

# The Evolution of Earth and of Life: A Holistic View

by ALICK BARTHOLOMEW

James Hutton, the father of geology, postulated (1785) that the Earth is alive, and is properly studied through physiology. How things have changed! We now have difficulty with this kind of holistic world-view because we live in the age of the particular, the individual, and the detached. A holistic view in any discipline brings with it a greater sense of meaning, as the connections and relationships discovered seem to point eventually to a common source of all creation and knowledge. Having been a student of orthodox geology, I would like to examine a more holistic view of evolution of the Earth and of life.

The Earth is generally thought to be about 4.5 billion years old. The first two billion years are clouded in mystery. But let us say that it would have taken about 1/2 billion years for the planet to develop a crust, and another 1/2 billion for oceans to begin to form. Probably about 2 billion years ago, the oceans became the womb for primitive forms of organic life, initially bacteria, worms and algae. It was impossible then for life to gain a foothold on land, which, up to 400 million years ago had a most inhospitable environment. There was no climate as such, no fertility. How and when the atmosphere formed is also a mystery. The early atmosphere must have been composed mostly of CO<sub>2</sub>, creating a very hot surface temperature (like Venus). It is thought that a cosmic impact (eg when the Earth/Moon system was created) may have removed this heavy atmosphere, to allow a thinner, life-friendly one to develop. Once photosynthetic plants became established on land the formation of an oxygen-rich atmosphere would be able to proceed.

## **Uniformitarianism or Catastrophism?**

Geology has its share of over-arching theories. One that has bugged the science and still does, is the question of how quickly do changes take place. Gradually or suddenly? It is similar to the debate about evolution of life. James Hutton proposed the theory of 'uniformitarianism' or gradual change over the eons. It seemed a reasonable hypothesis - mountains seem to change very little over historical time.

The contender is the theory of 'catastrophism' which is gaining support, especially with the evidence of damage caused by asteroids or planetary fragments - such as in human memory the diluvial chaos of about 9,500 BCE, which is recorded in many indigenous traditions, or the demise of the dinosaurs in the Cretaceous period. The truth is more likely to be a combination of the two. One further possibility is that cosmic events may have precipitated some major geological transitions, as they seem to have in species destruction. There is evidence of switching of the poles in the

geological past (*vide* Hapgood) which may have been the result of cosmic events.

A holistic approach to geology is concerned with the links between physical processes in the Earth and other systems - with life, for example. The evolution of terrestrial life as it has unfolded would not have been possible without Earth's extraordinary partnership with the Moon, which was probably formed about the same time as Earth. There is no other planet-moon combination known where the moon is as large as ours is in relation to its planet 1/4 size of Earth - it has been called a 'binary planet' system). The generation of a strong Earth magnetic field, which lessens damage to life systems from cosmic rays was probably due to prolonged heating following the likely impact that created Earth/Moon system.

### **The Earth/Moon System**

The Moon has influenced the evolution of terrestrial life - primarily by stabilising Earth's obliquity (inclination) at 23° 27', which allows predictability of seasons, climate, weather patterns, plant & animal environments. (*cf* Mars's varies 0°-60°.) It is possible that the stability of the Earth/Moon system has also limited disruption from cosmic impacts. Clearly, Jupiter and Saturn, because of their enormous masses, have been the first line of defence for Earth life (*eg* The Schoemacher/Levy impact of Jupiter in 1994).

The Moon's ability to generate large tides would have encouraged tidal pools for creating polymerisation of organic molecules and facilitated the emergence of life from the ocean. The effectiveness of water as the driver of life and evolution for all organisms is facilitated by the tidal influence of the Moon. The deeply rich diversity and sheer abundance of life as we see it on Earth is largely a product of this special Earth/Moon system.

### **Earth's Upheavals & Evolutionary Advance**

One of the most significant links between the Earth and the emergence of life is how evolution might have been stimulated by Earth's upheavals. The great freeze and restlessness of the Cadomian orogeny towards the end of the Pre-Cambrian era then seemed to introduce a gear-shift when what may be called 'Nature' started to take shape. Not much is known about this far-off period, except that there is evidence that the whole Earth was covered by a vast ice sheet for about two-thirds of the Cadomian period. Could this be seen as preparation for the first burst of life? There would certainly also have been seismic activity and tectonic plate movements.

At the dawn of the Palaeozoic era, some 545 million years ago, after the Cadomian mountain-building movements (orogeny), Earth went through an evolutionary advance which produced an explosion in the biodiversity of ocean life-forms, when quite complex organisms started to appear - vertebrates and hard shelled creatures like the trilobites (*see geological time-chart*). An abundance of oceanic fossil remains is found in the geological strata from this time onwards. Is it possible that

the orogeny helped to stimulate this evolutionary explosion?

Then, about 200 million years later, half way through the Palaeozoic (400 million years ago), Earth experienced another great restlessness, the Caledonian earth movements, which raised a great mountain chain extending from Ireland, through Scotland to northern Scandinavia, as well as in other parts of the world, whose land masses were then differently positioned. One of the remnants is the Torridonian sandstones, found today in the north-west of Scotland. Now quite worn down, they nevertheless retain a kind of mountainous grandeur, even though the sandstone was laid some 600 million years ago in Pre-Cambrian times.

One might describe Earth's four billion years before this as a long period of gestation, with the gradual cooling of the surface, establishment of solid crust with continental roots, formation of oceans, balancing the chemistry of water and formation of a primitive atmosphere and, eventually, experimenting with basic life forms in the womb of the oceans.

### **Life Emerges from the Ocean**

The Caledonian orogeny was a most significant period in Earth's evolution. It lasted about 75 million years, at its height in the Old Red Sandstone period, and signalled, if you like, Earth settling down after its gestation, and getting down to its real business of life-creation. Crucial to this goal was the formation of climates beneficial to life on the land. The Caledonian also brought widespread glaciation of what are now sub-tropical areas, India and Africa. This period of enormous change witnessed a transformation of the Earth environment which allowed life to become established on land.

The first terrestrial life forms were types of seaweed that absorbed CO<sub>2</sub> and transpired oxygen, and mangrove-type semi-aquatic plants and primitive ferns. The first non-aquatic plant life appeared, enabled by the creation of soils that could later support the first forests in the Carboniferous period and allow the first land vertebrates to emerge. The first land animals were amphibians and early vertebrates. The chemical composition of seawater creates an environment that limits the evolutionary potential of sea creatures. The ocean mammals got around this much later by developing a heart and blood circulation that required oxygen. Life has had a more tenuous hold on the dry land of this planet than would appear from the apparent success it enjoys in the current age.

These mountain-building movements were windows of intense activity lasting scores of millions of years. It would have taken about 20 million years of each orogenic period to extract minerals and trace elements from the mountain rocks in order to build up ecosystems sufficiently vital to support the higher plants and, eventually, animals. The combination of glaciation and orogeny seemed to provide the quickening impulse for life and evolution.

The next orogeny, the Hercynian, first generated vast amounts of molten igneous rock, followed by the uplifting and folding of sediment beds. The Jurassic forests, the dinosaurs and the first mammals followed some 60-80 million years later. The last period of orogeny, the Alpine, started at the end of the Cretaceous period, 65 million years ago, continuing for some 60 million years. The Eocene period saw rapid forest growth, and by 35 million years ago, oak and beech were growing alongside redwood, cinnamon, palms and magnolia.

In between these periods of intense activity, Earth's environment settled back into a generally more passive stasis, with increased desertification, interspersed with volcanic and seismic activity, environments more suitable for aquatic than terrestrial life. It was not devoid of life, but lacked the vibrant biodiversity of the times following periods of orogeny.

### **Ninety per cent of Life is in the Oceans**

It is easy to think of life on the Earth primarily as a terrestrial phenomenon, with fish and whales in the oceans as a bonus. Actually the reverse is the case, but it's only with modern research techniques that the extraordinarily rich life of the oceans is beginning to manifest, with some 13,000 new species discovered in 2003 alone, out of a known total range of 38,000 species from plankton to whales. More than 90% of Earth's biomass (in weight of living matter) is found in the oceans, of which 90% is made up of single celled and microbial species.

Containing approximately 97% of the Earth's water, the average depth of the oceans is almost 4,000 metres. It is thought that life started with *extremophile* species around the hydrothermal vents on the deep sea floor that can heat up the water to 450°C. Similar rare creatures are still found today. They do not need photosynthesis for food, as does 97.7% of the biosphere. They obtain their energy solely from chemical reactions, and were the first step in the evolutionary cycle.

The oceans and the atmosphere are the principal drivers of the Earth's climate. They moderate it by removing excess heat from the Tropics through the thermohaline oceanic circulation system. Although phytoplankton comprise only 0.2% of the world's biomass, their prodigious reproduction rate helps account for nearly 50% of the Earth's primary food source, and support the incredibly rich marine community, from zooplankton to whales; but it thrives only in cold waters. The rich biodiversity of the oceans is now under threat from decimation of the base of the food chain through global warming, and the higher part of the food chain by industrialised over-fishing and pollution.

### **Earth's Shifting Crust & Catastrophes**

The geological time scale measures the passage of time in the most extended scale of any field of enquiry. A geological period in which physical and climatic conditions seem to be relatively uniform may extend between 30 to 75 million years. A period of orogeny can even last for 20-100 million years. Judged from the view of the observer, this represents infinitesimally slow change that is the

basis of the theory of Uniformitarianism that James Hutton proposed in the 1790s, and which has remained the accepted wisdom to this day.

In the 1880s, Alfred Wegener proposed the theory of continental drift to explain how the land masses moved around the surface of the globe, from the days of a single continent that he called "Pangea". This hypothesis survived until the 1950s when the theory of plate tectonics was developed. This was a recognition that changes can happen quickly, as plates often move suddenly against each other.

Charles Hapgood, inspired by Wegener and encouraged by Albert Einstein, made a detailed study of the evidence for the movement of the North Pole in the present Holocene period and postulated a theory of the Earth's crust shifting under the uneven placement of huge ice sheets in glacial times.

The Uniformitarian hypothesis has been challenged by the evidence of catastrophic events which suggest that sudden changes in the Earth's environment were brought about by cosmic accidents, notably hits or near passes by asteroids or planetary fragments, which has given rise to the theory of Catastrophism. Evidence of such collisions was gradually obscured by new sedimentation or seismic events, so it is usually only the most recent that are visible.

The best known occurred at the end of the Cretaceous period with the demise of the dinosaurs; many believe the impact crater was in the Yucatan. Just within human memory (but heralded in the mythology of many indigenous peoples) was the apparent near pass of a planetary fragment about 9,500 BCE, which left craters over a wide area of eastern North America.

There are many other anomalies which have not been deeply researched, such as the origin of continent-wide deposits of loess (a fine sand) over much of Asia, the cause of the enormous lava fields over the centre of the Indian sub-continent, and strange evidence of human technology locked in geological strata millions of years ago.

Humanity is living in such a tiny instant of time in the great scheme of evolution that it is hard to appreciate how long an evolutionary movement lasts. In geological time, important cycles and processes, such as deep soil formation, took not just millions of years, but often scores of millions. However, the link between physical upheavals in the Earth body and sudden evolutionary explosions that we have described favours the cataclysmic view of Earth history and evolutionary change - over the gradual change Darwinian view.

### **Evolutionary Theories**

Darwin's theory of evolution rests on the assumption that life has evolved through a series of biological changes brought about by a combination of random mutations and natural selection.

Those species that are able most successfully to adapt to changing environmental conditions will

supersede those less successful - 'the survival of the fittest'. This is observable, and there is no doubt that natural selection takes place, but whether it is the main engine of evolution is open to question.

The theory proposes that, over a long period, one species gradually changed into another. Fish changed into amphibians, which became reptiles; reptiles evolved into birds, which metamorphosed into animals. This theory has been taught for nearly a century and a half, (and still is) in spite of the fact that it has never been proved.

The difficulty is that the fossil record, which is the most accepted form of proof, does not yield the transitional organisms, the intermediate forms between major groups. There is, for example, an abundance of fossils of early primates, hominids, Neanderthals and *Homo sapiens*, but no link has been found between the ape and man. The same difficulty appears with plants: no intermediate fossils have been found between primitive non-flowering plants, and the sudden appearance of flowering plants.

Darwin was well aware of the shortcomings of his theory. He called the origin of flowering plants "an abominable mystery". The biologist, Lynn Margolis, insists that the survival of any environmentally interdependent organism shows that cooperation or symbiosis is far more important in evolution than is competition.

It is hard to believe that simple hunter-gatherers 50,000 years ago could have had the ability and foresight to develop, from inedible wild grasses, complex grains fit for human consumption. It would mean engaging in a hundreds of generations crossbreeding experiment which would involve increasing the number of chromosomes by factors of 2, 3, 4 or even 8.

Speaking of chromosomes, it seems strange that modern man, who is supposed to be more developed, has only 46 chromosomes compared to the other primates' 48. There are many other significant differences that challenge a close genetic relationship between them. Faults have been found in the other cornerstone of Darwin's theory - genetic mutation. Geneticists have long accepted that mutations are usually mistakes, from the DNA failing to replicate the correct information. To be a dynamic force for change, natural selection would need a mechanism much more reliable and predictable than genetic mutation has proven to be.

The crux of the difficulties for evolutionary theory has come with the discovery of the enormous complexity of organic processes, and particularly in the intricately linked interdependencies of biodiversity. It is inconceivable that these complexities could have evolved in a random manner. Nevertheless, Darwin's theory of evolution is a pivotal part of the current scientific orthodoxy of reductionist materialism, which sees Nature's processes as mechanical rather than organic. A

scientist who challenges it still risks his future career.

So the situation is that, outside scientific circles, there is little awareness of the problems associated with the Darwinian theory. Many have heard about the war between Creationists and Evolutionists, as a replay of the battle between science and religion, which the Scopes trial was meant to have settled a century ago.

### **'Intelligent Design' or 'Purposeful Evolution'?**

The biblical Creationists' simplistic belief in the origins of life discourages credibility. The 'Intelligent Design' theory (a new trend in American Christian education) that has Creationist roots, says "life somehow assembled itself out of organic molecules". Another theory, which has yet to be elaborated, is that knowledge of edible grains was somehow passed from an earlier, developed, but forgotten, civilisation. A more recent theory claiming attention, the 'Interventionist', insists that life forms were introduced by extraterrestrial civilisations; needless to say, this theory has no orthodox support, being regarded as too fantastical.

Linked to the Catastrophism position - and perhaps the most interesting - is the theory of Continuous Creation, which is in direct opposition to the now generally accepted Big Bang theory that satisfies religious groups who believe in a single primordial act of creation by God. This new theory is proposed by Paul LaViolette who believes that the purpose of the relatively rare cosmic event of the galactic super-wave caused by massive explosions at the galactic core is to create matter from the 'etheric flux' that invisibly pervades the entire Universe. The last occurrence was about 15,000 years ago. The Vostock ice cores in Antarctica show a peak of cosmic radiation and a sharp increase in temperature at this time. LaViolette claims that this actual event could account for the classical Greek writer Ovid's description of a scorched Earth phenomenon and also for some 80 different societies' flood myths.

The concept of an etheric substratum from which matter is created originated in Hindu metaphysics, has attracted considerable scientific credence over the years. It has more recently been revived by Einstein's protege David Bohm, who sees the Universe as part of something far vaster, more ineffable and essentially conscious.

Our proposal holds a similar view of consciousness at all levels of life, but seen at the Earth rather than the Cosmic level, as a mechanism of intelligent Nature searching for greater complexity, biodiversity and consciousness in life forms. We might call it 'purposeful evolution'. The etheric flux (or 'ether') may be seen as the ground of consciousness, water as the vehicle for transmission and communication.

The evidence shows that with each burst of new life forms a stage higher than the last was attained

in terms of complexity and biodiversity. We see this form of evolution as spontaneous steps emerging out of a catastrophic situation initiated by Earth herself in the process of her evolution, a theory quite dissimilar to any of those described above.

Some may object to the concept of consciousness being introduced into evolutionary theory, but we hold that it is a quality appropriate to apply along with the increased complexity and inter-connectedness that evolution presents - consciousness defined as a level of perception of relatedness on a hierarchical scale. The discovery of meaning in creation is the occupational hazard for those who take the wide world-view. Some of the scientific pioneers, like Albert Einstein, Sir James Jeans or Carl Jung espoused a spiritual worldview.

In recent years there has been a rapprochement between esoteric theories of the evolution of life and some more holistic scientific ideas. Quantum physics now entertains the possibility of unifying concepts, suggesting even a sense of purpose in evolution. Creation myths and Eastern esotericism have traditionally regarded the Earth as empowered with a level of intelligence, which has been mirrored by contemporary scientists like James Lovelock and Lynn Margulis. Their Gaia hypothesis (1979) holds that the biosphere is a self-regulating entity that keeps the environment constant and comfortable for life. As a geochemist, Lovelock's principal concern is the constitution and homeostasis of the atmosphere, rather than the origin and evolution of life itself.

Taking the self-regulating concept of Earth a step further brings up the theory of Earth as an intelligent organism on its own evolutionary path, with Nature's evolution as a dependent part of the system. At this point there enters a spiritual dimension. In esoteric and spiritual traditions Nature is called 'the mirror of the Divine', which could also be identified as a level of 'being' of a more evolved Earth - manifesting complexities of life forms in response to Earth's own evolution. The evolutionary imperative of Nature, in these traditions, seems to be towards greater complexity and biodiversity, and towards higher levels of purpose.

In hindsight, the significance of these windows of Earth upheaval could be seen to have created an energy quickening to facilitate an evolutionary spurt (as in the Vendrian period, late Pre-Cambrian - see *chart*), but also later, particularly in Alpine times, the creation of pure water which would become the vehicle for more dynamic evolution, through ecosystems of increasing complexity and interdependence.

The prevailing world-view of Earth as a mechanism spills over into our need to rationalise every part of a process, and is uncomfortable with chicken/egg predicaments. The holistic world-view is more accepting of mysteries, believing that they will gradually release their truth at the appropriate time.

### **The Importance of Water for Evolution**

Viktor Schauberger (1885-1958) viewed the intricate inter-connectedness of all of Nature's energetic processes as essentially sacred, emanating from the supreme source, The-All-That-Is. He often refers to Goethe's similar world-view. The energy level is the actuality - matter is fossilised energy. He saw water (including sap and blood) as an organism, the vital life-giving and energy-empowering vehicle that intelligent Nature uses for all forms of transmission and communication, energetic as well as physical, a medium linking Earth and Cosmos, with a vital role in promoting higher evolutionary life forms.

Schauberger emphasised the importance of the water cycle. This intricate cycle, together with the minerals that it supplies, can be seen as providing the nourishment for evolutionary biodiversity. Water, as the vehicle for life, has its own evolutionary journey. Fresh water in Caledonian times is likely to have been much less complex than today's - not in its chemical composition - but in its structure.

Way back then, all that was required of water was a simple laminar structure. The evolutionary needs of new life forms demanded more complex DNA and chromosome forms. To support this, water would need to develop the potential of more complex geometric structures, eg: 3-dimensional geometry, complex octahedra, molecular clusters, Platonic solids and their derivatives. These structures appear only in the highest quality of water.

One of the properties of water that is now being recognised is its ability to carry information, often called 'water's memory', upon which the principle of homoeopathy depends. This extraordinary quality may have emerged as the essential tool of expanding biodiversity, particularly in the past 30 million years since the peak of the Alpine orogeny.

The creation of mountain systems near the coast with on-shore winds in those times allowed a complex water cycle to develop, essentially similar to what we find today. Air over the ocean becomes saturated by evaporation caused by the Sun's heat. This humid air is carried inland, either by the prevailing wind or by warmed air rising from the coast pulling it in. As it rises up the flanks of the mountains, the humid air releases heavy rain on reaching its dew point. This rain weathers the rock, penetrating the interior, and leaches out minerals, salts and trace elements, the essential nutrients for plants, whose purpose, together with bacteria and other micro-organisms, is to convert them into nutrients for higher life forms.

The underground water cycle is equally important, creating aquifers and huge storage systems that have remained, even under deserts, for many millions of years (until technological Man, without a thought for the future, is now draining them unsustainably). Wells and springs are part of this system. The relationship between underground and surface water cycles is significant. Working together, they form a balanced system of water of high enough quality to allow the enhancement of

life, providing the optimum conditions for biodiversity. In our ignorance and greed today, we have destroyed this balance, most critically in our destruction of the tropical rainforests.

This combined cycle of water, minerals and trace elements, kept active for millions of years by occasional orogeny, allows nutrients to penetrate the banks of rivers, to create fertile flood plains and, with the cooperation of plants and bacteria, gradually to build up a soil profile. From the onset of each episode of mountain building, a period lasting scores of millions of years established the fertility required for abundant growth and forests. The forest was Nature's brilliant innovation for the next surge of evolutionary expansion, at its most developed in the tropical rainforest. Viktor Schauberger demonstrates that the forest is also the cradle of water.

### **Mountains & Civilisation**

Mountains are the source, too, of ice formation and glaciation. Glaciers are the most powerful erosive agent, and glacial water the most potently endowed with minerals. Szent-Gyorgyi's and Flanagan's research suggests that imbibing the highest quality water can lengthen the human lifespan. They were particularly impressed by the extraordinary longevity enjoyed by some mountain dwellers, notably in the Hunza valleys of Pakistan and in the Georgian Caucasus, claiming that this was due to the qualities of glacial water.

The civilisations of Man could not have evolved without mountains providing the minerals, the water and the fertile land. Great alluvial flood plains became the cradle of civilisation - Mesopotamia, the Indus Valley, the Yellow River, the Nile delta. Considering the close links between mountains and our source of life, it is hardly surprising that they provide spiritual nourishment and fascination for many.

### **Humanity at a Crossroads**

Modern man has lost the plot. We no longer understand the importance of these natural cycles, forgetting the importance of remineralisation of the soil. Long passed are the days when the refertilisation of the croplands by the spring floods was celebrated. Nature's garden is self-sustaining and self-enhancing. Man's extractive methods deplete the soil of its minerals. His garden is barren, the living structure of the soil destroyed by chemicals. Due to the vast energy input of fossil fuels, the world's population has unsustainably quadrupled in the last century. The combination of exhausted, eroded and poisoned soils, fossil fuel depletion, population stress, flooding and desertification through climate change does not bode well for the long-term future of civilisation.

In the last one half of one percent of the 'eye-blink' of Man's appearance on the Earth, he has succeeded in destroying many of the complex eco-systems that has taken Nature 30 million years to establish. Will Nature (or the Supreme Creator) make another attempt to establish life at a higher level of consciousness in another few million years?

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