, but we shall feel agonies with the universe. Our sufferings are no longer the irrational and blind scourges of an unfeeling creation; our suffering is shared with all mankind and with the entire range of creation. Our pain is the pain of all. Their pain is ours. So with all the animals and plants and stars and suns, all creatures large and small, all entities created by God enter into community with us. Here we do differ from the usual religious outlook. We pray not to adore God as an object of our worship, but on the other hand I pray that I may join into a communion with God. And we must do more than merely pray; we must live in community with all creation. Jesus concludes the end of the world pointing out the weather and climate related causes which has been consistently the same throughout the planet's history:

“Great distress shall be upon the Earth. There will be signs in sun and moon and stars and upon the Earth distress of nations in perplexity at the roaring of the sea and the waves, men fainting with fear and with foreboding of what is coming on the world, for the powers of the heavens will be shaken” (Luke 21: 23-27).

Chapter - Six

Some of the Ecological and Environmental Issues in O.T

Adam and Eve: Exploitation of Natural Resources

Garden of Eden, perhaps is not a particular place on Planet Earth, on the other hand, Garden of Eden is the Planet Earth itself; *Pangaea*. Over tens of millions of years, the world's continents gradually converge into a single super-continent called Pangaea. Pangaea contains more than 95 percent of the world's landmasses. The nascent masses of continental crust had not yet congealed to their present size. Instead, smaller rafts of lighter rocks formed the nuclei of what would become more stable continental areas. The cycles of the earth; the generation and destruction of plates probably happened in a slow scale. It is surrounded by the global ocean Panthalassa.

Sea was whipped up by storms, reducing all land newly elevated by tectonic to sedimentary waste. Unprotected by any cloak of plants, the wind and rain worked fast upon the naked rocks. This was a world of tempests and flash floods, of jagged crags and dunes. Most of the young planet was covered with water and the fragile landmass was significantly very, very small. *Pangaea as Garden of Eden* was a delightful place, full of leafy and fruity trees, full of native flora and fauna, full of natural resources, where the first man lived and from which he was expelled for his pride and sin. Some scholars identify the Pishon River in Genesis with Indus River and Gihon River with the Nile. It may be possible that these rivers were near each other in time of Pangaea.

Later, continental drift or *Plate Tectonics* forced Pangaea to divide into two continents; Gondwana and Laurasia. This change, mostly catastrophic in nature, can carry a slice of paradise into oblivion. Gondwanaland was ancient landmass that consisted of the present continents of South America, Africa, Australia, and Antarctica as well as the Indian subcontinent. Gondwanaland is believed to have been intact at least twice, about 350 million years ago and about 200 million years ago. Laurasia was the northern parts of an ancient super continent of Pangaea, an ancient landmass thought to include what would become North America, Greenland, northern and central Europe and most of Asia. Between these two periods all seven of the present-day continents probably formed a single landmass called Pangaea.

Genesis 2:8-25 explains about the unlimited natural resources given to man by God. Apparently the Garden was intended to contain everything that man could want and need, and in later times, it was looked upon as an idyllic place of perfection, a paradise which is a Greek word, of Persian origin, meaning park or Garden. The creation story in Genesis also tells us how sin entered the world, and how the beautiful and perfect environment

that God created was marred. The world is now imperfect and sometimes ugly. It is very common in legends to speak of an early golden age when care was absent and food was so plentiful it could be picked off the trees without labor. Why not? Each human being in reasonable circumstances can recall a golden age of his own, when he was young.

The ancient Sumerians had a tale of *Gilgamesh*, king of Erech (one of the Sumerian city), who was in search of eternal life. It is the oldest epic of which we have knowledge, and was, in its time, undoubtedly very popular. The tale of Gilgamesh may have influenced the Greek legends of Hercules, and the tree of life in the Garden of Eden may itself be there under the influence of Gilgamesh's quest. The tree of knowledge of good and evil, it is to be assumed, is a tree bearing fruit that can convey knowledge when eaten. It is usually supposed that the particular type of knowledge it controlled, was that of moral awareness, of being able to distinguish between good and evil.

Aitareya Upanishad declares, "*In the beginning all this verily was Atman only, one and without a second. There was nothing else that winked. He bethought Himself: "Let me now create the worlds. He created these worlds: Ambhah, the world of water-bearing clouds, Marichi, the world of the solar rays, Mara, the world of mortals and Ap, the world of waters. Yon is Ambhah, above heaven; heaven is its support. The Marichis are the interspace. Mara is the Earth. What is underneath is Ap."*

The first ecological disaster happened in the peaceful and bountiful garden. Man was given everything and in return God expected man to do something. The book of Genesis states: "You are free to eat any tree in the garden, but you must not eat from the tree of the knowledge of good and evil, for when you eat of it you will surely die." (Gen 2:17).

One can suppose that evil is a punishment brought by human beings upon themselves as a consequence of their own thoughtless, foolish, sinful or vicious actions and exploitations. *Eating the fruit may kill the man spiritually, emotionally, environmentally, ecologically, destroying his innocence and filling him with void and sin.*

Nevertheless, the dream of immortality has always been with human beings throughout history, and there are inevitable legends of having immortality in the palm of one's hands briefly, and then losing it. The tree of life, it is to be assumed, is a tree bearing fruit that can convey immortality when eaten, a primitive concept that is common in ancient myths. Human beings find it difficult to live with the fact of mortality. We are, as far as we know, the only living species that is aware of the inevitability of death; the inevitability not only of death in general, but of our own personal death. Yet, in human myths, the Gods are almost always immortal. Perhaps there is a trick to it; something the Gods know that they won't tell to mortal men. Many cultures have legends in which some hero searches for the secret of immortality, though he never succeeds for, alas, we are still mortal.

God has given a generous and a bountiful Earth to man. Man had plenty of choices and it was a heaven with equilibrium. On the other hand God had a request for man; that is not to eat the fruit of the tree of life and the tree of the knowledge of good and evil, which was in the middle of the garden. In another words, God said to Adam and Eve: *Do not exploit the Natural resources*. This great gift is given to humanity, cherished in the past, present and future, and this Earth can't be divided among nations, and the natural resources don't belong to any one nation in particular. Earth does not belong to man, but man belongs to earth. A man from a slum in India has a share in the oil wells of Kuwait and Saudi Arabia. A man in the slum in China has a right of inheritance in the jungles of Amazon. These rights are given to man by Creator God himself. *Eating the fruit of the forbidden tree is seen as man's insatiable exploiting character of natural resources*, especially exploiting of fossil fuels.

Homo sapiens inherited a priceless fortune, the planet Earth and riches it contained. Part of that one-time bonanza is, of course, the great deposits of fossil fuels that have powered industrial civilization. But there are other riches, less obvious, perhaps, but even more valuable. Arguably the greatest treasure consists of the millions of other kinds of organisms, plants, animals, and microbes, with which people share the planet. These other living beings have provided us with all our foods; with wood, fibers, and skins for clothing and shelter; and with medicines, oils, soaps, resins, rubber and uncountable other useful items. Many organisms, of course, we domesticated and often improved by selective breeding to make them even more useful to us.

More important, that treasure of other species plays critical roles in providing us a hospitable environment. That environment includes such as essentials as a favorable *climate, breathable air, and deep, fertile soils*. All these came into existence over eons, in part as outcomes of the evolution of the Earth's diversity of life forms. Similarly, the fossil fuels, coal, oil, peat, and natural gas, are the geologically processed and preserved remains of ancient plants and microorganisms. The human inheritance also includes inorganic treasures such as vast underground supplies of pure *fresh water* as well as concentrated deposits of dozens of useful metals, from copper, iron, and mercury to zinc, all of which our clever species eventually learned to exploit.

For the first several million years of their existence, human beings, like other animals, were dependent for their resources almost entirely on other living organisms, the plants and animals they ate or used for fuel or to fashion simple tools, shelter, and clothing. All these are *renewable resources*, naturally reproducing themselves, or in the case of water, continually being replenished by natural processes that involve, plants, animals, and microorganisms. In a real sense, early people, like the prudent elder son of our analogy, were living on the income from their inheritance. With the

invention of agriculture, things began to change. Human beings not only learned to manipulate their biological environment to enhance their food supplies, they soon discovered the value of metal, the first significant use of *nonrenewable resources*. Agricultural people later overexploited some renewable resources such as soil, by depleting it of nutrients, failing to control erosion, or allowing irrigated fields to accumulate salts, and forests, by cutting them faster than they could regenerate.

Human beings greatly accelerated their shift from living on income (renewable resources) to depleting capital (nonrenewable resources) with the advent of the industrial age and the harnessing of coal and then of petroleum and natural gas as fuels. These seemingly abundant and cheap sources of energy permitted large-scale replacement of human labor in both manufacturing and agricultural production. They also allowed more rapid exploitation of other nonrenewable resources, making extraction easier and remote deposits more accessible.

The availability of cheap energy also made possible the development of powerful farm machinery, and abundant oil and gas allowed development of synthetic fertilizers, pesticides and other products to boost crop yields, considerably above those achieved with traditional methods. Similarly, we can thank fossil energy for facilitating the production of many useful goods and for stimulating rapid expansion of economies and of food production. In effect, fossil energy facilitated the population explosion of the twentieth century. Finally, cheap energy has accelerated humanity's conversion of resources from renewable to nonrenewable, both through overuse and through pollution. *Overuse converts renewable resources to nonrenewable ones by using them faster than they can be renewed.* Pollution on the other hand, can simply render them unusable.

Genesis 3:8-19, describe the environmental, ecological disaster in the garden after the sin. God walks in the Garden, when it is breezy, as a man might. The man and his wife hid, and God must call for them. God must ask if there had been disobedience, as if he was not at all-knowing. The man and his wife hide because they are unaware of the powers of God. God asks the question because he wishes a free confession on the part of man. God doesn't ask the serpent for an explanation, but condemns it unheard and the animal became endangered as several endangered species of today. What would have happened if God made Chinese people as the first parents? Well, the sin would have never fallen on humanity; they would have eaten the snake!

We read in Genesis 3:9-10, "And the Lord God called the man and said to him: Where are you? And he said, I heard thy voice in the garden, and I was afraid, because I was naked, and I hid myself." The simple searching question, "Where are you", has psychic as well as physical meaning: asking

not only about the *man's bodily location, but also about the place of his soul*. It calls for self-examination and self-assessment. Man's reply is, on the surface, largely evasive. But answers reveal man's state of mind. First time man encounters fear. Out of guilty fear, he explains where he is, beginning by blaming the sound of God's voice as the cause of his going into hiding; in doing so, man freely confesses his concern with the divine presence, even as he tries to rationalize his misconduct. Hearing God's voice made him afraid, and he was afraid not because he disobeyed but because he was naked. *Man becomes weak, useless, sinful, naked and vulnerable creature?*

Next the disaster falls on the woman in the verse (Gen 3:16). The woman has not had children yet, and one wonders whether, if the man and woman had stayed in the Garden, they would ever have children. If children had been born, presumably the process would have been easy and painless. One might argue that if the fruit of the tree had not been eaten, the man and woman would have continued to live in eternal bliss in the Garden. It was only after the fruit had been eaten and death had entered the world as an inevitable eventuality. As for women bringing forth children in sorrow it would appear that women do have a difficult time of it in childbirth, more so than most animals do. This may be related to the rapid evolution of the human brain and to its tripling in size in the last half million years. The pelvic opening of the female has barely kept pace with this growth, and the head of the newborn infant, which is the largest part of the body and the first to emerge, does not slip through the pelvic opening easily. It is a tight fit.

That brings us to man's fate in the Garden. Genesis 3:17 speaks of man facing of terrible consequences for the involvement with disobedience. This sounds very much like a sigh of a farmer. God condemns him to hard labor. Humanity lived for many thousands of years by gathering food and by hunting. When farming was developed, proper cultivation ensured a much larger food supply and it became possible to feed many more people on a given area of hoeing, of reaping, of guarding against predators meant backbreaking work. If there was any dim recollection of the days of food gathering, when all that work wasn't necessary, it might have been another factor that gave rise to the tale of a fruitful paradise where all you had to do was pick a fruit and eat. It is very common for human beings to recall a past way of life with nostalgia and longing and to compare it favorably with a present way of life, simply by forgetting all the disadvantages of the past and by remembering the advantages.

Genesis 3:19 speaks about the concept of recycling. We eat plants and animals and convert their tissues into our own. But then we die and decay and our tissues are converted into the tissues of other animals that may devour our bodies, or of lesser forms, worms, maggots, molds, bacteria that will live on the dead bodies. All those various life forms will in turn decay or

be eaten, and the atoms and molecules of a once living human body may well eventually form the tissues of another human body and be part of a living organism once more. The biblical writers knew nothing of microscopic life, but dust is not a bad way of describing it, in the absence of knowledge. Microorganisms are as small as dust grains, after all. Man learnt art of exploiting in the garden itself and carried out the unrelenting assault on the vulnerable Pangaea. Perhaps man broke Pangaea's heart by his unfaithfulness. Eventually, Pangaea broke into two pieces, and ultimately into twelve pieces. Will man do it again?

Magna Carta – Genesis 1:28-31

Magna Carta means in Latin, *Great Charter*. John is known to literature as a classic bad king and indeed he was. The brother of Richard I, he was conceited and moody and prone to childish rages, probably the result of doting parents. He was known as the Landless or Lackland because he was born late, and his father had already willed everything to his other children. As king John made up his lack by taking money from the royal treasury for his own use. Unfortunately, he lost most of England's possessions in France and became embroiled in intrigue, even facing excommunication from the Pope. He overtaxed and overrode the local aristocrats. Clearly he was not an ideal king. Ultimately the English barons presented him with a document, the famous Magna Carta. This forced the king to observe "ancient law" and respect the rights of barons to resist abuses of their privileges by the king. But because of his tyrannical rule, England and the rest of the world benefited. The English nobility forced him to sign Magna Carta, a document that guaranteed them certain political liberties, and which became the basis for the freedoms we enjoy today. John caved in to their demands and signed the document they gave him: *Magna Carta Libertatum*, which a later great politician described as the "*Bible of the Constitution*."

Magna Carta is the mother of such documents as the U.S. Constitution. The key is that it limits the role of absolute kings like John and it sets forth the basis of constitutional liberties. *It establishes the idea that individuals have natural rights; it establishes the rule of law. So the real importance of Magna Carta lies in its being first, a beginning. It was copied, studied, and added to over the years, and it culminated in the liberties many enjoy today. In effect, it was the beginning of the long history whereby the English kings gave up some of their royal powers but in return got to remain on the throne. In addition, the Magna Carta guaranteed fair trials, proportionate punishment, and certain feudal rights. It was the basis of democratic liberty that culminated centuries later in the World's constitutions and the United Nations Declaration of Human Rights.* As for John, he died of dysentery at the age of forty-eight while seeking revenge against the English barons for forcing him to sign the Magna Carta.

We have hundreds of Johns in the form of nations, who systematically plunder, abuse the natural resources which belong to all, including yet to be born. Urgently we need a “Magna Carta” which could stop the illegal plunder and limit the role of absolute governments, some of whom feel that they are above the law and somehow steer them to the stewardship or sustainable development. This is the Magna Carta given to our fathers and to their great grand fathers. This will be the Magna Carta given to our children and to their great grand children. This is given by God Himself and it has to be reminded to every generation.

“Here is the essence of Magna Carta given by God : And God blessed them, and God said unto them: Be fruitful, and multiply, and replenish the Earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air; and over every living thing that moves upon the Earth. And God said, Behold, I have given you every herb bearing seed, which is upon the face of all the Earth.”

This passage from the Bible portrays the Creator, a generous God. Some have criticized Genesis of an encouraging and exploitive attitude toward the ecology and environment. But I don’t think it’s true if we look carefully the two divine commands that define human beings in Genesis. “Be fruitful and multiply” and “Fill the earth and subdue it.” The first divine command tells human beings to continue in existence by procreation. That is to accept the gift of life and co-operative with God for the sake of the next generation. And the second command “subdue the Earth” does not give permission to exploit the environment. It means rather that God has given to each nation a defined territory from which they are to draw their sustenance. Each nation must therefore take their land or territory which in that thoroughly agrarian society was the source of life. God wishes each nation to have enough, to flourish. These two examples from the early chapters of Genesis suffice to show us how profound and how positive is the Biblical picture of human beings and society. They show us a generous God and a dignified and a treasured human race.

The Legend of Noah’s Flood

Genesis 6:5-7 explains about God’s disappointment and rage against humanity, *“And God saw that the wickedness of man was great in the Earth, and that every imagination of the thoughts of his heart was only evil continually. And it repented the Lord that he had made man on the Earth, and it grieved him at his heart. And the Lord said, I will destroy man whom I have created from the face of the Earth, both man, and beast, and the creeping thing, and the fowls of the air, for it repents, me that I have made them.”* The word grieved makes it sound as though God had decided he had made a mistake. Even so, it is clear that God was viewing humanity as an experiment that had failed.

In later ages, the concept of God grew more grandiose, and he was viewed as omniscient and incapable of making a mistake. The God of the early legends, however, was a little more human than that. Since Earth and all its life forms were made only for the use of humanity, they became useless without humanity and might all be destroyed. God apparently planned to return everything to chaos and wash out the whole experiment of Cosmos as a blunder. *Humans became endangered and pushed into the brink of extinction.*

The legend of Noah's Flood is one of the greatest puzzles to explore and to solve it by geological sciences. It is one of the biggest Ecological and environmental disasters in the history of geological time scale. That the scheme of a return to Chaos was not carried out totally by God, was owing to the fact that one man, Noah, found grace or favor in the eyes of God. The experiment was apparently not a total failure, so God decided to wipe out only part of it and then start again. It was God's intention, as it is described in the Bible, to destroy life on Earth by means of a flood. It requires no great effort of imagination to conceive of a flood as a means of destruction.

Science has a problem with the Flood Story in Genesis. If we apply this story with the *12 Plate Tectonic Earth*, which we know off, undoubtedly we'll have a problem. But during the time of Noah, the landmass was sitting on a one single plate called Pangaea as we saw earlier. As is true of any large river, unusual rises will bring about flooding conditions. In a land as small and flat as Pangaea, it would not take much of a flood to cover large portions of the entire region.

A particularly bad flood would live on in the memory of later generations, and particularly bad floods undoubtedly occurred. The dramatic tale of the Sumerian Flood was included in the epic of Gilgamesh, which must have been popular all over the ancient world and which couldn't help but influence the myths of other nations. Thus, Ut-Napishtim is sometimes called the Sumerian Noah. It might be more accurate to call Noah the biblical Ut-Napishtim. River floods, like any other natural disaster, do not usually come about through human agency, and in ancient times, their causes were not understood. The Sumerians assigned the event to the whim of the Gods.

The biblical writers, adapting the Sumerian tale, could not allow such whimsicality to stand and searched for a way of showing that humanity had brought the disaster on itself. Genesis 6:19 says, "And every living thing of all flesh, two of every sort," seemed no big deal to the biblical writers, who probably identified not more than a few hundred different animals together. The Greek philosopher Aristotle, a close and intelligent observer, writing about 350 B.C., could list only about five hundred species of animals. Yet we now know that there are some fifteen thousand species of mammals alone. Naturally, only a fraction of these are to be found in biblical lands, and

if the Flood were a local phenomenon of the Tigris-Euphrates region, as it undoubtedly was, those would be all that mattered.

God speaks of destroying all flesh, however, and in addition to the mammals there are fifteen thousand species of other land vertebrates and an enormous number of other land animals. There are at least a million species of insects, with more being discovered every day. There are five hundred different known species of flies alone. God seems to have a hobby of creating insects, which rank the highest number. It would seem that if God's instructions are taken literally, the ark must have contained anywhere from two to four million animals, some four-fifths of them insects. No mention is made of any of the sea animals. Presumably they will not be harmed by the Flood. Microscopic creatures were, of course, unknown. The animal world is still presumably vegetarian, in line with the instructions in Genesis 1:29-30. This means that Noah must collect ample quantities of all plants that are eaten by any of the animals, which, if the verses are accepted literally, would mean all land plants, of which there are at least a quarter of a million species.

Again these above classifications are made, keeping in mind the 12 Plate tectonic Earth. In the time of Noah, Pangaea had only few species of animals, the fact that the climate of *early earth was not that conducive for the proliferation of life on earth*. All life forms were following the rule of "*survival of the fittest*." During the Noah's Flood, Noah had the habit of inspecting his boat every morning. As he was inspecting the star board side, he was appalled by what he was seeing; he got so mad and screamed to the steward; "Who the hell brought the woodpecker on board?" I am sure of one species which made on board was "the woodpecker."

Genesis 7:11 reports "In the.....same day were all the fountains of the great deep broken up, and the windows of heaven were opened." There is at least a partial breakdown of the cosmic order as the divisions between land and sea, and between the waters below and above the firmament, are broken down. If we consider the actual Flood in Sumerian history, does the mention of the fountains of the great deep mean that it was more than a river flood? Did the waters of the ocean also invade the land? Were heavy rains accompanied by a *great tsunami or tidal wave* as well? The modern world has witnessed the power of tsunami in 2004. What must have caused tsunami in Biblical Sumerian? This was the powerful movement of the plate tectonics. There is a Crustal-Plate boundary that runs down the northeastern shore of the Persian Gulf, and it is possible that an earthquake may have taken place in such a way as to shake the sea and send a wave of water careening up the Gulf. In 2004 tsunami, *the Australian-Indian plate tectonic activity triggered the tidal waves in the Indian Ocean and also in the Bay of Bengal* killing thousands of lives and damaged to a large extent. More dramatically still, we might speculate that perhaps a *sizable meteor* made an unlucky strike on the waters of the Gulf and created a huge splash.

There is no evidence for either of these speculations, but neither is flatly impossible.

If one were to accept the verse literally and assume that the Flood covered the entire world as we know it today, as in fact most biblical readers did assume, and probably still do assume today, then we would have to imagine that the sea level rose five and a half miles in order to cover even the Alps and Himalayas. The amount of water required to raise the sea level by that amount is over three and a half times the total quantity of water on Earth. Genesis 7:20 hints, "Fifteen cubits upward, did the waters prevail; and the mountains were covered." Fifteen cubits is about twenty two feet. Bible reads, "The waters prevailed above the mountains, covering them fifteen cubits deep." In other words, the water was twenty two feet higher than Mt. Everest's 29,028 feet.

From scientific standpoint, *this is clearly impossible*, since there is not enough water on Earth to accomplish the task, we know that nothing is impossible for God; what is more, there is no sign of such a universal deluge in the third millennium BCE. Egyptian history, for instance, carries right through the entire third millennium B.C. without any sign of a break or any mention of a flood. On the other hand, if we consider the flatness of the Tigris-Euphrates valley, and consider the Flood to have been a local phenomenon of the region, we might well imagine twenty two feet to be a sober estimate of the depth to which the elevations of the region were covered. Genesis 7:21-22 explains, "And all the flesh died that moved upon the Earth, both of fowl, and of cattle, and of beast, and of every creeping thing that crawl upon the Earth, and every man: All in whose nostrils was the breath of life, of all that was in the dry land died." One can imagine drenched people trying to find high grounds, trying to keep their heads above water; cattle floating; vegetation disintegrating; stench all over. We make the same mistake one more time, in our attempt to make sense in relation to the present Cartography. Each above written word is true in relation with the 12 Plates.

Today's geologists still believe Noah's Flood to have been responsible for vast changes in the geological structure and surface topography of the Earth, and this Biblical story actually had an extraordinary influence on the early development of the science of geology. Several generations of geologists studying evidence along coasts and below the present sea surface have concluded that the sea was lowered during *Precambrian* period and each of several *Pleistocene* ice ages. This resulted from the withdrawal of thousands of cubic kilometers of water to form glacial ice over the continents. Each ice age left the continental shelves dry for a time, but when the ice melted, the sea rose, advancing again over the shelves to rest at what are roughly the present shorelines. The Flood story is a one more evidence to the *PDR theory*. God continues to create a new world through violence and

destruction, as passion and death in Christ, brought new life in resurrection. The Flood gave rise to new and more complex life forms, proliferating on Planet Earth.

Babel-The Failure of Civilization

The sacred text recalls, *“Confuse the wicked, O Lord, Confound their speech, for I see violence and strife in the city. Day and night they prowl about on its walls; malice and abuse are within it. Destructive forces are at work in the city; threats and lies never leave its streets.”* Psalm 55:9-11

The story of the city and the tower of Babel is told in the book of Genesis, chapter 11, is another Environmental and Ecological disaster. As everybody knows, God disrupts the building of the city, confounding the speech of the builders and scattering them into many nations spread across the face of the Earth. After Babel the Bible will turn directly to its main subject, the formation of the nation of Israel. This tale of the universal city completes the account of the universal human story, with human beings living largely on their own and without divine instruction. The language, technology, and the first prototypical city, expose philosophically the core of civilization and man as a rational and political animal and morally, as part of a search for wisdom regarding how to live.

For the building of the city and tower appears at first glance to be an innocent project, even a worthy one. It expresses powerful human pulses, to establish security, permanence, independence, even self-sufficiency. And it is accomplished entirely by rational and peaceful means: forethought and planning, arts that transform the given world, and cooperative social arrangements made possible by common speech and uniform thoughts. Babel, the universal city, is the fulfillment of a recurrent human dream, *a dream of humankind united, living together in peace and freedom*, no longer at the mercy of an inhospitable or hostile nature, and enjoying a life no longer solitary, poor, nasty, brutish and short. According to the story, however, God finds this humanist dream a nightmare. Taking strong objection to the city of man he thwarts its completion by measures designed to make it permanently impossible. Why?

Given that the human beings want the city but God does not, our first impulse is to think that the answer depends on knowing God’s reasons or seeing things from his point of view. Of this, all that we know for now is contained in God’s remark, no doubt uttered with a negative judgment, “The Lord said, if as one people speaking the same language they have begun to do this, then nothing they plan to do will be impossible for them.” (Gen 11:6). God apparently does not approve of the prospect of unrestrained human powers, exercised in support of unlimited imaginings and desires. He seems to be worried both about man’s boundless capacity to dream up grand projects

and, even more, about man's ability, sustained by unity of speech and purpose, to realize them. More generally, he may not like the absence of reverence, the vaunt of pride, the trust in technique, the quest for material power, the aspiration for self-sufficiency, the desire to reach into heaven. In short, the implied wish is, to be as Gods, with comparable creative power. From God's point of view, the city of man is, in its deepest meaning, at best a form of idolatry and self-worship, and at worst a great threat to the Earth.

The unity of the human race was linguistic or logical, not merely genealogical. It means sharing a common understanding of the world that any pure language implicitly contains. And because language also bespeaks the inner world of the speakers, sharing one language means also a common inner life, with simple words accurately conveying the same imaginings, passions, and desires of every human being. *To be of one language is to be of one mind and heart about the most fundamental things.* But where does this one language come from? It is strictly a human creation. It appears to come unaided, directly from the human mind. As we learn from the Garden of Eden story, man's first creative and distinctly human activity is naming the animals. Whatever name man selected became each animal's name. The human beings were not of one language, they were also of one speech.

Though mankind was told after the Flood, to disperse and fill the Earth, the human race chose rather to settle in one place, a fertile plain in the land of Shinar that is in the Euphrates valley that could accommodate and sustain them all. A fertile plain very likely suggests agriculture, not hunting and gathering; agriculture suggests settlement, rather than wandering, and also forethought fences and the art. As the story more than hinted from the start, the project for building the city depends on human speech. But whereas human speech has previously been used for a variety of other purposes, naming, self-naming, questioning authority, shifting blame, denying guilt, expressive fear, boasting in song, spreading shame and ridicule, and blessing and cursing. *Through words and speech man plays "the Creator."* God's creation of the world, we recall, also began with speech, divine speech that summoned the world into being, enabled things to come into being.

Man uses the same tool to create his world. If, indeed, all of mankind existed as a single family immediately after the Flood, then, indeed, they and, for that matter, their immediate descendants would all speak a single language. *The powerful tool of creation is ready and available to man.* In actual fact, in the twenty fourth century B.C., there was undoubtedly a multiplicity of languages already existing on the Earth even over the restricted area known to the Middle Eastern civilizations of the time. Sumerian, Acadian, and Egyptian were fundamentally different from each other, and there were undoubtedly hundreds, if not thousands, of other languages in existence outside the Middle East. We have no knowledge of when human speech drifted apart into separate languages. For one thing, we don't know when the ability of speech originated

and by what steps a formal language was developed. It is quite likely we will never know, but it seems reasonable to suppose that languages were already differentiated thousands of years before civilization began.

Genesis 11:3 talks about production of clay bricks. In prehistoric times, moist clay was used to daub woven baskets. Dried in the sun, the clay made it possible for the baskets to carry liquids. Such daubed baskets, if left too close to a campfire, may have hardened further, and more or less accidentally, it was discovered that if clay was baked, it became a sort of artificial stone. In this way, bricks and pottery came into use. The oldest such fire-baked clay has indeed been found in the region that eventually became Sumerian and dates back to about 6500 B.C., the Hebrew word translated as “slime” here is more properly translated “*Bitumen*” or as “*pitch*.” Bitumen is a soft, sticky, waterproof black solid; hydrocarbon in nature. Chemically, it is related to petroleum; petroleum from which the more easily evaporated fractions is gone. The Middle East, as we all know today, is rich in underground oil. Some of it seeps to the surface and partially evaporates, leaving the bitumen behind. Bitumen serves not only as a waterproofing agent, but as a mortar, too, making bricks stick together and forming a wall that is all one piece.

Genesis 11:4 reports, “And they said, let us build a city and a tower, whose top may reach unto heaven; and let us make a name, lest we be scattered abroad upon the face of the whole Earth.” Agricultural peoples did tend to build cities for self-protection, and these would include towers. A tower could serve as a look-out point from which the approach of an enemy could be seen and an early warning be given. If strongly built, it could serve as a citadel, a refuge for non-combatants a place for a last stand. A tower could also be a place of worship. Since it was common to worship sun-gods, sky-gods, and storm-gods, one would try to get closer to the homes of these gods in the sky, in order that the prayers, and the scent of the sacrifices, would have a better chance of reaching their target. In hilly regions, it would be reasonable to set up an altar on a hilltop. In the flat plain of that region, they may well have felt it necessary to build an artificial hill if they were expect their religious rites to be noticed by the gods. It is for that reason they might build a tower, and in that sense they would hope that it’s “top may reach unto heaven.”

We sense God’s disapproval of human projects in Genesis 11:5-9. God seems to be described here as fearing the powers of united humanity. One gets the impression that God is angered by human presumption in daring to try to build something high enough to reach heaven. If so, the tone of this verse is rather that of God fearing that humanity will attempt to storm heaven and conquer it and that he, God must take measure quickly to prevent it. By proceedings to “confound their language” that is, have different people speak different languages, God destroys the unity of humanity. In particular, one

presumes, they were unable to continue building the tower. These towers were called *Ziggurats* (means pinnacle, or mountain peak). One of them was ordered begun by a Sumerian king and was left unfinished. For centuries, this Ziggurat remained incomplete and perhaps gained fame because of its shortcoming, as does the Leaning Tower of Pisa or Schubert's Unfinished Symphony. It may be that this unfinished Ziggurat served as the model for the tale of the unfinished tower.

Babel is the Hebrew version of the Babylonian "*Bab-ilu,*" meaning "*the gate of God.*" The unfinished Ziggurat in Babylon was called "*Etemenanki,*" meaning "*house of the foundation of heaven and earth.*" In the sixth century B.C., Nebuchadnezzar, who ruled Babylon at its peak of greatness, finished it or perhaps rebuilt it. It was the largest Ziggurat ever built. It was formed in seven diminishing stages, one for each of the planets. The bottom most stage was about 300 feet square, and the whole thing reared 325 feet into the air. Building it was a remarkable feat, considering the state of the art at the time; it was a largest structure of its day in southwestern Asia. Although there are many people who know of the unfinished "tower of Babel," there are probably few who know that it was eventually finished.

In the Babel story, God's intervention would serve vividly to indicate the Chaos, confusion, and alienation that are the inevitable consequences. Misunderstanding and non-understanding make further cooperation on the project impossible, and the men leave off building the city. This way God spreads the civilizations far away, if not spreading, too many people in one place, putting pressure on natural resources. Dispersion, following upon the confounding of speech, leads to the emergence of *separate nations, with separate tongues and separate ways.* The emergence of multiple nations, with their divergent customs and competing interests, challenges the view of human self-sufficiency.

That brings us to the engineering of big cities and big skyscrapers in the modern world. The story of Babel has a great implied ecological and environmental truth in it; the anticipating decline of the quality of life in cities, and ever rising environmental problems of putting pressure on water, air, and health. *Cities like Dacca in Bangladesh with 15 million people, Calcutta with 13 million, Chennai with 13 million, some of the ecologically and environmentally problem filled cities in the world.* What about the big cities in the modern world, Calcutta with fourteen million, Mumbai with twelve million, New York, Boston, Rome, London, Dacca, Sydney, Beijing etc.? What kind of life you could expect? Is there any quality at all? It has been realized that high densities in human populations, made them subject to high rates of poverty and disease. Today cities have more problems, violence, prostitution, drug peddling etc... In rapidly growing, less-developed nations like India, migration to cities is going on at

unprecedented rates. The largest, Mexico City, held some 17 million souls in 1985 and, barring disaster, will have over 25 million about equal the present populations of Ireland, Denmark, Norway, Sweden, and Finland combined, by 2010. Sao Paulo will be around 21 million, and Calcutta and Bombay will each have over 16 million and Delhi over 15 million by 2010.

They have grown so fast that they have far outstripped their ability to care for their inhabitants. Lack of sewage systems, inadequate water supplies laced with pathogens, air pollution, and gigantic garbage dumps, often occupied and mined by the poorest of the poor, plague these overgrown metropolises. Half of the Delhi's population is now slum dwellers. Often, Chennai experienced water shortage during the summer time, no rain, drought situations persist every year. When the rains finally arrived, wells are polluted by the human feces that are everywhere, because of the inadequate sewage system, and a cholera epidemic breaks out among the poor. In Mumbai, shantytowns make up half the housing, and social workers estimate that 200,000 to 500,000 people sleep in the street.

Mexico City has so many people without sanitary facilities; its air pollution is rated the worst on the planet. Sao Paulo, Brazil, in the state of the same name, has been gathering problems in spite of its relative wealth. In the narrow verges of huge freeways, naked children now play among the cardboard shacks of *favelas* (*shantytowns*) within inches of eight lanes of roaring traffic. About 2 million people now live in the favelas, and about 5 million more in hideous slums. Many attempts are being made to resolve urban problems in poor nations, including the encouragement of industry to locate in secondary cities to divert some of the people fleeing from the countryside and reduce pressure on the mega-cities. But, as long as population growth continues at anything like current rates, trying to solve those urban problems is like trying to bail out the ocean with a thimble. Even rich nations are having trouble maintaining the livability of their giant cities. In New York City, the waiting time for a vacancy in public housing is eighteen years, and thousands of people are homeless.

In most American cities, the need for shelters has doubled or tripled. In Britain, which is sliding downhill compared to the rest of the European Community, over 40 billion pounds is needed to rebuild crumbling sewer systems, 8 billion pounds to repair gas mains, and many billions more to restore disintegrating government housing. There are many other problems that appear at least partially traceable to the cramming of more and more people into cities. Recently an "*Urban Stress Test*" was applied on eleven criteria; population change, crowding, education, violent crime, community economics, individual economics, births to women under age twenty, air quality, hazardous wastes, water quality, and sewage treatment. The results of the survey showed a strong relationship of problems with population. Large cities have higher amount of stress, more crimes, more poverty, and more environmental deterioration.

Man can learn from the past and move forward with new ways to solve the problems. The story of Babel could be a good example of modern cities, where God's intervention permitted the city having lower density of people otherwise the very existence of human species would have been threatened at very early stages of human evolution. Today's modern cities are in need of God's intervention and we pray for the swiftness.

Sodom and Gomorrah-The Doomed

Like Abraham, we readers are left in suspense regarding the fate of Sodom. Can ten righteous men found in Sodom? Will the city be spared? While we wait, with Abraham, for the denouement, the text allows us, but not Abraham, to see what goes on in Sodom and to discover for ourselves what the fuss is all about? We have been hearing of Sodom for some time, ever since the city was first mentioned in defining the boundaries of Canaanites, descendants of Ham (Gen 10:19) now for the first time, we get to go inside. When the two mystic men come to Sodom, the men are called "angels," and they appear to Lot as such. Lot apparently would not be able to penetrate their disguise: he would not have been able to see the divine hidden, within the human.

Genesis 19:1-3 reports the following events. Lot is not at home but hanging about the gate of the city, the passage through the encircling wall built to keep our dangerous outsiders. Lot does not rush forth to meet the strangers. He bows excessively, falls on their feet, insists with unseemly urging that they enter his house, makes them a much less gracious and generous offer, and prepares a less adequate meal, unleavened bread, later the bread of affliction of the Hebrew slaves in Egypt. All that Lot does he does all by himself; the nameless Mrs. Lot, a Sodomite native, soon to become famous as a pillar of salt, is not in evidence, and Lot's entire household is poorly organized to receive strangers. It is hard it seems, to be gracious to strangers in the city. Sodomites in contrast, see them merely as objects for their own pleasure. They came, menacing Lot's guests, showing the utmost contempt for their dignity, they seek to rape them. Genesis continues with the text (Gen 19 4-9) describing what happens further. All the men of the city came to Lot's house. And among them, presumably also Lot's sons-in-law! (Gen 19:14), have come to abuse the strangers. They seek to "know them" carnally, and even then, not freely but forcibly, not face-to-face like human beings, but from behind like animals.

Lot courageously but foolishly goes out shutting the door and pleads with his fellow Sodomites not to do wickedly. He flatters them by calling them "my brothers" and, in a perverse excess of hospitality, offers them his own virgin daughters, the two unmarried ones, to protect his guests from violation. But the Sodomites reject Lot's offer, and, their lust turned to rage, they focus instead on his imputation of their wickedness. For these city folk,

outsiders are of no account, and even less so are their notions of justice and right: rejecting Lot's assertion that what they demand is wicked, the Sodomites insist on adhering only to their own Sodomite ways. The Sodomites thus endorse not only xenophobia and sodomy, but also moral relativism, all exaggerated expressions of the "love of same." Lot and his family are saved only when the visitor-messengers pull Lot inside, shut the door, and blind the attackers, so that they wearied themselves to find the door. In this place where strangers are improperly treated, finally not even one's own kin are safe. Moreover, one decent man cannot save or reform a city.

The visiting angels urge Lot to gather his family and get them out of town, before the Lord destroys the city. Lot tries to rouse his sons in law to leave, but they think he is joking. Early the next morning, the angels again urge Lot to flee, lest he be "swept away in the iniquity of the city" (Gen 19:15). When he lingers, they forcibly drag him, his wife, and their two unmarried daughters out of town. They were told to escape to the mountains to avoid the coming onslaught against the cities of the plain. When Lot and his wife and daughters come unto the city of Zoar, the Lord rains brimstone and fire upon Sodom and Gomorrah: "He overthrew those cities and all the plain, and all the inhabitants of the cities, and that which grew upon the ground" (Gen 19:25). Lot's wife disobeying an order not to look back turned for a last glimpse of her native town and was turned into a pillar of salt. (Gen 19:26).

Sodom is a city notorious for injustice, and Sodomite injustice goes beyond mere inhospitality and violence toward strangers. It has an explicitly sexual character. The city's special brand of injustice is, in fact, epitomized in its own sexual perversions: the acts of sodomy (practiced by the citizens) and the acts of incest (later practiced by Lot's daughters on their father). Each is an excessive embodiment and each is also an expression of sexual selfishness: each is a manifestation of misogyny and contempt for marriage and procreation. Misogyny, though prevalent in the other social arrangements of the ancient world, reaches its fullest expression in the city. In Egypt, where Pharaoh rules as God, women are relegated to the harem; the tyrant uses beautiful women for sexual pleasure only.

The end of Sodom, conveyed in the story's final images, reveals the city's life—denying truth: "God annihilates "the entire plain" including "the vegetation of the ground" (Gen 19:25). That fatal fertility, so like Eden, is withered in the flames and the *Earth that bore it scorched*. In its place is left the sterility of the salt of the Dead Sea and of the pillar into which Lot's wife is turned. *Later we come to know these cities as Bab edh-Dhra and Numeira, along the Dead Sea*. Abraham awakens to see smoke rising from the cities and all the land of the plains, "like the smoke from a furnace" (Gen 19:28). The text says not a word about Abraham's reaction, but we can try to imagine what went through his mind. For sure, God's evident and

mighty power over human life inspired in him awe and dread. But what about the righteous for whom he had bargained? There could have been as many as nine who perished with the guilty, not to speak of innocent newborn babies, as the city went down together.

And what is of Lot? As Abraham watched, he no doubt concluded that Lot died in the conflagration. In the immediate sequel, we are told that “God remembered Abraham, and sent Lot out of the midst of the overthrow, when He overthrew the cities in which Lot dwelt” (Gen 19:29). God shows his mercy, saving Lot for Abraham’s sake. But God did not tell Abraham that he has done so. There will be time enough later to teach Abraham and his descendants about God’s mercy. For the time being, the painful lessons of the father’s and the founder’s justice must be allowed to sink in without a word of consolation. We wonder whether something of what he learned as he witnessed the smoke rising from Sodom and Gomorrah may have prepared Abraham for his greatest trial, enabling him to respond without so much as a peep of protest about the suffering of the innocent when God asks him to become not just an accomplice in the death of Lot, but an actual killer of his own beloved son.

We see the effects of Sodom and Gomorrah even today in volcanic eruptions, plate-tectonic activities, and organic extinctions. Perhaps the most crucial part of humanity’s inheritance being squandered to support rising overpopulation is *Earth’s biodiversity*. The planet’s plants and animals, including human beings are now threatened with the colossal extinction epidemic. It may prove to be a crisis even more severe than the natural episode that ended the reign of dinosaurs some 65 million years ago. There are aesthetic and ethical reasons for deep concern about the decimation of humanity’s only known living companions in the universe, but most people will probably feel the impacts of lost biodiversity through repercussions on the economic system.

Humanity has already borrowed the very basis of its civilization from nature’s genetic library, including all crops and domestic animals, important industrial materials, and the active ingredients of *numerous prescription medicines*. A handful of species of scruffy grasses from that library, through thousands of years of selective breeding, have been turned into wheat, rice, maize, and other grains. The 1.7 billion or so tons of those grains produced annually are the feeding base of humanity. Even so, the potential of the library to provide such useful items has barely been tapped. In exterminating, genetically distinct populations and species, *Homo sapiens* is foreclosing myriad opportunities to improve the health and selfish welfare of its exploding populations through as yet undiscovered new foods, medicines, and industrial materials. Indeed, we are even removing the raw material on which genetic engineering depends, threatening to close down a technology that many are counting on to improve the human condition.

Genetic engineering do not create brand new genes, they transfer genes of known function from one organism to another. They are dependent on nature's library to provide the genes they transfer. Even more worrisome, the reduction of genetic diversity threatens humanity's capacity to maintain high yielding strains of its most important crops, which often can be improved only by transferring genes from wild relative. In many parts of the world, close relatives of crop plants are being wiped out. As a result, the crops may become increasingly vulnerable to pest attacks and adverse weather. But most serious impacts of extinctions on society are not these direct economic losses, but the consequences of disrupting ecological systems which support humanity by supplying us with *indispensable ecosystem services*. All of these services depend on the participation of plants, animals, and microorganisms. The vital service do the control of the proportions of gases in the atmosphere, which influences the climate and regulation of the hydrologic cycle, the circulation of water through oceans, atmosphere, and land, including flood control and aquifer recharge.

Without the necessary biological background, laypeople are not in a position to understand either the constraints within which humanity must operate or the origins of those constraints. They can't understand why the human population has exploded or why the exploding human population threatens the very existence of civilization. They have little awareness of interactions between themselves and populations of other living beings and their nonliving environment. This lack of understanding represents a colossal failure of education, a failure that goes unrecognized by most educated people. Today that world is bleeding to death, yet the average person goes about his or her business quite oblivious to it. Let's look more closely at a major part of *that hemorrhage, the loss of biotic diversity*. Evolution and co-evolution, which is the reciprocal evolutionary interactions of ecologically intimate organisms, have produced the vast variety of life forms that make up Earth's biotic resources and that comprise the extraordinary richness of tropical forest communities.

As humanity destroys biodiversity in tropical forests and elsewhere, it reduces the pool of genetic variability needed to stay in the game of high yield agriculture. The loss of biodiversity also deprives us of tools that might help in the struggle to feed ever increasing numbers of people. For example, only a few of the more than a quarter million kinds of plants that exist have been investigated for their potential as crops. *Many other opportunities for creating new foods are doubtless out there in the library, awaiting discovery and development*. But the destruction over the next few decades of the tropical forests promises to remove permanently virtually all possibilities of benefiting from that part of the genetic library. Growing human populations are not only eroding the basis of agriculture, they are destroying the source of many of the most effective medicines, compounds such as aspirin and quinine were evolved as plant defenses.

About a third of all prescription medicines are either plant defensive chemicals or chemicals modeled on them. Moreover, the chemicals present vary both from one plant species to another and among populations of the same species, so preserving different populations is as important as preserving representatives of each species. *Conceivably, every time a square mile of tropical rain forest is burned, a drug with potential to help treat cancer or AIDS or some other deadly or crippling disease is lost forever.* Human overpopulation contributes in many ways to the destruction of rain forests and the species they contain, ironically compromising the chances for those increasing numbers of people to live long and productive lives. But the extinction of populations of plants and animals *often disrupts ecosystem services* well before entire species are seen to be threatened. The extermination of plant populations, for instance, can change the climate locally and also have severe regional effects through disturbance of the hydrologic cycle.

Humanity is not only rearranging the biotic systems of Earth, its impact on the planet's physical makeup is far from negligible. For some time, civilization has been mobilizing many minerals at rates much faster than geologic processes such as erosion and weathering. Even in the mid-1960s, humanity was mining iron at a rate roughly twelve times faster than it was being eroded from Earth's crusts by rain and rivers; four times as much manganese was being mined, fifteen times as much lead, and thirty times as much phosphorous. Those rates have continued to rise in the last two decades. This evidence from physical systems, as well as changes in cycles of nutrients such as carbon, nitrogen, and phosphorus, and in concentrations of atmospheric gases, reinforces conclusions based on the scale of the diversions and losses of biotic production. Altogether, they show unequivocally that *humanity has truly become a global force threatening the very habitability of Earth*, its ability to support civilization.

Homo species seems to be planning to double its population again well before the end of year 2050. Many people talk of a quintupling of economic activity, in order to allow for taking care of the additional people and raising standards of living. Such an expansion implies an *assault on global biodiversity* far beyond that already observed. Given current technologies and those that can be foreseen, the planet could not support a quintupled level of human activity for even a brief time. As any banker or businessman knows, one cannot continue to spend capital at a rapid and increasing rate for very long without going bankrupt, no matter how rich one is at the start. But society seems unaware that it is swiftly squandering its inheritance. Worse yet, in the process of expanding its capital, humanity is steadily degrading the systems that supply it with income. *We're eating the goose that lays golden eggs. Not a very clever course for a species with the hubris to call itself Homo sapiens.*

Continuous study and reinvestigation of cities throughout Palestine have helped to establish the sequences of habitation and destruction, to refine knowledge of the urban culture and architecture, and to define the settlement patterns of the inhabitants and the migrations of new peoples into the area. For example, past research at *Megiddo* and Jericho and recent investigations at Bab edh-Dhra and Numeira have disclosed much about the early Bronze Age civilization of the 3rd millennium BC. Dead Sea with towns of Bab edh-Dhra and Numeira could teach us some hard lessons. Nothing could live out there. *Are we moving toward our own extinction? Perhaps, story of Sodom and Gomorrah is revisiting – Planet Earth is doomed.*

Famine in Egypt-The Global Catastrophe

Genesis 41:53-57, reports a terrible environmental and ecological event in the history of the world, famine, seven years long of relentless pain of hunger and death, “the seven years of abundance in Egypt came to an end, and the seven years of famine began, just as Joseph had interpreted the dreams. When all Egypt began to feel the famine, the people cried to Pharaoh for food. Then Pharaoh told all the Egyptians, “Go to Joseph and do what he tells you.” When the famine had spread over the whole country, Joseph opened the storehouses and sold grain to the Egyptians, for the famine was severe throughout Egypt. And all the countries came to Egypt to buy grain from Joseph, because the famine was severe in all, the world. The global catastrophe and only one source of hope: Joseph and his stuffed granaries.

Joseph the Egyptian is in the position of savior of life on Earth, but he will not dispense his bounty freely. Selling with prices no doubt shaped by the facts of monopoly and extreme scarcity, Joseph is saving life by making Pharaoh rich and, soon, all-powerful. While we may applaud Joseph’s forethought, we are rightly made uneasy by this man who profits from exercising his god-like power over life and death. As we see in the Bible, it is a power Joseph rather enjoys exercising. He is the center of the world stage. He alone has the authority and the power to command events. All peoples from all the lands come and do as he directs. Once, Joseph had dreamt of precisely such mastery. Now he no longer has need for cheering dreams.

The story tells us that, Egypt would enjoy seven years of plenty, but these were to be followed by seven years of famine. To prepare for the lean years ahead, the king put Joseph in charge of storing up and distributing food. He was now a high official himself, second only to Pharaoh. His plan to deal with the famine has made him the chief of sheaves in Egypt. Bedecked in Egyptian garb and clean-shaven, Joseph at last comes into his own, not as a ruler in Israel but as an Egyptian demigod. His original, and as it were Egyptian, dreams of mastery have been realized, through his ability to interpret and carry out the dreams of the Egyptian sovereign. But the

very same famine that elevated Joseph in Egypt threatens to destroy his family in Canaan, driving them toward a new encounter with Joseph; this time on Egyptian soil.

We read in Genesis 42:1-3, “When Jacob learned that there was grain in Egypt, he said to his sons, why do you just keep looking at each other? He continued, I have heard that there is grain in Egypt. Go down there and buy some for us, so that we may live and not die.” The trip Jacob’s sons will take will produce the first full encounter of Israel and Egypt. The brothers arrive in Egypt amongst a great throng of people, all seeking relief from the famine, all seeking to buy grain. Necessarily, they must come before Joseph, the master of the land. As Joseph looks out over the crowd of suppliants bowing before him, he picks out his brethren with no difficulty. But their arrival, in fact, presents him with a difficulty. Joseph’s emotions on recognizing his brothers are, almost certainly, already quite complicated. He may be glad to see them, yet angry and eager for revenge. He spoke roughly with them. He may be sad to see them brought low, yet vindicated in seeing them bow before him, as he dreamt in his adolescent years.

He may be delighted by the opportunity to make them atone for their sin, yet also guilty for his part in provoking their anger. He may be eager to toy with them, but confused about how to do so. And he may be moved by some residuum of family feeling, yet afraid of the implications of the fact that he is their relation. This last point deserves emphasis. For in recognizing his brethren, Joseph also recognizes himself as their brother, as a man who once belonged, and still somehow belongs, to a different world; with different Gods and different ways; from the world of Egypt into which he has so successfully been assimilated. Can he afford to have them expose him as a Hebrew? The arrival of the brothers from the old country could jeopardize everything he has struggled to achieve.

Joseph charges them of spying. The brothers quickly deny the spying charge, insisting again that they have come to buy food. But Joseph presses his case and repeats the charge. They now compelled to say more than they did before and to elaborate their familial defense. “We thy servants are twelve brothers, the sons of one man in the land of Canaan, and, behold, the youngest is this day with our father, and one is no more.” (Gen 42:13). In this reply, the brothers add significant details; they give their number, identify their father’s home, mention the existence of a missing younger brother Benjamin; specify that he is alive and well and living with their living father, and reveal that they believe that their other absent brother; namely, Joseph is dead. Joseph endured everything with patience from slave to his ultimate vindication and triumph.

Egypt, after all, did not depend on the altogether undependable rainfall in Canaan to water its crops; it had Nile, the perennial river. So, when there

was a shortage of food in their own land, Canaanites could always make their way southward; they were probably not a strange sight to Egyptians. Indeed, Egyptian records report on a period when some Western Semites, *known as the Hyksos*, actually took over control of Egypt for a century or so, approximately 1670-1570 BCE. These foreigners, Hyksos is actually the Greek form of an ancient Egyptian phrase meaning “rulers of foreign lands,” appear to have gained control of a large area of Egypt and established their capital at Avaris, in the Nile delta; their rule extended to Memphis, Hermopolis, and other cities. It would be tempting to identify Joseph and his family as part of this non-Egyptian, Western Semitic population, but that would enquire a leap of the imagination; most scholars find it more prudent to suppose that the historical memory of such a period of Semitic rule in Egypt helped to shape either the original tale described above or its application in the Bible to Joseph and his brothers.

The story of Joseph and his brothers has ended happily, at least for now. Despite all that has happened, Jacob cannot help but love his son. No matter what Joseph may feel and do toward him, Jacob for his part has been and will continue to be alive as a father to his son. Jacob is revived as Israel, after hearing, Joseph is alive. Israel will go to Egypt, not intending to become Egyptian, but simply to reunite the bond between father and son. Old Israel goes to Egypt on his own terms. But will he like what he finds there? Will Israel and his people be able to preserve their identity and independence in Egypt? These are questions that, although he does not openly consider them, may soon cross Jacob’s mind. They surely cross the mind of reader.

Famine, drought and water and food problems are very often mentioned in the Bible. The deliberate cultivation of plants for food is thought to have been first practiced in Asia Minor and the Near East. The earliest farming communities grew wheat, barely, and rye, all the grasses native to the region, as well as pulses, various kinds of beans and peas, and fruits. A second center of agricultural development, based on rice, is believed to have originated at about the same time in Southeast Asia. A third, independent invention of agriculture, based on potatoes and maize, occurred in the New World several thousand years later. Although the archaeological record shows farming villages in the Near East appearing rather suddenly, the development of agriculture was very likely a gradual process, arising from the increasingly intimate knowledge by the food gatherers of the ecology of their preferred food plants.

Deliberate planting of seeds and casual weeding of competing plants in favorable places presumably led, through repeated beneficial results, to human groups carrying out these activities in a more and more systematic fashion. And over many centuries, by choosing and planting seeds primarily from individual crop plants with desired traits, early farmers slowly transformed plant species from their wild forms to much more productive

ones, to the domesticated crops familiar today. But nomadic herding culture in some semiarid regions unsuitable for cultivation may date as far back as the earliest farming. Bible has full of references about the nomadic tribes, starting from Abraham who came from the city of Ur of the Chaldeans. Like the development of agriculture, that of herding may have been a gradual process, as groups of people following migrating herds step by step asserted control over the animals, while protecting them against other predators.

However the processes may have occurred, farming and herding represented a radical new departure in the ability of human beings to manipulate their environment and the renewable resources on which they depended. The planting of crops meant, first, a replacement of the natural flora. By extension, it also spelled the displacement of much of the animal life that had depended on the flora, although some other animal species, pests, were favored by the bountiful new plantings. The advantages of the new way of life to the first farmers were quite clear. Food supplies were more dependable and much more abundant; many times more people could be supported by the agricultural production of a given area of land than through *hunting and gathering*. A settled way of life, as necessitated by farming, was a more secure existence than constant wandering in search of food. But the settled life and the more easily digested foods produced by agriculture may have enabled mothers to wean their children earlier and thus to bear infants more often. In any case, some food supply, greater security, and more frequent childbearing, led to a gradual expansion of the human population.

After a time, farming became so efficient that one farmer could produce enough food for several people, a circumstance that permitted some people to specialize in other occupations and eventually made possible the development of towns, cities, and governments. Mining and metalworking were among the new occupations; these marked the first important use of nonrenewable resources, the first inroads on our capital inheritance. The use of metals undoubtedly contributed to more efficient farming, as well as providing weapons for protection against other, hostile human groups. Because metals are unevenly distributed in Earth's crust, their use also presumably stimulated trade over long distances and, quite likely, the spread of ideas and technologies among different groups.

Not long after cultivation of crops began, people learned to channel supplies of surface water in areas where rainfall was sparse or unreliable. Some very early farming cultures developed complex irrigation systems to divert water from streams and rivers to the fields, another instance of human manipulation of a renewable resource. The ancient Sumerian culture of the Tigris and Euphrates valleys (in what is now Iraq), some five thousand years ago, was based on irrigation. One cause of the demise of that early civilization is believed to have been the result of centuries of irrigation; an inexorable accumulation of salts in the soil and siltation of the extensive irrigation systems.

The Mediterranean basin, once heavily forested and well watered, then converted to agriculture, supported the ancient Egyptian, Phoenician, Greek, and Roman civilizations, among others. But, over the centuries, deforestation, over-cultivation, and overgrazing by domestic animals led to a gradual depletion of soils and possibly contributed to a gradually drier climate. These are the factors perhaps, contributed the drought and famine in the land of Canaan during the time of Jacob and his sons. These fading of those once-brilliant civilizations may have been due in part to such *environmental damage and depletion of the renewable resource base*, although sources are not adequate to make judgments on the degree of responsibility. The exception was surely Egypt, whose civilization outlasted many others, because the fertility of its soil was continually restored by the annual floods of the Nile. Historians trying to explain why past civilizations rose, flourished for a time, then usually declined or fell prey to some conquering outside force have customarily looked for causes in social, economic, or political factors. Rarely have they considered population pressures, and their contributions to environmental deterioration and depletion of resources, as underlying causes of a civilization's downfall.

Yet numerous contemporary accounts documented problems with soil erosion, recurring floods and droughts associated with deforestation, and so forth. The Greek philosophers described such processes and warned of the consequences of continued deforestation and of overgrazing, especially goats. *The mighty Roman Empire itself was the victim of ecological and environmental problems of its heyday.* The warnings went unheeded. Such phenomena were not confined to the Mediterranean basin. Similar damage to natural resources, though even less well documented, seems to have destroyed a thriving early civilization in the Indian subcontinent, now the desert in Pakistan. *India today is nearly a desert, its soils thin and poor, the vast majority of its original forests long vanished. It is predicted, in South India, Northeastern Tamil Nadu, Tiruvallur, Kancheepuram, Chinglepet, Vellore, Tiruvannamalai, Tirupattur, Salem and Dharmapuri districts will see desertification in 50 years.*

Deforestation, followed by floods and droughts and other environmental changes in densely populated areas, was also recorded by the ancient Chinese; they are problems that plague China to this day. And some scientists think that intensive cultivation of erosion-prone tropical soils was a major factor that led the collapse of the *Mayan civilization in Central America*. Well, famine is on around the world, also in Egypt – but no Joseph, and even if he is, he may not save his own country Egypt from hunger.

Too Many People-Over Population

God has revealed his identity throughout time in many ways but in a privileged way through the dynamics of revelation as manifested through

the Hebrew people, recorded in the Bible, in the book of Exodus. In the struggles for freedom, identity, and land of the Hebrew people, God was acting and speaking on behalf of the poor and dispossessed of the world, who are often the victims of the greed of the more powerful. Yet even the poor and the oppressed of this world can become cruel, stubborn, and closed into themselves. Historically, human groups have evolved through their contacts with other peoples. It is in the exchange that takes place between persons and human groups that humanity advances, yet colonized and dominated groups fear contact with dominant powers because they fear that their ways will be destroyed and they will cease to exist, a type of ethnocide.

Jacob's descendants remained in Egypt and grew numerous. Eventually, a new king arose who feared this foreign population; he set out to enslave them and to prevent them from further increase. At first, he ordered the Hebrew midwives to kill any newborn boy that they delivered. The midwives, however, made an excuse not to carry out this order, so Pharaoh instead issued a general decree to the entire population to cast any new born boy into the Nile. We read in Exodus 1:6-22; "Now Joseph and all his brothers and all that generation died, but the Israelites were fruitful and multiplied greatly and became exceedingly numerous, so that the land was filled with them.

Then a new king, who did not know about Joseph, came to power in Egypt. "Look" he said to his people, "the Israelites have become much too numerous for us. Come we must deal shrewdly with them or they will become even more numerous and, if war break out, will join our enemies, fight against us and leave the country." So they put slave masters over them to oppress them with forced labor, and they built Pithom and Rameses as store cities for Pharaoh. But the more they were oppressed, the more they multiplied and spread; so the Egyptians came to dread the Israelites and worked them ruthlessly. They made their lives bitter with hard labor in brick and mortar and with all kinds of work in the fields; in all their hard labor the Egyptians used them ruthlessly. The king of Egypt said to the Hebrew midwives, whose names were Shiphrah and Puah. "When you help the Hebrew women in child birth and observe them on the delivery stool, if it is a boy, kill him; but if it is a girl, let her live."

The midwives, however, feared God and did not do what the king of Egypt had told them to do; they let the boys live. Then the king of Egypt summoned the midwives and asked them, "Why have you done this? Why have you let the boys live?" The midwives answered Pharaoh, "Hebrew women are not like Egyptian women; they are vigorous and give birth before the midwives arrive." So God was kind to the midwives and the people increased and became even more numerous. Then Pharaoh gave this order to all his people; "Every boy that is born you must throw into the river, but let

every girl live.” It was at this time that Moses was born. Historian Josephus reports, that Hebrew people, were too many and their quality of life in decline, giving rise to slavery, hunger and disease. They were forced to labor and prone to systematic elimination of their race.

Our society wakes up to population-environment trends that now threaten civilization. *India’s population would continue to grow until almost the end of this century, and when it stopped India would have about 2 billion people.* Picture what monsoon failures would mean to 2 billion Indians! While the need for population control is finally becoming clearer to some of those in power, achieving it is as difficult as ever. Indeed, the longer we dillydally, the harder it will be. Children are highly valued for powerful economic reasons in peasant societies, a factor that has been barrier to family planning success in many developing nations. Children are needed as a source of labor or income while young and as social security for their parents’ old age. In societies where as many as 25 percent of all children die before reaching their fifth birthday, large families are seen as necessary to ensure that some will survive to be adults. Today, more children survive than in the past, but infant mortalities in the poorest nations are still high and the compensating tradition persists.

China’s population has crossed 1.1 billion in 1989, 1.5 billion in 2000 and 1.7 billion in 2008. China has severe pollution problems because of its dependency on coal for energy, with falling grain production, and with natural ecosystems already severely compromised by massive deforestation, destruction of wetlands, and desertification, any population increase is too much. China’s future is a big question mark despite its great and effective effort to overcome its overpopulation.

India, the nation that by the end of this 21st century may challenge China as the most populous on Earth, made dramatic increases in wheat production between 1965 and 1995, thanks to its Green Revolution. *And water levels in aquifers are dropping rapidly in many areas.* In the south in Tamil Nadu, water tables fell 80 to 100 feet between 1975 and 1985, and 100 feet to 800 feet between the years 1986 to 2008, and overdrafts of aquifers through tube wells may threaten India’s breadbasket in Haryana and Punjab. The reduced water-holding capacity of eroded land leads to more runoff and less recharge of aquifers. On the positive side, considerable potential remains for expanding irrigated land on the plain of the Ganges River.

Exodus 2:23-25 reads, “During that long period, the king of Egypt died. *The Israelites groaned in their slavery and cried out,* and their cry for help because of their slavery went up to God. God heard their groaning and he remembered his covenant with Abraham, with Isaac and with Jacob. So God looked on the Israelites and was concerned about them.”

Slavery and Racism

Many people believe that racism and prejudice are things of the past in this country, that civil rights legislation and greater enlightenment have conquered discrimination. It is true that things have changed in the past ten or fifteen years. But it is also true that racism is still rampant both in this country and around the world. Many of us live with an illusion that all the problems have been solved and that we enjoy racial harmony in this land. But the minority press does carry full coverage of racial injustices and minority people are deeply aware of the crippling extent of racism in their own lives and elsewhere.

It is clear that racism and racial prejudice exist everywhere. No country is spared it ranges from the black racism of Uganda to the white racism of South Africa and Rhodesia. Racism exists in the Brahmins of Tamil Nadu to the Yadavas of Bihar. Racism festers between Protestants and Catholics in Ireland, between Muslims and Christians in Lebanon, between Arab and Israeli peoples in the Middle East, between French-and-English speaking Canadians, between the Flemish and the Walloons of Belgium, between Catholic priests and their Bishops. How did we get that way? Why do we who think of ourselves as good, kind, decent human beings allow racism to continue among us when it not only destroys the victims, but also, if we could only see it, destroys us. The problems of racism have not been solved and they will never be solved until we can learn to communicate with one another.

As in the past, if a minority person tells us truths about ourselves that offend our prejudices, we promptly brand that person “arrogant” or “uppity” and try to get rid of him. I believe that only through deeper awareness and understanding can we hope to cure the wounds that racism causes in ourselves as well as in those whom we hurt through our prejudices. When we were still young, perhaps six or seven, society, in the kind and gentle voices of our parents, grandparents, aunts and uncles, did a terrible thing to us. We learned to label the minority people as “the other.” We saw them as “other” and “different” and “not like us”, and always that implied that they were somehow inferior to us. Similar patterns hold true everywhere.

In Nazi Germany the non-Jewish child was brought up to view Jewish people as “other.” In Ireland today the Protestant child is taught to believe that the Catholic child is “other,” and the Catholic child is taught to see the Protestant child as “other.” We find the same pattern when we hear people refer to the French as “immoral” or to Mexicans as “lazy” or to any group as possessing “racial characteristics” of a degrading nature. And once we believe that a group of people is “different” then we can believe that they do not need or deserve the same rights and liberties we always claim for ourselves. Many of us go through life without ever realizing how deeply tainted we are by these prejudices.

The patterns of racism are identical regardless of where or when they occur and regardless of who victimizes whom. Racism always involves an injustice committed by one person or group against another person or group for reasons of race, color, religion or political ideology. It is fatal in the end because it always works to damage both groups. The more racism succeeds, the more it damages both the racist and his victims. We know quite a lot about racism. We know, for example, that prejudice exists at the irrational level, placed in us as early learned behavior patterns. It is so deeply formed in us that many tend to view prejudice simply as part of human nature, which it is not at all. We also know that we could no longer blame racial injustices on the “trash,” as we had always done in the past. We know that the world was full of people who are beautifully educated and who can handle reason superbly in every aspect of their existence except for a deeply held prejudice. When you approach people in this area of prejudice, their response tends to be immediate, emotional and irrational, and they seem impervious to scientific data. No, it isn't just the trash.

We have people of great distinction who are racists, religious in administration, who hold public office; political leaders, professional leaders, judges, and educators. Unfortunately, we sense these evil forces all around us and expect to live on as if nothing matters. Even more than that, we are well aware of the ugly prejudices people have against these “other people.” People called them ugly names, kept them out of many places because of their race, ridiculed them because of their vulnerability, told them, they could not make it in school or in society because they were not smart enough, and kept them out of seminaries and convents because they were not ethnically pure or holy enough to be there. Their own were never present in positions of leadership in their church, schools, or society, as if God himself did not trust us. Ironically Jesus called 12 disciples, who were of one race and the race of Jesus; and all of them were Jews. We know without any doubt that our own formation, no matter how benevolent, had filled us with prejudices at deep levels that had probably handicapped us for life. We might never see fellow human beings in their true light, simply as people.

Our prejudices have in a way shaped our life around neighbors and most of the times we come out with the verdict, guilty in our interactions between them. And since we cannot admit guilt, we cannot admit our prejudices, even to ourselves. Perhaps we must rethink this. There is not necessarily any guilt attached to having the prejudices, since most of us are no more guilty of acquiring our prejudices than we are guilty of acquiring a disfiguring pockmark from some childhood illness. We got both when we were very young and before we could do anything to avoid them. But prejudice becomes a source of unspeakable guilt when we allow it to cloud our intelligence and to goad us into cooperating with unjust actions against other human beings. All men face the same fundamental human problems of loving, of suffering,

of fulfilling human aspirations and of dying. These are common denominators in all people of all cultures and all races and all ethnic categories. One of the truly tragic by-products of racism is that it leads some people to make it more difficult for others to resolve these problems, and for no reason that makes any sense.

Today minority people can eat and sleep almost anywhere and can use un-segregated places in the church or in the cemeteries. But deeper problems of discrimination in employment, housing, schooling, banking, business, health services, churches and courts remain massive and crippling. Such discrimination makes itself felt in thousands of subtle ways that the laws have not touched and probably cannot ever touch. So, minority people continue to bear the burdens of injustice which spring from a racism that goes largely uncorrected in most contemporary societies. But despite massive efforts to make this country live up to its promise of equal justice and equal opportunities for all, prejudice and discrimination continue to plague minority people, as it does to this day. The prejudiced simply found ways to get around the civil rights laws.

The society expected, the minority were to be docile servants of the dominant society. We, in our hearts knew this was not right, and since many of the people who treated us as if we were inferior and unworthy apparently were good people, we could only attribute their ugliness toward us not as malice but as a result of a much deeper evil. In time we would come to recognize this deeper evil as structural sin, as structural violence, which leads good people to do bad and horrible things while being convinced they are doing a right thing. It is this structural evil that distorts, confuses, and sometimes even perverts our image and appreciation of others, of God, and worst of all ourselves. It is this structural evil that blinds people from seeing the truth (Mt 23:16-26, Catechism 399). Wasn't this exactly what happened to the good and holy people who condemned Jesus as diabolically possessed, as a blasphemer and a common criminal, while they were convinced they were speaking for God? Wasn't this the very "sin of the world" (John 1:29) that Jesus came to demolish, the very structures of society, in a special way the very hierarchy in a organized religion, which we are all familiar with, and that could not appreciate him and ultimately killed him?

As a result of this kind of cheating, our country has gone from good solutions to poor solutions in many instances. Alienation and separation are the decrees towards minority. A first principle of racism is that you "blame the victim." In Nazi Germany, Jewish people were blamed for everything that was wrong with the country, even their own holocaust. The same holds true everywhere. What suppressed minorities the world over have learned is that the racism directed against them has little or nothing to do with what they do or fail to do, that discrimination against them does not depend on them but on the political and economic climate as a whole. Today, the deepest

frustration of minorities comes from this fact. They are being blamed for conditions which they in no way caused. This takes its terrible toll on all of us, on the very climate of human civilization.

Why do people still cling to the prejudices that poison them as well as their victims? We ask this question again and again. What sense does it make to go on perpetrating a system that prevents fellow human beings from becoming fully-functioning and fully-contributing members of society? Some people say it is human nature. These prejudices spring from those early learned behavior patterns in which the children of one culture learn to view the children of other cultures as “different.” This dehumanizes them by destroying their respect for the lives of those who appear to differ from them. Until we see this and learn to break the vicious cycle that it perpetuates, we have little hope for durable solutions. Understanding the cause of the problem is half the battle. Serious people now understand that the problems of racism need the best minds and the best attitudes of all people, the oppressor and the oppressed.

Thank God these people are cautiously opening up communications once more. The question keeps pounding within my head and in my heart; Who humanly speaking, was Jesus of Nazareth, and why did God become this very particular, stereotypically marked human being in order to be the savior of the World? What is the saving element of his earthly identity? After all, God is conquering and colonizing empires of this world, but, through the marginal poor of the colonized peoples of the world. Yet he did not convert the colonized into colonizers but allowed them to initiate something new that would go beyond the categories of colonizer-colonized. Jean Lacroix, the great French philosopher of communications has said that before we can authentically communicate with one another we must first “open ourselves to the other.” I believe that before we can truly dialogue with one another we must perceive intellectually and then at the profoundest emotional level that there is no “other”, that the other is simply oneself in all the important essentials. In India, an actor turned politician MGR would say, “There are only two races; man and woman.”

Ten Plagues – They’re revisiting

Blood, frogs, flies, dead livestock... locusts swarm... rivers turn to blood... fire rains from the sky. The ten plagues of Egypt are described in Exodus, Chapters 7 to 11. At first sight one might imagine that the plagues took place in succession within a few weeks, but causal notes of time, as well as the nature of some of the plagues, would suggest that several months, even several years may well have been involved. It is clear that the plagues increased in severity and intensity, until the climax came in the death of the firstborn. The 10 Biblical Plagues seem to be recurring right now. And the more we seek answers, the more we question our own beliefs. We must

uncover the truth, because the Plagues are counting down and time is running out. What we do know is that we are witnessing biblical events. God sent the plagues as warnings to the Pharaoh to let His people go! But what is he supposed to be saying now? The Pharaoh's sorcerers used magic to match God, plague for plague, evil against good. Perhaps, we should look for sorcerers to deal with the existing ecological, environmental problems.

In 1400 BC a group of nervous Egyptians saw the Nile turn red. But what they thought was blood; but was actually an algae bloom which killed the fish, which prior to that had been living off the eggs of frogs. Those uneaten eggs turned into record numbers of baby frogs, who subsequently fled to land and died... Their little rotting frog bodies attracted lice and flies. The lice carried the bluetongue virus, which killed 70 percent of Egypt's livestock. The flies carried glanders, a bacterial infection which in humans causes boils. Soon after, the Nile River Valley was hit with a three-day sandstorm... otherwise known as the plague of darkness. During the sandstorm, heat can combine... with an approaching cold front to create not only hail, but electrical storms... which would have looked to the Egyptians like fire from the sky. The wind would've blown the Ethiopian locust population off course... and right into down town Cairo. Hail is wet, locusts leave droppings... spread both on grain and food, and you've got mycotoxins. Dinnertime in Egypt meant the first-born got the biggest portion... which meant they ate the most toxins, so they died. These are ten Plagues and these are ten scientific explanations.

1. Water turned blood, red algae, fish die (water related problems).
2. Frogs, too many, not enough food, death, stench (Hunger).
3. Gnats, biting humans and animals (New diseases).
4. Flies, flies in Pharaoh's and official homes (Drought).
5. Livestock diseased, horses, herds (Anthrax, Bio-weapons).
6. Festering boils on humans and animals (Global Warming).
7. Thunder and hail, fire came down on the earth (Nuclear weapons).
8. Locusts, eating crops, settled on the land (Famine).
9. Darkness, 3 days (CO2, smog, fog, water molecules).
10. Every firstborn shall die, Pharaoh's son (Armageddon).

Ten plagues are not only the historical events, but they're recurring! Ten plagues in the form of hunger, famine, disease, war, human activity still continue to haunt every country on planet Earth.

Chhandogya Upanishad reads, *“The essence of all these beings is the Earth; the essence of the Earth is water; the essence of water is plants; the essence of plants is a person; the essence of a person is speech; the essence of speech is the Rig-Veda; the essence of Rig-Veda is the Sama-Veda; the essence of the Sama-Veda is the Udgitha which is Om.”*

Chapter - Seven

Some of the Ecological and Environmental issues in NT

Biblical scholars use a German phrase “*Sitz im Leben*” (*life situation*) to ascertain a historical situation to a literary form from the Bible. I would like to add one more word to it: “*Wissenschaftliche Sitz im Leben*” (*scientific life situation*). God used the scientific mediums like gravity, electromagnetic force, strong and weak nuclear forces to create the world. The world he has created is still under the physical and scientific laws and God continues to create with the same medium. To all of this, evolution added one important fact; namely, that our biological origins are material as well. In a scientific sense, it is certainly true that the world runs according to material rules, that we are material beings, and that our biology works by means of the laws of physics and chemistry. *What if the regularities of nature were fashioned in a way that they themselves allowed for the divine?* All these sciences like, biology, sociobiology, were intended when God created the universe from Big Bang. If the Creator uses science, physics and chemistry to run the universe of life, why wouldn't He have used physics and chemistry to produce it, too? In that respect science is supplying lots of evidence to God's presence and the PDR Code is consistent in all the new inventions.

The Biblical text comes to life viewed from the scientific perspective. We tend to speak very often about the stuff we're interested in. It may be motivated by an academic learning, work, hobbies, interest and curiosity. By listening to someone talking at great length, one could decipher lots of information about him, his career and even his character. Jesus talks very often about plants, animals, rocks, food, housing, water, illness, kingdom, sin, suffering, and death. The focal point is on the ‘*Natural World*,’ conservation of all life in fullness and conservation of God's Grace in the natural world. The whole concept of salvation and redemption is designed by God solely for this purpose, ‘that nothing should be lost, whatever God created.’ One could never become more ecological and environmental than Jesus Himself. Jesus' parables were meant also to provoke thought (scientific) rather than diminishing into just a parable.

Over-Fishing to Fishers of Men

The Sea of Galilee is Israel's largest freshwater lake, approximately 53 km in circumference, about 21 km long and 13 km wide; it has a total area of 166 km and a maximum depth of approximately 43 meters. *At 209 meters below the sea level, it is the lowest freshwater lake on Earth.* It is not a sea by any normal definition; it is called a sea by tradition. The lake is also known on modern maps as Lake Galilee or Lake Tiberias. Capernaum was located near the northwestern shore of the Sea of Galilee. Capernaum (or Kefar Nahum) which played a sizeable role in the ministry of Jesus was a

center of that fish industry. The other lake towns of note among the 9 cities that flourished on shores of the Sea of Galilee were Bethsaida which means “the fishing house”, and Tiberias the capital of Galilee, a gentle town constructed by Herod Antipas in 17 AD when Jesus was a young man. From the fishermen of the Sea of Galilee, came at least, four of the twelve apostles; Peter, Andrew, James and John. Mary of Magdala, the first human to see and speak with the savior after his resurrection was from the town of Magdala on the western shore of the Sea of Galilee. Magdala was a prosperous fishing village at the time Jesus was active in this region. Its location on the ancient road made it strategically important. The water springs nearby, fertile land and fishing industry, all these made it the center city of one of the three Galilee regions in the Jewish Kingdom prior to the Romans.

It was here that he performed many miracles. Jesus stilled the raging storm on the Sea of Galilee that was about to swamp their boat. He walked on the stormy water to his disciples, preached the Sermon of the Mount and performed the miracle of the draught of fish. The constantly mild climate and the lake resources have made this an important site since antiquity. It has been plentiful source of sustenance and has witnessed many historical dramas. During the 1st century, the Sea of Galilee was a major commercial significance (fish industry). Many Galilean roads passed by it and much travel to and from the east crossed the Jordan Rift there. *Fish was a major food source in the area and the fishing industry flourished because there was no other significant freshwater lake in the entire region. Fishing on the Sea of Galilee and the River Jordan was a huge industry.*

During their exile in Egypt, the Israelites learned to prize fish from the Red Sea and for the people of the Old Testament, there were precise dietary laws for seafood. Three types of fish were primarily sought by fishermen in antiquity in these waters. Sardines likely were the “two small fish” that the boy brought to the feeding of the 5000. Sardines and bread was the staple product of the locals. Barbels are so known because of the barbs at the corners of their mouths. The third type is called Musht but is more popularly known today as “*St. Peter’s Fish.*” This fish has a long dorsal fin which looks like a comb and can be up to 1.5 feet long and 1.5 kilograms in weight. In the Pacific regions or in small lakes in the North America, St. Peter’s Fish are known by the name Tilapia or more often than not, Sunfish. This fish tends to absorb the flavor of the water it is raised in.

In the Stone Age, people didn’t need to find salt, because they were hunting a lot of their food and eating a lot of red meat. Red meat has plenty of salt in it naturally, without having to go find any extra salt. But when people began to farm, about 10,000 BC, they started to eat mainly grains like rice and wheat and barley and millet, and very little meat. Then they really needed another way to get salt. And when people began to keep cows and sheep, they needed to feed the animals salt too. Salt was also used to preserve

all different kinds of food, because there were no refrigerators; you use salt to make bacon or ham or salted fish. The earliest evidence we have for people producing salt comes from northern China, where people seem to have been harvesting salt from a salt lake, Lake Yuncheng, by 6000 BC and may be earlier. In Egypt people were using salt to preserve meat and fish by about 3000 BC, around the beginning of the Old Kingdom. *The Egyptians also used salt to preserve mummies. They evaporated seawater from the Mediterranean Sea and also bought salt from Libya, Tunisia and Nubia.* The Etruscans of Italy and the early Romans and the Carthaginians in North Africa, also used evaporation to produce salt. As the Roman Empire expanded, the Romans took over the Celtic salt mines and used that salt to help feed poor people in Rome.

Roman archives mention a name, “*Fish of Magdala.*” It was a very famous fish throughout the Roman Empire. With the invention of salt and the preservatives, people could catch enormous amounts of fish and store them for later use. *So, over-fishing created a big ecological problem in the times of Jesus. The Sea of Galilee did not have enough fish. The Gospel according to Luke reports the absence of fish in the Sea of Galilee.* Prior to the mission, Jesus came to Capernaum and met lots of fishermen who were sitting idle, not fishing. In fact, they were out of work, because there were not enough fish in the lake. In Luke 5:5 Simon said to Jesus, “Master we’ve worked hard all night and haven’t caught anything.” In John 21:3-5, Peter called other disciples to go fishing. They went out and got into the boat, but that night they caught nothing. Early in the morning, Jesus stood on the shore, but the disciples did not realize that it was Jesus. He called out to them, “Friends! Did you catch any fish?” “No” they answered. These biblical texts suggest *the presence of an ecological problem of over-fishing.* Jesus understood the problem and wanted to do something about it. If you want to stop the exploitation of over fishing, you’ve got to create alternative jobs for the fishermen. *Jesus created new jobs for them. Mathew 4:19-20 reports the call of the apostles. Jesus said, “Come after me! I’ll make you fishers of men.”* At once they left their nets and followed him. I love the fact that Jesus chose fishermen to be his first disciples. They were the perfect guys to build a ministry. They never seem to give up and even in bad times, they put their boat out again and again, looking for that big catch of the season. I guess Jesus thought that if he could encourage them to think that way about God’s Kingdom, they would always go out looking for more converts and disciples, more followers for Christ.

We know today that fish is low in cholesterol and contains healthy polyunsaturated fats. Since there was no way of preserving fish (except by salting), most people in Biblical times ate their fish fresh, a wonderfully rich source of protein, potassium, vitamins and minerals with only a moderate amount of sodium. We also now know that eating fish: thins the blood, protects

arteries from damage, inhibits blood clots (anti-thrombotic), reduces blood triglycerides, lowers blood pressure, reduces risk of heart attack and stroke, eases symptoms of rheumatoid arthritis, reduces risk of lupus, relieves migraine headaches, fights inflammation, helps regulate the immune system, inhibits cancer in animals and possible humans, soothes bronchial asthma and combats early kidney disease. For more than 200 years, cod liver oil was prescribed for a number of ailments, including rheumatism and arthritis, because it was believed it could “lubricate the joints.”

Over-fishing or Marine-Over-harvesting: Over-harvesting is the removal of plants or animals to the point that it is challenging to maintain viable population levels. This unsustainable practice has put a number of threatened and endangered species at risk for extinction. One third of God’s creation has been used up in the last 30 years. The World Wildlife Fund estimates that in 50 years’ time, we will need another planet Earth to sustain the world’s human population if we keep using resources the way we do today. At least 70% of the world’s important fish stocks are over-exploited already. Over-harvesting can also affect other species as well, as the over-harvesting of horseshoe crabs has led to a dramatic decline in Red Knot, a small shore bird, populations. Many marine ecologists believe that the biggest single threat to marine ecosystems today is over-fishing. The reality of modern fishing is that the industry is dominated by fishing vessels with technology created over the past 50 years that is able to far out-match the ability of fish to reproduce. Bay of Bengal, Arabian Sea faces a catastrophe of emptiness in their waters. Baby Sharks, baby crabs, baby king fish are the targets of the consumer market. The lack of enforcement of laws in India continues to create great vulnerability for India’s oceans. Almost 85 percent of fish species are decimated. Future generations would be able to see all these species of fish, only in museums.

Over-fishing has depleted fish populations to the point that large scale commercial fishing, on average around the world is not economically viable without government assistance. The collapse of the cod fishery off Newfoundland and the 1992 decision by Canada to impose an indefinite moratorium on the Grand Banks are dramatic examples of the consequences of over-fishing and the tragedy of the commons. Over-fishing in the Mediterranean Sea has led to the targeting of smaller and smaller fish. We are called by God to be cautious of over-harvesting. We read in Deuteronomy, *“If you come on a bird’s nest, in any tree or on the ground, with fledglings or eggs, with the mother sitting on the fledglings or on the eggs, you shall not take the mother with the young. Let the mother go, taking only the young for yourself, in order that it may go well with you and you may live long”* (Deut 22:6-7). We are to leave the mother so that the next generation can continue and the species may continue to exist. What would happen if we continued to consume both the mother and the

young? Finally as consumers we can start choosing fish to eat that are not in danger of being over-fished as we all have a responsibility to try and protect these fragile and unique pockets of life in the ocean before they are destroyed forever.

Parable of the Laborers in the Vineyard - Unemployment

The parable of the workers in the vineyard or the parable of the laborers in the vineyard or the parable of the generous employer, was given by Jesus in the New Testament Gospel according to Mathew (20:1-15). In it, Jesus says that any “laborer” who accepts the invitation to the kingdom of heaven, no matter how late in the day, will receive an equal reward with those who have been faithful the longest. Traditionally, the parable has been treated as an allegory and taken to mean that even those who are baptized late in life earn equal rewards along with those baptized early. Besides the spiritual side, there lies also an ecologically important connection. The parable of the laborers in the vineyard deals with *the unemployment problem in the Palestine during the time of Jesus*. Parable allows us to draw more information that lies in between the lines, the real problem of unemployment and it really transcends the usual scenario of the parable. In the parable, a land owner went out to find workers for his vineyard and agreed to pay each a day’s wage. In the morning, he sees people idling in the marketplace and employed them to work in his vineyard. He did the same thing in the afternoon and the evening. Came the end of the day, by his order, his supervisor paid the workers beginning with the latter hired going on to the first hired. The earlier hired ones expected to receive more than promised since the latter ones are paid as much. However, when they are paid the same and they grumbled. The people, the landowner hired were all doing nothing in the market place. They are without work and no means to support and feed themselves and their families. “Because no one has hired us,” they answered. Most of all, they are all unwanted. But the land owner hired them all on the spot.

The earlier workers have something the latter workers do not have. They have the earlier assurance from the landowner that they will be paid while the latter workers were still unemployed. The first worker has been promised the hope of what the wage can bring for himself and his family, while the others still unwanted and uncertain of their livelihood. We may not know why the people are not at the marketplace in the morning, but as the land owner gathered the workers throughout the day, he is not concern about how much wage he is to give out because he sure can afford it, but rather how many can he hire into his vineyard. He saw the *ecological problem of unemployment and just created more jobs. At this point he is not concerned about his own financial resources but, on the other hand he gives more importance to the necessities and the livelihood of the unemployed*. “Don’t I have the right to do what I want with my own

money?” Or are you envious because I am generous?” The landowner is at worst being fair to the first workers and at best he is generous and gracious to the last workers. The burden of going out so many times personally in the heat of the sun, the landowner worked harder than anyone of the hired workers, and yet he is the generous one paying everyone else. If the rich are able to see and act, as what the landowner did, this world could be a better place to live. As the problem of unemployment continues to escalate these days, society needs more Biblical landowners who could inflict a death blow on this ecological problem.

The motto of the Benedictine monastic order is “*Ora et Labora*,” which translates directly into English as “Pray and Work.” For the Benedictines prayer is work and work is a form of prayer. The life of the Benedictine is punctuated by a rhythm of praying through the Psalms coupled with a life of work. So often maligned for distancing themselves from the ‘real’ world this group of praying monks and developing saints may be more in tune with the ‘real’ than those of us robbed of their cloistered lifestyle. More than any other times in history men and women have both the freedom and opportunity to escape the ‘real.’ Whether it be through consuming media, acquiring wealth, or self-indulgent individuality the temptation to avoid the ‘real’ is greater than ever. Beginning with the Industrial Revolution and bearing full fruit in today’s information age, humans have become increasingly separated from work within the natural world and, as partial result, relationships with God and one suffer. Our careers suffer as well.

This ‘real’ world includes the daily and mundane tasks of our work. Sometimes the pressure of our daily lives combined with the frustrations involved in our work can easily lead to cynical attitudes toward our careers. As this happen our careers and jobs are divorced from our spiritual lives. Work becomes a trial to endure rather than a place of meeting God. Into this sterile experience breaks these words from the “*Aidan Compline*” in Celtic Prayer: “*May the virtue of our daily work hallow our nightly prayers. May our sleep be deep and soft so our work may be fresh and nice?*” With these words we witness a reconnection between work, whether it be work in the field or the office, and the sacredness of prayer. The link between these two remind us that only is prayer a sacred enterprise, our work is too. Work is good, virtuous even. Our work assists in making our prayers holy! No one denies that prayer is sacred, holy work? But let’s ask ourselves: “Can our work be sacred, a form of holy prayer?” Prayer leads us to our work where we can engage God’s world and people with a new love for both. Our work brings us back to prayer where our praying both deepens and enriches our work. Entering into a sacred rhythm of hourly prayer provides an arena for our prayer life and what is often the most mundane aspect of our daily life, our work, to touch and be transformed by the other. *This is the rhythm of real life: Ora et Labora.*

Golden Age of Work and Popes

The Industrial revolution started in England with the invention of the steam engine in the late 1600's and continued with various inventions like steam locomotives, cars, textile mills and machines that can shape and treat metal. The consequences of these inventions and all they brought with them have played a vital part in how the world is today. When looking outside England the situation was very much the same for all of Europe. Less than 10% of the total population lived in cities and manufacturing was very limited. With the invention and improvements of steam-powered machinery in the textile, coal and iron industries between 1720 and 1800 profits from these respective industries skyrocketed. Agriculture also became mechanized which led to increasing harvests all over Europe. Several new banks were also founded to handle the ever-increasingly flow of money. Between 1750 and 1800 the number of banks in London more than tripled. *This led to the creation of a new social class, this was the middle class.* The middle class were a class of people who did 'intellectual' work such as being doctors, lawyers, journalists, teachers etc. these people made enough money to get by and still have spare time at their disposal. They didn't have to worry about starvation or not having enough money to pay the rent. On the other hand the lower class, predominantly the workers in the industries were poor and living in miserable conditions.

During the 1840s, England was in the peak of the Industrial Revolution. This period marked a painful time for many workers. Wealth, power and corruption were rife, and factory owners were able to exploit needy workers due to massive levels of unemployment. There was a huge divide between the rich and poor and living conditions were notoriously low. Working conditions, especially for young boys and girls, were inhumanly bad. George Williams, a 22 year old drapery merchant, made up his mind that something had to be done. He gathered together a few friends to form a society that met regularly to support each other and gain renewed strength in body, mind and spirit. The group *called itself the Young Men's Christian Association, popularly known as YMCA.* From its inception, through to the early 1900s, the focus was on the welfare of young men, and related social concerns. It would be one of the greatest associations in the history ever to be invented.

At the same time the Catholic Church was struggling in its commitment to service to God and service to man. In earlier times the primary vehicle for Catholic Social Teaching was the jurisprudence of canon law. The social doctrine of the Church became the purview of papal encyclicals during the nineteenth century when the Church struggled with the rise of the modern industrial society with its new structures for the production of consumer goods, with its new concept of a just society, with the rise of the secular state, and with the modern world's new forms of labor and ownership. The papal encyclical *Rerum Novarum* is delivered on May 15, 1891, and offered

a prospect of a Catholic labor movement. It dealt with the capital and labor and the condition of the working class. It broke down the barriers that separated the church from the worker. The working class was exploited: working long hours, poor working conditions, low wages, and the use of child labor. These workers were excluded from the benefits of their labor, and it created an unhealthy society. Many thinkers and radicals offered solutions to this problem, among them *Karl Marx and his Das Kapital*. While Marx was proclaiming religion as being the opiate of the masses for neglecting the plight of the poor and the workers in the emerging industrial society, Pope Leo XIII offered *Rerum Novarum* as a response.

Rerum Novarum was deeply influenced by the medieval philosopher St. Thomas Aquinas and his ideas of a just society. It advocated the organization of workers into unions or guilds, the right of a “*just wage*,” the right of private property, and the obligation of the government to intervene for the “public good.” Rarely had the Church spoken on social matters in such an official and comprehensive fashion. Pope Leo XIII opposes Marxism as well as capitalism with the idea of a corporate society. In such a society every group would be an essential part of the whole. This is a society in which state power is crucial, and the various social groups are interdependent. In 1876, the Protestant flank established the Patrimonium workers’ alliance. The aim of this alliance was the pursuit of harmony, and therefore it was open to both employees and employers. With the publication of the encyclical “*Rerum Novarum*”, Roman Catholic workers were given the green light to set up their own organizations. Advisors from the Church were deemed indispensable. The radical socialist labor movement took shape in 1869 as a branch of the First International. It was not until later, under the charismatic leadership of Ferdinand Domela Nieuwenhuis, that this movement gained any significance

Forty years later, pope Pius XI issued the *encyclical Quadragesimo Anno*, which amplified the themes found in *Rerum Novarum*. Issued on May 15, 1931, during the worldwide Great Depression, *Quadragesimo Anno* stated that the right of property must be subordinate to the common good and it delineated the idea of subsidiary, the idea that a greater and higher association should not do what a lesser and subordinate organization should do. At a time when communist, socialist and fascist movements were making headway in the troubled economic times, *Quadragesimo Anno* pushed for Christian workers associations to help workers conditions. Pope Paul VI *encyclical Populorum Progressio* built upon the achievements of *Rerum Novarum* and *Quadragesimo Anno*, and it was also influenced by the liberal ideas of the 1960s. Issued on March 26, 1967, *Populorum Progressio* focused on the responsibilities of former colonial powers to its former colonies, the need of the state to help the poor, and a continuation of a critique of the previous two encyclicals of the pursuit of profit without any attendant social responsibilities. Pope Paul VI calls for a

more equitable relationship between industry and labor.

Recently, Pope John Paul the II wrote three encyclicals on social teaching. *First Laborem Exercens*; It is on Human Work, issued on September 14, 1981. It focused on the themes that work is central to the social question and that work has potential not only to dehumanize but also to be the means whereby the human person cooperates in God's ongoing creation. *The second is Sollicitudo Rei Socialis*, which was promulgated on the twentieth anniversary of Populorum Progressio. It was issued on December 30, 1987. Literally means 'on social concerns' Sollicitudo Rei Socialis presented an overview of modern social problems with some guidelines for action. It dealt with authentic human development and adopted a critical attitude toward both capitalism and communism. It warned that economic development alone may not set people free but only enslave them more. *Third and the most important of all is Centesimus Annus*, which was promulgated on the hundredth year anniversary of Rerum Novarum. It was issued on May 1, 1991. Centesimus Annus brought Rerum Novarum up to date and tied it to 'the preferential option for the poor' done in the context of the collapse of communism in Eastern Europe and the Soviet Union. Centesimus Annus is still being criticized for its comments on capitalism and communism (see chapter 5 for detailed treatment).

At present, as the world deals with the fallout of the financial crisis, unemployment claims have reached historic highs. But citizens around the world are increasingly finding themselves out of a job. The global financial crisis could increase world unemployment by an estimated one and half billion people, mostly in Zambia, Senegal, Kenya, South Africa, Honduras, India and China. In India 65% of people were jobless in 1980s, and 45% in 2000. Liberia has one of the world's highest unemployment rates at about 85%.

Multiplication of Loaves - Hunger

No man can worship God or love his neighbor on an empty stomach.
(Woodrow T. Wilson)

Though this story is about truly supernatural, miraculous action, it is not about God creating something out of nothing. Mathew 14:13-21 reports a miracle of food for the hungry. Jesus spent the whole day healing people who were sick and performing miracles throughout the crowd. But when it came time to eat, the disciples did not know how they would feed everyone. The disciples can sense the crowds are getting restless. They are hungry and have nothing to eat, it seems only one little boy gave any thought to preparation. He had five loaves and two fish, but there were 5000 men, not counting many of their wives and children. When Jesus told them, "You feed the crowds," they were stunned. John 5:9 contains the important question: "There is a boy who has five loaves and two fish, but what are they for so

many?” *But that little boy co-operated with Jesus and his disciples. This miracle is all about praying, sharing, caring, co-ordination and a fine example of team work.* Jesus fed 5,000 men with only a few loaves of bread and fishes. Jesus had proven that not only could he heal people of their illnesses, he could provide their basic needs, such as food, as well. And to do this, he used what little a young boy could provide. It doesn't matter how much or how little we have, Jesus can use us for his work. We simply must be willing to do what we can for him. If God has given great compassion, as he himself exhibited by sending his Son, then how can we turn a deaf ear to those cries for hunger and social justice?

It is our responsibility to listen to those cries and with God's mercy meet those needs. It is not for us to judge, or dictate, or control, those in need, but rather because they are fragile gifts from God, we are to meet their needs. Just as he has met our needs so must we do the same! James 1:22 exhort us to be just not listeners but doers. If we delve into the news media, become more aware of the needs of those around us, then our form of ministry will grow. An ostrich can't escape a storm if its head is stuck in the sand. I think many times as those who have experienced the great mysteries of Christ that we forget to look at the reality of those near us who are crying out for relief. We can't become so blind that we miss the forest for the trees. *I remember the old saying, if it is not me then who? If it is not now when! Our society needs the mercy of God's social justice now.* Let's face it, if the only people present that day were the crowds, the boy and the disciples, folks would have gone hungry. That little meal couldn't feed many, probably just enough for the boy. But Jesus was present. When Jesus is present, he can make the littlest go a long way. *Mikhail Gorbachev once was asked about problem of hunger and his answer was "Ask Jesus Christ! He knew how to deal with the hunger of those five thousand men."* Our financial resources, talents, and holiness are clearly inadequate to meet the needs of a hungry and confused world. The gospel commands us to offer these resources anyway, trusting that God would multiply them. Who could have guessed how God would multiply the loaves and fishes offered by an Albanian nun named Teresa when she walked into the slums of Calcutta to minister to those dying in the streets.

Every four seconds, a child dies from hunger or from violence. In one day, 35,000 children become fatal victims from starvation. The gap between the poor and the rich continue to widen, and due to the decline of economic prosperity in countries especially in Africa, India, China and South America, early childhood education remains unavailable to most children. According to U.N report, "For all the countries that have the biggest number of hunger are countries that have frequent food emergencies, such as famines, and high rates of HIV/AIDS." But hunger is not only happening in the poor countries, it's also happening to industrialized countries, countries in transition,

and developing countries. The numbers of people going hungry are increasing all the time, especially the countries that have AIDS. The number of hungry people seem like they never go down. They just go up and up all the time. *The number of hungry people will be increasing from 35 millions to 65 millions in 2010.* Undernourishment negatively affects people's health, productivity, sense of hope and overall well-being. A lack of food can stunt growth, slow thinking, sap energy, hinder fetal development and contribute to mental retardation. Poor nutrition and calorie deficiencies cause nearly one in three people to die prematurely or have disabilities, according to the World Health Organization. Most of these deaths are attributed, not to outright starvation, but to diseases that move in on vulnerable children whose bodies have been weakened by hunger. Every year, more than 20 million low-birth weight babies are born in developing countries. These babies risk dying in infancy while those who survive often suffer lifelong physical and cognitive disabilities. Chronic undernourishment on top of insufficient treatment greatly increases a child's risk of death.

Yet another report confirms India's losing battle against hunger. In the Global Hunger Index (GHI) India ranks the 117th for the prevalence of underweight children. Only Bangladesh and Nepal are worse-off. Overall, India is ranked 96th out of 119 countries covered by the index, which doesn't paint a rosy picture per se. But India comes off far worse in its record for malnutrition in children, as measured by body weight. The proportion of children found underweight in India, according to the latest figures is 47.5 per cent, which makes it worse than conflict-plagued, drought-stricken Sub-Saharan Africa, where the figure is some 30 per cent on average. *India's figure is also worse than that of individual Sub-Saharan countries.* The Global Hunger Index combines three indicators: child malnutrition, child mortality, and estimates of the proportion of people who are the calorie-deficient. India ranks a poor 66th among 88 developing and transitional countries on the 2008 Global Hunger Index (GHI-2008), says a report by Washington-based International Food Policy Research Institute (IFPRI). When different states were measured on the index Madhya Pradesh was worst. Punjab, considered as India's food bowl, also figured lower than countries like Gabon and Vietnam. It could not even measure up to the poorest countries of Africa like Sudan, Rwanda or Congo. The state was marked as "*extremely alarming.*" Startlingly the status of 12 of the 18 states, have been marked as "alarming." These include Gujarat, Maharashtra, Tamil Nadu and Karnataka. These are apparently on the danger list.

The GHI has asserted the fact that despite the economic prowess that India displays it is much lower than many African countries in the fight against hunger. This revealing index was based on three indicators namely, prevalence of child malnutrition, rates of child mortality and proportion of people who are calorie deficient. Results from the data revealed that India's high malnutrition

rates and children below age five being underweight were causes of its low rank. Madhya Pradesh had 60 percent of its children aged below five underweight. In Bihar it was 56.1 percent. The figure for Punjab which is known as grain bank of North India was one fourth of its entire population. The country's grocery list for 2030 will need to feed 1.5 billion people the population is growing at the rate of 1.8 per cent per year. *And to supply food for all India has to produce food "at an accelerated pace" adding four to five million tones of food-grain alone every year.* But the production of the nutritionally superior grains such as coarse cereals and pulses has been extremely uneven over the last several years. It must have an adverse implication for the country's nutritional security. One-third of the population living below the poverty line is afflicted with wide-spread protein deficiency and malnutrition.

Action is required to identify solutions for meeting future world food needs while reducing poverty and protecting the environment. This has created a window of opportunity for providing the needed knowledge resources for agriculture. The accurate evaluation and estimation, sufficient or latest information is required for timely solutions for increased productivity. One of the basic information that is not available is the cultivated area that could keep the planners well-informed of the further harvest, and prepared for food crisis in advance. Management of land with sustainable agricultural practices and methods admixed with modern techniques would help in increasing productivity and to combat with the hunger problem.

The Samaritan Woman – Water Problem

Samaritans were the most ancient people in the world. They were the descendants of the ancient northern kingdom of Israel. Samaritans had their own form of writing, their own historical traditions dating back to the creation of the world. The Samaritans built a temple at the summit of *Mount Gerizim which was considered a sacred place* where they worshipped. (John 2:20). The modern synagogue, which replaced an earlier one destroyed by an earthquake in 1927, houses what the Samaritans believe to be the world's oldest Torah scroll (The Pentateuch). They are the five books of Moses and the only part of the scriptures accepted by the Samaritans. Jacob's well is located at the entrance near Mount Gerizim. Jacob, on his return from Mesopotamia bought a plot of land from Hanor for "a hundred pieces of silver" (Genesis 33:19), on which he pitched his tent and dug a 35 meter deep well for himself, his children and his flocks. Since that time, the well has *been known as Jacob's well*. Tradition states that it was at this well that Jesus met the Samaritan woman and asked her for water to drink, the well has been an object of pilgrimage since then. A little to the north of Jacob's well is the traditional site of Joseph's tomb, an Ottoman building marked by a white dome.

Going northward from Judea to Galilee, one must need to go through Samaria. On this journey Jesus came to Sychar. Here the conversation took

place between Jesus and the woman of Samaria. We could look to Mount Gerizim on our left and remember the temple to which the woman pointed when she said: "Our fathers worshipped in this mountain." The well is now seventy-five feet deep and seven feet six inches in breadth. The diameter of the opening is seventeen and a half feet. A ruined vault stands above the well twenty feet long, ten feet broad and six feet high. The pieces of broken marble you see in the front belong to some ancient church. It was here by this lonely well that Jesus told to a woman and to the world the story of the true relationship between God and man.

In Bible the well is the place where life springs, where people meet, where news is given. For us Jacob's well is above all the setting for a meeting, a meeting wonderfully simple and luminous, the meeting of Christ Jesus, Samaritan woman. (John 4).

Jesus tells of his thirst to a woman a heretical who doesn't seem to be a very recommendable person. A meeting where Jesus awakes this woman's thirst and comes to meet her in her wound of love and in her sin. A meeting where he heals her and reveals to her his name and his being the Messiah thus granting his trust as never before: "I am he, I who am speaking to you now." A meeting where, Jesus turns this woman into a bearer of the good news for the people of Samaria. Conversion, healing, evangelization, the Church, the Father, the Son, the living water of the Holy Spirit...the whole mystery of God is present in this gospel account of John.

Besides the spiritual significance, one could clearly see an ecological problem of drinking water in this meeting between Jesus and Samaritan woman. According to the gospel of John, chapter 4, verses 7 to 15, simply gives away lots of information on the physical description of the well and water, stating the depth of the well. The scripture also give a historical perspective of the well, stating that the well was given by Jacob to his sons and their flocks who used the well for drinking water. *The main point of discussion between the woman and Jesus was "simply the problem of drinking water."* They talked about the rope, the bucket, the depth, etc...Middle Eastern countries are arid regions of our planet earth and drinking water is very short in these areas. There are number of biblical references to this problem. In Exodus 17:7, the Israelites are recorded for doubting God and thinking him to provide their needs as he led them on a journey to what was called the promise land. In the land of Massah and Meribah God came through and met their needs making water spring from a rock. Still, God provided.

As annual rainfall amounts scarcer and scarcer, due to severe climate changes attributed to global warming, the availability of fresh drinking water in the entire region is likely to decrease even more in the next few years. From the discussion of physical properties of drinking water, the conversation

makes a shift to spiritual realm of water. Jesus answered “Everyone who drinks this water will be thirsty again, but whoever drinks the water I give him will never thirst. Indeed, the water I give him will become in him a spring of water welling up to eternal life.” For the Samaritan woman at the well, Jesus leads her to the living water that she could only imagine. The living water was an allusion to the safety and salvation in Christ, our hope and life spring. She would find out that he provided more than what she would ever find at a well, in a rock, in anything made by man or even God unless it was God himself. We are energized and relaxed by the water that will never run out, even when faith wavers. His waters are too deep.

We have two different kinds of thirsts; two different kinds of needs. *The first kind of need is what we can call a finite or horizontal need.* These are the needs that we all have for the good things of this earth: food, drink, companionship, safety, fun, a good income, medical care, success at work or school, etc. These needs are all part of our nature as human beings, and there is nothing inherently wrong with desiring them. These are needs that we can usually fulfill through our own effort. We are hungry so we get ourselves something to eat, and then we are satisfied; at least for awhile. We are thirsty so we get something to drink. As long as we do not go to extremes, and we use proper means for satisfying these needs there is nothing wrong with having them.

However we also have another kind of need; ones that are deeper, infinite or vertical. These needs are part of our desire for meaning and purpose. These would include our need for love, truth, beauty, justice, and integrity. These needs are also built into our nature as human beings, but unlike our finite or horizontal needs, there is nothing that we can do to satisfy these needs by our own effort. Only God himself can satisfy these needs, because only God is infinite love, infinite beauty, infinite truth, infinite justice, and perfectly one. These are the needs that we can never get too much; the more we experience them, the more we desire them. God created us with these infinite, vertical needs in the very core of our being so that we would be constantly drawn toward him, towards intimate, personal contact with his eternal, transcendent and infinite love. It is because of these needs that we are always restless, even when we have satisfied all of our horizontal needs. It is when we forget this, when we try to satisfy our infinite, vertical needs with horizontal stuff that we put ourselves on the road to disappointment, frustration and even tragedy.

With over 1.1 billion people in the world who don't have access to clean drinking water, water-borne pathogens are a huge problem for the environment and for human health. The course of world society in the twenty-first century is likely to be substantially influenced by a single resource; drinking water. The first and most obvious fact is that water is an absolute necessity. Without water, life, animals, plants, or humans cannot exist. Water

comprises approximately 75 percent of the human body. Without adequate water, the body ceases to function. Depending on one's exertion level and weather conditions, the average adult should consume a minimum of eight to 2 liters of water daily. One might think drinking water should not be a problem in the twenty-first century, but it can be. Several related factors define the challenges. First, quantities of water on planet earth suitable for drinking are extremely limited. Less than 1 percent of all water on earth is available as groundwater and surface water suitable for human uses such as drinking and cooking. The remainder is either salt water (97 percent) or is locked up in ice (just over 2 percent). Second, precipitation, which replenishes groundwater and surface-water resources, does not fall evenly over the face of the earth. Additionally, some times of the year are rainy. Other times dry. Thus, water resources are bountiful at some times and in some places, but extremely sparse in others. Third, for more than a *billion people in developing countries, water is scarce and frequently contaminated*, thereby posing a health risk. In these parts of the world, contaminated drinking water along with primitive (or nonexistent) sanitation systems annually result in widespread illness and millions of deaths annually. The majority of the victims are children.

Moreover, competition for water for domestic, industrial, and agricultural needs can only be expected to accelerate in the years ahead. Increasing urbanization and development compete with nonurban uses such as agriculture; often, these very different land and water uses adjoin one another geographically. Lawmakers and resource planners worldwide face a daunting challenge to meet ever-increasing needs for adequate drinking-water supplies. The situation is worse in less developed countries. A water-supply infrastructure often does not exist. International assistance may provide a community well; but in many cases, people drink dirty and contaminated water because no other options are available in their communities. People typically gather water from the nearest source, which often is the same one used for bathing and washing activities, waste disposal, and perhaps even watering source for local livestock. These varied uses of the same water source frequently lead to the spread of diseases. *More than 1 billion of the world's people lack access to safe water, and nearly 2 billion people lack safe sanitation. Over 3 million people annually die from avoidable water-related diseases.* Dirty water from unsanitary conditions is the leading cause of death of children in Asia. And globally claims the life of one child every 30 seconds.

The search for water is a daily way of life for many people in developing countries, especially in most countries of the African continent, and numerous areas within Asia and south and Central America. A 2000 report by the Asian development Bank stated that of the 300 million people living in the Asia-Pacific region, one person out of three have no access to sources of

safe drinking water within 200 meters of their homes. Whether in cold or hot climates, the constant search for safe drinking water is often difficult and time consuming. This situation can worsen during droughts (and other adverse weather conditions), conflicts, and wars. Women and children most often carry out the task of gathering water. Compounding the problem are demographers' predictions that the world population will increase by approximately 33 percent over the first 25 years of the twenty-first century. As this century opened, the world population was just over 6 billion. At present growth rates, it will top 7 billion by 2013 and 8 billion by 2028. Much of this growth is expected to take place in developing countries, many of which are already burdened with serious drinking-water problems.

With 40 percent of the world's population facing water scarcity, United Nations Secretary –General Kofi Annan identified water as one of the key discussions for the 2002 World Summit on Sustainable Development held in Johannesburg, South Africa. The summit identified the limited availability of fresh-water resources, along with economic growth, industrialization, population growth, and urbanization as the major factors that have contributed to water scarcity.

The Parable of the Sower – Soil Science

In the “parable of the sower” the special characteristics of the Galilean landscapes are described, the meeting between the cultivated plots and the rocky fallow ground. The parable of the sower (Mathew 13:1-9; Mark 4:1-9; Luke 8:4-8) is more about the soil in which the seeds are sown than the sower himself. Indeed, from the explanation of the parable in Mathew 13:18-23, we know that the different kinds of soils represent the conditions of people who receive “the message of the kingdom.” In this parable the soil represents the various conditions of the human heart. As one reflects upon this parable, one cannot help but wonder about himself or herself *in relationship to the various kind of soils, which represents the minds of men and women in their reaction to Jesus*. Every individual should search his or her heart for an examination of the following questions: How do you relate yourself in your study of the various conditions in the soil? What kind of soil is your mind? One can read the parable of the sower without making practical application to one's own “Sitz im Leben (situation in life). However, the primary objectives in this study are to call attention to the kind of soil science that was explained by Christ. *We need to know the soil taxonomy to be able to understand the parable better.* Jesus depicts a sower casting his seed. But in the spreading of his seed, Jesus says that some seed falls on the roadside, some seed falls on the rocky soil, some falls among thorns, and finally, some seed falls on good soil. There is a progression in these four types from the seed never starting, starting but bearing no fruit, starting and bearing fruit but getting choked out, and starting and bearing good fruit that can be harvested.

This parable is based on soil science or soil taxonomy. Around 3 BC to 4 AD, in South Indian Sangam Literature (Tamil Literature), we learn about the 4 classifications of soils. Hindu Puranas and Shasthras (Hindu scriptures) are very descriptive about soil science: This science delineated what type of crop is suited for a particular soil. Or, what type of crop should be planned in a particular season. Jesus might have had an access to this kind of knowledge. The parable of the sower is in fact, more of a scientific explanation of the soil, teaching the people how to farm crops on the different types of soils. It is more than a parable. In other words, *the parable was originally a scientific statement (wissenschaftliche sitz im leben)*, but later on, the writers of the gospels, not able to grasp the scientific implications, merely reduced it into a parable. Today, modern science classifies global soil into 12 categories. It would be nice to know about them and this knowledge would help our minds to synch with the scientific implications, pointed out by Jesus himself.

The Twelve Soil Orders or Soil Taxonomy - Soil Taxonomy places soils in one of 12 categories known as orders. I have put together a collection of information to illustrate the distribution, properties, ecological significance, and use of these soil orders. The 12 soil orders are listed below in the sequence in which they key out in Soil Taxonomy.

1. *Gelisols* - Gelisols are soils of very cold climates that contain permafrost within 2 meters of the surface. These soils are limited geographically to the high-latitude Polar Regions and localized areas at high mountain elevations. Because of the extreme environment in which they are found, Gelisols support only ~0.4% of the world's population. *It is the lowest percentage of any of the soil orders.* Gelisols are estimated to occupy ~9.1% of the global land, and ~8.7% of the US land area. Although some Gelisols may occur on very old land surfaces, they show relatively little morphological development. Low soil temperatures cause soil-forming processes such as decomposition of organic materials to proceed very slowly. As a result, most Gelisols store large quantities of organic carbon. Only soils of wetland ecosystems contain more organic matter. Gelisols of the dry valleys in Antarctica are an exception. They occur in a desert environment with no plants and consequently contain very low quantities of organic carbon. The frozen condition of Gelisols landscapes makes them sensitive to human activities. Gelisols are divided into 3 suborders: Histels, Turbels, and Orthels.

2. *Spodosols* - Spodosols are acid soils characterized by a subsurface accumulation of humus that is complexed with Al and Fe. These photogenic soils typically form in coarse-textured parent material and have a light-colored E horizon overlying a reddish-brown spodic horizon. The process that forms these horizons is known as podzolization. *Spodosols often occur under coniferous forest in cool, moist climates.* Globally, they occupy ~4% of the ice-free land area. In the US, they occupy ~3.5% of the land area.

Many Spodosols support forest. Because they are naturally infertile, Spodosols require additions of lime in order to be productive agriculturally. Spodosols are divided into 5 suborders: Aquods, Gelods, Cryods, Humods, and Orthods.

3. *Aridsols* – The central concept of Aridsols is that, they are too dry for mesophytic plants to grow. Aridsols are the dry soils of deserts (the root arid or id comes from the Latin aridus for dry). *They do not receive enough rain to permit normal agriculture.* They may have the clay enriched subsoil and cemented to non cemented deposits of salts or carbonates. Salinization or salt buildup is the greatest danger in using Aridsols for irrigated agriculture. Most areas of true desert are retained as wilderness though the margins may be used for grazing. They are CaCO₃-containing soils of arid regions that exhibit at least some subsurface horizon development. They are characterized by being dry most of the year and limited leaching. Aridsols contain subsurface horizons in which clays, gypsum, and CaCO₃ tend to be leached from soils of moister climates. Aridsols occupy ~12% of the Earth's ice-free land area and ~8.3% of the US. Aridsols are used mainly for range, wildlife, and recreation. Because of the dry climate in which they are found, they are not used for agricultural production unless irrigation water is available. Aridsols are divided into 7 suborders: Cryids, Salids, Durids, Gypsid, Argids, Calcids, and Cambids.

4. *Andisols* - Andisols have formed in volcanic ash or other volcanic ejecta. They differ from those of other orders in that they typically are dominated by glass and poorly crystalline colloidal materials such as allophane, imogolite, and ferrihydrite. As a result, Andisols have andic properties – unique chemical and physical properties that include high water-holding capacity and the ability to “fix” large quantities of phosphorous. Globally *Andisols are the least extensive soil order and only account for ~1% of the ice-free land area.* They occupy ~1.7% of the US land area, including some very productive forests in the Pacific Northwest Regions. Andisols are divided into 8 suborders: Aquands, gelsands, cryands, Torrands, Xerands, Vitrand, Ustands, and Udands.

5. *Histosols* - The central concept of Histosols is that of soils that are dominantly organic. Histosols are dark soils that have slightly decomposed to, well decomposed organic materials derived from the sedges, grasses, leaves, hydrophytic plants and woody materials (root ist from the Greek histos for tissue). A soil is classified as Histosols if it does not have permafrost and is dominated by organic soil materials. *They contain at least 20-30% organic matter by weight and are more than 40 cm thick.* They occur in many environments from Alaska to the tropical islands. In cold regions the low temperatures retard organic matter decomposition and in warm regions the soil is saturated. Histosols form many areas of valuable wetlands. If drained they decompose rapidly but are valuable agronomic soils for vegetables or turf. The diagnostic feature is the histic epipedon. Most

Histosols form in settings such as wetlands where restricted drainage inhibits the decomposition of plant and animal remains, allowing these organic materials to accumulate over time. As a result, Histosols are ecologically important because of the large quantities of carbon they contain. These soils occupy ~1.2% of the ice-free land area globally and ~1.6 of the US. Histosols are often referred to as peats and mucks and have physical and subsidence when drained. They are mined for fuel and horticultural products. Histosols are divided into 4 suborders: Folists, Fibrists, Saprists, and Hemists.

6. *Inceptisols* - The central concept of Inceptisols is that of soils of humid and sub-humid regions that have altered horizons that have lost bases or iron and aluminum but retain some weatherable minerals. They may have many kinds of diagnostic horizons, but argillic, nitric, kandic, spodic and oxic horizons are excluded. Inceptisols are soils just starting to show horizon development because the soil is quite young and are found in any type of environment and are commonly found forming on top of floodplain and delta deposits. They have altered horizons but have not weathered enough to become illuvial horizons (the root ept comes from Latin word inceptum for beginning). *These are young or in the beginning stage of soil formation.* These soils occur in a wide range of temperature and moisture environments. They are more developed than Entisols, but still lack the features that are characteristic of other soil orders. Inceptisols are widely distributed and occur under a wide range of ecological settings. They are often found on fairly steep slopes, young geomorphic surfaces, and on resistant parent materials. A sizable percentage of Inceptisols are found in mountainous areas and are used forestry, recreation and watershed. With recent taxonomic changes, Inceptisols now occupy an estimated 17% of the global ice-free land area, the largest of any soil order. In the US, they occupy ~9.7% of the land area. Inceptisols support ~20% of the world's population, also the largest percentage of any of the soil orders. Inceptisols are divided into 7 suborders: Aquepts, Anthrepts, gelepts, Cryepts, Ustepts, Xerepts, and Udepts.

7. *Oxisols* - The central concept of Oxisols is that of soils of the tropical and subtropical regions. They are mixtures of quartz, kaolin, free oxides, and organic matter. For the most part they are nearly featureless soils without clearly marked horizons. Differences in properties with depth are so gradual that horizon boundaries are generally arbitrary. Oxisols are only in the tropics. The root comes from the French word oxide for oxides. They are intensely weathered, resulting in colors that are yellow to red from the accumulation of large amounts of iron oxides. *Even if they are clayey, their ability to retain nutrients is low as the clay fraction consists of iron oxides and kaolinite.* These soils contain few weatherable minerals and are often rich in Fe and Al oxide minerals. Oxisols occupy ~7.5% of the global ice-free land area. In the US, they occupy ~0.02% of the land area and are restricted to Hawaii. Most of these soils are characterized by extremely low native

fertility, resulting from very low nutrient reserves and high phosphorous retention by oxide minerals, and low cation exchange capacity (CEC). Most nutrients in Oxisol ecosystems are contained in the standing vegetation and decomposing plant material. Despite low fertility, Oxisols can be quite productive with inputs of lime and fertilizers. Oxisols are divided into 5 suborders: Aquox, Torrox, Ustox, Perox, and Udox.

8. *Mollisols* - The central concept of Mollisols are that of soils that have a dark colored surface horizon and are base rich. Many also have an argillic or nitric horizon or a calcic horizon. A few have an albic horizon. Some also have a duripan or a petrocalcic horizon. *Mollisols are the soils of grassland ecosystems*. They are characterized by a thick, dark surface horizon. This fertile surface horizon, known as a mollic epipedon, results from the long-term addition of organic materials derived from plant roots. The surface layer has a soft, fluffy feel. These soils formed from nutrient-rich parent materials and are commonly in grasslands. They are naturally fertile and generally hold large amounts of water. These soils are prized for agriculture. Mollisols primarily occur in the middle latitudes and are extensive in prairie regions such as the Great Plains of the US. Globally they occupy ~7.1% of the ice-free land area. In the US, they are the most extensive soil order, accounting for ~21.5% of the land area. Mollisols are among some of the most important and productive agricultural soils in the world and are extensively used for this purpose. Mollisols are divided into 8 suborders: Albolls, Aquolls, Gelolls, Xerolls, Ustolls, and udolls.

9. *Vertisols* - The central concept of Vertisols is that of soils that have a high content of expanding clay and that have at some time of the year deep wide cracks. *They shrink when drying and swell when they become wetter. During dry periods, the soil volume shrinks, and deep wide cracks form. The soil volume then expands as it wets up.* This shrink and swell action creates serious engineering problems and generally prevents formation of distinct, well-developed horizons in these soils. Globally, Vertisols occupy ~2.4% of the ice-free land area. In the US, they occupy ~2.0% of the land area and occur primarily in Texas. Vertisols are divided into 6 suborders: Aquerts, Cryerts, Xererts, torrerts, Usterts, and Uderts.

10. *Ultisols* - Ultisols are strongly leached, acid forest soils with relatively low native fertility. *They are found primarily in humid temperate and tropical areas of the world*, typically on older, stable landscapes. Intense weathering of primary minerals has occurred, and much Ca, Mg, and K has been leached from these soils. Ultisols have a subsurface horizon in which clays have accumulated, often with strong yellowish or reddish colors resulting from the presence of GFe oxides. The “red clay” soils of the southeastern US are examples of Ultisols. Ultisols occupy ~8.1% of the global ice-free land area and support 18% of the world’s population. They are the dominant soils of much of the southeastern US and occupy ~9.2% of the total US land

area. Because of the favorable climate regimes in which they are typically found, Ultisols often support productive forests. The high acidity and relatively low quantities of plant-available Ca, Mg, and K associated with most Ultisols make them poor suited for continuous agriculture without the use of fertilizer and lime. With these inputs, however, Ultisols can be very productive. Ultisols are divided into 5 suborders: Aqualts, Humults, Udults, Ustults, and Xerults.

11. *Alfisols* - Alfisols are moderately leached soils that have relatively high native fertility. These soils have mainly formed under forest and have a subsurface horizon in which clays have accumulated. Alfisols are primarily found in temperate humid and sub-humid regions of the world. Alfisols occupy ~10.1% of the global ice-free land area. In the US, they account for ~13.9% of the land area. Alfisols support about 17% of the world's population. *The combination of generally favorable climate and high native fertility allows Alfisols to be very productive soils for both agricultural and silvicultural use.* Alfisols are divided into 5 suborders: Aqualfs, Cryalfs, Udalfs, Ustalfs, and Xeralfs.

12. *Entisols* - Entisols are soils of recent origin. The central concept is soils developed in unconsolidated parent material with usually no genetic horizons except an A horizon. All soils that do not fit into one of the other 11 orders are Entisols. Thus, they are characterized by great diversity, both in environmental setting and land use. *Many Entisols are found in steep, rocky settings.* However, Entisols of large river valleys and associated shore deposits provide cropland and habitat for millions of people worldwide. Globally Entisols are extensive, occupying 16% of the Earth's ice-free land area. Only Inceptisols are more extensive. In the US, Entisols occupy ~12.3% of the land area. Entisols are divided into 5 suborders: Aquepts, Arents, Psamments, Fluvents, and Orthents. Now it is time to put our knowledge of 'soil science' to the test.

The hard hearted hearer – (comparable soil is number 4-Aridisols)
Mathew 13:4 "As he was scattering the seed, some fell along the path, and the birds came and ate it up." Mathew 13:18 "When anyone hears the message about the kingdom and does not understand it, the evil one comes and snatches away what was sown in his heart. This is the seed sown along the path." Does this first soil, *wayside ground (hard-packed soil), represents the closed mind?* This kind of soil represents the one who allows the word of God to enter one ear and go out the other. They listen but they do not act. *Does this soil portray the religious leaders to illustrate as individuals whose minds are shut and the truths of God cannot gain entry? Does this soil characterize mental arrogance?* In other words, the wayside ground pictures the man or woman who thinks that he or she knows everything already. Even today, many people refuse the path of spiritual inquiry, which is also a condition of the soil of one's mind. We sometimes speak of someone as hard-hearted. You just can't get a message into their

hearts. This kind of person is represented by a trodden path or Aridsol. This is the person who is closed the word of God. They may have a million different reasons but the bottom line is that this is a person that is not interested to receive the gospel. Aridsol is hard and not easily penetrated so the birds came and ate the seeds sown along the path. Paths along the field become trampled by foot. Soon these paths become as hard as pavement. What if you planted a corn field in a paved parking lot? You would not get any crops. It is not the kind of soil that will support the seed to grow into a mature plant. The path is the hard heart of men.

Shallow hearers – (comparable soil is number 6-Inceptisols) “Some fell on rocky places, where it did not have much soil. It sprang up quickly, because the soil was shallow. But when the sun came up the plants were scorched, and they withered because they had no root” (Mathew 13:5-6). “The one who received the seed that fell on rocky places is the man who hears the word and at once receives it with joy. But since he has no root, he lasts only a short time. When trouble or persecution comes because of the world, he quickly falls away” (Mathew 13:20-21).

The second is “thin-veneer soil or rocky soil. In Palestine much of the land is a thin two or three inch veneer of soil over the limestone bedrock. Here some of the seed falls, the warm sun quickly heats the seed in the shallow soil, and the seed sprout in feverish growth. But then the sun beats down, the plant’s roots meet the bedrock, and it withers and dies. This type of soil represents one whose faith is superficial, or shallow when one’s faith is just on the surface, one’s acceptance of Christ is easy, but it is not easy to be a Christian. Many individuals are deeply moved by hearing the Christian message of redemption; on the other hand, unless one is willing to reflect upon God’s love in all its richness, one will not be able to withstand the hardships with the storm of life. If there is not a deep-rooted conviction about Christianity, the effects will be temporary in spite of stirring emotions. Christianity is not trouble free. These persons have no depth in their lives. *They are spiritual gypsies. They are shallow hearers.* The shallow hearers may be attracted to the blessings, abundant life and heaven. But they don’t count the cost of discipleship. They are like plants; they sprout up quickly, but at the same time, they die out quickly. What is the soil of your mind? Is it rocky Inceptisol?

Compromising hearer – (comparable soil is number 7-Oxisols) “Other seed fell among thorns, which grew up and choked the plants” (Mathew 13:7). “The one who received the seed that fell among the thorns is the man who hears the word, but the worries of this life and the deceitfulness of wealth choke it, making it unfruitful” (Mathew 13:22).

The third type is “thorn-contaminated soil which allows the cares of the world to distract them from spiritual things. Many let the cares of the world

shut them out from god. Jesus as he explains this parable, says, “Still others, like seed sown among the thorns, hear the word, but the worries of this life, the deceitfulness of wealth and the desires for other things come in and choke the word, making it unfruitful” (Mark 4:19-20). *Jesus speaks of those with divided hearts.* This time it is the cares of the world that choke out the sprouts soon after the seed has been sown and the shoots start to sprout. The deceitfulness of wealth is what ends the spiritual life of the seed that falls among the thorns, the compromising hearer. The deceitfulness of wealth is not limited just to the rich. The poor who are working hard to get ahead can be snatched away spiritually by wealth too. For the rich the trap of pursuing luxuries and pleasures can choke out their spiritual life. It is ironic what some call the “good things in life” may actually be the briars and thistles that choke out the gospel. Is your mind Inceptisol?

Reproducing Christian – (comparable soil is number 8-Mollisols) “still other seed fell on good soil, where it produced a crop, a hundred, sixty, or thirty times what was sown” (Mathew 13:8). “But the one who received the seed that fell on good soil is the man who hears the word and understands it. He produces a crop, yielding a hundred, sixty or thirty times what was sown” (Mathew 13:23).

The fourth and the last classification is “good soil”. Jesus speaks of this soil this way: “Still other seed fell on good soil. It came up, grew and produced a crop, multiplying thirty, sixty, or even a hundred times” (Mark 4:8). This good soil represents one who is open to the word of God. This heart that is open will produce fruit more abundantly. *The good soil of the mind is a heart that allows the word of God to take deep root and produce a rich harvest.* The good soil has an open mind to the teachings of God. When one’s heart becomes crowded with things of the world, this double-mind smothers the spiritual growth and puts a stop to a great harvest. Paul enumerates many of the fruits of Mollisols. “But the fruits of the Spirit is love, joy, peace, patience, kindness, goodness, faithfulness, gentleness and self-control” (Galatians 5:22). It is exciting when someone responds and serves Jesus and reproduces. There is a principle that when you sow abundantly you reap abundantly. 2 Corinthians 9:6 says: “Remember this: whoever sows sparingly will also reap sparingly, and whoever sows generously will also reap generously.”

You are Rock – Geology to Theology

Mathew 16:18-19 states, “And I also say to you that you are Peter, and upon this rock I will build my church, and the gates of netherworld will not prevail against it. I will give you the keys of the kingdom of heaven; whatever you bind on earth will be bound in heaven, and whatever you loose on earth will be loosed in heaven.”

While all might agree that there is a play on words between the name Peter and rock, Catholics consider this scripture as the origin of Papal

authority. The original citation is found in Mathew 16:13-20. Why did Jesus say “Thou art Peter” first? Was it just a play on words, or was he saying that Peter was the rock upon which he would build his Church? Most Christians would say that Peter is the rock. The word for Peter was ‘petros’ meaning stone or little rock (pebble). The word for rock used was ‘petra’ meaning bedrock. ‘Rock’ was a nickname Jesus gave Peter. His actual name was Simon. Bible also states that the name he was given was Cephas which meant ‘seer stone.’ Rocks are used in many symbolic ways throughout the scriptures. Here is a list of them. Rock, a place of sacrifice; rock, the wellspring; rock, as salvation and defense, rock, the refuge; rock, a place to build a house; rock, a bad place to plant seeds, rock as doctrine or gospel, rock, as molten to make tools. Almost all of the above can also be symbols that refer back to the savior, and in fact, that’s another way to interpret the scripture, although not what is usually suggested.

Peter was the popular one among the twelve. There are examples of Peter’s authority among the apostles. Next to Jesus, Peter is mentioned more than any other apostles in scripture (152 times). He stood up and spoke on behalf of the apostles (Mt 19:27, Acts 1:15, 2:14). He stood up at the birth of the Church at the Pentecost to lead them (Acts 2:14). The disciples were referred to as Peter and the apostles (Acts 2:37, 5:29). Peter was given authority to forgive sins before the rest of the apostles (Mat 16:18). He was always named first when the apostles were listed ((Mark 3:16-19)... Sometimes it was only “Peter and those who were with him” (Luke 9:32). John ran ahead of Peter to the tomb but upon arriving he stopped and did not go in. He waited and let Peter go in (Jn 20:4). Jesus told Peter to “feed my lambs...tend my sheep...feed my sheep” (Jn 21:15-17). The difference between a sheep and a lamb might be significant. A lamb is a baby, a sheep is an adult. Perhaps Jesus was asking Peter to take care of both the general people (the lambs), and the apostles (the sheep). Regardless of that interpretation of sheep and lambs, it is clear Jesus is asking Peter to feed and tend his flock. That is what a shepherd does. It appears to me that he is asking Peter to shepherd his Church on earth, on his behalf.

There are some remarkable quotes on ‘*Peter and Rock*’ from the early Fathers of the Church. Origen (230-250 AD) says, “See what the Lord said to Peter, that great foundation of the Church, and most solid Rock, upon which Christ founded the Church...” (Origen, In Exodus. Hom. V. 4 tom. Ii). St.Hippolytus (225 AD) says “Peter, the Rock of the Church, whom Christ our Lord called blessed, the teacher of the Church, the first disciple, he who has the keys of the kingdom. (hippolytus, Ex Fabricio, Op. Hippol. Tom. Ii. De Fine Mundi et de Antichristo, n. 9). St.Cyril of Jerusalem (363 AD) says “Our Lord Jesu Christ then became man, but by the many he was not known. But wishing to teach that which was not known, having assembled his disciples, he asked, ‘Who do you say that the Son of man am?... and all

being silent, for it was beyond man to know, Peter, the Foremost of the Apostles, the chief herald of the Church, not using language of his own finding, but having his mind enlightened by the Father, says unto him, 'Thou art the Christ,' and not simply that, but 'the son of the living God.' And a blessing follows the speech... and upon this Rock I will found my Church..." Cyril, Catech, xi. N. 3). St. Basil the Great (371 AD) says "The house of God, which is the Church of the living God, the foundations of which are on the holy mountains, for it is built upon the Apostles and prophets. One also of these mountains was Peter, upon which Rock the Lord promised to build his Church" (Basil, T. i. Comment. In Esai. C. ii). St. Augustine (410 AD) says "These miserable wretches, refusing to acknowledge the Rock as Peter and to believe that the Church has received the keys to the kingdom of heaven, have lost these very keys from their own hands" (Augustine, Christian Combat). St. Cyril of Alexandria (424 AD) says "He suffers no longer to be called Simon, exercising authority to rule over him already as having become his own. But by a title suitable to the thing, he changed his name into Peter, from the word *petra* (rock); for on him he was afterwards to found his Church" (Cyril T. iv. Comm. In Joan).

When Jesus talked about Rock, his mind was concentrating on the scientific properties of the rocks that he had perhaps learnt from the desert experience (*wissenschaftliche sitz im leben*). How long one could pray in the desert? When Jesus was not praying, he was examining the rocks in the desert as other scientists would do today. Jesus spent most of his life time in the desert he could have educated himself in Geology, Paleontology and Petrology. The gospel writers later on, unable to recollect and unable to grasp the scientific essentials have left out lots of scientific information on a particular subject. When Jesus talked about Rock, he was interested in the *characteristics and the properties of the rock*. Ancient Egyptians, Persians, Mesopotamians, Romans and Indians had scientific knowledge of stones. They built great monuments, aqueducts, pavilions, dams, temples, obelisks, and made great sculptures. In India the art of sculpture is known as "*silpa sastra*" (document on the principles of temple building and sculptures of religious importance). In the time of Jesus, Jerusalem had a beautiful temple, an ancient marvel, made out of stone. It is obviously clear that Jesus had some kind of special knowledge of rocks.

Igneous Rock

Today science tells us that rocks are aggregates of minerals. Geologists divide rocks into three groups: *igneous, metamorphic, and sedimentary*. Igneous rocks crystallize from the magma. Metamorphic rocks form by the deformation and/or recrystallization of pre-existing rock by changes in temperature, pressure, and chemistry. Sedimentary rocks form the weathering and erosion of preexisting rock to make sediment, which is lithified into rock. Church is like rocks; strong, durable, and almost eternal. The

important features of the igneous rocks are that they are generally hard, massive, and compact with interlocking grains. It generally contains more of quartz and feldspar minerals and entire absence of fossils. For two thousand years, the Church has been making its way at the price of ceaseless trials and tribulations. The apostles were the privileged witnesses of the death and resurrection of Jesus and they were its foundation stones. *“The stone the builders rejected has become the cornerstone; the Lord has done this, and it is marvelous in our eyes. (Psalm 118:22-23). “The stone that the builders tossed aside is now the most important stone of all. This is something the Lord has done, and it is amazing to us” (Mathew 21:42).* The first Christians were strong as a rock in their conviction and in their profession of faith. The martyrs sprinkled it with their blood. Then the fathers of the desert defended its purity by separating themselves from the world to pray. Soon they recognized the need of coming together in monasteries. Then came, the Reformation, then renaissance, and then Liberation theology, rest of it is simply history. The Church is compared to rock, perhaps the Church is as strong as the igneous rock: with her sacramental diversity (richness in Grace), durable as old as 2000 years, indestructible in the wake of trials and tribulations, powerful enough to crush down the anti-ecclesiastical rivalries, and generous enough to contribute her resources to the sustenance of the world, Church is indeed a Rock.

Igneous rocks begin as magma and they are classified as Intrusive igneous rocks and extrusive igneous rocks. Intrusive igneous rocks, like granite, form when magma cools inside the earth. Extrusive igneous rocks, like basalt lava end up as granite and form at the earth’s surface. Volcanic rocks are extrusive igneous rocks. Igneous rocks are one of the three major rock types and are basically rocks that solidified from magma. Magma is the term for liquid or melted rock and is usually quite hot. After all, the term igneous comes from the Latin word for ‘of fire.’ Most people have seen pictures or video of magma that flows out of a volcano. When magma flows onto the surface of the earth it is called lava. When the lava cools and forms a rock, that rock is an igneous rock. But there are also rocks that form from magma that does not reach the surface of the earth. These rocks form in what are often called plutons and are also types of igneous rocks. These two types of igneous rocks are called: extrusive (because it extruded or came out of the earth), and intrusive (because it intruded and stayed inside the earth). *They are also referred to respectively as volcanic and plutonic. These rocks can dispense dozens of minerals to the plants and animals by natural processes like, wind and water. The Church also dispenses the sacraments to all the members, for the spiritual nourishment of the Church.*

Metamorphic Rock

Metamorphic rock is rock that has been altered by heat and pressure. Rock is changed by heat and pressure produced mainly by movements in

the earth's surface which are associated with the formation of mountains. 'Metamorphic' means 'change of form,' heat and pressure can change the forms of many things, for example, a glassmaker uses heat to change a certain kind of sand into glass. Rocks change when mountain-building forces apply a great deal of pressure and heat to them. Metamorphic rocks started out as some other type of rock, but have been substantially changed from their original igneous, sedimentary, or earlier metamorphic form. Metamorphic rocks form when rocks are subjected to high heat, high pressure, hot, mineral-rich fluids or, more commonly, some combination of these factors. Conditions like these are found deep within the earth or where tectonic plates meet. In metamorphic rocks some or all of the minerals in the original rock are replaced, atom by atom, to form new minerals.

Metamorphic rocks are often squished, smeared out, and folded. They have been changed usually from their original condition into rock with new minerals and structures; some of the minerals in rock are broken down and form new minerals. The grains that make up the rock may become larger. The mineral content of metamorphic rocks depends both on its protolith and the metamorphic conditions the rocks endured. The presence of some specific minerals in a metamorphic rock can indicate the degree of heat and pressure it sustained. Metamorphic rocks are sedimentary or igneous rocks that have been modified or changed in form, that is, the size, shape and arrangement of the minerals in rocks. Despite these uncomfortable conditions, metamorphic rocks do not get hot enough to melt, or they would become igneous rocks! Some of the classifications of metamorphic rocks are Quartzite, Hornfels, Schist, Gneiss, Slate, phyllite, Limestone Marble, Dolomite Marble.

Metamorphic rock is meant to be an example of ever changing Church. It is obvious that the *Church has been changing for the past 2000 years. The Church is constantly changing now and its change in the future is inevitable. Church is under watchful eye of the Spirit, guiding and changing its course in good and bad times.* Church has seen its share of pressures from rulers and philosophers and has taken in lots of heat from different people in different times. Recently 50 catholic groups published an open letter to Pope Benedict calling for the Church's ban on contraception to be lifted as it "has had a catastrophic impact on the poor and powerless around the world, endangering women's lives and leaving million at risk of HIV." The letter was published in Italy's largest newspaper, *Corriere Della Sera*, on the 40th anniversary of the late Pope Paul VI's controversial encyclical "Humanae Vitae," which established the ban. While criticism of the Vatican is fairly common in articles and editorials in Italian newspapers, it is unusual for a group to take out paid advertising against the pope. The letter stated that the encyclical continued to be "a source of great conflict and division in the Church" and because most Catholics use contraception

and feel they are not sinning, the policy has been “an utter failure.” There are many other problems like, Global Warming, conservation, celibacy, women priest, homosexuality and gay marriages, abortion, and euthanasia, all of these issues, obviously leave the people constantly divided. But we hope and pray that Church would take a right and dependable step on its march towards change. It is unimaginable what the Pope could do with just a stroke of his pen? He could move mountains if he wills. More than a billion people on Earth are ready to obey the pope and ready for a change! If a solid and hard rock could change into a metamorphic rock, what about the human mind and heart?

Sedimentary Rock

The forces of weather break rocks into small pieces that are carried away and deposited elsewhere. These small pieces are often deposited in shallow seas or lakes as sediments. As the layers of deposits pile up, perhaps over millions of years, pressure from the weight of the sediments above turns the lower layers into solid rock. Sand may turn into sandstone; silt and clay become shale. Such rock, made of sediment, is called sedimentary rock. Geologists believe that sedimentary rock was forming three and a half billion years ago. Sedimentary rock is formed when mineral matter of plants and animals settle out of water and, less commonly, air or ice. The most common materials for sedimentary rocks are fossils, formed when sediment covered dead plants and animals as the sediment changed into rock. The remains are outlines of the dead plants and animals. Some limestone is made entirely of fossils, microscopic sea life, and is deposited in oceans. The parent rock can be any type of rock, igneous, metamorphic, or sedimentary. Coal, a sedimentary rock, is the source of electrical power in all over the world. Some of the sedimentary rocks are; quartz sandstone, dolostones, limestone, diatomite, peat and coal, chalk, oil shale...etc.

Our world is a place of unity in diversity. Its large size has given rise to different types of national and regional diversities and they are still flourishing. Different physical and religious features of a country or a region and its climate have contributed to the development of these diversities. Each country and region has its own distinct style and flavor in its folk form of music and dance, and mutual influences are not rare. Distinct style and character can be seen in paintings, sculpture, architecture, poetry and other traditions of the country. Every culture has its own richness. This richness is the result of the freedom which every country and community has enjoyed to develop its genius through mutual interactions. Unity in diversity: The main purpose of “*unity in diversity*” is to help build positive relations among all people, to strengthen equality and promote the eradication of all forms of prejudice. This means recognizing diversity in its broadest sense, including race, gender, age, class, religion or culture, difference of ability, education or economic positions. When it comes to religions, in Vatican Council, Unity in diversity is pushed to the limit.

The example of sedimentary rock suggests that different kinds of minerals from different kinds of rocks are brought together by natural forces into one unity. The restoration of unity among all Christians is one of the main concerns of the Second Vatican Council. The division among Christians openly contradicts the will of Christ, scandalizes the world and damages the holy cause of preaching the gospel to every creature. The primary goal of ecumenism is to foster unity among all Christians so that the one body of Christ may be a visible sign of salvation for everyone. The ecumenical movement plays down the issue of coming to a true biblical definition of what is a Christian for the sake of unity and cooperation. Christian ecumenism is the promotion or cooperation between distinct religious groups or denominations of Christianity. It is the coming together of those under the umbrella of Christianity (Protestants, Anglican, Roman Catholic, Eastern Orthodox, etc...).

It needs to be stated that Vatican II is the first council in the history of the Church to speak positively of other religious traditions. *Jews are acknowledged as “first receivers of God’s covenant,” Muslims as “followers of Abraham, “Hindus and Buddhists as “advanced civilizations...with a deep religious sense” (LG, 16; NA2).* The Council’s 1965 Declaration on the Relationship of the Church to Non-Christian Religions (Nostra Aetate) states unequivocally that “the Catholic Church rejects nothing that is true and holy in these religions.” Indeed, Christians should “acknowledge, preserve and encourage the spiritual and moral truths found among Non-Christians, as well as their social life and culture” (NA, 2). *The Fathers of the Second Vatican Council...affirm that in the religious traditions of non-Christians there exist “elements which are true and good” (Lumen Gentium, 16), “precious things, both religious and human” (Gaudium et Spes, 92), “seeds of contemplation” (Ad Gentem, 18), “elements of truth and grace” (ad Gentem, 9), “seeds of the Word” (Ad Gentem, 11;15), and “rays of that truth which illumines all humankind” (Nostra Aetate, 2).* According to explicit councilor indications, these values are found and preserved in the great religious traditions of humanity. St.Paul assures with his recommendation, “God wills all to be saved” (1 Tim 2:4). Thanks to the ‘rock science.’ Next time when you hear about ‘Peter and Rock,’ be sure to remember your Geology as well as your Theology.

Lost Sheep – Extinction of Species

Lost sheep symbolizes the extinction of species in general. (For more information, kindly refer to the chapter 5 on Weather and Climate, found in this book). The New Testament portrays Jesus as interpreting it that “there will be more rejoicing in heaven over one sinner who repents than over ninety-nine righteous persons who do not need to repent.” *This emphasis on the lost, the hurting, the disadvantaged and marginalized is seen*

throughout the Hebrew and Christian Bibles. Jesus likens a “sinner” to one who is lost. Finding him is more important than many who are not lost. In modern times, we often see many men and women risking their lives to try to save one person. The person in peril is at that moment more important than those who are not. If the “sinners” are people in peril, then it makes sense that Jesus spends more time with them.

Extinction is the death and disappearance of a species. The fossil record shows that extinctions have been frequent in the history of life. Mass extinctions refer to the loss of a large number of species in a relatively short period of time. Episodes of mass extinction occur at times of rapid global environmental change. *An extinction may be of two types; phyletic or terminal.* Phyletic extinction occurs when one species evolves into another with time; in this case, the ancestral species can be called extinct. However, because of the evolutionary lineage had continued, *such extinctions are really pseudoextinctions.* In contrast, terminal extinction marks the end of an evolutionary lineage, termination of a species without and descendants. Most of the extinctions recorded in the fossil record and those occurring today are terminal. It has been estimated that 99% of all species that have ever lived are now extinct.

Causes and consequences: The consequences of loss of species for ecosystem function depends upon the *role played in the ecosystem by the species or group of species*, and by the degree to which roles are or could be assumed by other biotic components of the ecosystem. In general, the loss of a species in an ecosystem with naturally low species diversity is likely to have a, larger consequences than the loss of a species in a more complex environment characterized by high species richness. There have been numerous theoretical and empirical investigations that have sought to validate this simple proposition. Unfortunately, owing to the natural complexity and diversity of ecosystems within the biosphere, no hard and fast rule on the consequences of the loss of species richness on ecosystem function has yet been accepted as above reproach. What appears much clearer is the impact of human activity on species loss and accelerating species loss worldwide. There is close parallel between early human migrations and the disappearance of large game species.

Overexploitation of biological resources has continued to the present time, and numerous species have disappeared in regional environments as a consequence. The wholesale loss of species in some twenty-five hot spots around the world, as a consequence, largely of habitat modifications such as, clearing tropical forests for agriculture and construction of dams, road, and houses. Biodiversity loss is one of the most consistent signs of *ecosystem distress syndrome (EDS)*. Estimates range widely, but generally current estimates of species losses are ten-fold to one thousand-fold greater than historic levels, leading some to speculate that the earth is already entering a

period of the sixth major extinction of life on the planet. *This extinction, however, differs from the past 5 mass extinctions, in that the primary cause appears to be the effects of human activity.* Humans appropriate more than 50% of global primary productivity. They have also altered the chemical composition of the atmosphere, triggering climate change, which in turn destabilizes ecological balance.

Humans, as part of the web of life, are not immune to events that trigger the extinction of organisms on the profound scale that appears to be currently taking place; and the implications for human health are numerous and diverse. First, there are direct effects: for example, the loss of marine fisheries (over 70% of the major commercially fished marine stocks are overexploited and in decline), translates for many communities into a loss of reliable food supplies. This contributes to malnutrition, a rising problem, particularly in developing countries, where an estimated two billion people, approximately one-third of the global population, presently suffers from lack of adequate diet. Malnutrition reduces the longevity of a population more susceptible to diseases. *Another direct impact is the loss of potential biological materials that are useful as medicines, both in traditional medicines and as ingredients in modern pharmacology.* The loss of the inventory of biotic resources for medicinal purposes directly threatens human health. Finally, there is the loss of economic opportunity, and the loss of social cohesion that often accompanies a degrading environment, an impoverished socioeconomic condition generally is associated with a host of health threats, including substance abuse and violence. Indirect effects are more difficult to pin down. Clearly, the loss of a significant portion of the species that inhabit a particular ecosystem has major implications for ecosystem functioning, including the provision of ecosystem services such as production of food, regulation of hydrology and pollination that form part of the life-support system for humans and other species. Degradation of such environments through human activities, with a subsequent loss of species components, poses a host of threats to human health through the loss of critical ecosystem functions. It is time to think about stewardship or conservation!

What is conservation? *Conservation is the protection of natural resources from loss, change, or damage. Natural resources include ecosystems, communities, species, soil, water, air, and energy.* How to conserve? Resources are protected through several broadly overlapping approaches. *First, sustainability is the management of natural resources without depleting and saving the resources for future generations. Sustainability is approached by maximizing efficiency of use, including reduction of consumption and eliminating waste. Second, preservation is the perpetuation of natural resources by maintaining them in a natural state; in many senses a synonym of conservation. Preservation, as*

distinct from sustainability, commonly implies more of a “setting aside.” This way, natural resources are managed more for longevity than for sustainable production. Biodiversity (number of species in a given area) is heavily dependent on maintenance of large areas of natural environment. *Third, restoration of habitat or resource to a natural condition may also be a component of conservation, but it is more difficult because it requires that human use be reduced from previous levels or geographic expanse.* “When he has found it, he carries it on his shoulders, rejoicing. When he comes home, he calls together his friends and his neighbors, saying to them, ‘Rejoice with me, for I have found my sheep which was lost!’ I tell you that even so there will be more joy in heaven over one sinner who repents, than over ninety-nine righteous people who need no repentance” (Luke 15:3-7).

Why conserve? Motivation for conservation generally can be attributed to one or two broad reasons, apart from moral and ethical. *First is human-oriented.* We are all interested in ways to keep our own species alive and to ensure each individual’s ability to maintain his life, liberty, and pursuit of happiness. Maintenance of biodiversity preserves potentially useful food and medicinal source, it possibly contributes toward stability of ecosystems, and many of us find that the existence of at least partial elements of a diverse natural world contributes to our own sense of well-being. Humans benefit from increased understanding of the world they live in. *Second is the other-oriented.* Many species of organisms, probably a majority of them are evolutionarily older than humans and it can be argued that they have at least an equal right to continued existence. Human population growth and activity will be responsible for an extinction of many species, and it can be the responsibility of only humans to stop the loss of life.

Prodigal Son – Homecoming to “Stewardship” – Rags to Rapture

“To all who are lonely and need a friend; to all who are weak and need strength; to all who are adrift and need a purpose; to all who are searching and need to discover, to all who have richly receive and need to give thanks; the heavenly Father opens wide its doors and bids you welcome.”

The parable of the prodigal son (Luke 15) proclaims a message of great hope to all who have sinned and fallen short of the mark. It declares that the Father of all mankind has a deep and abiding love for his children and desires with all his heart to receive them unto himself. The biblical record indicates that Jesus was addressing the scribes and the Pharisees (Luke 15:1-3), when he told the story of the “lost son.” There are certain things that occur in this story that suggests the father anticipated the return of his son. First, the father saw his son “when he was still a great way off” (Lk. 15:20). This being the case, how could he even recognize his son at such a great distance?

How could he know that the small figure on the horizon was actually his child? In truth a loving parent can easily do this without difficulty. Anyone who has had children can attest to this. You may not recognize friends or acquaintances from a distance but your own child is something far different. A loving parent is so proudly connected to his children that he can recognize them in a crowd. However, this brings us to another question: Why was the father looking out on the horizon in the first place? There can be only one answer. He was looking out in the hope of seeing the son he loved so dearly. Something in him just knew his child would come home. But there is more. The powerful story Jesus tells indicates that the father was “*moved with compassion*” and ran out to meet his son. The word compassion in this verse implies pity. The question we need to ask ourselves is why would the father pity a son he had only seen from a great distance? What would make him think his son would even need his pity?

The implication although not stated directly, is that the father knew that the world to which his son had gone would be treacherous and evil and had the potential to cause his child great harm. Because he had a keen awareness of both his son and the world in which he was going, the father rightly anticipated the result. Many parents today can identify with this. They see their children pursue things that the parents know will only bring pain and heartache. It is clear that the father allowed his son to go into that world in order to learn a lesson that could not be appreciated by staying at home. Although the son left the father’s estate of his own volition, he did so with his father’s consent. This is not unlike God’s children today. Many have left the faith only to return again and seek out God’s forgiveness and mercy. God is not surprised when his children return. He is filled with joy. Another indication that the father knew his son would return is that he had a fatted calf ready to be slaughtered for a great feast (Lk. 15:23). This being the case it is reasonable to think that the father must have anticipated a celebration would be held. The lesson for God’s people today is that the Father knows his children so well that he can plan for their return even when it doesn’t look like there will be such an event.

When prodigal returns in tears to his father, he begs him to allow him to work as a servant on the family estate. But the father would have none of this. His reaction speaks volumes about how God views genuine contrition and repentance. This wonderful patriarch provides his son with exquisite gifts, each of which tells an extraordinary story of distinction and honor. The sandals picture freedom. Slaves at that time were barefooted. And although the prodigal wanted to be a servant, the father saw him as much more. He was a son and his father cherished him greatly. Father also gave him a ring. A ring is a symbol of power and authority. It actually carries the weight of the one who gives it. In addition to giving his son sandals and a ring, this loving father directed his servants to bring him a coat. But not just any coat.

It had to be the very finest for his dear son. The scriptures speak prolifically concerning the significance of garments. Bestowing such a gift was not only a sign of distinction and honor, but also reflection of intimacy and affection. The last gift the father bestows on his son is a great celebration. The joy of his return just had to be shared with others. Now consider the significance of this act as it pertains to those who repent and appeal to God for mercy.

The story of prodigal son symbolizes the “*squandering and exploiting nature,*” in human beings, in relation to ecology and environment. We know from the past how mature civilizations once vanished, entire species disappeared and whole populations died out because of the misuse of natural resources. The Bible summarizes on the human activity as follows: “*Younger son got together all he had, set off for a distant country and there squandered his wealth in wild living*” Lk 15:13). Development in technology, has radically improved our standard of living. This progress has also entailed increased energy consumption, all too often accompanied by *the squandering of our assets. Intensive exploitation of natural resources will always cause chronic global disequilibrium.* Inappropriate management of their potentialities reinforces disparities between communities and jeopardizes populations’ survival. However, this concern for our environment should start by securing the population’s need for a decent living, guaranteeing communities’ expression and protecting citizen’s rights. The policy will only be effective if it is part of a concerted global effort and involvement of viable institutions supported by each of us. Otherwise, we will regrettably learn to appreciate the natural resources of our planet only when they have already failed to meet our needs.

As prodigal sons and daughters, we get a second chance to make everything right. “For this son of mine was dead and is alive again; he was lost and is found” (Lk 15:24). With regard to environment “sustainable development” is the key for long term progress. The expected *sustainable development index (SDI)* is not only a mathematical model measurement of country’s or a region’s long-term progress. The index also encourages investment in crucial economical and social sectors in order to ensure fair development. Promoting such investment helps combining our interests with our values, revealing a responsible achievement for the global community. This new way of sharing, helps fight poverty, shrinks inequalities, and consolidates social capital. We aspire to transform troubles we face today into righteous actions which will create a good legacy for the future. The challenge will always be to know what to take, what to give, and how to use what we have?

Exploitation of natural resources in the past led to conflict and the enrichment of a few at the expense of many. Natural resources remain an important source of income. During the 1990s 65% of all foreign direct

investment was in oil, gas and mining. Lithosphere is extremely exploited for oil, gold, iron, rocks and other natural resources. Hydrosphere is exploited for fish, oil and other natural resources, leaving it with problems of erosion and pollution. Atmosphere is polluted with the greenhouse gases and resulting increase in temperatures. Biosphere is wounded and bleeding with extinctions of species by human activity. Man needs conversion of his heart. We need the change of our hearts, minds and souls towards the natural world. Only by thinking, working and learning together can we tackle the impact on the natural resources and uncertainties induced by climate change. The word conversion, as we use it in religious circles today, usually implies the acceptance of a religious belief system. *But the fundamental biblical meaning is “to turn” usually to turn to God. However, in the story of prodigal son, conversion means to come back to the father, or to come back to the relationship. In ecological sense, conversion means “coming back to biblical stewardship, coming back to sustainable development.”* This, of course brings up a crucial question: What do we turn away from? When are we to turn to sustainable development? What do we set aside when we are converted? Or, in different words, why do we need conversion? What separates us from the sustainable development in the first place?

Conversion starts with repentance. Repentance is a redirection of life in mind and behavior, and it is redirecting life toward God. There are number of examples from the Bible: John the Baptist preached a baptism of repentance for the forgiveness of sins, Jesus denounced the cities in which most of his miracles were done, because they did not repent, Jesus was supposed to preach repentance for the forgiveness of sins. Repentance is an expression of faith; “I trust what God did so much for me, entrusting me as a steward of his creation, on the other hand, have failed him miserably and disconnected with nature, but now, *I realign my entire existence towards the co-existence of my world with the natural world.* In that way I get connected again!” Then, repentance leads to conversion as a response that redirects my entire life and enters in a covenant relationship with God. The result of conversion is the genuine desire to have my life ruled by God and by moral and ethical principles and that is my choice, not my necessity! The faith is so real and so deep that it produces a redirection of life. *We must redirect our lives away from the ecological degradation of technology and development, say no to consumerism and get away from the evil behavior and attitude toward the natural world. Result could be a desirable shift from disequilibrium to equilibrium.* Christ’s relationship to creation is that of the firstborn (prototokos) over all of it. “Christ is the visible God. He existed before God made anything at all and is supreme over all creation. For it was in him that all things were created, in heaven and on Earth, things seen and things unseen, whether thrones, dominions, rulers, or authorities; All things were created and exist through him and in and for him. He existed before everything else began, and he holds all creation

together” (Colossians 1:15-17).

The urgency and the necessity of repentance and conversion toward planet Earth, could lead mankind to a better understand of the relationship in which life is all about the simple things we can do to put more passion into our relationship with nature and our personal lives. It’s about living everyday with more meaning, enjoying life with the natural world and delivering exceptional results to the environment around us. We attempt to revive damaged ecosystems, transforming and strengthening their relationship with the rest of nature. It is an attempt *to bring back the dignity and beauty of the Earth*, which was lost, because of our irresponsibility. Luke 13:3-5 reads, “I tell you, no; but unless you repent you will all likewise perish. Or those eighteen on whom the tower in Siloam fell and killed them, do you think that they were worse than all other men who dwelt in Jerusalem? I tell you, no; but unless you repent you will all likewise perish.” Jesus commented on the problem of evil. He referred to a news report of his own day. There was a tower-building project at Siloam, and the whole thing collapsed and killed 18 people. Was this some kind of divine punishment for their secretive sins? No, said Jesus. These people were not any more sinful than anybody else. Jesus did not say why the tower fell. He did not give clever reasons why God would allow such pain and suffering for these families. No doubt he had compassion on the victims. And he probably would have said something different if he had been talking to their families. But he brought the situation home to his audience. He made it personal for them: Unless you repent, you will also perish. The tragedy at Siloam became an object lesson for them to repent, before another impending catastrophe.

Stewardship is a way of life. Stewardship is a conversion of heart. Stewardship is a disciple’s response. Stewardship is an expression of love. Stewardship is part of our vocation. Stewardship is an honor and an opportunity. Living as good stewards of God’s gifts will satisfy the deepest, strongest longings of your heart. It will fill you with joy, happiness, satisfaction. Stewards know the meaning of life and make real sacrifices to make the world a better place, making their own lives better in the process. Many are concerned that liberty, science, and technology are more a threat to the environment than a blessing to humanity and nature. Human understanding and control of natural processes empower people not only to improve the human condition but also to do great harm to each other, to the Earth, and to other creatures. As concerns about the environment have grown in recent decades, the moral necessity of ecological stewardship has become increasingly clear. At the same time, however, *certain misconceptions about nature and science, coupled with erroneous theological and anthropological positions, impede the advancement of a sound environmental ethic.* In the midst of controversy over such matters, it is critically important to remember that while passion

may energize environmental activism, it is reason, including sound theology and sound science that must guide the decision-making process. We identify four areas of common misunderstanding:

Dominion model: Humans feel that they can rightfully exploit natural environment. The emphasis here is that humans are not at all at home in nature. It stresses differences between humans and the rest of nature, while we are not above the nature but with the nature. The danger is the arrogant disdain for material world; subjugating and empowering nature and environment, which leads to exploitation.

Stewardship Model: Humans care for creation, which is intended to serve our needs. The emphasis is that there is a wide gap between humans and the remainder of creation; anthropocentrism, in which the human person is the center of creation. There is the danger of overemphasis on mastery, with focus on conquering and controlling nature; speciesism; no sense of solidarity with other species.

Creation-centered Approach Model: Humans are not so much caretakers as fully part of creation the emphasis is on intrinsic value and sacredness of nature, so all species deserve protection; recognizes interdependence within the web of life. The danger is in the call for sustainable development leaves many unresolved issues! It is unclear how to balance human needs with solidarity with other species.

Deep Ecology Model: It is the radical re-visioning of the relationships and boundaries between humans and the rest of creation. The emphasis is on the call for revival of asceticism, human renunciation, and mysticism; eco-theology views nature as a medium for the mystery of the sacred, which humans must not presume to know fully. The danger is overly romanticized view may make creation into an idol; danger of totally neglecting legitimate human needs.

What man can do?

1. Many people mistakenly view humans as principally consumers and polluters rather than producers and stewards. Consequently, they ignore our potential, as bearers of God's image, to add to the Earth's abundance. The increasing realization of this potential has enabled people in societies blessed with an advanced economy not only to reduce pollution, while producing more of the goods and services responsible for the great improvements in the human condition, but also to alleviate the negative effects of much past pollution. A clean environment is a costly good; consequently, growing affluence, technological innovation, and the application of human and material capital are integral to environmental improvement. The tendency among some to oppose economic progress in the name of

environmental stewardship is often sadly self-defeating.

2. Many people believe that “nature knows best,” or that the Earth-untouched by human hands-is the ideal. Such romanticism leads some to defy nature or oppose human dominion over creation. Our position informed by revelation and confirmed by reason and experience, views human stewardship that unlocks the potential in creation for all the Earth’s inhabitants as good. Humanity alone of all the created order is capable of developing other resources and can thus enrich creation, so it can properly be said that the human person is the most valuable resource on Earth. Human life, therefore, must be cherished and allowed to flourish. The alternative-denying the possibility of beneficial human management of the Earth-removes all rationale for environmental stewardship.
3. While some environmental concerns are well founded and serious, others are without foundation or greatly exaggerated. Some well-founded concerns focus on human health problems in the developing world arising from inadequate sanitation, widespread use of primitive biomass fuels like wood and dung, and primitive agricultural industrial and commercial practices; distorted resource consumption patterns driven by perverse economic incentives; and improper disposal of nuclear and other hazardous wastes in nations lacking adequate regulatory and legal safeguards. Some unfounded or undue concerns include fears of destructive manmade global warming, overpopulation, and rampant species loss. The real and merely, alleged problems differ in the following ways.

Faith as Guiding Light

Our beliefs teach the following theological and anthropological principles are the foundation of environmental stewardship.

1. God, the Creator of all things, rules over all and deserves our worship and adoration.
2. The Earth, and with it all the cosmos, reveals its Creator’s wisdom and is sustained and governed by his power and loving kindness.
3. Men and women were created in the image of God, given a privileged place among creatures, and commanded to exercise stewardship over the Earth. Human persons are moral agents for whom freedom is an essential condition of responsible action. Sound environmental stewardship must attend both to the demands of human well being and to a divine call for human beings to exercise caring dominion over the Earth. It affirms that human well being and the integrity of creation are not only compatible but also dynamically interdependent realities.

4. God's Law-summarized in the two great commandments (to love God and neighbor), which are written on the human heart, thus revealing his own righteous character to the human person-represents God's design for shalom, or peace, and is the supreme rule of all conduct, for which personal or social prejudices must not be substituted.
5. By disobeying God's Law, humankind brought on itself moral and physical corruption as well as divine condemnation in the form of a curse on the Earth. Since the fall into sin people have often ignored their Creator, harmed their neighbors, and defiled the good creation.
6. God in his mercy has not abandoned sinful people or the created order but has acted throughout history to restore men and women to fellowship with him and through their stewardship to enhance the beauty and fertility of the Earth.
7. Human beings are called to be fruitful, to bring forth good things from the Earth, to join with God in making provision for our temporal well being, and to enhance the beauty and fruitfulness of the rest of the Earth. Our call to fruitfulness, therefore, is not contrary to but mutually complementary with our call to steward God's gifts. This call implies a serious commitment to fostering the intellectual, moral, and religious habits and practices needed for free economies and genuine care for the environment.

Our Aspirations

In light of these and concerns, we declare the following principled aspirations.

1. We aspire to a world in which beings care wisely and humbly for all creatures, first and foremost for their fellow human beings, recognizing their place in the created order.
2. We aspire to a world in which objective moral principles-not personal prejudices-guide moral action.
3. We aspire to a world in which reason (including sound theology and the careful use of scientific methods) guides the stewardship of human and ecological relationships.
4. We aspire to a world in which liberty as a condition of moral action is preferred over government-initiated management of the environment as a means to common goals.
5. We aspire to a world in which the relationships between stewardship and private property are fully appreciated, allowing people's natural incentive to care for their own property to reduce the need for collective ownership and control of resources and enterprises, and

in which collective action, when deemed necessary, takes place at the most local level possible.

6. We aspire to a world in which widespread economic freedom-which is integral to private, market economies-makes sound ecological stewardship available to ever greater numbers.
7. We aspire to a world in which advancements in agriculture, industry, and commerce not only minimize pollution and transform most waste products into efficiently used resources but also improve the material conditions of life for people everywhere (from Cornwall declaration on environmental stewardship).

Finally...

As long as I could remember, India and China are the most populous nations in the world. Most of the people in India and China still plough the land with bulls, wash clothes with hands, wash dishes with hands, cook food with wood, commute on bullock carts and bicycles or motorcycles, still use resources what is enough to sustain, no air-conditioners, no washing machines, and no cars. This kind of lifestyle seemed to be a sustainable development for the past 6000 years and still the countries could feed and offer drink for 3 billion people. At this rate of energy consumption, India and China could sustain even another one billion more people. *Unfortunately, India and China are on the path toward western technology and development*, which has been already proved to be dangerous and their lifestyles have brought a crumbling and disastrous effects on environment and climate change within the shortest amount of time of their civilizations, as low as 150 years in Australia, 350 years in USA and Canada, perhaps 1500 years in Europe, in spite of their populations only in few millions. The energy consuming lifestyles of technology and development of the western world are now faced with the dead end.

Religious view of God includes a most consoling affirmation that God is always active in the world and never abandons the created world in the moment of need. The God of justice is present wherever he is needed just as no one may limit the actions of the Holy Spirit, it is impossible to shackle the gospel of peace and justice. *This is the moment of God's intervention.* To be concerned about the effect of all one's actions on the fragile ecosystem is to nurture an attitude of care for others that is most consistent with the core messages of all Christian and religious social teachings. Local campaigns to expand recycling, to encourage organic farming, and to raise funds to preserve the world's shrinking rain forests have often been started or co-sponsored by churches. If one look hard enough, it is possible to find church based activism on the full range of ecological concerns: deforestation, soil erosion, and over-fishing of the world's oceans, ozone depletion, hazardous nuclear waste, acid rain, oil spills, threats to biodiversity, loss of aquifers and

wastelands, and others. *The climate crisis is, indeed, extremely dangerous. In fact it is true planetary emergency.* The voluminous evidence now strongly suggests that unless we act boldly and quickly to deal with the underlying causes of global warming, our world will undergo a string of terrible catastrophes.

This too is a moral moment, a crossroads. This is not ultimately about any scientific discussion or political dialogue. It is about who we are as human beings. It is about our capacity to transcend our own limitations, to rise to this new occasion. To see with our hearts, as well as our heads, the response that is now called for. *This is a moral, ethical and spiritual challenge.* The climate crisis also offers us the chance to experience what very few generations in history have had the privilege of knowing *a generational mission*; the exhilaration of a compelling moral purpose; a shared and unifying cause; the thrill of being forced by circumstances to put aside the pettiness and conflict that so often stifle the restless human need for transcendence; the opportunity to rise. When we do rise, it will fill our spirits and bind us together.

Our Earth is a special place, where millions of species coexist, each one an integral part of our planet's fabric. What we do will determine their fate and ours. We can undo the damage we have caused. The Earth we inherited can again be a garden, beautiful and bountiful. Everything we need for life is here. Shimmering blue, it is our haven, in a vast black sea of space. This is our home; it will be home to our children and to their great grandchildren. It is home to all the nations of the world. It's home to the people of America and Russia. It's home to Israelis and Arabs. It's home to the people of India and Pakistan. It's home to the Asians, Africans and Europeans. It's home to the species in Arctic and Antarctica. It's home to the aboriginal people and the farmers of the Australian outback. It's home to all of us. And it is our only home.

Humans need animals and plants to sustain the very essence of human life, but animals and plants have no need of us. We are insatiable, our appetites cause us to consume with abandonment, driving so many species to the absolute edge of extinction. Man can do homicide, biocide, ecocide and even theocide. Sometimes, man is the most dangerous animal. This is absolutely true. These animals and plants perhaps, need man's absence to survive, not our help. How can we stop? Find the stillness, find the quiet. Discover some small miracle in nature and begin to focus all of your energy on appreciating one small process. Do not interfere, step aside, trust in nature and life will find a way! Until that time comes, we still leave: Earth-The Lost Paradise of Happiness.

“Lord! You’ve been our refuge in every generation. Before the mountains were born, before you gave birth to the Earth and the Universe, from everlasting to everlasting, you are our God” (Psalm 90:1-2).

Glossary

1. Amitabha – He is the Buddha of infinite light. His body of red light, the color of the setting sun, symbolizes that he is the embodiment of the enlightened speech of all Buddha.
2. Arjuna – He was oldest of his five brothers and a devoted disciple of Sri Krishna. He symbolizes the ascending human soul and Sri Krishna symbolizes the descending divine soul.
3. Akkadians – These were semi-nomads at a time when many people roamed from place to place depending on the seasons.
4. Ashur – It was a city on the west bank of the Tigris river,
5. Amida – Buddha with the greatest and infinite compassion.
6. Australopithecus – means Southern Ape.
7. Asherah – Semitic mother goddess.
8. Anat – Prehistoric god of Canaan.
9. Apollo – He was the son of Zeus, the Greek god who personified youthful masculinity, and a god of many roles, including prophecy, music and medicine.
10. Asklepios – He is the god of medicine. He is carrying his staff with the serpent, symbol of medicine even today Athens National Museum.
- 11.
12. Monad – Monad is an elementary un-extended individual spiritual substance from which material properties are derived. It is a basic entity in metaphysics of Leibnitz and it is an indivisible indestructible unit that is the basic element of reality and a microcosm of it.
13. Celts – At the end of Bronze Age in Ireland, there appeared a new cultural influence. Developing in the Alps of central Europe, the Celts spread their culture across modern day Europe.
14. Norse legends – Norse legends are known as Scandinavian mythology comprises the indigenous pre-Christian religion, beliefs and legends of the Scandinavian people. (Norway, Sweden, Denmark, Finland)
15. Daoism – It is the primary indigenous religion of China. Daoism has a complex history of integrating various techniques of meditation, spirit communication, consciousness projection, bodily movement, medicine and integration of spirit, mind, and body.
16. Shinto – It is an indigenous beliefs and practices of Japan. The word Shinto means “mystical or superior,” came into use in order to distinguish indigenous Japanese beliefs from Buddhism. Shinto has no founder, no official scriptures, and no dogmas.
17. Two Thousand Year Cycle – Jewish and Christian God perhaps, is in the habit of revealing every “two thousand year cycle.” Four thousand years back Father (Yahweh), two thousand years back the Son and right now Holy

Spirit for next two thousand years: Next revelation could be expected in the year 4000, the next will be in the year 6000, and the next will be in the year 8000.

18. Kurukshetra – The place in the state of Punjab, India, where the war between Kauravas and Pandavas took place.
19. Stonehenge – It is a prehistoric monument on Salisbury Plain in southwestern England that dates from the late Stone and early Bronze Ages (about 3000-1000 BC). The monument, now in ruins, consists of a circular group of large upright stones surrounded by a circular earthwork. Stonehenge is the best preserved and most celebrated of the megalithic monuments of Europe. It is not known for certain what purpose Stonehenge served, but many scholars believe the monument was used as a ceremonial or religious center
20. Nasca Lines – are giant sketches drawn in the desert of western Peru by ancient people. The drawings were created on such a large scale is such that the shapes can be readily discerned only from the air.
21. Theseus – He was one of the great legendary kings of Athens.
22. Minos – Minos, in Greek mythology, legendary ruler of Crete. Minos was the son of Zeus, father of the gods, and of the princess Europa. From the city of Knossos he colonized many of the Aegean islands.
23. Sumerians – These were the first civilization to occupy the Tigris-Euphrates river valley called the Mesopotamia.
24. Baal – Canaanite god of storm.
25. Rig Veda – It is a group of poems and prayers that were first sung and recited for thousands of years in Hinduism.
26. The Aryans – They were semi nomadic people who crossed the Hindukush and entered India through Afghanistan and captured the greater part of the northern India.
27. Vedas – These are the ancient Indo-Aryan religious literature. Vedas were not written by anyone, but were eternally, existing.
28. Aranyakas – They are known as “forest books.” Each Veda has four parts: Manthras, Brahmanas, Aranyakas and Upanishads. The Mantras are hymns or prayers recited at offerings and sacrifices to the Gods. The Brahmanas give the meanings of the hymns and the rites and instruct how and when to use them. The Aranyakas, give philosophical interpretation of these rites.
29. Brahman – means Supreme God, Absolute reality. Everything is part of Brahman. The Goal of all beings is to unite the soul (atman) with Brahman.
30. Atman – Sanskrit word which is translated into “personal soul.” Atman is eternal, all knowing and cannot be killed.
31. Enuma Elish – Babylonian Creation myth.
32. Marduk – He was the primary God of Babylonia, from the epic Enuma Elish.
33. Tiamat – From Enuma Elish, Tiamat is a dragon, an element of chaos, which is also considered the sea. Tiamat perpetuates chaos through her creation of other monsters.

34. Enlil – In ancient Sumero-Babylonian myth, Enlil is the god of air, wind and storms. In the Sumerian cosmology he was born of the union of heaven and earth. Enlil holds possession of the Tablets of Destiny which gives him power over the entire cosmos and the affairs of man.
35. Homer – He was a legendary Greek poet, author of the Iliad and Odyssey.
36. Zeus – He was the highest ranked god in Greek mythology. Every god and goddess was ruled by Zeus.
37. Rheia and Kronos – These were the parents of Zeus in Greek mythology.
38. Poseidan – He was the Lord of the sea in Greek mythology. Poseidan was also known as the earthshaker, as he could grasp his mighty trident and thrust it into the ground to conjure giant waves and even raise islands to the surface.
39. Leviathen – This was a long, thin snake-like dragon which controlled the power of water.
40. Henotheism – Hinduism is often defined as “henotheistic.” Forms of Hinduism recognize a single deity. However, they view other gods and goddesses as manifestations or aspects of that supreme God.
41. Uriel – Uriel, Gabriel, Michael and Raphael are the four archangels mentioned most often in Hebrew, Kabbalistic, Islamic and Christian traditions. The name uriel literally means “Fire of God.”
42. Akhnaton – The first was of ancient Egypt and the Pharaoh known as Akhnaton or the son of sun. The pharaoh acceded to the throne in 1383 BC.
43. Ether – Ether is a mixture of alcohol and sulphuric acid. It vaporizes very easily at room temperature.
44. Demiurge – it is a powerful creative force. These are subordinate god.
45. Tertullian – A Christian theologian and writer in the 3rd century.
46. Constantine – Constantine the Great, under whom, as sole ruler (324-337 AD), Christianity became the state religion.
47. The Sangha – it is the unbroken chain of the order of monks dating back to the Buddha himself.
48. Shakyamuni – the sage of the Shakyen clan is the historical Buddha, also known as Siddhartha Gautama.
49. Camelot – name of a city in Arthurian legend, where King Arthur ruled.
50. Modalism – Modalism is the heresy that confuses the persons of Father, Son, and the Holy Spirit.
51. Saoshyant – the day the earth and humanity faces the final culmination.
52. Meitrya – It is the embodiment of the loving-kindness of all Buddhas.
53. Chandogya Upanishad – It was sung by sage Chandogya. This Upanishad belongs to Sama Veda and it gives a deep insight on the ideal way of living.
54. Zoroaster – Religious founder from Persia.
55. Rastafari – It is a religious belief from Ethiopia.
56. Trinitarianism – Christian definition of One God and three persons.

57. Big Bang – Cosmic explosion which is believed to be the beginning of universe.
58. Supernova – Death of a massive star in a violent explosion.
59. Eagle Nebula – Cosmic dust from a supernova.
60. Andromeda galaxy – Our neighbor believed to be a replica of our Milky Way.
61. Constellation Sagittarius – Believed to be the center of our Galaxy.
62. Precursor Star – Star which gave birth to a new star from its supernova debris.
63. Half Life – The time required for the amount of radioactive material to decrease by one half. Radioactive decay occurs when an unstable nucleus loses a particle and electromagnetic radiation. This decay produces a daughter atom that may also be unstable and occurs at an average rate, which is called the half-life, the amount of time it takes for one half of the parent material decay to the daughter.
64. Isotope – Atoms with the same atomic number but with different atomic masses are called isotopes. Isotopes have identical chemical properties, yet have different nuclear properties. For example, there are three isotopes of hydrogen. Two of these isotopes are stable (not radioactive), but tritium (one proton and two neutrons) is unstable. Most elements have stable isotopes.
65. Progenitor Star – Parent Star for our Solar System from which our sun was born.
66. Sirius – One of the brightest stars, near to our sun.
67. Angular Momentum – It may be an object or body moving in a circular trajectory.
68. Nuclear Fusion – Nuclear Fusion is one of the methods to produce nuclear energy. Two light elements, like tritium and deuterium, are forced to fuse and form helium and a neutron. This is the same reaction that fuels the sun and produces the light and heat. Fusion produces less energy than fission (uranium 235 based exothermic reaction by Chain Reaction), but the components are more abundant and cheaper than uranium.
69. Core and Mantle – Interior layers of the Earth.
70. Warpage – When a supermassive star dies, its corpse collapses into a knot so tight, not even light can escape. And this drain on the fabric of the universe can actually warp the shape of space and of time. In other words, warpage can bend almost space-time itself, as it is believed that space and time are woven together.
71. Tornado – Powerful swirling storm, sucking and tearing everything on its path.
72. Gamma-Rays – These have smallest wavelengths and the most energy of any other wave in the electromagnetic spectrum. These waves are generated by radioactive atoms and in nuclear explosions. Gamma-rays can kill living cells, a fact which medicine uses to its advantage, using gamma-rays to kill cancerous cells.
73. Event Horizon – Entering point of a black hole.
74. Nucleo-synthesis - A star's energy comes the combining of light elements into heavier elements in a process known as fusion or nuclear burning. It is generally

believed that most of the elements in the universe heavier than helium are created, or synthesized in stars when lighter nuclei fuse to make heavier nuclei. The process is called nucleosynthesis.

75. Quarks – Quarks are the building blocks of protons, neutrons, but not electrons. There are six kinds of quarks. Their names are: up, down, strange, charm, bottom, and top. Quarks have positive charge.
76. Baryons – The constituents of the universe are classified according to the principles of the standard model of elementary particles. This model identifies baryons as matter composed of triplets of fundamental particles called quarks. Baryons contain 3 quarks.
77. Muons and Tau – These are neutrinos. They come in 3 flavors: electron, muon, and tau.
78. Neutrinos are everywhere and 100 trillion neutrinos pass through our body in one second. Neutrinos are created by nuclear reactions in our sun, and carry away about 10% of the sun's energy. Most neutrinos created in the big bang.
79. Virgo Cluster – It is the nearest big cluster. If you go outside in the spring, you can see many of its galaxies with a small telescope, in the constellation of Virgo.
80. Virgo Constellation – Group of stars forming a picture of a maiden. It is visible between latitudes 80 and minus 80 degrees. It is best seen in May (at 9 PM).
81. Hadrons – Hadrons are a class of particles made of quarks, held together by aptly named gluons; the most common hadrons are protons and neutrons.
82. Leptons – Electrons, neutrinos, and a few other particles make up another group of particles called leptons. Leptons are not considered divisible and are not made up of quarks.
83. Dark Matter – Invisible matter in the universe.
84. Gaia Hypothesis – This is an ecological theory that proposes that living and nonliving parts of the Earth are viewed as a complex interacting system that can be thought of as a single organism (a term coined by Lynn Margulis). It was proposed by James E. Lovelock, who is an independent scientist, author, researcher and environmentalist who lives in England.
85. Enzymes – These are proteins that speed up chemical reactions without being changed themselves.
86. Taiga - The taiga is primarily located in the sub arctic regions. The winters are long, cold and dry, and there is very little sunlight. Precipitation falls as rain during summer and as snow during winter.
87. Conifers – Coniferous means cone-bearing. Coniferous trees, or conifers, are trees that produce seed cones. Conifers have unusual leaves called needles. These needles are covered in a thick, waxy, substance that will prevent water loss. Most conifers are also evergreen, meaning they do not lose all their leaves at a given time each year. They lose and replace their needles slowly throughout the year.

88. Sequoia Trees – These trees can grow 300 feet tall and can grow as big as twenty-three feet around. Towering above the central valley of California, these massive trees dominate the landscape. It belongs to the redwood family. You will be even more amazed when you consider that these redwoods are 2200 years old, with the average age of a Sequoia Tree on the coastal range being at least 600 years old. The oldest known Sequoia Tree was estimated to be 3,200 years old based on a ring count.
89. Phytolith – Phytoliths, as the name suggests, are the solid copies of plant cells that remain intact after a plant has died and decomposed (from the Greek bases ‘phyto’ meaning ‘plant,’ and ‘lith’ meaning ‘stone’). A team of European researchers recently reported the oldest known phytoliths from a dung of dinosaurs that lived in India 70 million years ago.
90. Feedback Mechanism – Any change in the environment leading to additional and enhanced changes in that system is the result of a positive feedback mechanism. Alternatively, if a change in the environment leads to a compensating process that mitigates the change it is a negative feedback mechanism.
91. Photosynthesis – It is how plants use sun light and water to make sugar. Sugar is created in the green parts of a plant and every animal on earth depends on it. Without plants we would have no food to eat or oxygen to breath.
92. Symbiosis – It is an intimate living together between different species.
93. Food Pyramid – Known also as Food Web, from herbivore to omnivore.
94. Humus – Organic soil is called humus.
95. Subduction – Functioning part of Plate Tectonic system. The subducting plate is naturally predestined for consumption in the Earth’s mantle.
96. Paleoanthropology – is a specialized branch of Paleontology and physical anthropology involved with the study of ancient human beings. Paleoanthropologists are those investigating the origin and subsequent evolution of human physiology by examining fossil remains and other ancient evidence.
97. PDR Code – Passion, death and resurrection is a divine rule which could help understand the projects of God.
98. Trilobites – means “three lobed” and is derived from the fact these animals had bodies featuring three longitudinal lobes. We know that Trilobites are hard-shelled, segmented creatures that lived hundreds of millions years ago in the Earth’s ancient seas. They are considered to be one of our planet’s earliest complex life-forms and are one of the key signature creatures of Paleozoic Era. Trilobites went extinct before dinosaurs even existed.
99. Carboniferous – this period is famous for its vast coal swamps. These plants took so much CO₂ from the atmosphere, the Earth underwent Ice Age. Such swamps produced the coal from which the term “Carboniferous”, or “Carbon-bearing.”
100. Glaciation – large masses of snow, recrystallized ice and rock debris that

accumulate in great quantities and begin to flow outwards and downwards under the pressure of their own weight. Glaciers form when yearly snowfall in a region far exceeds the amount of snow and ice that melts in a given summer. In this way, massive quantities of material accumulate in relatively small periods of geologic time.

101. Deep Time – through reconnecting with past at the very beginning of the universe and future generations and it enables us to get in touch with sources of strength and inspiration from the far past and our far future.
102. Vedas- refers to a collection of ancient Indo Aryan religious literatures that are associated with the Vedic civilization and are considered by adherents of Hinduism to be revealed knowledge.
103. Manu – the word “man” is said to derive from Manu. Most important is the Manu Samhita still consulted in Indian law. It was written by Manu, an administrative demigod (the ruler of mankind) and the first law giver. There are 14 Manus. Manu Smriti contains 2,700 verses divided into 12 chapters. The Manu Smriti explains the rules and regulations of the Hindu way of life.
104. Vasuki – is the king of serpents in Hindu mythology.
105. Brahmanas – the Brahmanas lay down various roles (karma) to be performed and explain the procedure for the same. It interprets the words of the mantras (prayers). Brahmanas constitute a guide for the conduct of sacrifices.
106. Planetesimal – the seeds of planets crash together in the solar nebula, gradually growing larger.
107. Stromatolites – they are one of the earliest life forms, still seen in Australia.
108. M87 – The M87 galaxy is an enormous elliptical galaxy located at the center of the Virgo Cluster, roughly 60 million light years from us. M87’s size is due to the fact that it has merged with so many other galaxies. A phenomenon known as galactic cannibalism.
109. Deuterium – which contains one proton and one neutron, was created a few minutes after the Big Bang. Its presence today in the local universe serves as a tracer for star creation and galaxy building throughout the Eons.
110. Accelerators – these are devices producing beams of energetic ions and electrons which are employed for many different purposes in science.
111. Anthropic principle – claims that the Universe is our own playground, made specifically with humanity in mind. It was proposed in Poland in 1973, during a special two weeks celebration of Copernicus’s 500th birthday.
112. Polar Tundra – one of the two biomes that encircle the pole is the tundra. The treeless tundra has long summer days and short sessions of winter sunlight.
113. K-T boundary – the most well known extinction event is at the boundary between Cretaceous and Tertiary rocks. Cretaceous rocks are indicated K to distinguish them from Tertiary rocks, which have a T abbreviation).
114. Anthropoid – these are primates include all living monkeys and apes (including humans).

115. Savanna – is characterized by a grassy ground layer and a distinct upper layer of woody plants.
116. Locomotor – is basic movement, walk, run, jog, hop, jump, skip, gallop and slide.
117. Niche – in ecology, a niche refers to the place or position occupied by an organism or a population within an ecological community called the ecosystem.
118. Malthusian premise – at the end of 18th century Malthus from Austria has put forward a famous doomsday argument; population tends to increase exponentially while food supply increases only linearly; therefore, as human population increases, it becomes overwhelmed by famine.
119. Galapagos – an island in South Pacific having prehistoric biodiversity.
120. Upanishad – the text that describes the variety of spiritual experiences of various sages called as “darshana.”
121. Hominoids – all members of the ape family and their ancestors including gibbon, orang-utan, gorilla, chimpanzee and bonobo and Homo or human.
122. Hominids – members of the Homo genus, which led to modern humans.
123. Australopithecines – were members of the genus Australopithecus.
124. Homo floresiensis – it sounds too incredible to be true, but this is not a hoax. A species of tiny human has been discovered, which lived on the remote Indonesian island of Flores just 18,000 years ago. Researchers have unearthed remains from individuals who were just one meter tall, with grapefruit-sized skulls. These astonishing little people, nicknamed “hobbits,” made tools, hunted tiny elephants and lived at the same time as modern humans who were colonizing the area.
125. Turkana Boy – a nearly complete 1.6 million year old skeleton, found near Lake Turkana, Kenya, belonged to an eight year old boy. Nicknamed “Turkana boy,” the fossil is more than five feet tall and much more fully developed than a modern eight year old. Yet analysis of the teeth and bones indicates the boy was still growing and probably would have reached six feet as an adult. Turkana Boy is a member of the species Homo ergaster, the first early human with long legs, short arms and a tall structure; body proportions essentially like our own.
126. Hutterites – the followers of Jacob Hutter in farm communities. Hutterites believe in sharing their possessions in common as demonstrated by Christ and his apostles. Christ commanded us to love one another, and Hutterites believe that living together is a wonderful and unique expression of love for their fellow man. There are 450,000 Hutterites live in Western USA and Canada.
127. Natural Selection – the principle mechanism of evolutionary change, originally proposed by Darwin (1859), by which those individuals possessing certain advantageous characteristics contribute more offspring to the next generation than those who don’t.
128. Paleolithic – pertaining to the earlier part of the prehistoric Stone Age.
129. Phylogeny – the evolutionary origin and development of species.

130. Shamanism - The practice of Shamanism is nearly as old as human consciousness itself. Arising from a primary impulse towards ecstasy, the shaman seeks communion with all that is, and in the process adopts the role of mediator, counsel and healer to his or her community. Because he seeks union with nature in all its manifestations, he becomes conversant with the natural powers, and by following their guidance he is able to achieve feats denied to ordinary mortals.
131. Double helix – It is a double helix of DNA, a twisted pair that describes blogging dynamics. It contains two polynucleotide strands wound around each other.
132. Neocortex – Primates have huge brains. And one part of the brain, the neocortex, is remarkably larger in primates than in every other mammal. The neocortex handles complex thought and reasoning.
133. DNA – Deoxyribonucleic Acid is sometimes called “the blueprint of life” because it contains the code, or instructions for building organisms.
134. Baghwd Gita – one of the greatest scripture of India to the world, which is considered to be the first revelations from God.
135. Nazi Eugenics – Nazi Eugenics was primarily concerned with German Whites as superior race. Nazi Eugenics program raises some uncomfortable questions about our own fascination with the human genome (DNA code).
136. Herculaneum – Roman settlement near Naples, Italy.
137. Minoans – early settlers in the island of Crete near Greece.
138. Asthenosphere – the uppermost layer of the mantle of a rocky planet, located below the lithosphere. On Earth, this zone of soft, easily deformed rock lies at depths of about 100 to 250 km. it is more plastic than adjacent layers because the combination of pressure and temperature places it near the melting point.
139. Hurricane Katrina – one of the biggest storms in US history.
140. Lemuria – prehistoric island believed to be submerged under the Pacific Ocean.
141. Atlantis – prehistoric kingdom submerged under Atlantic Ocean.
142. Machu Picchu – early Incas ceremonial site on Andes in Peru.
143. Chicxulub – name of the asteroid impact crater in Mexico, which drove dinosaurs to extinction, some 65 million years ago.
144. Carbon Footprint – the total amount of carbon dioxide and other greenhouse gases emitted over the full cycle of an individual or a product, from the computer used to the next meal you eat.
151. Carbon sink – or carbon storage in forests, oceans, atmosphere and soils.
152. Pangaea – For almost one hundred million years, only one continent existed. It extended from the North Pole to the South Pole. Today, this land mass is known as Pangaea. It formed almost two hundred and fifty million years ago. The northern part of Pangaea was composed of what is now North America, Greenland, Siberia and Scandinavia and Eurasia. Southern Pangaea was the continent known

as Gondwanaland. The lands of South America, Antarctica, Africa, India and Australia existed as a single continent during the Paleozoic Era.

153. Panthalassa – 250 million years ago the ocean was called by the name Panthalassa. Though somewhat arbitrarily divided into several “separate” oceans, these oceans are in fact one global, interconnected body of salt water, often called the World Ocean. At present, the major divisions are defined in part by the continents and a variety of archipelagos, and are labeled the Pacific Ocean, the Atlantic Ocean, the Southern Ocean, and the Arctic Ocean. Smaller regions of the oceans are called seas, gulfs, straits and other names.
154. Plate Tectonics – According to the theory of Plate Tectonics the earth’s crust is broken up into at least a dozen rigid plates that move independently of one another. These slabs rest upon a layer of heated, pliable rock called asthenosphere, which flows slowly like hot tar. Geologists have not yet determined exactly how these two layers interact, but a popular theory is that the movement of the thick, molten material in the asthenosphere, forces the upper plates to shift, sink, or rise.
155. Gilgamesh – The epic of Gilgamesh was the first written epic poem and one of the oldest pieces of literature in the world. It was a eulogy to Gilgamesh, king of Uruk. It was originally written on 12 clay tablets in cuneiform script. Gilgamesh, originally a Sumerian legend recopied by the Assyrians, was composed and recited many times before written down. It was part of an earlier oral tradition.
156. Meteor – Meteors are actually pieces of rock that have broken off a comet or asteroid and continue to orbit the sun. A meteor that does not completely burn up in the atmosphere, but actually crashes into the earth instead, is then called a meteorite.
157. Precambrian – Nearly 4 billion years passed after the earth’s inception before the first animals left their traces. This stretch of time is called the Precambrian. To speak of “Precambrian” as a single unified time period is misleading, for it makes up roughly seven-eighths of the earth’s history. During Precambrian, the most important events in biological history took place. Consider that the earth formed, life arose, the first tectonic plates arose and began to move, eukaryotic cells evolved, the atmosphere became enriched in oxygen and just before the end of the Precambrian, complex multicellular organisms, including the first animals evolved.
158. Pleistocene – the Pleistocene Epoch is arguably one of the most important Epochs of the Cenozoic Era, if not all the geologic time periods. This period that ran from around 1.8 million years ago until 11,000 years ago, marked the evolution of mankind, thrust the world into a global ice age, and saw the extinction of many of the species that had dominated the Age of Mammals.
159. Biodiversity – Biodiversity or biological diversity simply means the variety of life. It included all living things from the smallest flea to the biggest tree. You will see biodiversity everywhere in the Vale: in town gardens and

window boxes, woods, roadsides, open countryside, rivers and coast. Biodiversity is critical to our survival. We depend on it for almost everything: food, fuel, clothing, building materials and medicines and it is also very important to our quality of life.

160. Megiddo – Megiddo is an ancient city located in the Jezreel Valley of northern Israel. Megiddo has assumed a huge role throughout history, from the earliest recorded conflicts, through the Israelite conquest of Canaan, to the decisive battle between the British and the Ottomans in 1918. Also known in the biblical text as Armageddon, Megiddo is the location of the final battle between Jesus Christ and his enemies (Revelation 16).
161. Mayan Civilization – The Mayans were found to be a very highly developed civilization. They lived between, 700 AD - 900 AD. They lived in the rain forests of Mexico and Central America. The Mayan culture was the most developed culture in the whole of ancient America.
162. Aidan Office – “Officium divinum”-A series of non-sacramental services of prayer to be chanted or recited at determined hours of the day. The series of “hours” has been a regular practice in cathedrals and monasteries since the 4th century. By the 13th century the hours were incorporated into one volume, called the Breviary, for the private use of monks and clergy. Orthodox churches still use the older collections of liturgical books for the divine office. Divine Office has been obligatory for all priests in the Roman Catholic Church since 1918. The Second Vatican Council revised the Breviary and changed its name to Liturgy of the Hours.
163. Mount Gerizim – Gerizim is an ancient name of a small but prominent peak in Palestine now called Jebel el Tur. It has an elevation of about 850 m (2500 feet) and is located in the West Bank near the town of Nablus. Gerizim is usually paired with nearby Mount Ebal, and the two mountains are prominent in Biblical history. According to Deuteronomy 11, the tribes under Joshua gathered on Ebal and Gerizim. It was also a holy place of the Samaritans.
164. Soil Taxonomy – In 1975 a new classification scheme known as soil taxonomy was published in the US and is now used by the USDA. Unlike earlier systems, which organized soils according to various soil formation factors, the new system emphasizes characteristics that can be precisely measured, including diagnostic horizons (which give clues to soil formation), soil moisture, and soil temperature. The top level of the system consists of 12 orders. Each term employs a Latin or Greek word root to describe a range of soil characteristic.
165. Stupas – Stupa, also tope or dagoba, hemispherical or bell-shaped masonry monument designed as a Buddhist or occasionally Jain shrine or reliquary. Stupas range in size from small, rudimentary structures to massive, ornately decorated monuments such as the stupa at Sanchi, India (3rd century BC to 1st century BC).
166. Krakatau – an island in Indonesia, known for its biggest volcanic eruption in history. 167. Thera or Santorini – biggest volcanic eruption in the past 10,000 years.

Bibliography

1. The Earth changes Survival Handbook by Page Bryant. (Sun Books, Albuquerque, New Mexico, 1983)
2. Time's Arrow-Time's Cycle by Stephen Jay Gould (Cambridge, MA and London, 1987)
3. An Inconvenient Truth by Al Gore (Bloomsbury Publications, London, England, 2006)
4. Earth in the Balance: Ecology and the Human Spirit by Al Gore (Bloomsbury Publications, London, England, 1992)
5. Cry of the Poor by Leonard Boeff (Rio de Janaro, Brazil, 1996)
6. History of God by Karen Armstrong (Bloomsbury Publications, London, England, 1997)
7. Toward a New Catholic Church by James Carroll (Boston, USA, 2002)
8. Creation and Evolution by Norman D.Newell (New York, USA, 1982)
9. Is God a Creationist? By Roland Mushat Frye (New York, USA, 1983)
10. A History of the End of the World by Yuri Rubinsky and Ian Wiseman. (William Morrow and Co., New York, 1963)
11. Neuroscience by A. Longstaff (Bios Scientific Publications Limited, Oxford, UK, 2002)
12. From Neuron to Brain by J.G. Nicholls, A.R. Martin, B.G. Wallace (Sinaur Associates, Sunderland, MA, 1992)
13. The Neuron: Cell and molecular Biology by I.B.Levitan, L.K. Kaczmarek (Oxford University Press, Oxford, 1997)
14. The Human Nervous System by M.L. Barr, J.A. Kernan (Harper and Row Publications, Philadelphia, 1983)
15. The Power of Now by Eckhart Tolle, Penguin Publications, Vancouver, British Colombia, 1998)
16. New Earth by Eckhart Tolle, Penguin Publications, Vancouver, British Colombia, Canada, 2006)
17. Introduction to Environmental Engineering and Science by Gilbert M. Masters (Pearson Education, New Delhi, 2004)
18. Mining the Earth by J.E. Young (Worldwatch Institute, Washington DC, 1992)
19. Pain: The Science of Suffering by P.Wall, R. Melzack (Penguin, London, 1999)
20. The Biochemical Basis of Neuropharmacology by J.R.Cooper, F.E. Bloom, R.H. Roth (Oxford University Press, Oxford, 1991)
21. The Age of Cataclysm by Alfred L. Webre and Phillip H.Liss. (Berkely Books, New York, 1974)
22. Sri Sathya Sai Baba and the Future of Mankind by S.P.Ruhela. (Sai Age Publications, New Delhi, 1991)
23. Pole Shift by John White (Doubleday and Co., 1980)

24. Face to Face with God by V.I.K. Sarin. (Saindra Publications, Prashanthi Nilayam, 1993)
25. World without Trees by Robert Lamb. (Magnum Books, London, 1979)
26. Why the End? By J.T.Revelator. (Information Pioneers Publisher, USA 1999)
27. Herald of the New Age by Ruth Montgomery with Joanne Garland. (Doubleday and Co., USA, 1896)
28. Cataclysms of the Earth by Hugh Auchincloss Brown. (Twayne publishers, New York, 1967)
29. The Late Great Planet Earth by Hal Lindsey with C.C.Carlson. (Zondervan Publishing House, U.S.A. 1970)
30. It's a matter of Survival by Anita Gordon and David Suzuki. (Harper Collins Publishers G.B. 1991)
31. Global Warming: The Green Peace Report Edited by Jeremy Leggett. (Oxford University Press, Great Britain 1990)
32. Vimana Aircraft of Ancient India and Atlantis by David Hatcher Childress. (Adventures Unlimited Press 1991)
33. Global Warming by Stephen H.Schneider. (Sierra Club Books, San Francisco, U.S.A. 1989)
34. The Climate Threat by John Gribbin. (Fontana Books U.K. 1978)
35. Earth Changes Update by Hugh Lynn Cayce. (A.R.E. Press Virginia Beach, 1980/1988)
36. Rolling Thunder: The coming Earth Changes by J.R. Jochmans. (Sun Books, Santa Fe, New Mexico, 1983)
37. The State in Ancient India by Beni Prasad. (Allahabad, India, 1928)
38. The Institutes of Vishnu by J.Jolly. (Oxford Publications, 1880)
39. Evolution of Ancient Indian Law by N.C. Sen-Gupta. (Calcutta, 1953)
40. Village Communities in Western India by A.S. Altekar. (Oxford, 1929)
41. A Study in the Economic Condition of Ancient India by Pran Nath. (London, 1929)
42. The Life of the Buddha as Legend and History by E.J. Thomas. (London, 1927)
43. The Heart of Jainism by Mrs.S. Stevenson. (Oxford, England, 1915)
44. A Source Book of Indian Philosophy by S.Radhakrishnan and C.A. Moore. (Princeton, 1957)
45. The Vishnu Purana by H.H. Wilson. (Calcutta, India, 1961)
46. The Hole in the Sky by John Gribbin. (Corgi Books, Great Britain, 1988)
47. Notes from the Cosmos by Gordon Michael Scallion. (Matrix Institute Inc, Chester Field, 1997)
48. We are the Earthquake Generation by Jeffrey Goodman. (Berkley Books, New York, 1979)
49. Encyclopedia of Natural Disasters by Lee Davis. (Headline Book Publishing, GB. 1993)

50. Astrology Looks at History by Marc Penfield (Llewellyn Publications, South Carolina, 1995)
51. Origin of the Species by Charles Darwin (London publications, 1859)
52. The New Solar System by J. Kelly Beatty and Andrew Chaiken (Cambridge University press, 1990)
53. Planetary Landscape by Ronald Greeley, second edition (New York, Chapman and hall, 1994)
54. Universe by William J.Kaufmann, fourth edition (New York, W.H. Freeman, 1993)
55. Dreams of a Final theory by Steven Weinberg (New York: Vintage Books, 1994)
56. Empires of the Mind by Dennis Watley and Nicholas Brealey Publishing, 1995)
57. An Unfinished Dream by Dr. Varghese Kurien (Tata McGraw hill, 1997)
58. Manifest Your Destiny by Dr. Wayne W. Dyer (Harper Collins, 1997)
59. Stardust to Planets by Harry Y.MaSween (New York: St. Martin's, 1994)
60. The Grand Tour: A Traveler's Guide to the Solar System by Ron Miller and William K.Hartmann (New York: Workman, 1993)
61. Exploring Planetary Worlds by David Morrison (New York, Scientific American Books, 1993)
62. Cosmos by Carl Sagan (New York: Random House, 1980)
63. The Call of the Cosmos by Konstantin Tsiolkovsky (Moscow, Foreign Language Publishing House, 1960)
64. Particle Physics and Inflationary Cosmology by A.Linde (Harwood Academy publishers, 1991)
65. Volcanoes: A Planetary Perspective by Peter Francis (Oxford: Oxford University Press, 1993)
66. The Heavens and the Earth: A political History of the Space Age by Walter A. McDougall (New York: Basic Books, 1985)
67. The Home planet by Kevin W. Kelley (Reading, MA: Addison and Wesely, 1988)
68. Earth Under Siege: Air pollution and Global Change by Richard Turco (New York; Oxford University press, 1995)
69. Space resources: Breaking the Bonds of Earth by John S. Lewis and Ruth A. Lewis (New York: Columbia university press, 1987)
70. The Search for Extraterrestrial Intelligence by Thomas R. MacDonough (New York: John Wiley and Sons, 1987)
71. Contact: A Novel by Carl Sagan (New York: Simon and Schuster, 1985)
72. The Four Noble Truths by H.H the Dalai Lama. Translated by Dr. Thupten Jinpa (London: Thorsons, 1998)
73. Is anyone out there? By Frank Drake and Dava Sobel (New york: Delacorte, 1992)
74. The End of History and the Last Man by Francis Fukuyama (New york: The Free Press, 1992)
75. Comet by Carl Sagan and Ann Druyan (New York: Random house, 1985)

76. Charisma by Charles Lindholm (Oxford, Blackwell, 1990)
77. The World, the Flesh, and the Devil by Freeman J. Dyson (London: Birkbeck College, 1972)
78. Interstellar Migration and the human Experience by Ben R. Finney and Eric M. Jones (Berkely: University of California press, 1985)
79. Understanding the Present: Science and the Soul of Modern Man (London: Picador/Pan Books Ltd. 1992)
80. Kindness, Clarity, and Insight by H.H. the dalai Lama (Jeffrey Hopkins, Snow lion Publications, 1984)
81. A Flash of lightning in the Dark of the Night – A guide to the bodhisattva’s Way of life by H.H the dalai Lama (Boston: Shambhala Publications, 1994)
82. The Good Heart – A Buddhist Perspective on the Teachings of Jesus by H.H the Dalai Lama (Boston: Wisdom Publications, 1996)
83. India as Knowledge Superpower by Task Force, report to Planning Commission, 2001)
84. The Horse that Flew by Chidanand Rajghatta (Harper Collins, India, 2001)
85. Light from Many Lamps by Lillian Eichler Watson (Fireside, 1988)
86. India 2020: A vision for the New Millenium by A.F.J. Abdul Kalam and Y.S.Rajan (Viking, 1998)
87. Environmental Education by K. Nagarajan, P. Sivakumar, R. Srinivasan (Ram Publishers, Chennai, 2005)by Richard P.Mcbrien (Harper Collins Publishers, San Francisco, USA, 1995)
88. Wonder That was India by A.L. Basham (Picaudor Publishers, Australia, 2004)
89. World Access by Kathryn and Ross Petras (Simon and Schuster Publishers, New York, 1996)
90. Universe by Nancy Hathaway (Penguin Books, USA, 1994)
91. Encyclopedia of Catholicism
92. Concepts of Ecology by J.K. Edward (Prentice Hall of India, New Delhi, 1991)
93. Environmental Science – A Study of Interrelationships by Eldon D.Enger and Bradley F. Smith (McGraw Hill, New Delhi, 2000)
94. Evaluating Environmental Biodiversity by Bennett, B. Dean (CPR Environmental Education Center, Chennai, 2003)
95. Helping Nature Heal – An Introduction to Environmental Restoration by Nilsen, Richard (Point Foundation, USA, 1991)
96. The Impact of Environmental Degradation on the People by Viegas, Philip, Menon, Geetha (Indian Social Institute, New Delhi, 1989)
97. Sustainable Development by CPR. Environmental Education (Eldoms Road, Chennai, 2003)
98. Management of Environmental Education and Research by P.R. Trivedi, Gurdeep Roy (Akashdeep Publishing House, New Delhi, 1992)
99. Igneous and Metamorphic Petrology by Francis J.Turner, John Verhoogen

(CBS Publishers and Distributors, New Delhi, India, 2004)

100. The Vijayanagar Empire by Chronicles of Domingos Paes and Fernao Nuniz (Asian Educational Services, New Delhi, 2003)
101. Organic Evolution by N. Arumugam (Saras Publications, Kottar, India, 1974)
102. Ecology by Jennifer Freeman (Smithsonian, Harper Collins Publications, New York, 2007)
103. Chemistry by Denise Keirnan and Joseph D'Agnese (Smithsonian, Harper Collins Publications, New York, 2007)
104. Ocean Science by Jennifer Hoffman (Smithsonian, Harper Collins Publications, New York, 2007)
105. Biology by George Ochoa (Smithsonian, Harper Collins Publications, New York, 2007)
106. Geology by Mark A.S. McMenamin (Smithsonian, Harper Collins Publications, New York, 2007)
107. Weather by Trudy E.Bell (Smithsonian, Harper Collins Publications, New York, 2007)

Magazines Quoted

- | | | |
|---------------------|-------------------------|-------------------------|
| 1. Science Digest | 7. Readers Digest | 13. The Washington Post |
| 2. India Today | 8. The Time | 14. The Pilot |
| 3. Frontline | 9. USA Today | 15. The Geo |
| 4. Newsweek | 10. National Geographic | 16. Gladrags |
| 5. The Outlook | 11. The Boston Globe | 17. Maxim |
| 6. The Sydney Times | 12. The NewYorkTimes | 18. The New Man |

Video Films

- | | | |
|-----------------------|--------------------------|------------------------|
| 1. Deep Impact | 15. Asteroid | 29. Grand Canyon |
| 2. Jurassic park | 16. Planet earth | 30. Genesis |
| 3. Day after Tomorrow | 17. Seas of Life | 31. Serengetti |
| 4. Volcano | 18. Carbon Footprint | 32. Evolution of Man |
| 5. Discovery | 19. Earth-the Biography | 33. Big Bang |
| 6. History Channel | 20. Seas of Life | 34. The Universe |
| 7. Animal planet | 21. Blue Planet | 35. Monster of the Sky |
| 8. Dante's Peak | 22. Deep Sea | 36. Black Holes |
| 9. The Big Chill | 23. Atmosphere | 37. Supernova |
| 10. Global Warming | 24. When Worlds Collide | 38. Pre-Cambrian Life |
| 11. Meteorites | 25. Emerald forest | 39. Milky Way Galaxy |
| 12. Armageddon | 26. Tropical Rain Forest | 40. Solar System |
| 13. Deep Core | 27. Amazon | |
| 14. A Fire in the Sky | 28. Everest | |