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The Story of the Universe: Our Story

A sense of identity is a major problem for our young people. Questions arise such as: Who am I? Where am I going? Where am I in relation to my family? What is the meaning of life? What is the meaning of human dignity, love and community? Have I an important, unique role to play. The New Story as told by Berry will offer some answers to these vital questions. The New Story assures us that each person makes a unique contribution to the universe by the development and creative use of his/her gifts and talents.

One of the problems with our present culture is that the fundamental story, which gives meaning to individual human life, is not accepted by society at large any more. The creation story in Genesis Chapter 1, tells how the world was made in seven consecutive (Gen 1: 2-4a) days. The chapter tells how humankind arrived on the scene (Gen 1:26-31). This account of how our world came to be is no longer adequate or effective in the light of modern science.

We need a modern comprehensive myth or story to account for the emergence of the world and our place and role in it. The New Story that has been developed by Berry in the light of modern scientific knowledge has provided us with a credible and acceptable story. This story is the context within which all other stories of origin find their fulfilment. The Genesis account elaborates a religious and moral view, it does not give us a historical or scientific account of the origins of the universe, planet Earth or our own unique habitat.

At the beginning of the 21st century we are beginning to see the Earth in its context of the Universe. Because of space travel, we have been able to stand apart from the Earth and see it, at least in photographs, as a whole. We have become used to a new picture of the Earth, as a single, beautiful, blue-green planet shared by all living creatures. This new understanding of the formation of our universe and our earth must now become the largest possible context for our global, national and individual lives. It must become the foundation of all meaning. This story or myth attempts to answer the ultimate questions which humankind have always posed and wrestled with since *Homo sapiens* emerged on the planet. From where do we come? Where are we now? What are we to do? How are we to live our lives today? What is our destiny? What does the future hold for us?

This is the context in which we must view the work of Thomas Berry. He is an American Passionist Priest, a theologian or geologian, as he prefers to call himself. Building on the work of Teilhard de Chardin he helped to articulate a more comprehensive story of creation. In both, *The Dream of the Earth*, and, *The Universe Story* (which he wrote with the scientist Brian Swimme) he uses insights of astronomers, physicists, biologists, cultural anthropologists, historians and religious scholars like Mircea Eliade to tell of the emergent Universe. In these books he charts out the extraordinary unbroken sequence of events from the initial flaring forth to the beauty, fruitfulness and diversity of life on this blue-green planet. Everything that is now present in our universe and more particularly on earth has emerged through these

unbroken series of transformations. Everything is connected to everything else. Humans, for example, have emerged from the rocks and the flowers.

The Origin moment in the great flaring forth

Some 13.7 billion years ago, in a great flash the universe flared forth into being. The British astronomer Fred Hoyle facetiously called this singularity the Big Bang in a radio broadcast in 1952. Everything in the universe is rooted in the extraordinary generativity of that first moment when primordial energy blazed with an intensity never to be equalled again. This model of the universe captured by the image flaring forth was first developed in the 1920's and 1930's by the Russian scientist, Aleksandr Friedmann (1888 – 1925) and the Belgian priest scientist George LeMaitre (1894 – 1966). They postulated that the universe began much smaller and much hotter. It began with a 'singularity' no bigger than the centre of an atom.

By 400,000 years radiation had weakened and the Universe had cooled so atoms could begin to form. This gave rise to the atoms of hydrogen and helium. The Universe ends up being 75% Hydrogen and 25% helium. This is close to what it is today. With the emergence of matter mass and gravity became important.

Now the four forces of the Universe are in play – gravity, electromagnetism, the strong nuclear force and the weak nuclear force. We may ask why four? We are not sure but we know that they were the result of the process that preceding processes. This has led to the situation that the initial singularity of the universe now appeared as four different activities. In this transitional phase as it were the fundamental architecture of the universe's interactions were set for all time. Gravity, electromagnetism, the strong nuclear force and weak nuclear force would apply in every part of the universe and act in the same way.

Cosmic Moments of Grace

In his writings Thomas Berry speaks about cosmic moments of grace, by which he means events which are crucial to the development of a universe which supports life and intelligent life, often happen at almost zero possibility. For example the relative strength of the four forces of nature are critical to the development of the universe, the earth, life on earth and the emergence of humanity. If the rate of expansion one second after the flaring forth had been smaller than even one part in a hundred thousand million, million the Universe would have collapsed before it reached its present size.[i] If the explosion had been more violent the gases produced – hydrogen and helium – would move apart so fast that there would have been no local density/differences and, therefore, no first generation stars would have formed.

The anthropic principle is another example of a cosmic moment of grace – this time for biological life. According to John Polkinghorne this is based on a collection of scientific insights which indicate that the possibility of the evolution of a carbon-based life depended on a very delicate balance among the basic forces of nature and, possibly, also on very specified initial circumstances of the universe.[ii]

What is particularly striking in the emergence of the universe is the lack of repetition in its development. Fireball gave rise to the galactic phase and the first generation of stars. The hydrogen/ helium percentage of gases in the universe only takes place once. Later some of

these give rise to solar systems and planets, each different from the rest. The oceans only arise once. We find these crucial moments in a universe of unending diversity.

The Galactic Phase: 10 – 13.7 billion years ago

The first star did not appear from possibly 100 million years after the flaring forth.[iii] Then clouds of the hydrogen gas that had cooled down clustered together and, under the force of gravity, heated up again giving rise to the first gigantic stars and galaxies. This formation of the first stars and proto-galaxies began the process of cosmic evolution.[iv] The largest of these stars are called *supernova*. The normal *supernova* is about 20 larger than our Sun. Most stars die after their hydrogen has been exhausted with little enough fuss. When a supernova 'dies' the explosion releases the energy of a hundred billion suns. This process is known as nucleosynthesis. As supernovas collapse they spewing out the heavier elements like carbon and iron. Carbon is the chemical basis of life. So the carbon atoms in every living cell like the cells in our bodies have once been part of distant stars and probably other creatures before they became part of us.

Formation of Solar System: 5 billion years ago

Our mother star in the Milky Way, exploded and scattered her stardust into space. Our solar system emerged out of the creativity of so many former beings. The elements of the pre-solar cloud from which it emerged, had been created by former supernova stars and by the primordial fireball. Gradually, though the action of gravity, this ball began to bond together and ignite and give rise to a nuclear reaction. At this moment in time 4 million tons of hydrogen are transformed into helium each second. This energy fires almost every organic activity on planet earth. By itself the sun holds 99.9% of the matter in the solar system.

Earth: 4.5 billion years ago

When the sun had been formed some of the residue of elements swirling about the sun gave rise eventually to Mercury, Venus, Earth and the other planets. It is estimated that it took about 200 million years in all for the Earth to form. Right through that period it was bombarded with cosmic debris and it was still molten.

The earth is neither too big or nor too small; it is not too warm or too cold for life to emerge and survive on it. The precise location of the earth in relation to the sun is also hugely important. It makes it possible to maintain an optimal temperature for the emergence of complex molecules, and hence of life. If it were closer everything would have burned; if further everything would be frozen. Earth is 93 million miles from the sun and light travels from it at the rate of 186,000 miles a second. Our Sun too is the right size. If it had been much bigger it would have burned out in 10 million instead of 10 billion years. It takes about 8 minutes for energy from the Sun to reach the earth.

About 4.4 billion years ago a large object, possibly the size of Mars, crashed into the earth and dislocated a huge amount of matter which went on to form the moon. Within a very short period of time the displaced material reassembled itself into a sphere and began to circle the earth. Our moon has a steadying influence on the Earth. Its gravitational pull keeps the earth spinning at the right speed. It also keeps it spinning at the right angle. This stability over

long periods of time is vital in the development of life on earth. It is also very important in terms of movement within the ocean and tides.

Over a period of time the 'infant' earth acquired an atmosphere mostly made up of carbon dioxide, nitrogen, methane and sulfur. It was not like the current oxygen-free atmosphere but was dominated by carbon dioxide and methane. The carbon began to give rise to a green house effect. This was very important for the 'infant' planet because the luminosity of sun was much less then than it is today. Without this greenhouse gas the earth might have remained a frozen planet, inhospitable for life.

For about 500 million years the young earth was continually bombarded with meteorites. These visitors brought material which would eventually become the water that fills our oceans and the elements which are necessary for life. Initially the earth was a cauldron of gaseous material. It cooled gradually and formed the atmosphere, oceans and land mass.

We now know that the earth's crust is not like an orange skin continuous right around the planet but is made up of different sections called plates. The first person to develop a theory on the movement of plates was geologist Alfred Wegener (1889 – 1930). Looking at a map of the world he noticed that South America seemed to fit nicely into Africa. His theory of plate tectonics was dismissed by geologists and other scientists of the time, including Albert Einstein. It is only since the 1960s that it is now accepted that the crust of the earth is composed of between 8 and 12 large plates.

Emergence of the Ocean: 4.45 billion years ago

The oceans have a very special place in the story of the universe. To us the oceans may seem ordinary but we can truly appreciate their significance when we view them as the universe unfolding itself in a new way. As far as we know running water is found nowhere else in the Universe. Water vapour or ice may have been found on other planets but only on our planet have the oceans been created and maintained for four billion years.

Furthermore, the oceans are the womb of life. The origin of life remains a mystery. It appears that gradually more complex elements emerged in the oceans, including amino acids and, finally, proteins. Proteins are extraordinary and, by all the laws of probability, should not exist. In order to make a protein you must assemble amino acids in a particular order like the way we need the proper sequence of alphabet letters to spell a word correctly.

Emergence of life: 4 billion years ago

Life emerged when the Earth was being bombarded by multiple lightening storms. A prokaryote is an organism whose cell lacks organelles and a nucleus. These prokaryotic cells are the basic building blocks of life. They reproduced asexually by dividing and creating exact copies of themselves. These bacteria can live forever if the environmental conditions remain right.

For almost 2 billion years bacteria were the only form of life on earth. During the first billion years the blue-green algae learned how to 'fixed' hydrogen from the oceans and release oxygen into Earth's carbon dominated atmosphere. This was the beginning of photosynthesis.

Gradually oxygen began to saturate the land, atmosphere and the seas. In the anaerobic world (lacking oxygen) oxygen is toxic so this new development created problems for the living world.

In time a new, more complex form of life emerged. These were cells which had organelles (little tools in Greek) and also possessed a nucleus. The captive bacterium became a mitochondrion. In this way oxygen is now turned into a source of energy which drives most biochemical reactions in living organisms. Oxygen provides the energy a cell needs to move and divide.
These new entities are called eukaryotic cells. They emerged about.2 billion years ago of the result of the merger of different prokaryotic cells. These are nucleated cells which contain a large number of oxygen using sub-cellular units called organelles. In time the eukaryotic cells became much bigger than their prokaryotic older cousins.

The Beginning of the Era of Co-operation
3.5 billion years ago in shallow seas cyanobacteria began to cling to together and form visible structures which are called stromatolites from the Greek word for matress. This was the first communion experience. Another significant breakthrough for life was the emergence of nervous system and brain in a worm species.

About 1.3 billion years ago single cells gathered together and committed themselves to each other. In the more complex processes this enhanced the venture of life. An increase in size gives selective advantage. The diversity and cooperation was further expanded by the invention of meiotic sex, about one billion years ago. This meant that two different genetic beings could unite to form a totally new being. Their offspring inherit one set of chromosomes from each parent. This rich genetic heritage enhances their chance of survival in different environments.

The Emergence of Plants
Plants evolved from green algae. They gradually came ashore from the ocean to dry land. To survive they had to bring with them their own water supply. This process of colonisation happened about 450 million years ago.
There are about 250,000 varieties of plants. They include liverworts, mosses, horsetails, ferns, ginkgos, conifers and flowering plants. One of the major transformations in the life of plants was the movement from water to the land. They need to bring the water with them and formed a waxy layer, the cuticle over most of their surface.

A number of features are associated with flowering plants or *angiosperms.* First of all they are flowers which are pollinated by wind insects or birds. The second feature is the ovule which is enclosed within layers of tissue. Fertilisation takes place through the pollen tube. Flowering species have been very successful in the past 50 million years and today comprise about 90% of all plant species.

Palaeozoic Era: 600 - 245 million years ago

During this period the first soft-bodied animals evolved in the oceans e.g. jellyfish. One of the greatest inventions of this era was the development of a hard shell using the minerals, phosphorus and calcium.

Mesozoic Era 235 - 67 million years ago

In the change over from the Palaeozoic to the Mesozoic Era two things emerged that altered the character of terrestrial animal life. The first was the development, in reptiles, of an amniotic egg, i.e. a membranous fluid-filled sac which was water tight and which protected the developing embryo. This meant that the animals were now free of bodies of water for mating purposes and were able to roam far and wide inland. There are about 6.500 different kinds of reptiles. Some of the better known are crocodiles, alligators, turtles, lizards, dinosaurs and snakes.

The first mammals appeared in the late Triassic period about 210 million years ago. In the intervening period the educated guess is that there has been 100 mammalian species for everyone species which exists today. The number today is 4.300 though new species of mammals are being discovered as I write.[v]

Mammals are warm blooded creatures that evolved from reptiles and carried their young within their own bodies. These creatures have various distinctions. The baleen whale is the largest animal to have ever existed on the planet, though many people might mistakenly believe that this distinction belongs to some dinosaur. The cheetah is the fastest animal that has ever lived and no animals in the history of life have had the stamina of either horses or dogs.

For almost 100 million years mammals and dinosaurs existed together on the planet but the dinosaurs were masters as only a few species of mammals reached the size of a polecat. Mammals really thrived during the cenozoic period after the dinosaurs had been eliminated.

Extinction

It is important to emphasize that life did not continue to evolve in a straight line pattern as it were. We know from the fossil records that there has been five moments of mass extinction of species. We are familiar with mass extinction at the end of the Mesozoic period that wiped out the dinosaurs. It seems that a large meteor crashed in the planet somewhere in the area of modern Mexico. The impact of the meteor threw up huge quantities of dust darkening the earth and interfered with photosynthesis. As a result of this cosmic accident dinosaurs' habitat was destroyed.

At the beginning of the 21st century we are witnessing another great extinction spasm. In November 29th 2000 David Attenborough on a BBC nature programme (entitled The State of the Planet) stated that if we continue destroying the habitat of other creatures as we have been doing in recent decades half the species on the planet will be extinct within the next 50 to a 100. This is a horrendous thought and yet little is being done to stop this haemorrhage of life. Biologists like Edward Wilson, author of *The Diversity of Life* (1993, Penguin) point out that this present extinction is not caused by cosmic or climatic conditions but by one species – *Homo sapiens*. Looked at even from a selfish perspective human kind need this diversity of

species for our food and medicinal requirements. Finally, and most chilling of all, the contemporary extinction spasm is not another pruning of life which we give birth to a new era of biological creativity. Unfortunately it is a great sterilizing for which future generation will curse this waste and destructive generation.

Cenozoic Era: 55 million years ago it started

Over the course of the next fifty five million years Earth greets rodents, whales, monkeys, horses, cats and dogs, apes, grazing animals, elephants, camels, pigs, baboons primates and the first humans. It was the age of flowers, primates and hominids. Primates evolved from mammals about 55 million years ago. Over the next 50 million years they diversified into lemurs, tarsiers, gibbons, orang-utans, gorillas, chimpanzees, monkeys, apes and eventually hominids. There are about 200 species of primates.

The Emergence of Humans

7 million years ago a new species broke off from the chimpanzee line. They are called *Australopithecines*. They were bipedal and emerged in Africa. One of these named 'Lucy' was discovered in Ethiopia in 1974. She was quite diminutive, just three and a half feet tall and with a brain capacity of 400-500 cubic centimeters. She is the first in the line of *Australopithecus*.

One group that did use tools was *homo habilis* and like the *australopithecines* they were bipedal. The increasingly dexterous use of hands 'encourage' greater brain capacity and greater intelligence. This increased humans' ability to out maneuver other creatures and capture them for food.

Present knowledge indicates that *Homo Erectus* is linked to *Homo Habilis*. They appear about 1.8 million years ago in Kenya and had more 'human' features than 'ape'-like features. Some scientists feel that *Homo Erectus* is not the ancestor of humans but rather an evolutionary dead end, albeit a very successful one for over 200,000 years. They claim that the cousins, *Homo Ergaster,* who remained at home in Africa has a better claims on being our direct ancestor. These emerge about 400,000 years ago in Africa. In Europe they are known as *Homo Neanderthaensis*.

The direct ancestors of our species, *Homo Sapiens, Sapiens* emerged out of Africa about 100,000 years ago. They had the ability to speak. Speech led to more cohesive social relations and also the development of symbolic language and art, as well as the capacity for song and dance. This group populated the planet within a relatively short period of time. For most of his/her existence on the Earth *Homo Sapiens*, *Sapiens* has been a hunter and gatherer. This was the tribal age. It was a period of great creativity for humankind. A wide variety of languages, and social, political, moral and religious systems emerged during this springtime of human creativity. Tribal people created the world of myth, and they identified and shaped many of the archetypal structures of human consciousness which still guide our secular and religious life today.

The Beginnings of Agriculture

Between 12 and 10 thousand years ago in the Neolithic period, new social structures appeared and new technologies including weaving and pottery. Agriculture began with the domestication of wheat and rice, also of sheep, pigs, cattle, horses and chickens. One of the major changes which humans have wrought on the planet was the turn to agriculture about 11,000 BC. This involved planting seeds and harvesting them and also domesticating animals. One major result of agriculture was the increase in population density as farmers lived in settled communities. Naturally, hunters and gatherers continued their way of life in tandem with agriculturalists.

Civilizations

Then, some five thousand years ago the Western civilization story began to unfold. It and many other cultures arose in river valleys – the Tigris/Euphrates, the Indus and Ganges and the Yangtze. In Mesoamerica, among the Mayan and Aztec, it was somewhat different.

Classical religions began to emerge about 3000 years ago such as Judaism, Buddhism, Hinduism, Christianity and Islam and these have profoundly shaped our moral and religious consciousness. Through agriculture and new living patterns human began to shape the environment in an extensive way. This was the period when villages began. Towns and cities eventually arose out of these simple social structures.

During this period writing was invented. This helped solve numerous organisational challenges which numerous and far-flung cultures posed to political and commercial leaders. The written word also enabled societies to record their cherished myths, stories, poetry and liturgies. In the legal sphere it allowed leaders to promulgate laws and scholars to plot the movement of the heavenly bodies. This in turn led to the development of the calendar.

Another important legacy of this era was the development of abstract thought. This began in Greece in the 4th century B.C. but it continued right through the Roman times and the Middle Ages right up to our time.

Technological Age

This began about 200 years ago and was grounded in the scientific insights of people like Roger Bacon, Rene Descartes and Isaac Newton. That new scientific age gave rise to revolutionary technologies. As technologies became more sophisticated humans had greater power to transform the world of nature in extraordinary ways. Much of this transformation happened through pressure from the liberal capitalism economy system.

The first phase of the industrial revolution began in Britain. The source of energy was coal which was abundant. It drove the steam revolution. Then Thomas Edison's discoveries regarding the use of electricity, and the discovery and use of oil in the later part of the 19th century led to the electrical and petrochemical phase of the industrial age. Studies in physics at the turn of the 20th century finally led to the emergence of nuclear power both civilian and military. This era began with the bombing of Hiroshima on August 6th 1945. Further revolutions in the 20th century involved the micro-chip and digital age. On the biological side developments in genetics and biotechnology have led to the biotech era in agriculture and medicine. In *To Care for the Earth* I wrote; *one cannot deny that some comforts and benefits of this*

age have helped ease the toil of life for many, the benefits have come at enormous cost. The industrial age has changed chemistry, geology and biology of planet Earth and affected every preceding phase of the story of the universe in an irreversible way.[vi]

An atlas produced by the American Association for the Advancement of Science (AAAS) called *Atlas for Population and Environment* shows the extent to technology has transformed the world. Many of these changes are doing enormous damage to the fabric of the earth. Two-thirds of the world's rivers have been damned for electricity and irrigation. The challenge of the 21st century is to develop technologies which work with the earth's processes. We have changed the chemistry of the planet, the biosphere and even the geology of the planet. Human need to radically change the way they see, view and relate to the Earth.

The Great Work

According to Thomas Berry in his book, *The Great Work,* as we move into the new millennium humans are challenged is to carry out a transition from the period of human devastation of the planet to a period when humans would be present to the planet in a mutually enhancing manner. Responding to the cry of the Earth and the cry of the Poor ought to be at the centre of Christian discipleship and Mission today.

[i]**Notes**

Hawking, Stephen, 1988, *A Brief History of Time*, Bamtham Books, p. 34.

[ii] Ponkinghorne, John, 1996, *Science and Christian Belief,* SPCK, London, p. 195.

[iii] Richard B. Larson and Volker Broom, "The First Stars in the Universe", *Scientific America,* Special Edition, Vol. 14, no. 4, 2004, p. 4.

[iv] *Idem*, p. 11.

[v] Colin Tudge, 2000, *The Variety of Life: A Survey and a Celebration of All the CREATURES that have EVER LIVED,* Oxford University Press, p. 233.

[vi] Seán McDonagh, 1985, *To Care for The Earth*, Geoffrey Chapman, London, p. 92.