Environmental Overview: Planet Earth

NB: This is a brief to give an overall understanding in order to place the environment in its proper perspective. Information contained in my description of the Earth and Cosmos mainly sourced and formulated from Stephen Hawking's 'Universe', BBC's 'The Planets', BBC's 'Universe' and Discovery channel's 'Planet of Life' Volume Four.

Sincerely,

Andrew Webber

Federal Policy Coordinator NSW

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In the beginning there was darkness. And God moved upon the darkness and said; "Let there be light." And there was light. In a blinding flash the explosion that would create the foundries of the universe, erupted.

The explosion thralled a fireball that expanded ever-outward deep into space, like a rippling mirage of fire riding a shock wave of intense blistering heat and sub-atomic alchemy. This, heralding a chain reaction that eventually was to lead to light and life. As professor Hawking says, "At one moment it was sub-atomic, the next, enormous." It was a fiery sphere, our universe, full of immense energy, heat, radiation and eliminatory particles and anti particles; it was somewhat like a huge mad swarm of bees. Sub-atomic particles flying in all directions and frequently colliding with each other, producing more energy and sub-atomic particles. This was matter vs anti-matter and it is the most powerful release of energy known.

Anti-Matter: A positron, the opposite of an electron: When a photon, a particle of energy that has no electric charge, collides with another particle, there is an explosion of energy, which creates a particle of matter and a particle of anti-matter. The collision also creates another photon, which then splits apart forming an electron (matter) and a positron (anti-matter). At the moment immediately following the big bang, the Universe was a sea of energy. Matter and anti-matter, met and annihilated each other. The Big Bang, having created the Matter and Anti-Matter in the first instant, saw to a war being waged in which matter was to become predominant.

Then, as the Universe expanded, its temperature lowered and the particles slowed down. They then began to approach each other and bond together to form protons and neutrons. It took around 200 thousand years before these then began to bind together with electrons around their nucleus to become hydrogen atoms, which in turn began accumulating in vast gas clouds. So in the early Universe at half a billion years, numerous immense clouds of hydrogen gas had evolved. Gravity pulled these clouds ever tightly together, forming a gaseous sphere and disc. The resulting mass eventually ignites a nuclear reaction and a star begins its life. Between 1 and 2 billion years the first stars and galaxies were born. Now, some 15 billion years since the "moment of creation", there is somewhere around one hundred billion trillion stars.

For at least 13 billion years, stars have been generating all the stuff that you and I and all that we see are made of. The stars are factories that continue the process of the creation of matter and anti-matter in the Universe. They make other stars and solar systems. They transmute elements from one to another down the periodic table. All this from hydrogen gas.

About 5 billion years ago, a massive star on the outer edge of our galaxy ended its existence as a Super Nova. When the giant star collapsed in on itself, it triggered the fusion of all the elements heavier than iron and blasted those searing hot grains of iron, gold, silicon and all the other elements into a neighbouring gas cloud. This caused the cloud to collapse in on itself. Gravity and magnetism, swelling the cloud into a mass in the centre, ignited yet another nuclear reaction. In a blinding flash our Sun sprang to life. The remaining debris in the mid-plane of the gaseous disk accumulated to form the proto-planets. Again gravity and magnetism at work, fine molecules of dust gathering together to make larger clumps, which in turn gather together to become larger still, slowly at first, but as it increases in size, the number, size and velocity of other objects hitting it, greatly increase. The larger the planet to be becomes, the greater the dimple in time and space and as gravity would have it, increasing the size, number and velocity of objects approaching and colliding with the proto-planet. This constant bombardment generates immense heat. The Earth was thus a cauldron of molten plasmatic rock and iron. Earth was at one point not the only planet orbiting at the same distance from the Sun. It's well possible that it was Mars that collided with Earth, blasting out a fair mass of magma and spraying it off into space into an orbit around our planet. It rapidly rejoined the largest body and formed our moon. Mars, by comparison, has two smaller moons, Fobos and Demos.

We live in a universe that is generally accepted to be around 15 billion years old on a planet in a solar system that is some 4.5 billion years of age.

Sol: our Star, the Sun, is in a sense halfway through its existence, for every star is born with a finite amount of fuel. Therefore the activity and fate of our Star also govern the life and weather on our planet - our polar regions, the temperature of our oceans, the gravitational pull of our moon as well as the geothermal activity of our world, the positioning of its land mass along with the elements which act as the medium, all affecting life on the planet.

Thus, man upon the face of the planet, in perspective, becomes humble; however, man's impact is an undisputed factor.

Our planet is the same age as our Sun because we were formed as a consequence of its conception. Every billion years our Star increases its temperature by 10%. Consequently, in just one billion years our Sun will start to vaporise our oceans and earth's atmosphere shall become denser. At two billion, Earth may start to resemble Venus. Mars, at this stage, shall become warmer, trapped water ice shall begin to melt and eventually pool and precipitate upon the surface. Volcanism shall rebuild her magnetosphere, atmosphere and oceans. Geothermal activity on Mars, however, is dormant. Consequently, the planet is presently inactive and because of this, has not a sufficient magnetosphere, which is vital for the maintaining of an atmosphere. This may well pose a problem to future terraformers despite it appearing advantageous, although the prospect of causing Mars to recreate a sufficient molten interior must be of curiosity and one; no doubt, Sol shall remedy as she expands. In two billion years our Sun has already begun to swell out, increasing substantially in size and shall be 20% hotter, solar flairs and mass coronal ejections shall become ever more frequent and larger still. Several Moons of Jupiter and Saturn, Titan and Europa amongst them, have the potential to become Earth-like. By four billion years our Star has swollen so large as to reach out near the current orbit of our planet, having totally consumed Mercury and Venus and destroying all life on Earth. Any life on Mars shall also perish.

At the death of our sun, Jupiter just may well swell in mass sufficiently to ignite and become a star in its own right. Finally, our sun will explode outward from its polar regions, leaving its heavy core behind glowing intently, till eventually fading. The debris flung away from the sun shall form a beautiful gaseous cloud in the shape of an hourglass, which in time shall give birth to a new star and solar system.

Our solar system is travelling along at the breakneck speed of 600 kilometres a second and accelerating. So are all the other solar systems in our galaxy, as are all the other galaxies immediately around us. We are all being drawn to what is referred to as the Great Attractor. A super cluster of galaxies to which we are being drawn towards and which we shall join some time between 50 and 100 billion years; in which time our solar system, as we know it, shall be long dead. It would seem then for our species to continue, our future will involve space travel and the colonisation of other planetary bodies with whatever plant and animal life we so choose. But we, as a species, have to survive the present and immediate future, for history has shown us catastrophic events shall challenge our existence, not being from our own hands alone.

50 thousand years ago, a fifty metre fragment of a planetoid, blown apart over a billion years earlier, collided into the Earth in what is now Arizona, USA.

Hits around this size have occurred right across the Earth including Australia. They leave a crater around 3 kilometres across and half a kilometre deep. They make the detonation of one modern nuclear warhead pale into insignificance. One would not destroy an entire city, but an entire state; indeed much of the country would be decimated. The shock wave and resulting tsunami would send destruction abroad.

However the meteorite that struck some 65 million years ago and created the Gulf of New Mexico was to benchmark the 5th Extinction. For it was not 50 metres in diameter but 6.5 miles, so it would not really matter too much where you were on the planet if one of this size ever stuck again.

Life sprang into being almost immediately after our planets completion, some 3.9 billion years ago, and only half a billion years after our sun's creation. It appeared in the form of a single cell. There resulted an explosion of life over eons where Earth's first multi-cellular organisms multiplied and evolved. Three billion years ago the highest form of life was bacteria, at one billion, the jellyfish, worm and coral, starfish, sponges, trilobites, sea scorpions and sea snails, graptolites, brachiopods, armoured jawless fish, molluscs and echinoderm-crinoids.

Then came the first of the Mass Extinctions. Four hundred and forty million years ago. Killing off over 90% of Earth's species, leaving the oceans barren.

But then plants evolved, soon after, insects, along with primitive carnivorous reptiles. But they too would be decimated in a second mass extinction. There have been a total of five mass extinctions and nine distinct periods of evolutionary development in tune with distinct periods of change upon the Earth, where numerous (around 20) extinctions took place of a large range of creatures.

Four million years ago, the first creatures of human resemblance appear; around 100 thousand years ago modern man took his first steps. If life on earth is represented on a time scale of 12 months, Homosapians have then existed for only 13 minutes in the final hour.

From of the five mass extinctions of almost all the different species that sprang from that first primitive singular beginning, the Earth's surface plates have come together, formed a Super Continent known as Pangaea, then broke apart forming Laurasia in the northern hemisphere and Gondwana in the southern. It was at the forming of the super continent that saw yet another mass extinction. Today's positioning will again change as the plates move into and away from each other. The changing in positioning of the continents also affecting the axis, temperature, weather and sea level of the planet and therefore impacting directly on its inhabitants. This natural evolution has in the past also seen mass extinctions. Albeit these extinctions are Natures workshop and life today on this planet exists only because of those past extinctions. Nature shall always remind mankind that where man can destroy, nature can obliterate. The eruption of Mount St Helen's threw out more carbon into the atmosphere in 20 minutes than the entire US industrial sector could manage in the preceding 20 years.

Influenza killed more people than World War One in the same period of time. Indeed disease and virus are other examples of nature's dark scythe. But does mankind have the ability to avert his own extinction? We would be demonstrating our own naiveté if we believed that mankind is anything but removed from life's evolution on this planet. What we do as a species has been that of nature because we are a part of it. We, as a species, have worked tirelessly upon the face of our planet, conforming it and the life around us to best suit our needs. Consequently the laws of cause and effect take place. There is good reason to be concerned, but what we are worried about and trying to fix, and what is actually transpiring, are too often entirely different matters.

Our planet retains around 30 % warmth from its "greenhouse" atmosphere, which is just enough to keep it in the temperate range that it's in. "Greenhouse" is thus essential, not a demon and is 97% water vapour. World temperature fluctuations in the past have been common. Also sudden and dramatic variations that, I might add, occurred without the assistance of Man.

It is also interesting to note that every 50 million years our solar system passes through one of the spiral arms of our galaxy. When this occurs, our Earth and all its inhabitants are potentially exposed to extinction because of the intense radiation from stars that have turned nova. It is a 50/50 chance and every mass extinction has occurred when earth and our solar system had passed through this arm. Earth is also in danger of being struck by a comet/meteor that has been stretched back from our solar system by the pull of other stars that cyclically pass by. These bodies are then catapulted back towards the sun as those other stars move away again. As geological and astrological evidence has shown us that this is a cyclic phenomena and one now due. 2012 AD Possible near miss.

20 thousand years ago existed the last great ice age. Greenland's ice core samples show that the temperature was –20°F, or –29°C. Temperatures since then have steadily climbed, till around 13,000 years ago reaching –7°F. Since then, fluctuations between highs and lows in a range of half to three degrees have occurred.

It jumped suddenly by six degrees within a hundred year period to reach a high of –1° F. Then at that time, 11 thousand years ago, there was mass glacial meltdown that had built up before bursting through into the warming Atlantic, in a torrent rush of fresh ice cold water. This is most likely the contributing factor that saw the world's temperature then suddenly plummet by 18 degrees and threw the world into the grip of another substantial, yet brief, ice age that was to last a thousand years. At its coldest, the temperature dropped to –19° F. Today it is 0°F or –18°C, where it has been sitting for around five thousand years.

So it is with the Universe, from the smallest Neutrino to the largest star, that everything works in cycles, replicating and evolving. Its calculus chaos that everything moves to a mathematical logic, yet is subject to random and evolutionary factors that govern a change.

Life finds a way. Do we mourn the extinction of the Mammoth, Woolly Rhino and Sabre tooth Tiger or celebrate the survival of our own species? In turn, life on this planet may depend upon man for its continuing existence. As species have disappeared, others have taken their place, but it's in the immediate that nature has its threshold. Life though never relents and is constantly on the move. There is always some aspect of life adapting, changing, evolving and not just becoming extinct. Some of mankind though is overpopulating at unsustainable levels; we are also the most contaminated creature on the face of the planet, having poisoned ourselves with every known carcinogen. Globally we are finding ourselves running out of space and food. Humanity is thus headed toward the crunch decade; where mankind will need to redress the seemingly forgotten real nightmares that threaten the globe, otherwise face ever greater famine, plague and potential war. Grandstanding on the world stage over make believe monsters will go nowhere to addressing these problems.

We need to appreciate the environment in which we live and ensure that what is utilised is done so at sustainable levels. We should not irresponsibly lock it away, but do need to protect what we have. We should co-exist with nature and be of minimal impact as far as practically possible, but not to the point of insanity, for we need to manage and work with nature as well.

We must be able to exist and manipulate the environment where needed to sustain an environment that is best friendly towards ourselves and that of the ecosystem to which we not only adore, but also depend upon.

We have to, in all accounts, ensure our survival and make whatever impact necessary upon the environment in the overall picture to be capable of achieving and maintaining that survival and in turn that of the environment.

The future success of humanity rests not only with his understanding of himself, but his place within nature and the universe.

Andrew Webber Policy Coordinator. NSW Federal.

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