Born This Way
A History of Life on Earth through Climate Change

Climate Change has always been with us. From the very beginning of Earths' long and turbulent history everything has continued to change and evolve. Many of these Climate Changes have been cataclysmically profound. Yet up unto the present day, the entire evolution of the Human species has occurred during a time of relatively calm and cool climatic conditions.

Many times throughout geological history, Climate Change Events have often been the precipitating factor in the advancement and evolution of successful species. Especially for Humankind and Mammals, every Global Warming Climate Change Event, and even some of the cooling events, so far have proven to be times of unprecedented abundance, evolutionary growth and development.
Every Geological change in Earth's history has resulted in winners and losers. Those that could adapt and evolve lived on while most everything else became extinct. Mass Extinction Events litter the historical records as testified by fossil and stone records dating back billions of years. Never in the entire history of the Earth has anyone or anything ever been able to stop it and no one alive today can either!

When explaining the effects of adaptation to Climate Change, some take the scientific Darwinian Evolutionist approach: survival of the finest, fittest and sometimes 'lucky'. Others believe that God created Heaven and Earth in 'seven days'. New Zealand Maori believe in the union of Papatuanuku and Ranginui; Japanese Shinto sees the world as one of unified Spirits call Kami. And there are

any number of the other Godly and non-spiritual scenarios explaining the development and evolution of their world.

Whether called by any other name, or if you don't believe in God at all but perhaps adopt a strictly 'scientific' explanation, the fact still remains that each and every interpretation of life on Earth accepts the fact of Change, continual and sometimes dramatic change as being a fact of life.

Everything in this world has been born that way; and for a reason. Each living creation emerges from nearly nothing, begins to develop and transform as it learns to cope and adapt to the immediate environment. Some meet the challenges of living quite well and live on to contribute and/or produce further offspring while others do not.

This fact is quite obvious to any Gardener who has ever saved seeds from a favourite plant or attempted to breed something 'new and improved'. Almost any batch of seed collected and sown will create a variety of different offspring. Sometimes a single sowing of seed can produce very different and unusual things that might result in a new hybrid cultivar.

It is actually much easier to produce a variety of different things from a batch of seeds than it is to sow seed and have their offspring all come up the same. They never do!

Matter of fact every single thing in the entire living universe appears to be at least slightly different from everything else. Each one was born that way, each a little different than everything else around it. Each has the same opportunity to face the challenges and uncertainties of the world into which it has been born. And each living creation sees the world through different eyes, from a subtly different perspective. And that world is constantly changing and evolving in a kaleidoscope of eternally shifting days, each and every one different than the last and never to be exactly repeated ever again, as far as anyone has yet determined.

The strongest and most adaptable and sometimes the most fortunate 'lucky' ones are those that often live on to produce others equally able to cope with the world around them. The most successful become new species from which an entirely new genus might arise.

Sometimes there is an unusual fortunate opportunity for a less hardy or diminutive species to advance due to the random chance that it arrives just at the 'right' moment when surrounding conditions favour and shelter it sufficiently to survive. These are often those unusual living things that remain remarkably

unique to life. Sometimes they interbreed with another successful survivor resulting in an entirely new genus or species.

This is easily observed in the Kingdom of Plants. The giant Sequoia trees of California have withstood the ebb and flow of 'modern' climate changes over thousands of years. They are today's largest living representatives of the massive Pinophyta a division of plants which includes at least 68 genera and 630 living species, plus thousands more now extinct.

Yet fossil stone records trace these forest giants all the way back more than 300 million years to the Late Carboniferous (Pennsylvania) Period to a humble and very simple tree with fern-like leaves known as a Cordaite which adapted to climate and environmental change from a small rush-like swamp plant very similar to the common Horsetail. Another of these clever plants eventually adapted and changed into the primordial Gingko Tree, known botanically today as Ginkgo biloba!

Fossil and stone records reveal much about the Earth's prior history. From these stone records, combined with extensive Geological and Scientific research, it has been possible to trace back nearly the entire history of Planet Earth. All these time periods have now been organized into Eons, Epochs, Eras and Periods of time.*

*Apologies to Young-Earth Creationists who consider the Earth and all its wonderful creations to be only a few thousand years old. This theory may prove to be justified by the Second Coming. Please consider the following information more as a general guideline as to the apparent order in which the Lords' Creations first appeared upon the Earth.

In many circumstances I have included more than one date for each Eon, Epoch, Era or Period. Carbon dating is the best tool science has at its disposal to estimate the true age of any fossil or rock sample. But even scientific carbon dating and associated research is often conflicting which supports the idea that only the Lord knows the True Story of Creation.

The Hadean Eon:

The Hadean Eon Earth and Moon was a place of profound Climatic Change and extremes more like an image from science fiction. Image courtesy Mark Garlick www.spaceart.com

The Hadean Eon 4,800/4,600-3,800 million years. There is a great amount of conjecture and speculation about the early Earth this long ago, as very few rock outcroppings exist. What stone records there are suggest a molten and fluid surface early on with an atmosphere filled with Carbon Dioxide, Hydrogen and Water Vapour.

Somewhere in its early formation, Earth may have collided with a small planet about the size of Mars. This Giant Impact Hypothesis suggests that the Moon may have been evolved from the debris field created as a result of that impact. Most recently scientists have theorized that the debris from this collision possibly created a larger and smaller Moon. These eventually collided to create our present Moon.

By 4,000 million years the Earth had significantly cooled. Oceans were forming and there is evidence of plate tectonics and the formation of stones which suggest the possible earliest forms of life.

From the few earliest stones dating 4,300 million years ago, it is believed that the Earth's atmosphere then was 54% Carbon Dioxide combined with a number of toxic gases and almost no Oxygen. At this stage the earth was vulnerable and often bombarded by meteors. The earth's molten core was young and dynamic.

Floating on the molten surface, the Earth's crust was just forming and as it cracked and shifted great volcanic eruptions poured magma over the surface and hot gasses filled the atmosphere. As the surface cooled water vapour from these

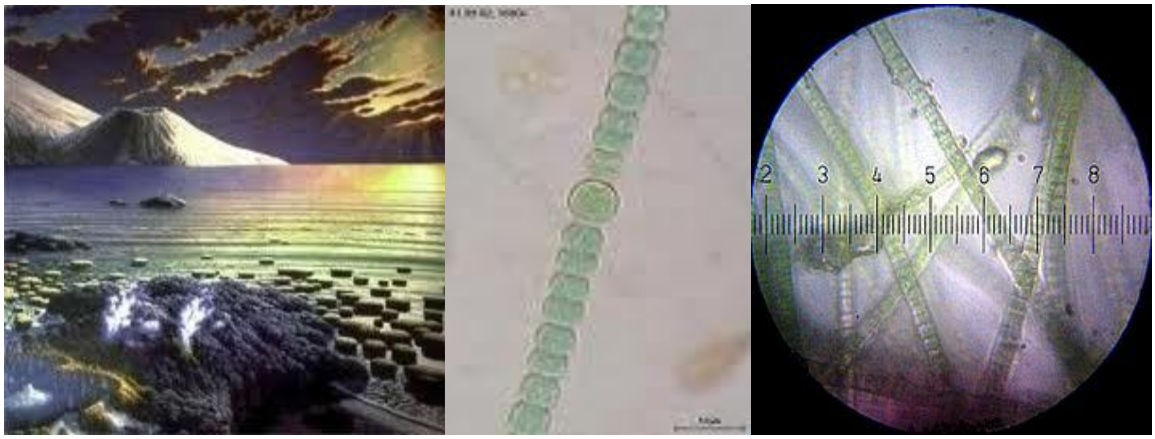
hot gases condensed causing so much rainfall that it filled the many basins on the surface creating shallow seas. These earliest of Earths days, are so shrouded in debris, destruction and eons of time that they remain vague times before there is enough known to successfully date them.

Continued volcanic activity, combined with frequent lightning, shock waves from frequent bombardment by meteors and chemical reactions caused by the intense ultraviolet radiation streaming through from the Sun, resulted in chemical reactions that created carbon compounds like the amino acids upon which life forms are based.

There are a few more stones that date back at least 3,700 million years ago when the planet was still being bombarded by meteors. Talk about 'climate change'. Some of the oldest stones with any evidence of fossil 'life' occur in Australia.

The earliest records of any sort of 'life form' would be the Stromatolites at least 3,500 million years ago! These were formed from primitive Algae which grew one layer upon the next in the shallow warm seas. These resulted in mounded bands of fossilised rock. So it is thought that primitive algal plants were the first successful life forms!

The Archean or Archeozoic Eon:



Archean Eon had little more than bacteria and plankton life. Courtesy www.innovates.net Anaboena spirica (centre) and Cyanobacteria (right) from the fast diversifying Prokaryote Family were some of the most advanced life forms. Images courtesy of en.wikibook.org

The Archean or Archeozoic Eon 3,800-2,500 million years was convulsive and turbulent. Earth's internal heat levels were much higher but atmospheric temperatures were similar to modern times. There was little if any free Oxygen but many greenhouse gases in the atmosphere. Sea levels were high and very acid.

There are a few more stones that date back at least 3,700 million years ago when the planet was still being bombarded by meteors. Talk about 'climate change'. Some of the oldest stones with any evidence of fossil 'life' occur in Australia. The earliest records of any sort of Life forms consisted of Algae and Bacteria, Cyanobacteria , forming in mats that developed into mounds known as Stromatolites.

These 'life form' Stromatolites are found in fossil stones at least 3,500 million years ago! These were formed from primitive Algae which grew one layer upon the next in the shallow warm seas.

These resulted in mounded bands that eventually compressed into fossilised rock. So it is thought that these primitive Algal plants and Bacteria were the first successful life forms!

The next really big change occurred about 3,000 million years ago. The Earth was mostly very warm seas. There was nothing habitating the land, which appears to have been largely volcanic, very unstable and constantly changing. But in the warm, shallow seas where Algae 'bloomed' a wonderful transitional change occurred.

Some of the Algae suddenly transformed from the slim mould Cyanobacteria into blue-green 'single-celled' Algae. The miracle was that they had adapted to climate change and now had 'learned' to photosynthesize sunlight, Carbon Dioxide and water into plant food and release as a bi-product, Oxygen!

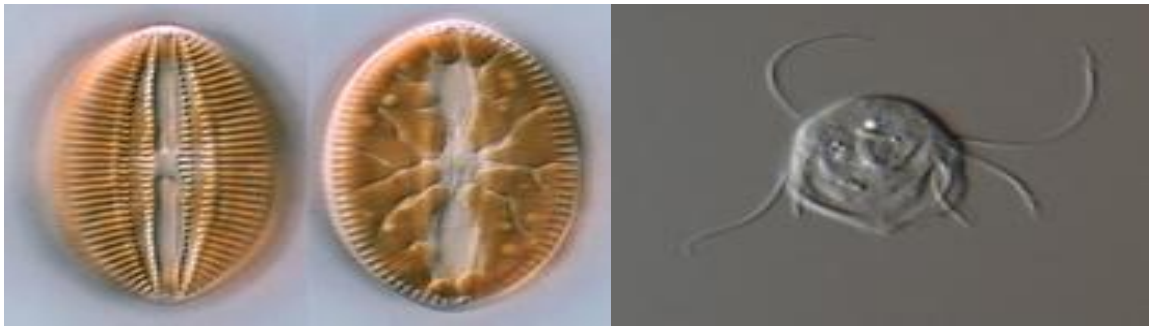
The Neoarchean Era:

The Hot Neoarchean Earth; Cyanobacteria photosynthetic organisms flourish in the warm seas and coastal fringes. Pictures courtesy www.scientificpsychic.com

The Neoarchean Era occurred from 2,800-2,500 million years ago. The Super-Continent Kenorland formed starting around 2.7 billion years ago. This is when oxygen photosynthesis first evolved in single and multi-cell Algae and Plankton. Soon the warm shallow seas were green with Algae producing Oxygen. All the while big changes began again and the Earth became violently volcanic. Massive

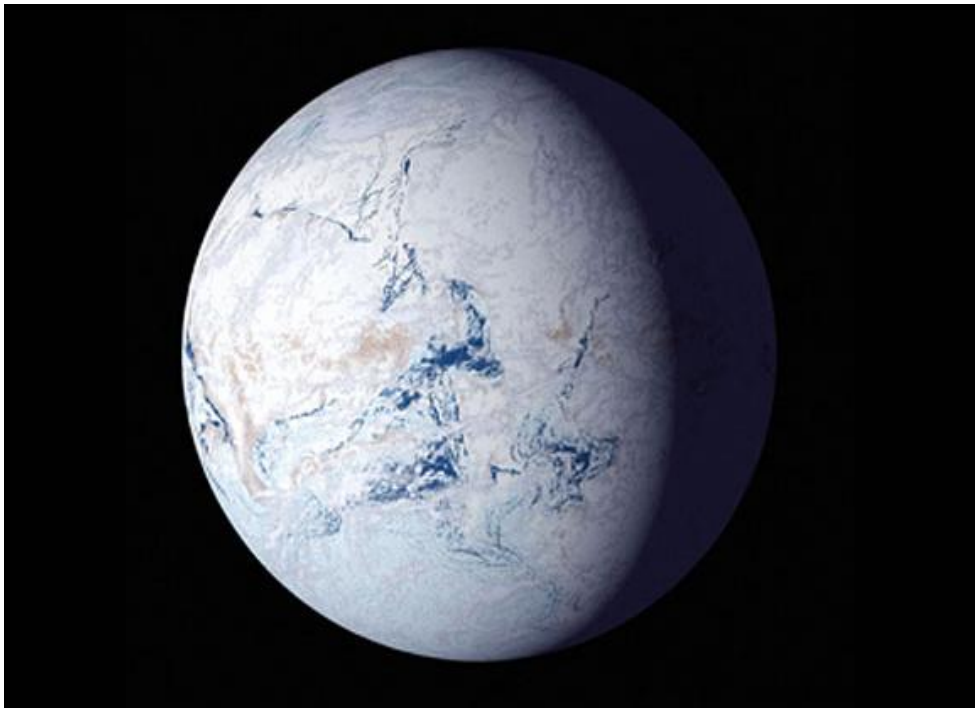
volcanic gas clouds blanketed the Earth causing massive climate change. But now the atmospheric composition had changed and Oxygen was involved. This resulted in the creation of much more complex hydro carbon molecules all floating about in this warm shallow sea soup.

The Paleoproterozoic Era:



Micro-Eukaryotes: Diploneis courtesy David G Mann; Trepomonas sp. a diplomonad courtesy Ivan Cepicka

The Paleoproterozoic Era 2,500-1,600million years ago is another era of massive Climate Changes and Mass Extinction Events. As the Cyanobacteria continued to multiply and produce Oxygen, the Oxygen levels continued to rise into the atmosphere. At first the Oxygen is absorbed by oceans, organic materials and Iron ore. But eventually they reach maximum saturation. Soon the excess Oxygen supersaturates the atmosphere with poisonous levels of Oxygen.



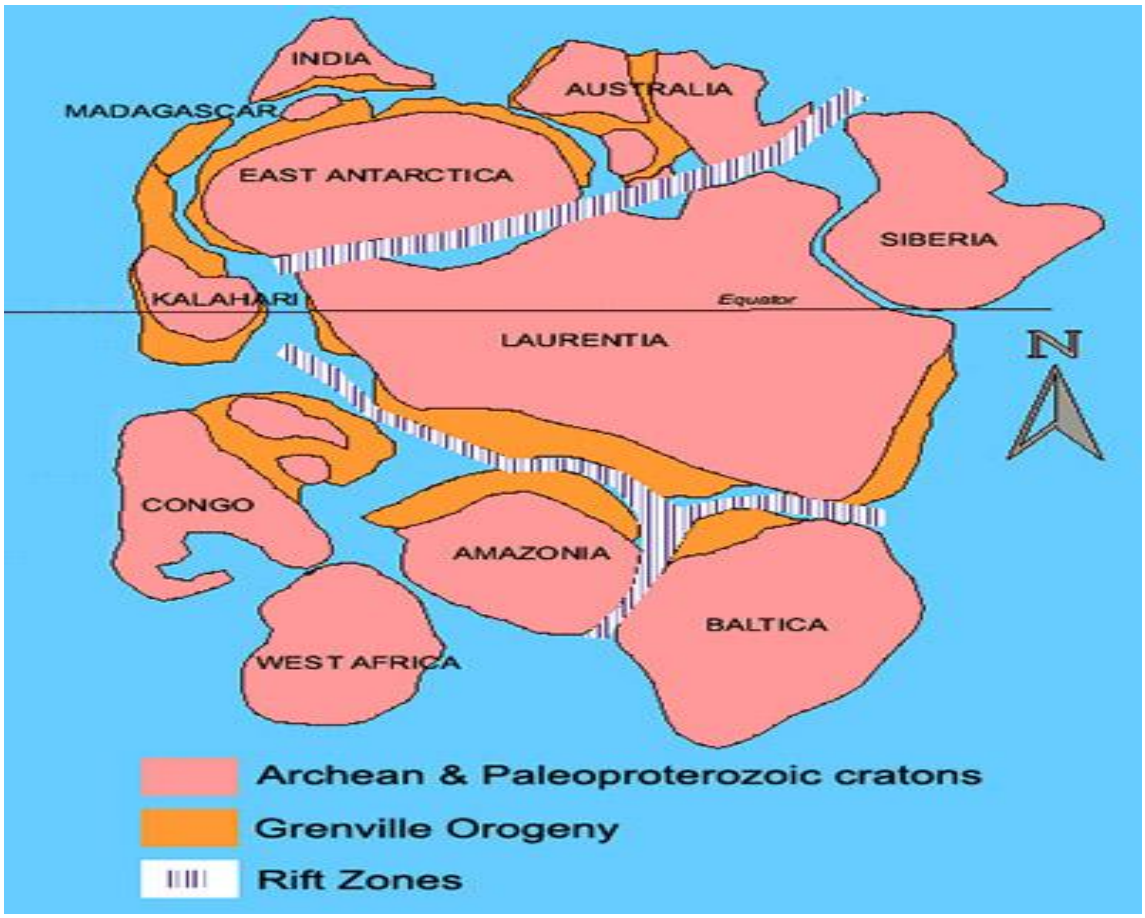
Snowball Earth demonstrates the extreme Climate Changes of primordial Earth. Courtesy www.spacerefpress.com

This Great Oxygenation Crisis Event killed massive numbers of anaerobic organisms resulting in perhaps the largest Mass Extinction Event in Earth's history. The excessive Oxygen combined with atmospheric Methane and the global clouding from continuous volcanism soon caused the Huronian Glaciation, resulting in the first and possibly the longest ever Snowball Earth glaciation event, lasting 300-400million years!

At 2,000 million years stone records suggest that the Earth's atmosphere had now changed back to 1% Oxygen and that Carbon Dioxide had reduced to about 4%. As the Planet once again began to warm, Oxygen levels then continued to increase, eventually this produced another epic change: the first multi-celled creature, known today as a Eukaryotes then appeared about 1,400 million years ago.

But the atmosphere was still so thin that ultraviolet radiation from the Sun continued to scour the Earth. There was not sufficient O2 to create 03 which is the Ozone shield which screens out these harmful rays today.

The Mesoproterozoic Era:



Super-continent Rodinia during the Mesoproterozoic Eon courtesy www.essayweb.net

During the Mesoproterozoic Era 1,600-1000 million years ago, the Earth was coming out of the Snowball Earth Ice Age of Climate Change. Tectonic plate forces were very strong tearing apart the supercontinent Columbia and producing supercontinent Rodinia.

The only protected places were about 10m/30ft below the ocean surface. There were many such hospitable environments in the warm, shallow seas.

So here is where life continued to adapt, change and evolve. Over many long ages these one-celled Algae adapted again and produced tiny almost leafy water plants and plankton which quickly multiplied and further increased the Oxygen level in the seas. Stromatolites reached their peak during this period.

Stromatolites, living bacterial mounds, reach their peak. Courtesy www.google.co.nz

Meanwhile because the oxygen produced from the Algae and plankton was most concentrated there, this produced changes that allowed the multi-celled Eukaryotes to development into more advance creatures that would eventually be known as Ediacara biota Fauna.

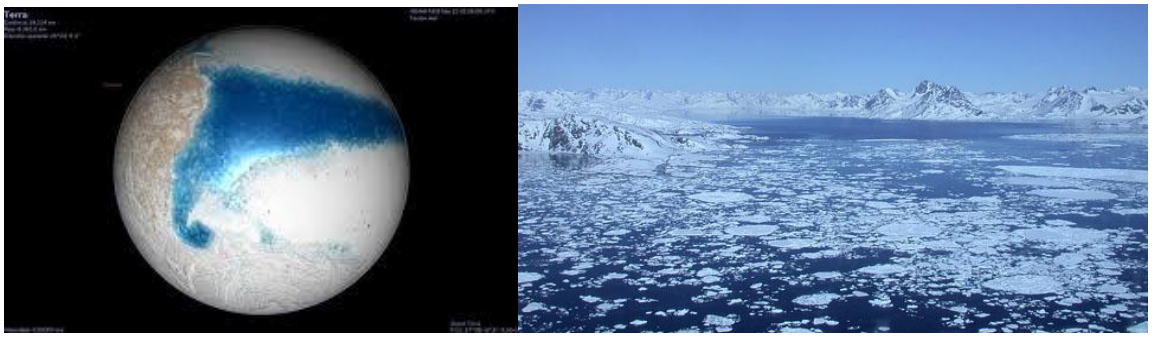
It is believed that during this time 1,200-1,000 million years ago the Eukaryotes somehow adapted to their changing environment by developing the first primitive sexual reproduction in living organisms.

The Cryogenian Period:

But before they could advance, the Earth was swept suddenly by one of its most extreme and greatest periods of climate change: the Cryogenian Period. This Period happens during the middle of the Neoproterozoic Era which comes near the end of the ancient time known as the Proterozoic Eon. The Proterozoic Eon started 2,500 million years ago and this Eon ends about 1,000 million years ago during what is often known as the Precambrian Period . The Precambrian Period covers the entire time span from 4,600-570/542 million years. It is followed by the time known as the Cambrian Period when fossil and stone records become more abundant.

Cryogenian means literally “cold birth”. This Eon is often referred to as the ‘Snow Ball’ Earth. It lasted from 850 -635 million years ago. For some yet unknown reason, possibly volcanic clouding or meteoric impacts, but more likely the eccentric orbit of the Earth, the entire Planet suddenly plunged into a time of extreme glaciations.

There were at least two, possibly three long periods of glaciation followed by several rapid and rhythmic pulses of very warm weather. Because each period of glaciation and following interglacial period appears to have been so rhythmic, this supports the Milankovitch cycles of Orbital Eccentricity Theory.



Snowball Earth Climate Change during Cryogenian Period put an end to most early life forms courtesy www.astronomyforum.net and www.nationalgeographic.com

This was the world’s most severe Ice Age. At its worst glaciers reached 1 mile thick and spread right to the Equator. Average surface temperatures hovered around -70C/-94F! There were two major periods of extreme glaciations. The Sturtian Ice Age lasted from 750-700 million years ago.

This was followed quickly by a period of extreme heat that created a ‘hot house’. During this time of extreme contrasting temperatures, the Earth was swept by massive hurricanes, severe storms and acid rain. This suggests that sudden and very violent volcanic activity may have been the cause.

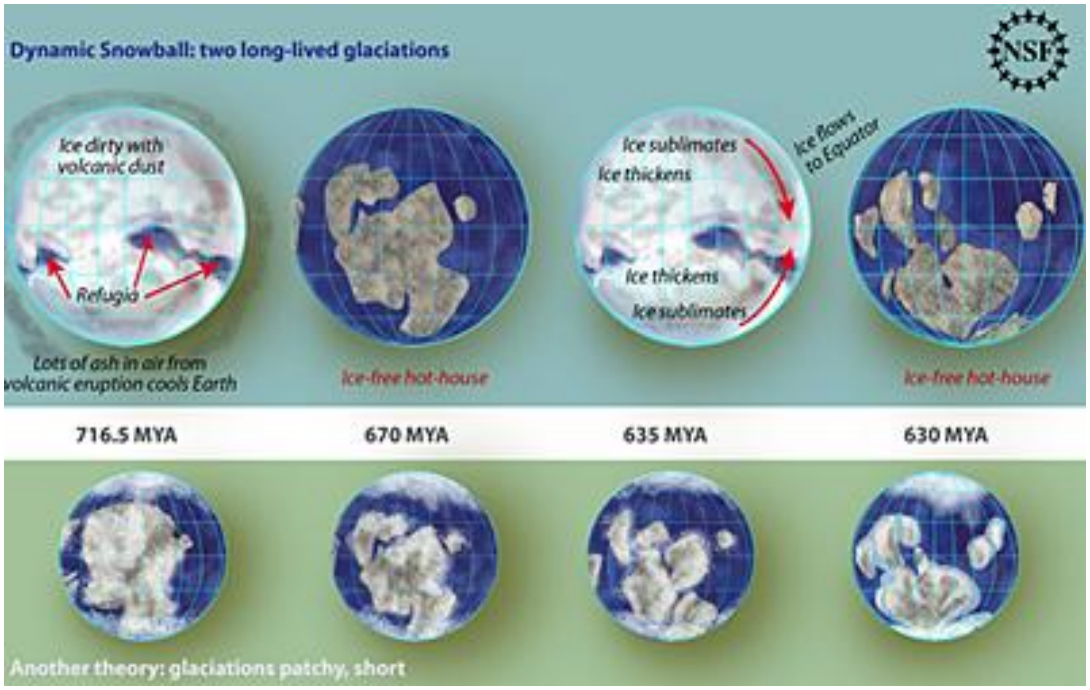
Possible due to the extreme imbalances on the Earth's crust caused by extreme glaciations, massive volcanoes erupted, covering the skies and blanketing the ice in ash which quickly melted it when the Sun shone once again.

Then next massive Climate Change was the Marinoan Ice Age which lasted from 660-635 million years ago. Once again, this was followed by an extreme heat event where temperatures suddenly rocketed and may have reached a global average of 110F/43.3C! Today's average global temperature fluctuates from 14-16C. Once again massive storms swept the Earth. The ice melted and seas rose dramatically.

As one would expect this was a time of mass extinction. With each period of cold the glaciers locked up all the water, so sea levels fell dramatically, exposing almost all the vulnerable life zones in the previously shallow and warm seas.

When the sun did shine the Earth was scalded with ultraviolet radiation. Nearly 70% of all Precambrian species died in this mass extinction. At its worst, life was reduced to tiny algae, bacteria and fungi confined to deep undersea volcanic vents and sunlit cracks in the ice sheets.

Then the Marinoan Ice Age ended quite suddenly with another 'hot house' Earth climate change event. This again happened in a series of pulses that quickly raised average temperatures, melted the ice and caused sea levels to dramatically rise and flood the continents.



Snowball Earth Theory suggests that the Earth nearly completely froze and thawed many times during its long geological history. Courtesy the register.co.uk

For more information and images visit www.daleharvey.com

The Ediacaran-Vendian Period:

This ushered in the Ediacaran-Vendian Period from 635-542 million years ago. During this time there was little if any animal and plant life which could survive on the Planet's surface. Almost everything lived in the shallow seas and marshes. Sea levels remained rather high providing many wonderful places for mostly near-microbial life to develop and flourish. The prior mass extinction actually resulted in much greater diversification of species.

Ediacara biota included Dickinsonia, Sea Pens and many strange multi-celled organisms. Courtesy www.essayweb.net

As the Earth thawed the Ediacara biota emerged. Instead of the single-celled organisms of the past, now cells began to bond with collagen to create multi-cellular organisms. These were very strange soft-bodied creatures, most were immobile bag-shaped affairs, sometimes flattish discs, or tubular and others were flat frond-like smaller creatures that resembled Sea Pens which apparently remained almost stationary.

But Dickinsonia and a few others appear to have been mobile. Perhaps the most advanced were segmented worms that have left distinctive fossilized trails in the primordial mud. Soon nearly 100 distinct genera emerged.

The Vendian Period Mass Extinction Events:

Near the beginning of the Vendian Period about 600 million years ago, there was a Mass Extinction of most marine species caused by yet another sudden cold Climate Change. This resulted in massive glaciations that wiped out all but the few marine creatures able to survive near volcanic vents or in warmer equatorial waters.

Then another Climate Change Mass Extinction occurred near the end of the Vendian Period which ended the Precambrian Super Eon. This was also a marine Vendian Mass Extinction. The end of the Vendian Period was a time of great upheaval and mountain building which possibly resulted in drastic and massive Climate Change. The cold suddenly returned. But following that, life quickly resurged and further diversified. Jelly Fish, Sea Pens and other more advanced forms of aquatic plant species began to evolve.

The Cambrian Period starts the Paleozoic Era:

Cambrian Sea Life included the predatory Sea Scorpion. Courtesy www.bbc.co.uk

Big Climate Changes began again and the Earth became warmer, wetter and the oceans rose. This introduced The Cambrian Period . Researchers differ on when it started and finished somewhere between 570/543 million years ago until 505/490 million years.

It marked the beginning of the Paleozoic Era and was a time of major almost constant Climate Change. Yet the Paleozoic Era also witnessed one of the greatest explosions of new life forms and species ever to appear on the Planet in a single Era.

During the following Cambrian Period the Earths' weather changed from a cold climate and gradually warmed. But as in the past there were rhythmic cycles of warming followed by cooling Climate Changes. This lead to some Ice Cap glaciation at the poles, followed by melting and rising seas. At roughly 580/550 million year the super continent Gondwana (included Africa, Arabia, India and Madagascar collided into East Antarctica and Australia. While Baltica, Laurentia (much of North America) and Siberia floated off.

Later this land mass then collided into the southern tip of South America around Argentina. This created the mountain ranges there in a series of massive upheavals which would have continuously rocked the Planet.

Most of the continents were desolate, wind-swept, low-lying deserts and plains. As the sea level continued to rise, the flat lands were flooded. Laurentia (North America) became little more than a few islands. Temperatures continued to rise to much warmer than today. Once this happened, there were no polar glaciers at all. At its peak, the entire world was reduced to warm shallow seas, islands and oceans with a very moderate and even climate.

Trilobites came in many forms. courtesy www.earthlife.net and www.progenesis.org

In the shallow seas and marshlands, many marine creatures and early plant species developed and flourished. Oxygen levels rose to 10%. This was a time of Sponges, Molluscs, Trilobites and segmented walking Worms.

Sponges and Stromatolites created massive reefs which became the home of remarkable shellfish. Soon nearly 600+ genera of Trilobites diversified into the first 'sophisticated creatures known to have true eyes. These were made of Calcite.

Some Trilobites had eyes with more than 500 lenses in each with near 360 degree, stereo-visual capacity. Possible the greatest adaptation during the Cambrian Life Explosion in the seas was the arrival of Picaea, believed to be the very first true small vertebrate.

This was a small, soft and very thin eel/minnow-like creature with a soft, but true internal vertebrate skeleton.

Soon there were many more vertebrates. Very similar Haikouichthys, was a small, thin and tapering soft vertebrate with true eyes and a brain with a spinal or

notochord surrounding very simple. These would develop during late Ordovician, about 450 million years ago and onward into the sharks and armoured jawed fish. Later into Reptiles, then Mammals and eventually Humankind!

Haikouichthys some of the first vertebrate life forms. courtesy of www.wikipedia.org

The Cambrian-Ordovician Mass Extinction Event:

But at the end of the Cambrian Period there was a Mass Extinction Event in the seas about 505 million years ago. At that time the climate cooled, seas levels dropped exposing the shallow sea beds. Many species of marine organisms perished and almost all the Trilobites disappeared.

Rapid Climate Change appears to be the cause of this huge marine extinction. Glaciation quickly dropped seas levels exposing shallow seas and marshlands to cold and dry conditions. Much of the fresh water became tied up in glacial ice and oxygen levels dropped as quickly as sea levels and their temperatures. This quickly wiped out many species.

The Ordovician Period:

The Ordovician Sea begins to diversify. courtesy of Cincinnati Fossils

During the Ordovician Period that followed 488-443 million years ago the Earth became quite hot. Tectonic activity increased. Air temperatures and C02 Carbon

Dioxide levels rose greatly creating a greenhouse effect. By 480 million years ago ocean temperatures rose to 45C degrees (today's average ocean temperature is 3.9C/39F degrees) and sea levels reached 1,970ft/600m higher than today! This set back some life forms but the seas were still full of life.

But then the climate gradually began to cool again and by 460 million years ago temperatures and climate became much as they are today and remained warm and wet. New life forms mostly in the oceans flourished. There were massive reefs of sponges supporting jawless fish, other-worldly planktonic Graptolites and a multitude of Brachiopod shellfish molluscs and cone shells.

Also Conodant eel-like vertebrate creatures with giant eyes. Most spectacular were the squid-like Nautiloids. Soon hard-shelled arthropods like Horse Shoe Crabs, true 'living fossils' that survive to this day, bravely crept up upon the land and were welcomed by the first primitive plant species, mostly Mosses, Lichen and Fungi which quickly spread across the land.

As the supercontinent Gondwana came together it combined Africa, South America, stretching from near the Equator downward and Antarctic, Australia, Congo, India, Kalahari reaching to the South Pole. Laurentia (North America) lay largely submerged over and north of the Equator. As sea levels continued to rise much of Gondwana was also submerged under clear, shallow seas.

The Ordovician-Silurian Mass Extinction Event:
Climate Change again took its toll. Late in the Ordovician Period, Gondwana slowly drifted south until it lay over the South Pole. As it did massive glaciers ground over the southern parts of present day Africa and South America.

It is likely that the Earth's eccentric orbital pattern further aggravated the cooling trend as did renewed volcanism.

This resulted in continually cooling continental temperatures that eventually caused a massive Ice Age which lasted for 20 million years. This created the second largest mass extinction ever and resulted in more than 50% of all the marine live disappearing forever.

Then at the end of the Ordovician Period (440-438 million years) there was the second largest of all extinction events: the Ordovician-Silurian Mass Extinction Event. C02 Carbon dioxide levels dropped sharply and the Planet plunged into an Ice Age. It is theorised that as the continent Gondwana shifted over the South Pole this resulted in massive glaciations which drastically reduced seas levels and surface temperatures resulting in this Mass Extinction to over 60% of most life forms.

The Silurian Period:

Silurian Cooksonia an early land plant (left) and Sea life flora and fauna (right) courtesy Seadiora and Wikipedia

During the Silurian Period that followed 443/438 million year ago to 417/408 million years saw the temperatures again began to rise with the next Climate Change. The glaciers melted causing seas levels to rise again.

Life again expanded in the seas. Massive coral reefs became abundant which supported high predacious Eurypterids (Sea Scorpions) these were somewhat Shrimp-like creatures but with long hooked appendages at the front which could quickly stab and grasp prey.

Sea Scorpions soon adapted to change and grew from small beginnings to become a massive 10ft/3+m! Perhaps as a protective adaptation to the Sea Scorpions so there appeared many new Fish with jaws and some were very well armoured.

Eurypterid Sea Scorpio courtesy www.farangelus.com and www.arizona.edu with thanks to Alan Lang's Meteorites

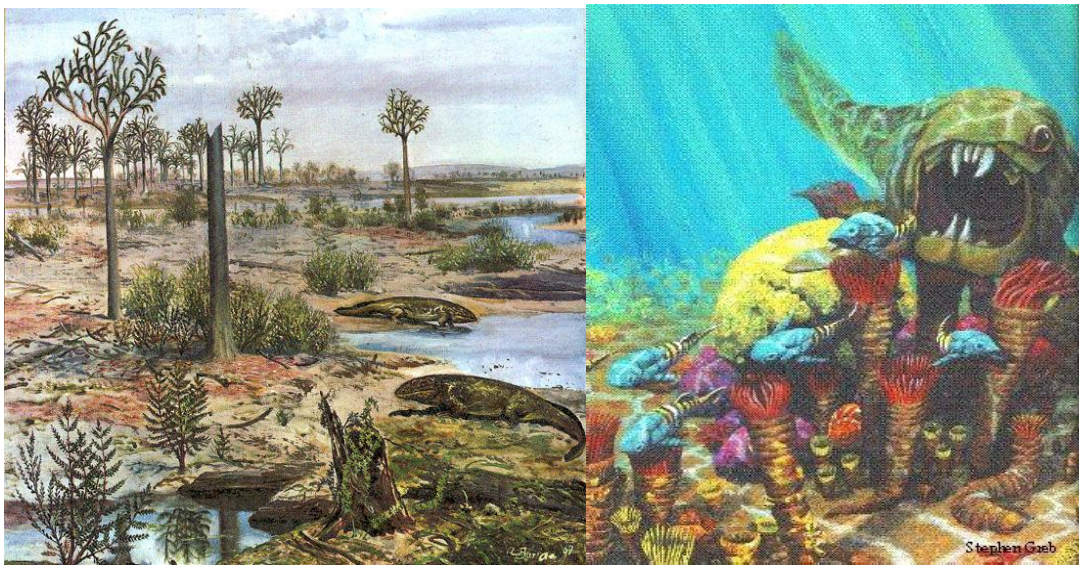
While much of the Earth was flooded, continental collisions produced many islands and new mountain ranges that caused the shallow seas to recede around them. Now shallow water species had to adapt to living on land or perish. Lichen,

fungi and mosses transformed the rock into soil. Soon the first true land plants adapted with vascular bundles able to draw water up into the plants. This brave first species soon diversified and became known as Cooksonia.

Silurian Cooksonia courtesy www.intechinc.com and www.wix.com

Climate Change caused at least three Minor Extinction Events during the Silurian Period. These are known as the Ireviken, Lau, and Mulde Extinction Events. All were deep marine extinction events. Some spread to shallow seas and marshland marine life and occasionally into the flora as well. Climate Changes caused recession of sea levels followed by rapid inundation of coast lines as the climate warmed once more. However life and species evolution continued to advance.

The Devonian Period:



Devonian landscape courtesy www.creatonism.ws; Devonian ocean life courtesy www.uky.edu and Stephen Grebs

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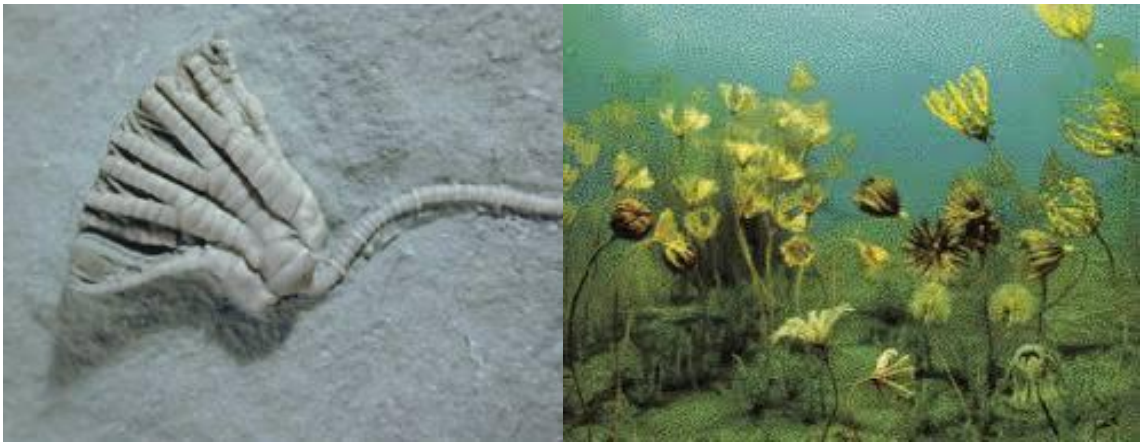
The Devonian Period 416/408-360/359.2 million years saw a continuation of moderate conditions which resulted in a flourishing of life forms. The early times were arid and warm with no glaciers. Later on weather remained warm and temperate.



Devonian Crinoids courtesy www.fossilmuseum.net and www.higheredbcs.wiky.com and Harold L. Levin

In the warm oceans and shallow seas Molluscs and Coral were abundant. Graceful Lily-like Crinoids were abundant on the sea floor. This was the 'Age of Fishes' which saw many armoured, fearsome giant fish and sharks plus Cephalopods , the early relatives of Squid.

This was a transitional moment that witnessed the pectoral and pelvic fins of fish transform into legs which allowed them to walk upon the land and become Tetrapods, the first land animals to walk on four legs. Other crustaceans transformed into many varieties of Arthropods, often Crab or Scorpion-like creatures and many forms of Trilobites which became one of the most diverse and successful of species which would assume remarkable diversification and variance in size.

Early Devonian Period witnessed nearly rootless small Lichen and Mosses transform in the first seed-bearing plants. What started off as 30cm/1ft plant species ended the age as 30m/100ft forest giants. They became Horsetails, Ferns, and the first true branching trees with true roots and scale-like leaves, and pillar trees topped with feather plumes. Soon these spread into massive forests that covered the Earth and greatly lowered the CO2 levels in the atmosphere while Oxygen levels continued to rise.

The Devonian Mass Extinction Event:

The Devonian Period ended with the Famennia Stage 374/359-360 million years: Devonian Frasnian/Famennia Mass Extinction 367/360 million years ago. This

may have actually been upwards of seven separate Extinction Events resulting in mass extinction of various species. This massive extinction primarily killed off 22% of all marine families and 57-75% of all species some in the oceans but mostly in the marches and shallow seas. Many Coral, Fish and Shellfish species perished. They all appeared to have died from 'ocean anoxia', a lack of oxygen in the water and their remains were preserved without decay. Yet land plants and the overall massive forests were unaffected.

Explanations for this extinction include asteroid impacts, which might have precipitated substantial climate change and sea level shifts. But so far all explanations are flawed. But personally I think it was a combination of factors combining with the rapid expansion of forests that caused this.

Devonian Forests www.encyclopedia.com; Devonian seascape www.flickr.com

This Devonian Age was the great 'greening' of the Planet. The marshy land was covered in giant Horse Tails, massive Ferns and many species of tall pillar and branching trees with near-coniferous, scale-like leaves.

All related similar species today carry great amounts of tannin and pitch sap/resins. And marshes are great sources of Methane Clathrates.

If there were a series of modest bolide impact events, or volcanic activity the skies would be temporarily clouded and the climate would suddenly cool resulting in a brief mass death of many forested areas. Also the Planet was completely forested by plants that absorb vast amounts of CO2 Carbon dioxide, a greenhouse gas. As the CO2 levels decreased so would the temperatures.

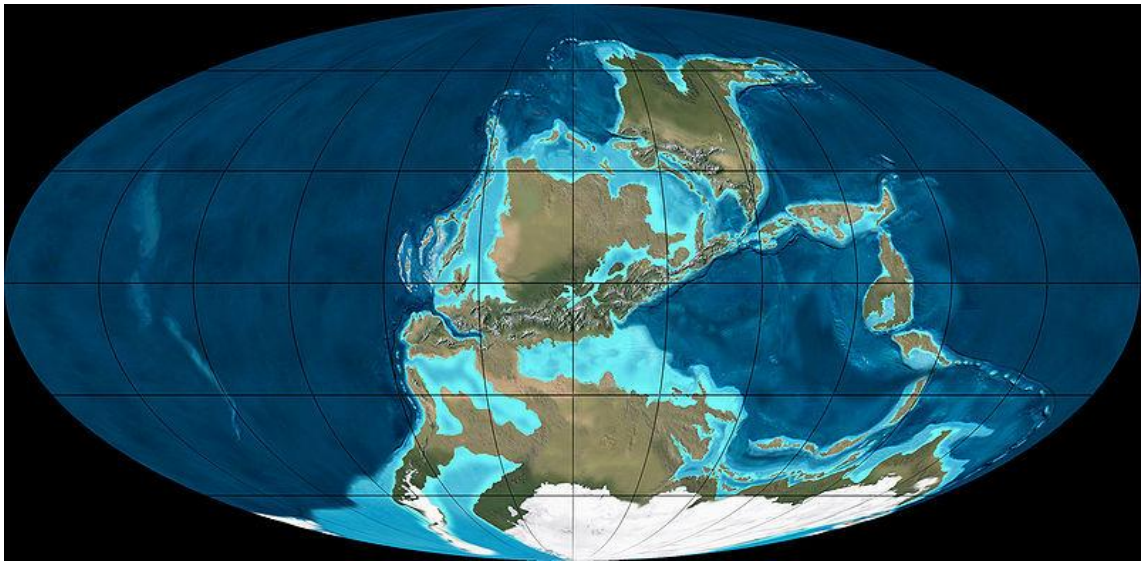
As these forest plants died and decayed en mass into the marshes connected to the shallow seas, they would have toxified the water. As the climate suddenly cooled this would release Methane from the marshes, ocean and seas which would further acidify the water and toxify surrounding marshland. And this is where most of the species perished. Plus resins and tannins are natural preservatives which would prevent decay. And this is exactly what happened!

The Carboniferous Period:

The carboniferous Forest courtesy Ralph E. Taggart

The Carboniferous Period 360/309 million-299/286 million years ago saw another major Climate Change toward colder conditions and renewed glaciations near the South Pole. At that time Gondwana sat over the South Pole with Antarctic almost central over it.

Also there was South Western Australia, the Southern tip of India, Southeast Africa and nearby Southern South America all connecting near the South Polar Region. Great glaciers covered these regions. Later on Gondwana collided with Eastern North America raising mountain ranges there and also in Europe.



Later Carboniferous Earth courtesy www.wikipedia.org

For more information and images visit www.daleharvey.com

Global average temperatures and CO2 levels were as low as they are today. Climate was very similar, too. This allowed glaciation to increase which lowered sea levels as well as further lowering temperatures.

Much of the Earth was covered in subtropical swamp, marshes and shallow seas. Continental collisions continued to raise mountain ranges which produced a wide variation in climate zones.

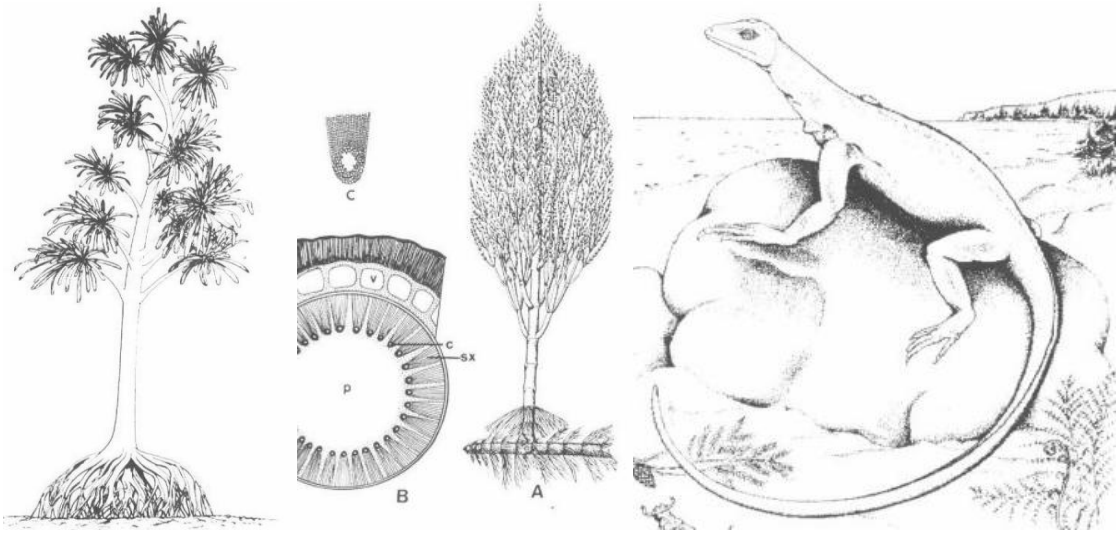
The land was almost entirely covered in dense marsh and swamp vegetation and forest. Much of this was similar to the Devonian Period but larger and much more extensive. Among these life forms were gymnosperms, sea and marsh plants with long thin leaves circling up tall simple stems.

There were giant plumed trees of which modern Horsetail is a descendent. Giant Ferns were common and the first Tree Ferns, relatives of modern Cyathia appeared in many forms 30m/100ft high throughout the forests.

Other trees closely resembled modern Palms. There were Lycophytes (close relatives of today's tiny Club Mosses) but these were enormous branching trees. And massive Calamites: giant Horse Tail Rush trees that towered like fringed Bamboo.

One of the most distinctive and important of the Carboniferous forest trees were the cone/seed Ferns called Cordaites . These were large, branching trees with long strap-like leathery leaves. As the climate changed and became colder and drier, these Cordaites soon adapted and developed into true Araucaria-type Conifers which appeared near the end in the great Carboniferous Forests.

Their ancestors are the Conifers of our modern world.

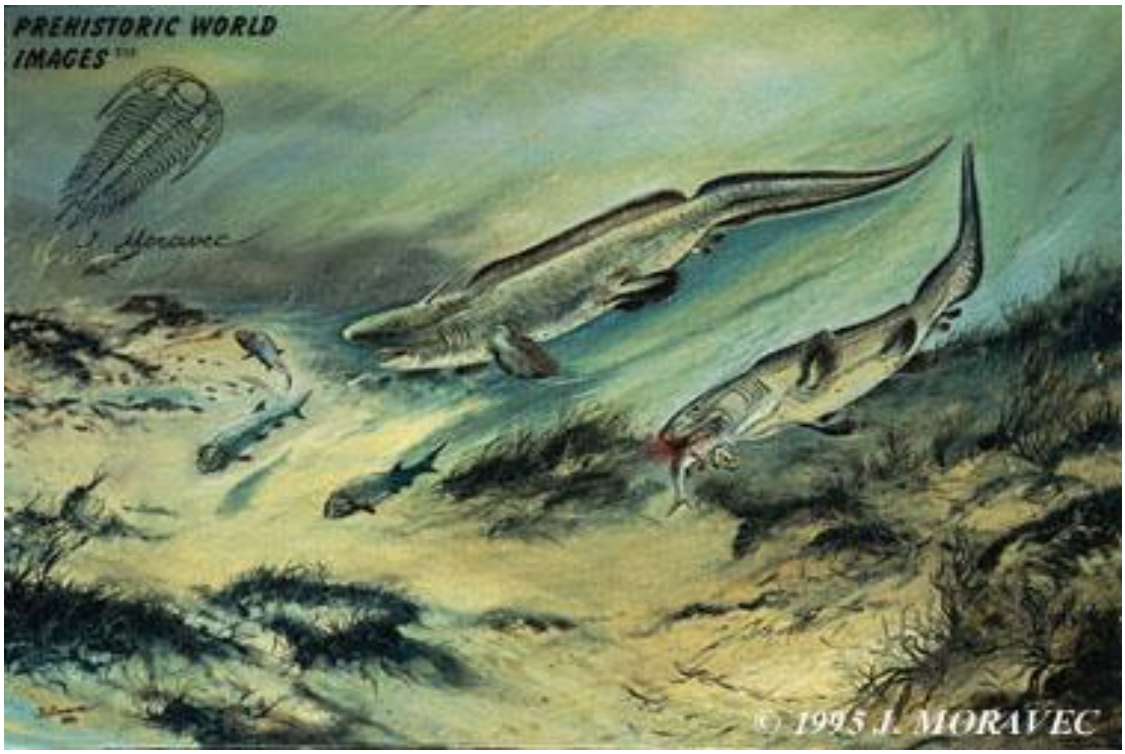


Cordaite (left) Calamite (center) Petrolacosaurus, courtesy Ralph E Taggart

This massive forestation quickly raised the Oxygen level of the entire Planet to 35%. This resulted in gigantism in both Amphibian Tetrapods and Insects.

Giant Dragon Flies filled the air. In the landscaped roamed the first Spiders, also the earliest Lizards and Reptiles which produced the first eggs.

The oceans and shallow seas teamed with life, especially in the warmer regions nearer the temperate zones and Equator. Massive Coral and Sponge reefs covered the ocean floor and were filled with Brachiopods, molluscs, and shellfish, Crinoids and a wide variety of other aquatic life.



Carboniferous ocean with Xenacanthus Sharks courtesy www.prehistroy.com and J Moravec

Great toothed Fish and Sharks ruled the oceans and there were many types of fish for them to feed upon. Wherever the shallow seas and oceans remained warm, Algae (Diatoms) greened the water. As they fell to the bottom, they created great depths of debris and sludge that eventually condensed onto the oil we use today.

Extreme Climate Changes happened about the middle of the Carboniferous Period. The climate suddenly cooled even further as the glaciers began to spread out from the poles. The steamy shallow seas began to cool as a consequence of the glaciers. Sea levels dropped drastically. This suddenly exposed all the shallow seas. Coral/Sponge reefs started to dry out resulting in a Mass Extinction Event which today is known as the Mississippian Epoch

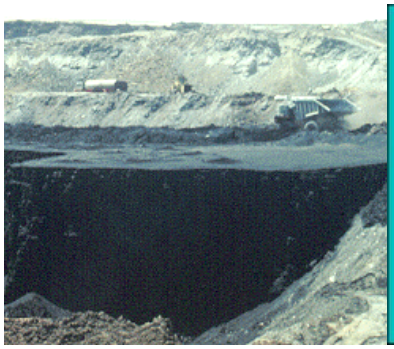
limestone shelf. Much of the world's limestone and Dolomite were produced during this time.

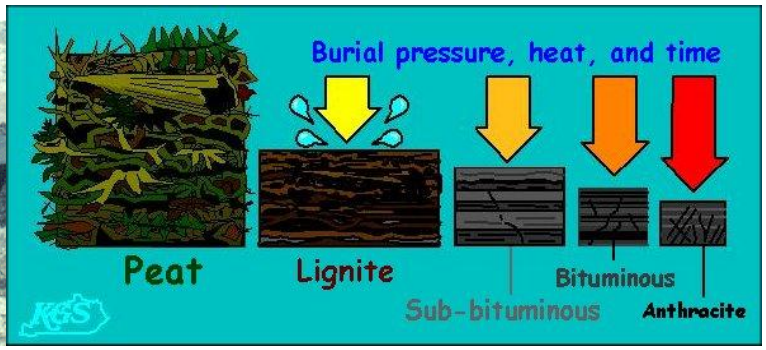
Continents crashed into one another creating rocketing mountain ranges that further altered drastically wind and weather patterns. The lowered sea levels created enriched dry ground and even more shallow seas. These were quickly covered by immense dense forests of towering trees with very thick bark with fiber full of Lignin. As generation after generation of forest and swamp plants grew one layer upon the next the debris from these stacked deeply over the landscape.

The Carboniferous Mass Extinction Events:

With the next major Climate Changed the weather became colder, drier and more extreme at the end of the Carboniferous Period. Then such a Massive Extinction Event occurred all quite suddenly that great areas of the Earth were left covered in deep, heavy layers of debris. The corpses of animals and plants buried the earth beneath it in a deep layer of organic material.

This layer of corpses and debris was so deep and heavy that eventually the debris condensed and packed down and was eventually buried under eons of dust and earth. Over time its remnants are what today we mine as Coal. This became known as the Late Carboniferous period or the Pennsylvania Period.





Coal seam Powder River Basin, WY courtesy www.wou.edu (left)
How peat turns into coal courtesy www.uky.edu (right)

Ironic that the burning of these harvested coal deposits created from an Age of Corpses killed by sudden cataclysmic Climate Change is partially responsible for the Climate Changes the Earth is experiencing today. Almost as if the energy and smoke released from their crushed existence is try to guide and warn us.

Yet shortly after this time of cataclysmic climate change, was when the first true Coniferous species appeared on the Earth. Fossil records suggest that the first Conifers were an adaptation to these changing climatic conditions.

Some of these early tree species like the Araucaria, the Monkey Puzzle and Norfolk Island Pine and Gingko are today's living 'fossil' relatives that first originated as a successful adaptation to a Climate Change Crisis.

The end of the Carboniferous had no further mass extinction event but drifted into the Permian Period.

The Permian Period:

Permian Landscapes courtesy www.rareresource.com

Permian Period was the final period of the Paleozoic Age starting 290/286 million years ago. The Permian Period ended in the greatest of all the life extinctions on the Earth somewhere around 257/248 million years ago.

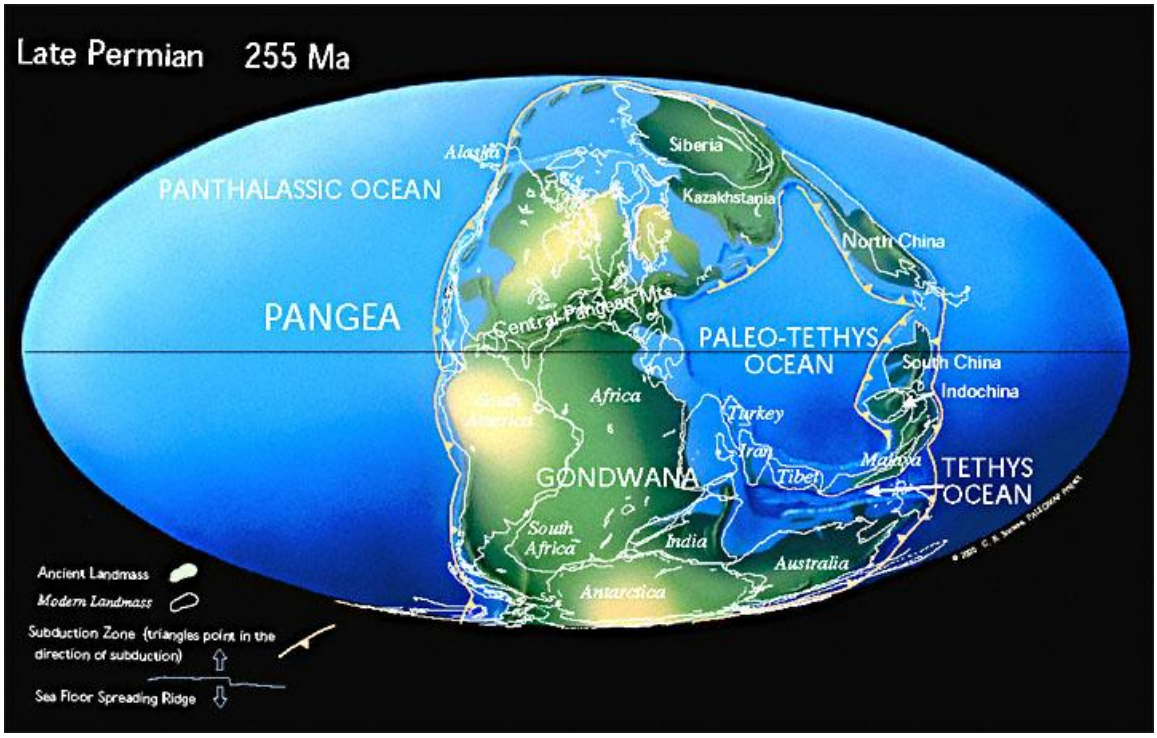
At its beginning of the Permian Period, the great Carboniferous forests and fauna continued to thrive and spread. This time there was no mass extinction. But soon things drastically changed!

Gondwana collided with the other large continental masses to form the Supercontinent Pangaea. This created one massive C-shaped continent spread over the Equator. The warm Tethys Sea was cradled within the C and the massive Panthalassa (Universal) Sea spread out around it.

This must have been a time of unprecedented upheaval. Earthquakes and massive tsunamis swept over great areas of the coast. These seemed to have happened repeatedly as tectonic forces bulked the colliding continents.

The climate drastically and suddenly changed to an extreme continental climate with hot and cold temperatures, vast deserts or only seasonal rainfall and violent monsoons.

Sea levels remained low and coastal margins were greatly reduced. As the climate changed, marsh and swamp land dried up and the Carboniferous forests were replaced with hardier Coniferous and seed/spore bearing species which could adapt to the changes.



Permian Globe courtesy www.scotese.com

Collectively known as Glossopterids, these shrubby to 30m/100ft tall flat-topped; simple and smooth-leafed evergreens created the dominant genus with many species especially in the Southern Hemisphere. These created dense, towering evergreen forests known as Glossopterid forests. These were softwood, berry/seed-bearing species of many forms much like the Araucarias that appear to have preferred very swampy, wet ground. Many appear to be shaped much like Christmas trees with leaves more like a Laurel or simple-leafed Oak.

By Mid Permian Conifers, Cycads, seed/spore-bearing Ferns and trees similar to Eucalyptus dominated the deep and dense forested landscape.

Only in the remote Equatorial/tropical regions (now Southern China) did Carboniferous scale-like forest species survive including giant Bull Rush and Horse Tail Trees like the Cordaites and towering Tree Ferns. Araucaria Conifer species, Cycads, and Ginkgo are 'living fossil' survivors to this day.

In the forests the first Beetles and true Flies like the May Fly arrived. There was a remarkable array of small to enormous Amphibians including the first herbivorous and carnivores. Some resembled modern the Hippopotamus.

There were many tetrapods (four-legged creatures) and Reptiles including remarkably adaptable Sauropsida. This species eventually transformed into many of the Dinosaurs and today is represented by Birds, Crocodiles, Lizards, Snakes and Turtles. In its early stages of development these were mostly Synapsids like the Pelycosaurs and fin-backed Dimetrodon.

The Mid Permian Period:

By Mid Permian these had changed into Therapsids which were both in small and two ton forms in herbivore and carnivore like Gorgonopsia, the top carnivore. These adaptable somewhat cat-like survivors were the early ancestors to Mammals. Dicynodont was a tusked herbivore with some species as small as a Rat and others the size of an Ox with a totally unique appearance that also thrived until the time of Permian-Triassic Mass Extinction.

Permian Fauna courtesy www.erbzine.com and www.devianart.com

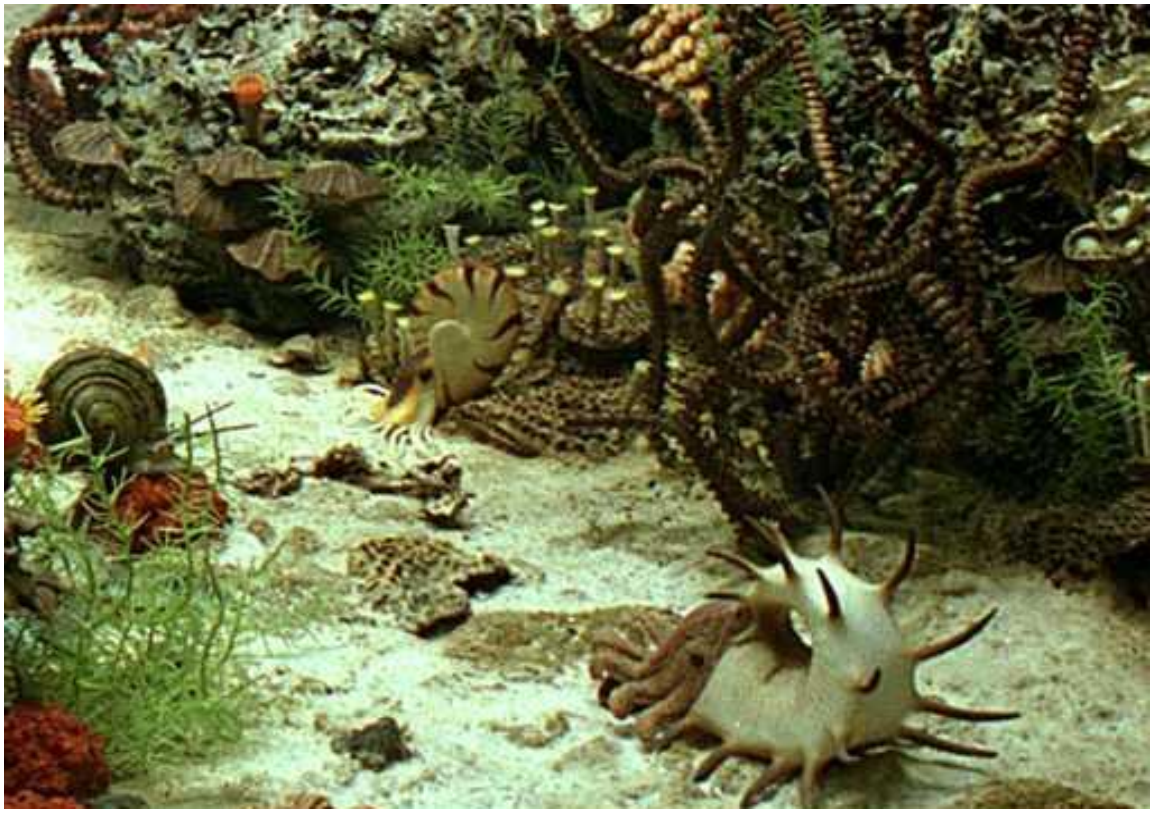
Probably the most profound arrivals in the Mid Permian Period were the world of Synapsids. These at the Early Permian Period were at first mostly Reptiles with some Mammal-like traits. They would ultimately prove to be the great survivors.

They proved to be adaptable, flexible, intelligent, resilient and able to change with the times. Their relatives would continue to evolve and become the Dinosaurs that eventually developed into the world of vertebrates including all Mammals and Humans!

The Late Permian Period:

By Late Permian the Archosaurs (Ruling Lizards) appeared. These had smaller heads, strong teeth and muscular legs that made them highly adaptable. While limited in numbers at first, these would succeed in the Triassic Period to become the Dinosaurs. Smaller and adaptable Cynodants were Reptilian but with Dog-like or Mammal-like features. Their ancestors also survived and their adapted to become modern Mammals.

Cynognathus (left); Archosauriformes (right) courtesy www.wikipedia.org



Permian Period seascape courtesy www.rareresource.com

The oceans and shallow seas were amazingly full of life with Brachiopods and Molluscs, Crinoids, Starfish, and the spectacular Cephalopods like the Nautilus, whose ancestors would adapt to become modern Squid. Many types of fish were common.

The Permian-Triassic Mass Extinction Event:

The Permian-Triassic Mass Extinction Event 257/248 million years ago most emphatically ended the Permian Period.

Nearly 90-95% of all marine creatures and 70% of all terrestrial creatures perished. In all nearly 99.5% of all species disappeared suddenly! This was the greatest mass extinction event ever recorded on the Earth. Explanations range from the largest volcanic event in 500million years in Siberia. This event is

documented to have occurred around this time and could have blanketed the skies with ash for years causing mass extinction. Another explanation is that Hydrogen Sulphide gases vented from the bottom of the deep anaerobic/anoxia (Oxygen-starved) oceans possibly from Algae. Over time these could have produced enough noxious gases bubbling up from the depths and rising up out of the ocean to eventually eliminate the protective Ozone screen. This would have allowed ultraviolet scorching of all life.

Since there are almost no traces of any marine life or even sediments in the oceans or shallow seas around this time, obviously something profound happened. And Hydrogen Sulphide mixing with water would have certainly made a very acid sea. Possibly it was due to radiation from a nearby supernova. There seems to be no known way to test for this possibility.

Many believe it was due to a meteor or comet impact. But no telltale Iridium layer has been found as might be expected of such a large impact. Although multiple impacts especially into the atmosphere directly overhead as happen over Lake Cheko, Tunguska, Siberia in 1908 might have been equally devastating.

The Shoemaker-Levy comet which so dramatically impacted into Jupiter in July 2004 and another in July, 2009 demonstrate that such impacts are much more common than once thought. And a massive 500 kilometre wide crater dating from around that time has been recently discovered in Antarctica.

Another interesting clue is known as the ‘Coal Gap’ between the Permian and Triassic Period rocks. When the earlier Carboniferous Period dense forests collapsed and decayed, these resulted in huge coal deposits found in many places around the world. While great forests towered to the end of the Permian-Triassic extinction event, the dividing line in stone at the time of the Permian-Triassic Extinction event reveals no coal deposits anywhere.

Perhaps the receding ocean level, combined with very dry conditions, tsunamis and possibly a cataclysmic intense comet or meteoric impact event incinerated everything into dust that blew away into the sands of time. The most plausible explanation combines all the evidence quite nicely. What happened was a chain reaction of events where everything went wrong one thing after another.

First the Siberian eruption occurred. This documented event was massive. Because it was the largest volcanic eruption in 500 million years, there is some speculation that there might have been mitigating circumstances such as a comet or meteoric impact or series of impacts. A large meteoric crater dating from roughly the same period was recently discovered in 2006 in Antarctica. Nearly 20% of the total pyroclastically ejected material from this Siberian eruption

shot upward into the Stratosphere. This ejecta would have been filled with toxic gases like Hydrogen Sulfide. It blocked out the sunlight around the entire Globe and toxified the air. Super-heated molten ash covered a region as large as all of Asia.

The eruptions produced staggering amounts of magma. Much of the magma continued to pour into the shallow seas and ocean. This resulted in a massive release of Methane gas from Methane Clathrates; these are molecules of Methane usually trapped within icy crystals ½-1km below the Earth's surface. This allowed vast amounts of toxic and highly explosive Methane gas to be released into the atmosphere.

As the dense clouds of Methane gas rose up high into the atmosphere they quickly caused the atmosphere and the oceans to warm considerably. This rapid Global Warming 'instant' Climate Change Event of the entire Planet caused further Methane Clathrates to be released from the Earth and oceans resulting in even greater quantities of toxic Methane gas which accelerated more warming.
Such catastrophic and rapid global warming first would have resulting in immense storms and winds that further circulated both the highly acidic volcanic ash and the Methane. Pounding the Planet with highly acid rain and throwing the entire Planet into darkness and gloom.

Then as the entire Planet continued to rapidly heat up from pole to pole, the temperature variances so diminished that it nearly stopped all weather events. This stopped the transference of essential minerals and nutrients between the land and the seas, which helpful algae and bacteria feed upon. But the acidic oceans, already deeply clouded with a blanket of volcanic particles and now overly-warmed, spawned huge Algal blooms. These quickly darkened the entire oceans like a blanket. Quickly, the oceans and seas became anoxic; completely starved of Oxygen.

The combination of heated water, blanketed with Algal bloom and volcanic ash; little if any sunlight and no Oxygen killed almost everything in the oceans and seas. The only things to survive would have been anaerobic bacteria, Green Sulphur Bacteria which would have quickly spread to displace anything else left alive. And as they multiplied, they released massive clouds of Hydrogen Sulfide gas emissions.

Hydrogen Sulfide gas is flammable and very poisonous. It has a foul stench like rotten eggs. When mixed with water it creates a weak acid called Sulfhydric Acid or Hydro Sulphuric acid. Hydrogen Sulfide gas mixed with air is highly explosive. When Hydrogen Sulfide gas burns in air/oxygen it creates Sulphur dioxide. Sulphur dioxide mixed with water creates highly caustic Sulphuric Acid: acid rain

and acid oceans. This would have polluted the oceans possibly dissolving everything there.

Adding misery to calamity, Hydrogen Sulfide gas is heavier than air, but mixes with it freely. The Hydrogen Sulfide gases, as first volcanically ejected in massive quantities high into the Stratosphere mixed and combined with the Ozone, this would have destroyed the protective Ozone layer high above the Earth.

That allowed deadly ultraviolet radiation to penetrate to the Earth and scald to death any remaining life. There is some fossil and stone evidence of this UV damage in the top layer of Permian-Triassic rocks!

And as Hydrogen Sulfide gases mixed with and chemically reacted with the Ozone molecules, these resulted in Sulphur Dioxide, a major toxic air and water pollutant. Because both Hydrogen Sulfide and Sulphur dioxide gases are heavier than air, they would have descended over the entire Earth taking the protective Ozone Layer with them; transforming them as they dropped into the most deadly form of acid rain. This would have combined with the toxic clouds of Hydrogen Sulfide gases bubbling up from the Green Sulphur Bacteria in the acid oceans to brew an impossibly toxic acidic rain. What possibly could have survived?

The actual series of events leading to the 'Great Dying' Mass Extinction Event may never be known. Whatever the cause, the climate change was apparently sudden and final for most life on Earth.

But this Mass Extinction Event, even being as profound as it was, opened the door for what did survive. Those adaptable and perhaps 'lucky' individual species would later continue to successfully adapt and change to become the Dinosaurs, Flora and Mammals of the Mesozoic Era.

Triassic Period:

Triassic landscapes courtesy www.rareresources.com

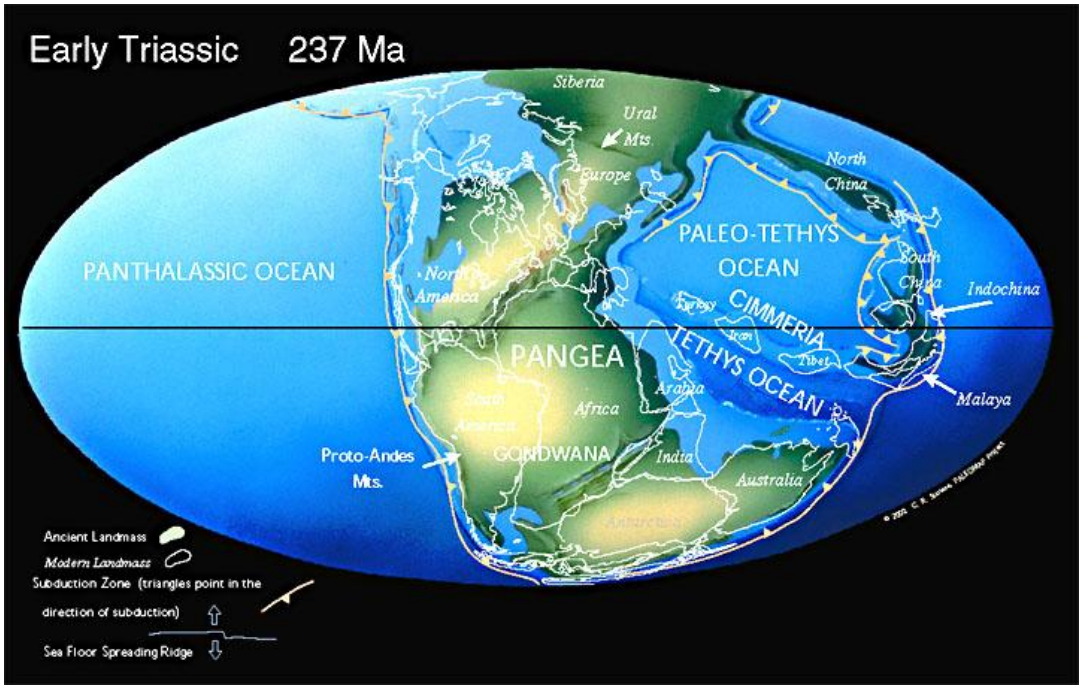
For more information and images visit www.daleharvey.com

250/248 million-213/200 million years began and ended in turbulent Mass Extinction events. This Period was born out of the greatest Mass Extinction Event ever witness on the Earth. What very little that did survive seemed to be short-lived. It took nearly 30 million years for life to truly flourish again. The land remained as a single supercontinent, Pangaea, well into the next Jurassic Period before it would begin to split apart.

But within this vast continent, tectonic activity was still very active and the entire shape of Pangaea began to buckle inward nearly surrounding the Tethys Sea into a large gulf. The land stretched from one pole to the other with North and West Africa, Northern South America and Eastern North America sharing the equatorial regions. Alaska, Western Canada, Siberia, Greenland and Northern Europe were nearer the North Pole while the Southern tip of South America, South Africa and Madagascar, Antarctica, Australia and India were nearer the South Pole.

By the end of the Triassic period a great rift had opened within Pangaea. This would eventually tear the supercontinent apart during the Jurassic Period when New Jersey, Nova Scotia and the Eastern United States would be torn away from Morocco and North western Africa; Eastern South America from Western Africa; Eastern Africa from India and Southeast Africa from Antarctica and Australia.

Tectonic events that would result in such a cataclysmic upheaval must have rocked Pangaea with violent earthquakes throughout the Triassic Period.



Triassic Globe courtesy www.google.org

For more information and images visit www.daleharvey.com

Throughout the Triassic Period the climate remained dry and hot. The central equatorial regions appear to have been largely arid deserts; often quite windswept. This reduced the remains of the Permian Period and exposed rock surfaces to red dust. Even today, it is this distinctive red sandstone rock stratification that best identify Triassic Period stone. There were no significant glaciations through most of Pangaea and what freezing there was predominated nearer the Poles. Even the Polar Regions were moist and relatively mild. Weather conditions there were suitable for Reptiles to live there! The climate was one of continental extremes: dry, hot summers, cold winters and seasonal monsoons.

After the Extinction Event, the Glossopteris the dominant broad leafed evergreens of the destroyed Permian forests were immediately replaced at first by many species of Fungi, Lichen and Mosses. Then the mosses began to support Ferns followed by a very few but frequent-found Coniferous species. In the Southern Hemisphere these conifers were mostly the distinctive Podocarpus species. Beneath them was an under story herbaceous species of small to shrubby Club Fern-type plants known as Lycopods.

Conifer species of entirely different varieties also covered Eurasia and North America. But these were primitive species of Juniper, Pine and Sequoia. Possibly due to the inability of seed to cross the vast ocean divide, the two separate north and south genera never interbred. The dividing line between Northern and Southern Coniferous Forest species ran from the Amazon Valley, through the Sahara across Northern Arabia to India, across Thailand and down to Australia. Perhaps in addition to an ocean barrier there may have been an arid desert climate barrier as well in the middle of Pangaea that separated the Southern climates and the somewhat cooler continental Northern region.

Triassic Landscape courtesy Karen Carr

As the flora began to proliferate into forests again, a few hardy surviving species of Glossopteris may have survived in remote corners, especially around the area of India. But the coniferous Podocarpus, Araucarias, Cycads, Bennettitales (Cycad-like plants with more plumy foliage), giant seed grasses and reeds plus the fan-shaped flattened-leafed Ginkgophyta remained the dominant species in the warmer regions and the Northern Conifer species continued to proliferate.

Triassic Landscape courtesy Karen Carr; Triassic ocean dwellers courtesy The Dinosaur Collectors

The oceans remained remarkably empty of some time. Sea levels dropped considerably and there were frequent seismic/ tsunami events that kept marine conditions turbulent. But Corals began to create small reefs in sheltered and warmer shallow waters.

Fish species were in few types but those hardy survivors from the previous extinction event eventually proliferated. The predominant fish of the marine environment were the Teleost Fish known as Pholidophorus. These were 40cm/16inch classic fish closely resembling the modern Herring. They appear to have bred in great numbers and were the food for some impressive marine predators. Mostly large Sauropterygia and Plesiosaurs both of which rather closely resemble what are so often described today as 'Loch Ness Monsters'.

Thalattosauria was known as the 'Ocean Lizard' that was a true Reptile which lived in the sea. The well-know and very impressive Ichthyosaur was a Reptilian fish which resembled a very large Marlin or Dolphin. These became quite prolific during the late Triassic Period and developed into a huge size especially during the following Jurassic Period. Most ironically, they originated from land reptiles that returned to the sea and followed a parallel but slightly different lineage to modern Dolphins and Whales.

Little is known yet about the marine sea floor during the Triassic time. The few types of sediment found reveal no fossils at all. Either almost all of these

sediments appear to have fallen away during the many subduction events that followed. Or possibly, if the deep oceans did release huge quantities of Hydrogen Sulphide gases, the entire ocean floor may have been dissolved by exceptionally acid seas.

The Fauna of the Triassic Period was indeed impressive. At first there was next to nothing for many millions of years. What survived struggled and seemed to disappear soon after it arrived. There were a few notable exceptions. Proterosuchus was one such hardy survivor. This was a carnivorous large lizard much like a Crocodile which was a survivor throughout the earlier extinction event.

Triassic carnivores courtesy http://www.physorg.com/news141994803.html

Another genus of hardy extinction event survivors was the Amphibian group known as Temnospondyli. This group of small to large primitive Amphibians somehow survived in the Permian swamps. Some of them resembled Alligators, others needle-nosed Crocodiles and some Salamanders. Most of these were carnivorous or insect eaters.

Lissamphibia species include the first Frogs and earliest Salamanders which first appeared at the beginning of the Triassic. These were possibly food for the Temnospondyli group as few Frog fossils are found until the larger Temnospondyli carnivores disappeared in the next extinction event at the end of the Triassic period.

Archosauromorpha Reptiles especially the Archosaurs was at first uncommon. But eventually it overtook and replaced many of the Permian Synapsids, mostly the mammal-like Reptilian Therapsids, which took a back seat but were still

contenders throughout the Triassic period. Actually the larger Therapsids became meat-on-the-table for Archosaurs. Those that survived were the quicker, smaller ones which could escape. These adapted to continual harassment and predation by becoming smaller, nocturnal insectivores. Possibly the few survivors were born this way, just a little different from the rest. And this is why, as time progressed, their descendents developed a higher metabolism and fur!

The earliest Turtles, Proganochelys appeared as herbivores mostly during the middle and late stages of the Triassic. And there were a number of smaller lizards resembling Salamanders known as Procolophonidae that early off had sharp teeth and were thought to eat insects. But later on these adapted to changing times and became herbivores!

Pterosaurs courtesy www.gly.bris.ac.uk and www.dinosaurusi.com

Pterosaurs are one of the greatest achievements in adaptation which occurred near the end of the Triassic Period. These were the first "Flying Lizards' that varied from rather small creations to those with wing spans several metres across. They had hollow bones and large almost bat-like wings made from a membrane attached with muscle to their bones. Their bodies were covered in hair-like filaments. They had long jaws and most had impressive teeth and were carnivores, feeding at night. When on the ground they appear to have walked on all four legs. Some closely resemble the proportions of the modern Albatross and Condor. These eventually developed in the Jurassic period into the famous Pterodactyls.

The Triassic-Jurassic Mass Extinction Event:

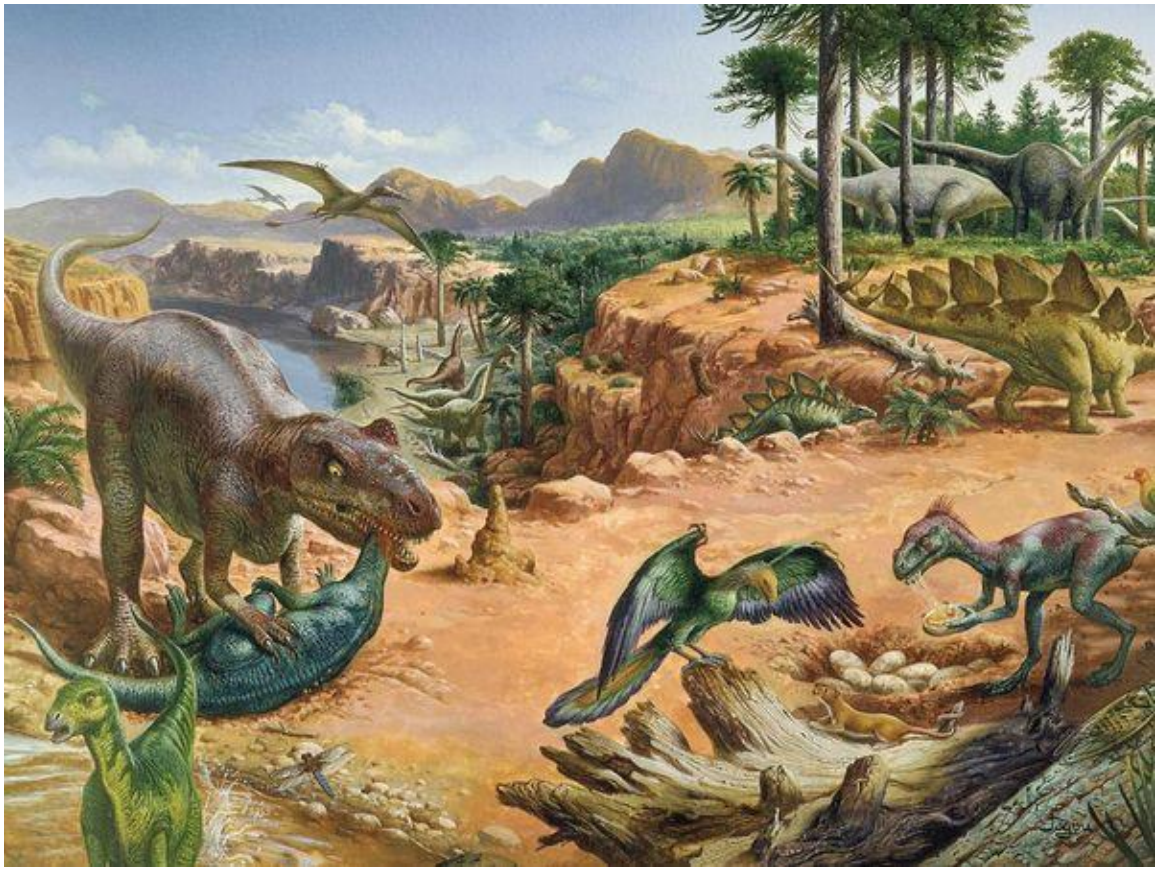
The Triassic-Jurassic Mass Extinction Event 213/200 million years ago ended the turbulent Triassic Period. Once again, the cause remains somewhat unclear, although there is no doubt that severe and sudden Climate Change was the descriptive cause. Like the former Permian-Triassic Mass Extinction Event, this one was most likely again volcanic at the start. A major eruption in Morocco dates from this time and carbon samples in stones of that Period support this.

This event occurred just shortly before Supercontinent Pangaea was torn apart by violent tectonic forces.

Whatever the reason, this Extinction event killed at least 20% of all marine species. On land most Amphibians, Reptilian species, especially the Archosaurs (Crocodile-like Reptiles) and most reptilian-mammal species died quite suddenly.

Especially in Europe wherever Triassic-Jurassic rock strata are exposed, these rock fossil sites reveal remarkable bone grave yards where thousands of species perished all at the same time!

The Jurassic Period:



Jurassic Landscape courtesy National Geographic Society

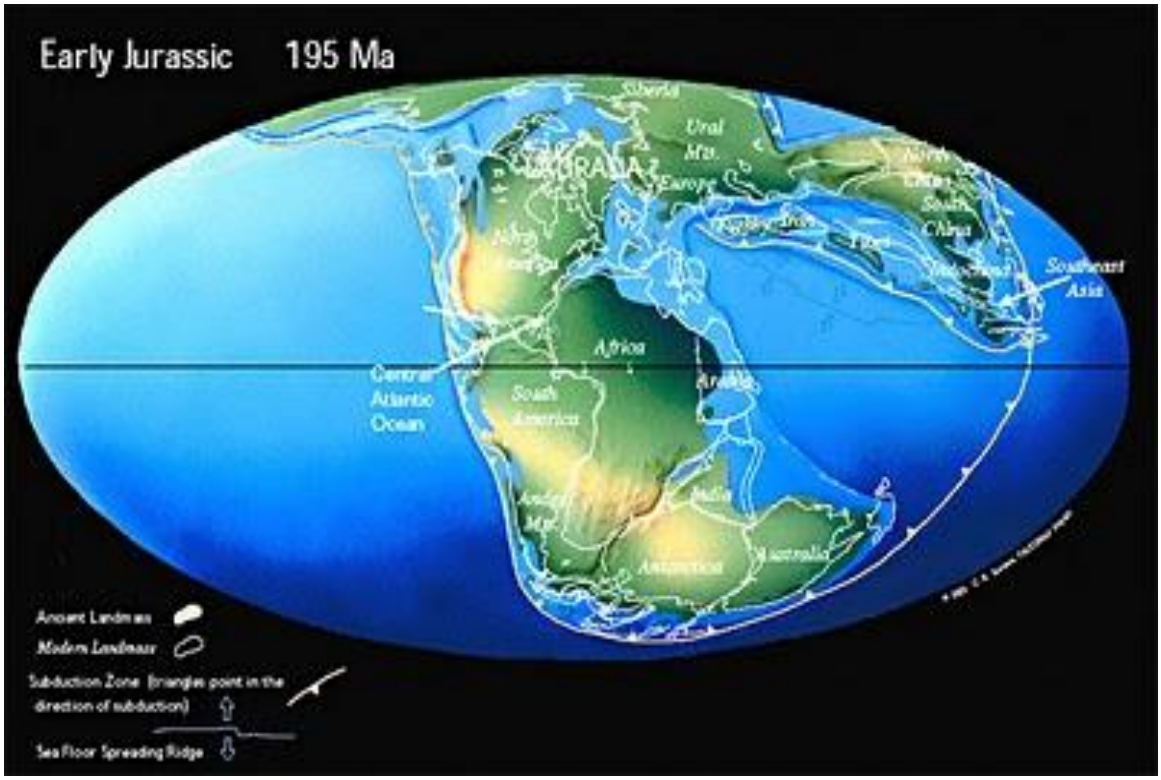
The Jurassic Period is perhaps one of the most famous in ancient paleontological history. This is largely due to our unquenchable fascination with the remarkable array of Dinosaurs that arose during this Period.

Dinosaurs seem to inspire awe and a certain captivation like no other fossil or even most living species other than ourselves. Perhaps this arises from a deep subconscious memory that we are somehow tied to these creatures.

Indeed, the science of modern Palaeontology does actually classify Humankind as a Synapsid species, which started as Reptiles with some mammal-like features. This makes us indirect descendents of Dinosaurs as are modern vertebrates and Birds!*

*See footnote discussion in the Reference Section under 'Dinosaurs and Humankind'

The Jurassic Period is one of the most famous and widely publicised periods of them all. This is a favourite for school age children who wish to learn about other worlds other than our own. It is broken up into Early, Middle and Late Jurassic Period.



Early Jurassic Pangaea Earth courtesy Google

The Early and Middle Periods have four separate stages and there are three within the Late Jurassic Period. Throughout almost this entire great expanse of time the climate was warm and dry at first (average16-18C) then subtropical or tropical thereafter with no appreciable glaciations once the Period got underway following the Mass Extinction event.

With warm temperatures and no glaciations the oceans remained quite high and warm as well. This was a time of some climate stability and life on Earth flourished! Although great movements in the super-continental tectonic plates

resulted in massive earthquakes, great subductions and huge upheavals resulting in the rise of great mountain ranges.

The Early Jurassic Period:

Early Jurassic was a recovery time after the Great Triassic-Jurassic Mass Extinction Event. This period lasted from199.6-175.6 million years ago. At first there seemed to be little life anywhere.

But as things once again began to settle, the few remaining species began to proliferate, especially in the sea.

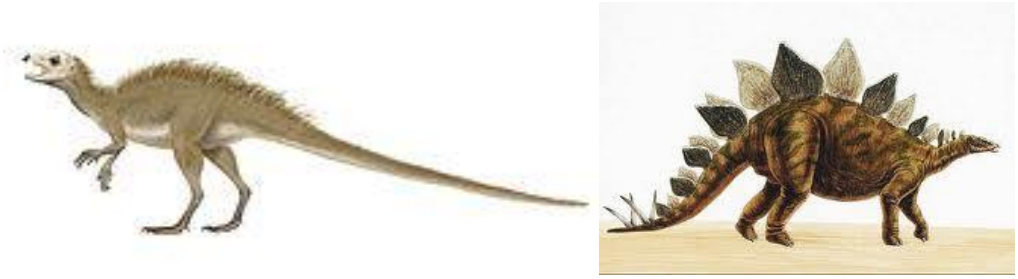
Marine:

Early Jurassic Temnodontosaurus (left) and Ammonite Asterocerus courtesy of Wikipedia.

Ammonoides were the first to rapidly multiply. These were the typical spiral shelled Nautilus-type marine creatures. They appear to have been quite good swimmers and lived in the open ocean. Shell sizes vary for time 1inch/2.5cm up to a masive2m/6.5ft!

Many of the giant marine reptile species that swam the Triassic seas like Ichthyosaurus, Plesiosaurs and Temnodontosaurus also survived the Extinction and soon flourished in the open oceans.

Fauna:



Early Jurassic Heterodontosaurid Fruitadens (left) and Stegosaurus (right) courtesy Wikipedia and Google

Very quickly several new Dinosaurs appeared that were quite different from those ever seen before this included Heterodontosaurids, Scelidosaurs, Stegosaurs, and Tetanurae. They joined the late Triassic extinction survivors the large bodied, long-necked Sauropods, and very similar Sauropodomorpha. These were herbivores that often attained an immense size with massive bodies, supported on short, stocky legs. They had long thick tails and distinctively long necks with a small head. These appear to have been herding reptiles that stayed in protective colonies where they reared their young. In contrast was the slender and tiny upright running Podekosaurus a very small and active carnivore which was only 90cm/3ft long and 1ft/30cm high.

The Mid Jurassic Period:

The Mid Jurassic Period 176-161million years ago, is a time of great tectonic activity and change.

Pangaea begins to separate into Laurasia and Gondwana. As it does the Tethys Ocean becomes completely closed in and the Atlantic Ocean begins to open. The eastern and southern coasts of Laurasia are continuously rocked by tectonic activity.

On the western coast of North America a subduction zone develops which begins to build the Rocky Mountains. This brings substantial climate changes as the rising mountains begin to block and divert the predominant wind flow, changing climate and especially patterns of rainfall.

During this time the marine creatures and ocean reptiles remain largely unchanged but become more numerous. Aquatic plants of many species flourish and become much more diversified as the ocean temperatures rise and shallow seas encroach onto shallow flood plains.

Mid Jurassic Brachiosaurus (left) courtesy Josef Moravec and Cetiosaurus courtesy Google

On land Coniferous Forests which also included various species of Ginkgos, Cycads and Ferns continued to develop and spread. Within their protective shelter, several new Dinosaurs arrive including Cetiosaurs, the Whale Lizard of Europe and Africa, another Sauropod 18m/59ft and an herbivore. Brachiosaurs, another Sauropod was one of the largest herbivores ever weighing 20-90 tons!

It was found in many places including Africa, Asia, Europe, North America and the Middle East. Megalosaurs was a smaller carnivorous Theropod that only seems to have lived during this period but was widely dispersed throughout Africa, Europe, North and South America, and smaller Hypsilophodonts, the Iguana Lizard was a 2-3m/6-10 herbivore with a distinctive bird-shaped pelvis that continued develop into the larger, unusual and quite variable Iguanodont.

Mid Jurassic Trithelodont (left) courtesy Wiki dot and Trirachodon (right) courtesy Google

Descendants of the Therapsids, the Cynodonts were still flourishing along with the Dinosaurs even though they were Shrew-sized; none exceeded the size of a Badger.

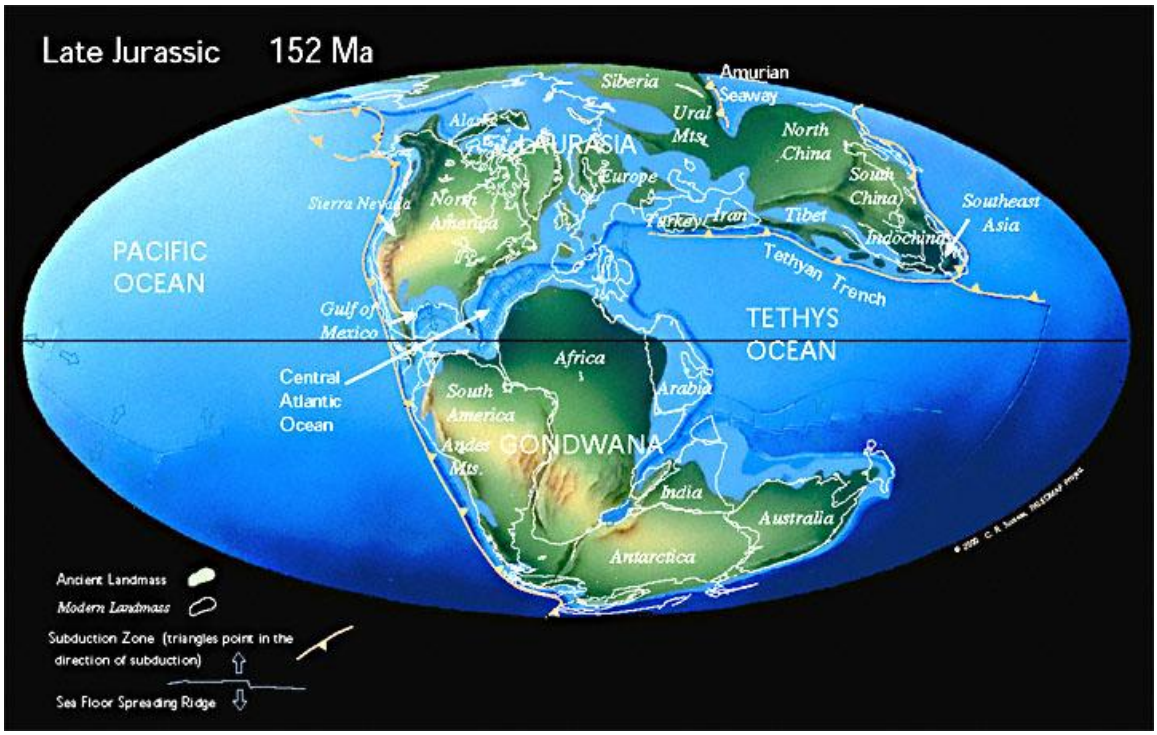
A group of Cynodonts, the Trithelodonts like Trirachodon were very mammal-like reptiles commonly found during the Jurassic Period especially through South America and South Africa but would become rare and eventually became extinct at the end of this epoch.

Mid Jurassic Mammaliformes Adelobasileus (left) courtesy Wikipedia and Ptilodus (right) courtesy Google

Perhaps the most profound changes during the Middle Jurassic Period were the arrival of Mammaliformes. These appear to have evolved from a group of Cynodonts which remained rather rare and less significant at this time. Yet it was at this point in the Jurassic Epoch that the first "true" Mammals evolved.

Pictures previous page: Jurassic Mammaliformes Therapsida Pristeroognathus courtesy Google and Repeuomamus (right) courtesy Wikipedia.

The Late Jurassic Period:



Late Jurassic Period Pangaea courtesy Google

The Late Jurassic Period 161.2-145.5/144 million years ago witnessed Pangaea breaking apart into Laurasia to the north and Gondwana to the south with a much-narrowed Atlantic ocean slowly opening up between them. Climate remained 'greenhouse' tropical with the major disturbances being tectonic plate movement resulting in many earthquakes.

This epoch was teaming with life in the air, on the land and under the seas. This is the time when the great Dinosaurs, ruled the land. These include many species most of which were types of Sauropods, the giant herding herbivores.

Mamenchisaurus is among the longest-necked of any of these mammoth creatures with a neck length of 14m/46ft and a total 25m/80ft length head to tail. This made them able to reach tender foliage in tree tops and to reach deep into dangerous swampy land for delicate vegetation.

The Theropods, represent those classic giant carnivorous beasts, like Tyrannosauriods that were so hardy that they survived until the end of the Cretaceous mass extinction event. They were mostly found in North America, Europe and Asia.

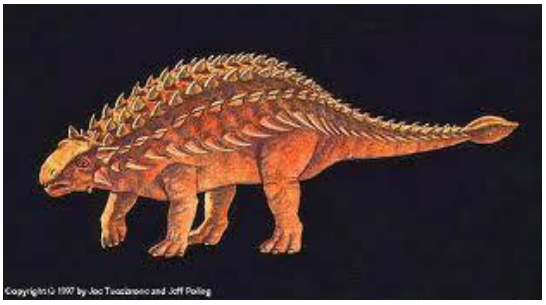
These were large, muscular beasts with large heads and many huge teeth, making one of the most fearsome creatures ever to rule the Planet. Their skin appears to have been leathery and covered with bumpy or bony scales.

But some recent fossil finds of Theropods have revealed them to be covered in feathers!

Late Jurassic long-necked herbivore Camarasaurus and Allosaurus courtesy Josef Moravec

For more information and images visit www.daleharvey.com

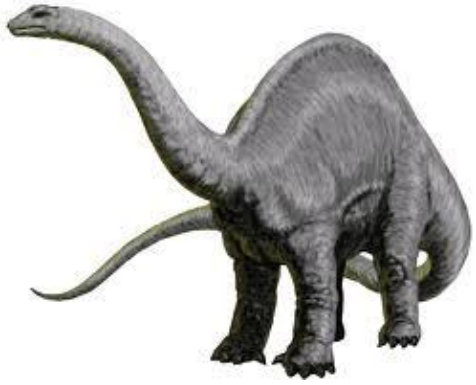
Thyreophorans, were an adaptive group of mostly herbivorous Shield or Armoured Dinosaurs like Stegasaurus . Apparently, in order to protect themselves against aggressive attack by Theropods they were almost completely armoured head-to-tail. Ankylosaurids have a somewhat similar appearance to an enormous hedgehog covered in armoured plates and a special clubbed and spiked tail which it could whip about and disarm predators.

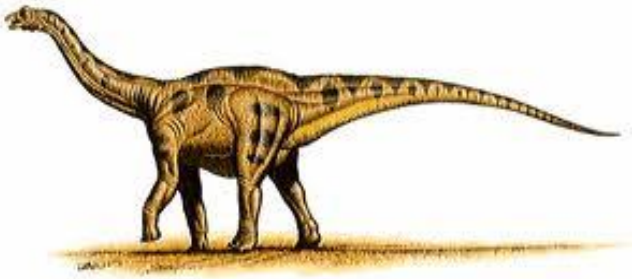


Ankylosaurus courtesy dinosauria (left) and Ornithopods courtesy Wikipedia

One of the most successful groups were the Ornithopods, a remarkably adaptable and diverse group of herbivores with bird-like hip structure and a very sophisticated method of chewing and digesting food. The Ornithopods successfully survived on every continent but were most numerous in North America. In the following Cretaceous Period they would develop into the Duck-Billed Dinosaurs.

These all thrived in the mild Jurassic climates and multiplied to become many unusual species. At first they appear to have been quite small, fast-moving with curved spikes that kept them upright. But over time they developed and adapted to grazing and so gained the ability to bend forward; often onto all four legs. This ultimately gave them the appearance of modern Bison or Moose. Yet they could still run upright and reach high into trees.





Late Jurassic Apatosaurus courtesy Rare Resources and Rainbow Dolphin.com

Apatosaurus, commonly known as Brontosaurus lived 154-150 million years ago. This was one of the largest animals ever to have existed on the Planet. Some skeletons found have been 23m/75ft long and are estimated to have weighted 23

metric tons! These were peaceful herbivores that used their long necks somewhat like Giraffe to reach high into trees for tender foliage. They could also counter-balance with their long and massive tails to stretch forward and down to gaze at ground-level.

Pterodactylus is the legendary 'Flying Lizard' of the Jurassic Period. These were about 1.5m/5ft across very like the Pterosaurs but with even longer jaws and more teeth but without the conspicuous body hair. When not flying, they also walked on all fours very much like modern Bats. Pterodactyls appear to have been mostly (semi) nocturnal, feeding mostly at night.

Late Jurassic Archaeopteryx (left) and Pterodactylus (right) courtesy Josef Moravec and Google

Other animals adapting and arriving during the Late Jurassic Period include true Crocodiles, the first true Tortoises and the first birds Archaeopteryx .

These birds were mostly found in Europe. They had true feathers much like modern birds but these had jaws with teeth and long, vicious claws.

They were about the size of a Raven with a .5m/1.6ft wingspan. Their wings were broad and they had a long and broad tail. Most appear to have been diurnal, being most active during the day, as are modern Birds.

The Jurassic Extinction Event:

Jurassic Extinction ** 144 million years ago ended this remarkable period.

**** See Footnote at end of Reference Section**

Little is known or understood about what happened near the end of the Jurassic Period. But rather suddenly almost all the large Sauropods like Brontosaurus and most all related species simply disappeared along with most of the Ammonites and most of the large sea creatures.

While the few survivors continued on into the Cretaceous Period many species perished for some unknown reason but fairly suddenly. This suggests some sort of Climate Change Event resulting in a change within their food chain supply. There are no signs of comet or meteor collisions or major volcanic events.

The rapidly shifting continents certainly changed the climate and this may have proved the end of these species. Near the end of the Jurassic Period the climate became drier and warmer and sea levels rose still higher. Since many of the large Sauropods fed and lived near sea level on swampy ground, perhaps the sudden rise in ocean levels decimated their food supply before it could re-establish itself on higher ground which was now much drier.

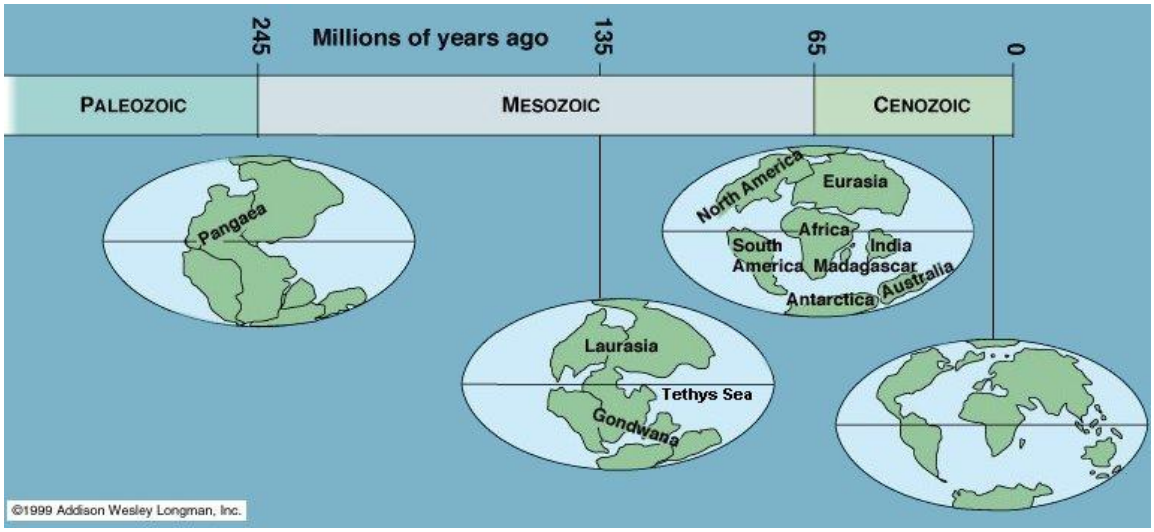
The larger sea creatures were acclimatised to colder ocean temperatures. Possibly as the oceans became subtropical, eventually reaching 42C/107F degrees, this might have altered their food chain or resulted in environmental stress possibly causing out-breaks of disease. So far scientific evidence is lacking and no conclusive explanation has been found that accounts for all the many species that faded away at this time.

The Cretaceous Period:

The Cretaceous Period lasted from 145.5/144-65.5/65 million years. This time period is the last in the Mesozoic Era and is the boundary to the beginning of the Cenozoic Era. This is the longest Period in the long Phanerozoic Eon. It is divided into Early and Late Cretaceous with six stratigraphic subdivisions in each. During this long Period, Pangaea continues to split apart.

Early Cretaceous Giganotosaurus vs.Argentinosaurus (left) courtesy Sischofiled.com; Tyrannosaurus vs. Spinosaurus (right) courtesy dinosaurs.wikia.com

This is the height of the great Dinosaurs like Tyrannosaurus and even larger Giganotosaurus and more vicious Spinosaurus. In contrast to this violent predation the Cretaceous Period witnessed the first small furry placental Mammals and also the first true Flowers and truly leafy trees.



During the Cretaceous Period Pangaea dramatically separated into the eight modern continents: Africa remained partially submerged with several low islands in the north; Antarctica and Australia remained nearly combined; Europe and Asia were separated by a very shallow sea with most of Europe submerged as numerous low islands; India was only a small island then drifting rapidly northeast away from Africa; North America also remained partially submerged through its middle creating three large islands; and South America appears much as it is today but with smaller land mass due to the higher sea levels.

Each continent was surrounded by shallow seas or ocean. This is when the South Atlantic opened up and the Indian Ocean formed. All of these continents continued to rapidly move away from each other. Massive tectonic forces rocked the Planet as Pangaea split apart and the continents began to so rapidly shift.

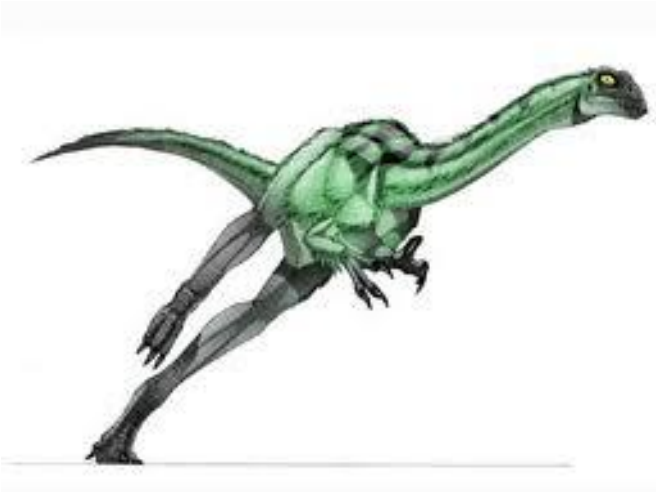
Volcanic eruptions were common. Especially during the Mid Cretaceous Period, the Sierra Nevada Mountains rose quickly on the California west coast and so did the Rocky Mountains. In Europe the Alps were suddenly thrust up.

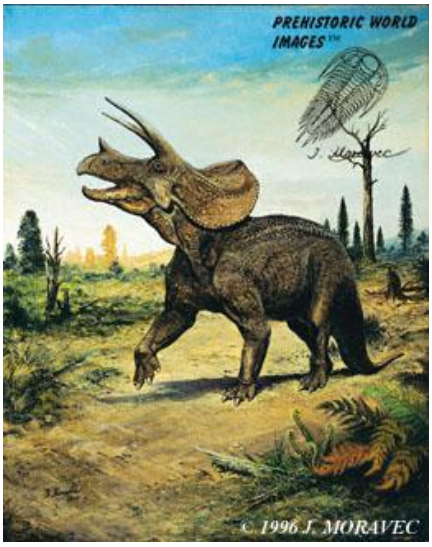
Climate Change probably resulting from the shifting continental positions quickly brought on a climate with cool, dry winters and warm summers. Then the climate again became increasingly more (sub) tropical. There were numerous Global Warming Events. These appear to be associated with volcanic activity that increased CO2 levels which lead to rather regular and rhythmic further Global Warming Events. Seasonality subsided and the entire Planet entered one of its most consistently stable and warm climates from Pole to Pole. All glaciations melted and the sea levels rose to one of their highest ever levels. At their highest levels the seas were 275m/918.5ft higher than they are today. This flooded nearly one third of all land masses creating vast shallow seas spotted with subtropical verdant islands. The Gulf of Mexico actually flooded through the

centre of North America and connected with the Arctic Ocean. Most life flourished but remained around sea level.

Early Cretaceous Psittacosaurus and related life courtesy planetdinosaur.com

During the Early or Lower Cretaceous Period most of the surviving Jurassic Dinosaurs thrived and several new ones arrived including: Psittacosaurus, Spinosaurids and Coelurosaurs. Psittacosaurus was one of the first Ceratopsian Dinosaurs which were mostly biped herbivores with rather heavy-set bodies and largish heads with a distinctive beak for an upper jaw. These were common and wide-spread especially through Asia. Later in this Period they would develop into the well-know Triceratops.





Early Cretaceous Coelurosaurus courtesy David Cerny and Triceratops courtesy of Josef Moravec

Spinosaurids were Theropod Dinosaurs: large biped carnivores and frightful predators with large Crocodile-shaped skulls and massive jaws on muscular bodies. They had a large conspicuous sail on their back and were possibly the largest of all the giant predators. These ruled Africa, Australia, Europe, and South America.

Coelurosaurs were quite small and slim to very large, muscular and massive Theropods which included Tyrannosaurus and Velociraptor that would ultimately transform themselves into Birds. These were fast moving predators running on their back legs with quite small front legs. Many if not most of them had feathers!

Flowers known as Angiosperms arrived about 100 million years ago. These Flowers appeared quite suddenly and there is still question as to their true parentage. But most likely they developed from Anthophytes. There are still missing links in the developing evolution of Anthophyta. The first advanced Anthophytes plant species first appeared upon the land 475 million ago most as represented by Algae, Fungi, Mosses, Ferns, Horse Tails and other Gymnosperms most notably cone-bearing plants and trees like: Conifers, Cycads, Ginkgo and Araucaria species. By 80 million years ago these flowering species were spreading rapidly.

Their divergence in numerous genus and species is attributed to them being separated on low, isolated island environments. Monocot species soon evolved from them and became diverse.

Anemopsis (left) and Houttuynia (right) courtesy Berkley University Education thought to be nearly identical to the first Early Cretaceous flowering plants.

From the very start, flowers developed a symbiotic, or friendship relationship with Insects and Mammals which for the price of nectar and pollen transmitted pollen grains from one flower to another, thus reproducing the species, more frequently than wind pollination.

By the end of the Cretaceous Period, flowering plants were very widely spread and today have grown to upward of 400,000 species!

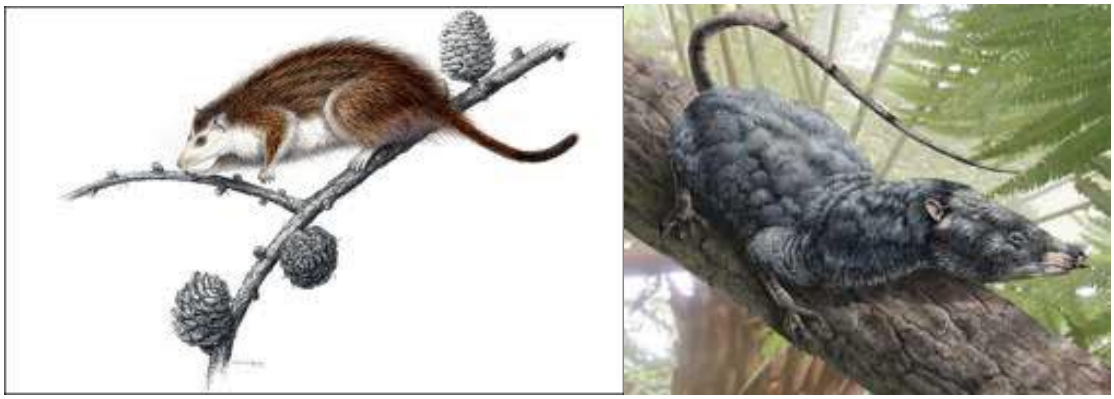
Cretaceous Monocots of Liliopsida courtesy Berkley University Education.

The most common early flowering forms were trees like Credneria (Platinus or Plain and Sycamore Trees, Ficus (Figs) species, Magnolia, Quercus (Oak) species, Sassafras, and Viburnums.

By the end of the Cretaceous Period shrubby and tall leafy trees with large and spreading canopies were becoming commonplace in many forested areas.

In more open spaces the Monocotyledonae (Monocot) group of plants like the Liliopsida Family developed and quickly diversified to include nearly one quarter of all flowering plants.

These include: Agave, Grasses, Lilies, Orchids; and the essential grains: Barley, Corn, Rice and Wheat.



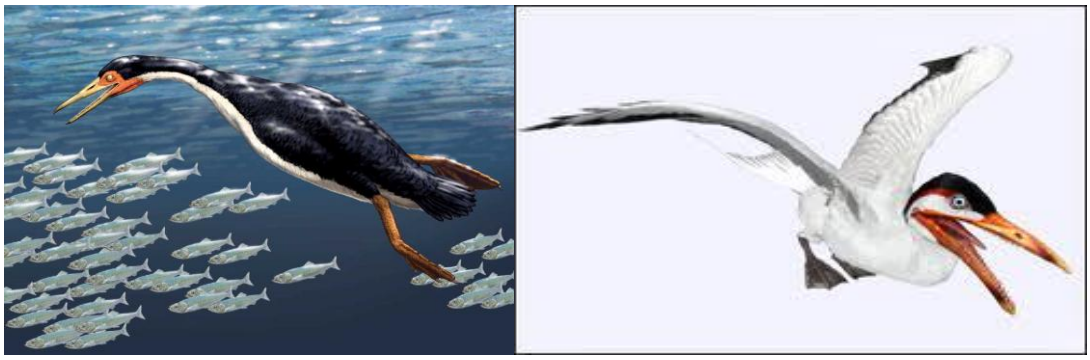
Eomaia (left) courtesy National Geographic Society and Cimolestes, a Eutherian mammal courtesy Lucius Fischer Gallery

Mammals continued to spread slowly like Eomaia (Dawn Mother Mammal) and similar rodent-like species Eutheria the first placental mammals.

These were small like Hamsters, Mice and Rats. While they were dominated by predators and their natural environment, they would eventually develop into all the amazing mammal species known today.

Pterosaurs and Pterydaclyt the classic reptilian birds were very numerous. So was Archaeopteryx, the great feathered tooth-billed bird somewhat similar to a large Magpie.

But by the end of the Cretaceous Period Hesperornis, a flightless aquatic, reptilian-type bird was becoming more common as were Ichthyornis, the 'Fish Bird' which closely resembled a Sea Gull but had a bill full of teeth. None of these birds appear to have survived the mass extinction at the end of this Period.



Cretaceous Birds Hesperornis (left) courtesy Oceans of Kansas.com and Ichthyornis (right) courtesy Discovery Channel

Insect species also began to diversify. The oldest known Ants and Termites and some Lepidopterans, which include the relatives to Butterflies and Moths, appeared. During this time the first Aphids, Grasshoppers, and Gall Wasps also arrived.

The Cretaceous-Tertiary Period Mass Extinction Event:

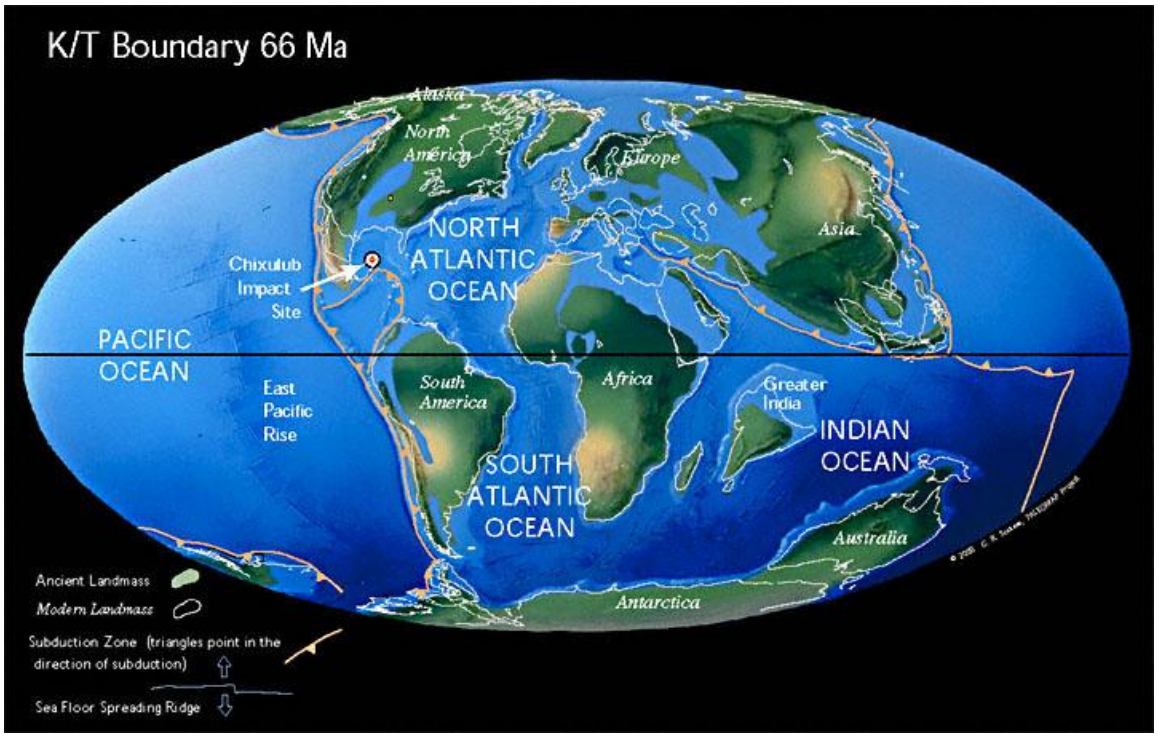
Cretaceous-Paleogene-Tertiary Extinction Event was the second largest known mass extinction event in Earth's history. It occurred somewhere between 67.5/65.5 million years ago at the end of the Cretaceous Period and is known as The K-T Mass Extinction Event. It gets its name from the boundary layer between the chalky (Khalkis) top layer of the Cretaceous rocks and a fine 1-2in/2.5-5cm Iridium 'boundary' layer dividing the Cretaceous Period sedimentary stones from those rock layers of the next Tertiary Period: the Khalkis-Tertiary or K-T Boundary.

Last of the sunny days: K-T Mass Extinction Event courtesy World News and Technology

Many Geologists, Palaeontologists and Scientists believe this thin but very distinct boundary layer was created by a massive meteor or comet impact. In support of this theory, they theorize that the telltale Iridium layer that has been found is what might be expected from a large asteroid or meteor impact. Iridium is rarely found on the Earth but is frequent in Meteors.

A thin Iridium layer has been discovered around the entire world at the boundary sedimentary layer of rocks between the Cretaceous and Tertiary boundary. This Iridium layer is most pronounced throughout rock outcrops in North, Central and South America but is very distinct and significant elsewhere as well. Rocks

immediately below the Iridium layer are teaming with fossil relics. Yet directly above the Iridium layer are nearly 'empty' sedimentary stones.



Globe at the K/T Boundary Event courtesy Google and The Azimuth Project.

Geologist searching for oil deposits also located a massive crater 105mile/120km across off the Northern Yucatan Peninsula which dates from 65 million years ago. Sedimentary samples taken from around the Gulf of Mexico and nearby continental regions reveal a massive tidal wave surge at the same time.

Since then Geologists have discovered more than 20 other impact craters which all occurred over the last 25 million years of the Cretaceous Period. Most likely they all occurred within a short time of each other.

While such a devastating impact has never occurred in recorded Human history, the multiple impacts of the Shoemaker-Levy comet in July 2004 demonstrate how highly likely such an event could be. In July 2009 the world witnessed the awesome impact of multiple comet fragments of Comet Shoemaker-Levy repeatedly bombarding Jupiter. These impacts blew massive holes in Jupiter's atmosphere that were visible for months. This was followed in July 2009 by another much 'smaller' asteroid or comet impact in Jupiter's Southern Hemisphere which left a crater in the atmosphere larger than the entire earth.

The Yucatan crater would suggest an asteroid of possibly 6m/10km across blasting a massive hole in the Earth. The ejecta would have shot beyond the Stratosphere, blocking out the Sun for a very long time, probably many years.

K/T Mass Extinction Event picture courtesy rtfa.net

Massive earthquakes, devastating firestorms and profound tsunamis would have swept the globe. Most likely the shock waves that rocked the Earth following this impact would result in multiple secondary earthquakes and more tsunamis plus near immediate volcanic activity. And a massive volcanic eruption did take place at exactly that time in Deccan Traps, India. This would have ejected massive quantities of volcanic ash, dust and toxic gases into the atmosphere, further aggravating the ejectae from the asteroid impact. Recent evidence suggests that the massive and repeated volcanism of the Deccan Traps was actually much more devastating and far-reaching globally than the related meteor impacts at eliminating almost all life on the Planet.

Catastrophic and sudden climate change would have resulted within days! The result would have been lack of sunlight, perhaps total darkness and gloom. It would have killed masses of vegetation on the Planet. That would have starved all the herbivore Dinosaurs which were the food supply for the carnivorous Dinosaurs. All would have perished and did quite suddenly judging from the masses of fossilized skeletal remains found around the world just below the K-T Boundary.

In the oceans, ash would have blanketed the seas causing anoxia and death of much that lived there. Green Sulphur bacteria would have fed off the remains. These bacteria release Hydrogen Sulfide gas which would have further acidified and toxified the seas and the air. Little would have survived there and sedimentary stones support this fact.

As the combined asteroid and volcanic highly acidic debris, gases and smoke eventually fell through the upper atmosphere, these would combine with the

Ozone Layer locking up the Oxygen and transforming it into intense acid rain. This would have scoured the Earth's surface. Fossil remains plus sedimentary rocks from that time support this. Once the air finally cleared the atmosphere lacked its protective Ozone Layer so anything remaining on the Earth's surface would have been scorched to death by the intense Ultraviolet radiation.

It is miraculous that anything survived at all. Truly at least 50% of all species perished including all the Dinosaurs other than the Birds, and even most of them perished, too! 57% of all plant species perished in North America and most Insects. In the seas, larger sea Reptilian creatures perished along with most Ammonites and the Corals, many Marine Invertebrates and Molluscs. Up to 60% of all sea creatures perished.

What did survive were those species that could adapt to the changes, or those in a position to migrate away from the areas of destruction. Sharks and jawed fish who were carnivores and those species that could migrate away from the worst affected areas all survived along with bottom-feeding species that lived off of debris on the seas' floor.

Omnivores, insectivores and carrion eaters survived which included many of the small mammals and some bird species alive at the time. They would eat almost anything and so survived. They often lived on the few remaining Insects, Snails and Worms which were feeding on other dead creatures.

Species living in natural spring and stream communities also faired quite well. These often lived off detritus and other debris and minerals bubbling up from the Earth from uncontaminated sources. This included most of the Amphibians, Frogs, Turtles, many Salamanders and some Snakes plus Alligators and Crocodiles.

While masses of plant species and forests were destroyed, many of the cone species, seed and spore-bearing species survived. This included many of the Algae, Ferns, Fungi, Mosses and newer seed-bearing flowering plants. Even when initially destroyed, their off-spring soon re-emerged once the climate returned to more normal conditions.

White Cliffs of Dover courtesy Lets Tour England.com

Another remarkable group of survivors were micro-biota especially the various calcareous nano-plankton which fed off the carcasses and debris from the mass extinction. Thanks to them, their remains created massive chalk sediments that preserved so many precious fossils from this period and also give the Cretaceous Period its name.

The mammoth amount of carcasses and debris they consumed is testified by the great chalk deposits that are today known as the White Cliffs of Dover!

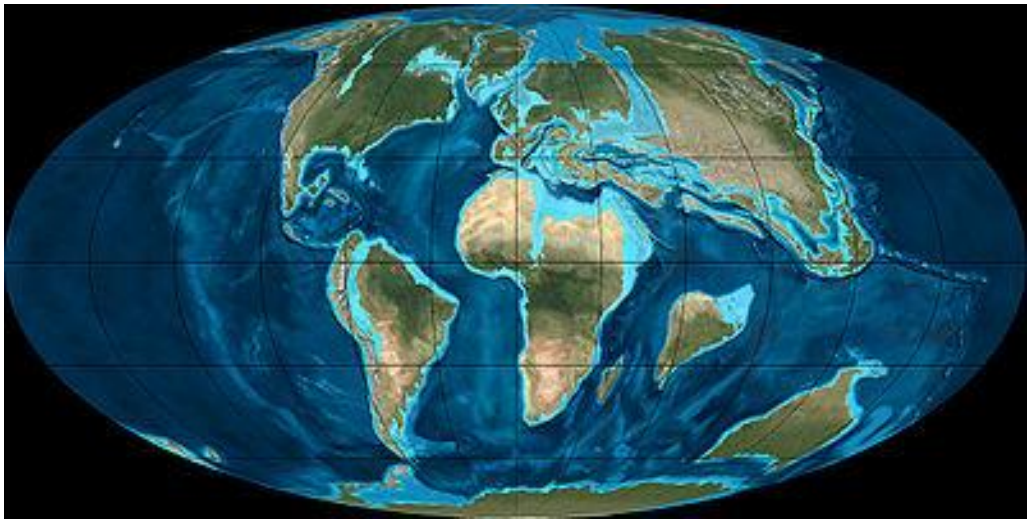
Everything has a bright and dark side. So while the Cretaceous-Tertiary Mass Extinction Event ended forever the great Age of the Dinosaurs, it opened the door for the expansion of Mammals and the eventual arrival of Humankind.

Tertiary or Cenozoic Period:

The Tertiary or Cenozoic Period includes the Paleogene and Neogene Periods starting 65.5/65-2.6 million years. Climate Change is continuous throughout this Period. First starting off cool and dry after the recent Mass Extinction Event then was warming up to tropical conditions. Yet by the end of this great Period, the World had entered an Ice Age! This was the Age of Mammals and also flowering plants.

The Tertiary Period/Paleocene Epoch:

The Paleogene Period is divided into the Paleocene, Eocene and Oligocene Epochs.



Courtesy of Wikipedia

The Paleocene Epoch starts with Gondwana still partially intact but rapidly splitting up. Australia remains joined with Antarctica near the South Pole at first.

But then about 45 Millions years ago makes a sudden and probably cataclysmic break and begins drifting north. Europe remains joined with North America through numerous islands, land bridges and shallow seas. These submerge and reappear with the fall and rise of sea levels and tides.

Africa and South America have separated forming the Atlantic Ocean. Both continents remain partially submerged through their interiors. India makes a remarkable break with Africa and Madagascar and rapidly advances northward toward Eurasia.

Earthquakes and volcanic activity continue on a regular basis as the massive forces driving the Tectonic plates shift the continents further apart. These tectonic changes also drastically alter ocean currents and weather patterns around the world resulting in near continuous Climate Change.

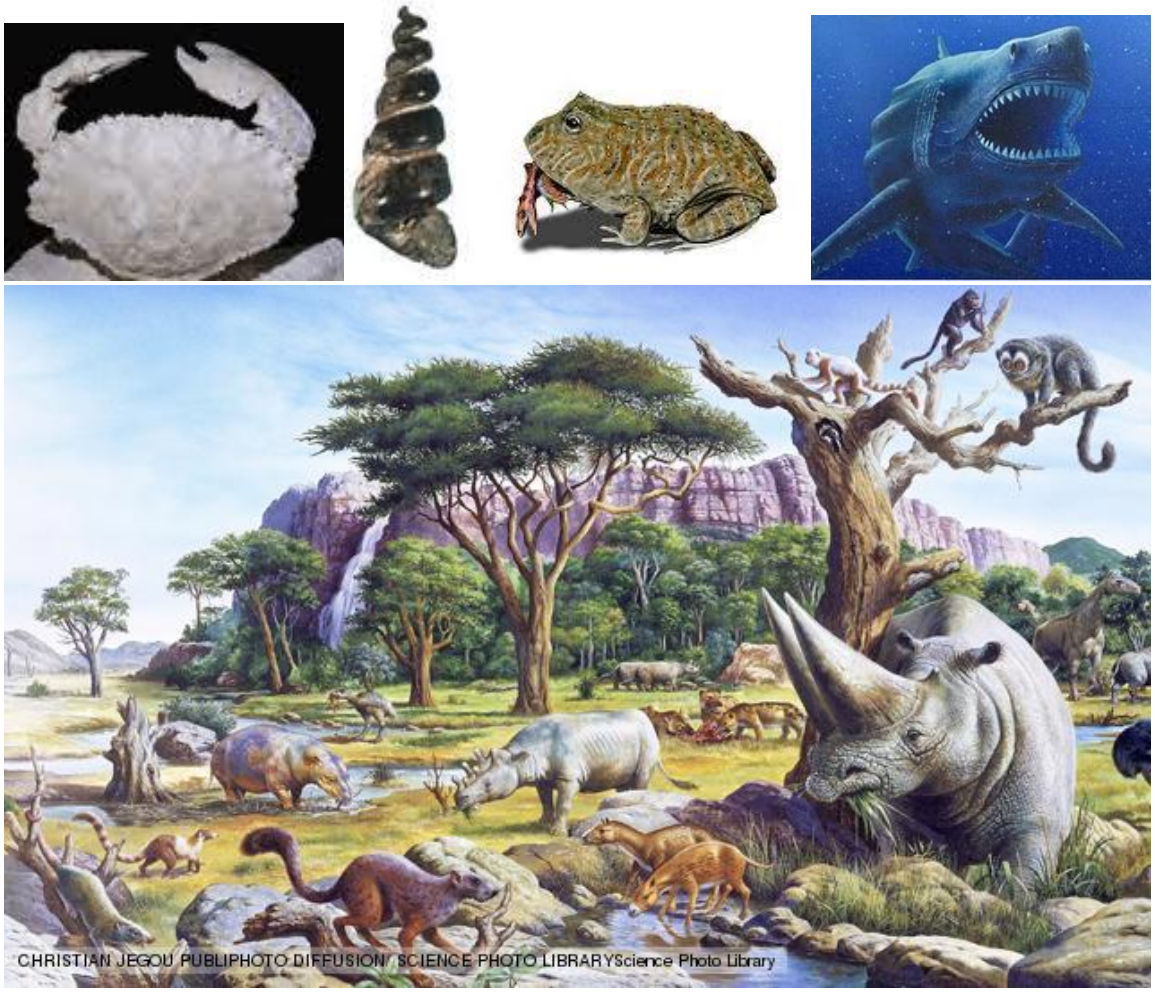
At the very first stage of the Paleocene Epoch there is a sudden cold Climate Change Event associated with the Mass Extinction. Then the Earth quickly warms and remains in a very tropical and warm climate throughout the world.

Palaeocene landscape and rainforests courtesy Denver Museum of nature and Science and www.sussexvt.k12.de.us

Palm Trees grow as far north as Greenland. Seas levels were high. The Earth is still recovering from the recent Mass Extinction Event, so life both on land and in the oceans is at first limited. But rather quickly, plants of all sorts, especially Ferns, begin to multiply and spread throughout the Earth.

This included many species of flowering plants and leafy shrubs and trees, also Cacti and Palm Trees. Due to the high sea levels and separating continents, many species developed in isolation from one another, this led to the thousands of different genus and species known today. The first true Rain Forests emerge by the end of this Period. At first, ocean life is very limited, but as conditions

improve and the seas warm, crustaceans and fish return, especially Sharks. Coral reefs soon abound. There were Gar-like ocean-dwelling Reptiles and many Amphibians.



Palaeocene forest, landscape and mammals courtesy www.sussexvt. Timeline and BBC television.

With the extinction of all the Dinosaurs and other large predators, the small adaptive Mammals had their chance to multiply and spread.

This started with the Rodents and soon included the Condylarths, the many hoofed herbivores whose ancestors would eventually develop into the cattle and grazing animals of today.

The largest were the Titanoides which were sometimes as large as a Rhinoceros. The Platypus and other Monotremes like Echidna arrived, along with Marsupials like the Kangaroo. Later arrivals include the first primitive Primates.

Also arriving were a great variety of Birds including the Crane, Ducks, Hawks, Herons, Owls, Pelicans, and Woodpeckers. Also appearing are the large flightless birds like the Gastornis (Terror Bird) that could grow to over 6ft/180cm.

Gastornis, the Terror Bird courtesy Science Photo Library.

Paleocene-Eocene Thermal Maximum:

Global warming on a remarkable scale occurred 55.8 million years ago at the boundary between the Paleocene and Eocene Epochs. Temperatures rose by an average of 6C/11F degrees over 20,000 years.

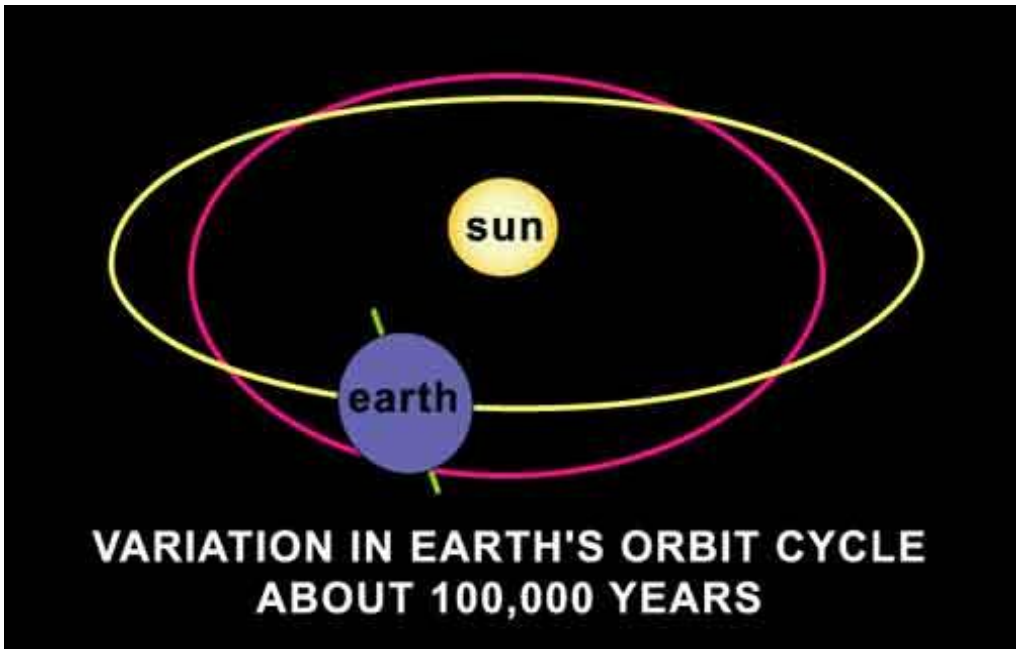
There were two major hyperthermal events each of about 1,000 years about 20,000 years apart. The second one is known as the Eocene Thermal Maximum 2 event. Ocean temperatures rose. All glaciers melted. Temperatures increased greatest at the poles rising to 22C degrees which were warm enough for (sub) tropical species to grow at the poles! Seasonal variability increased as the temperatures rose with greater extremes within the seasons.

Fresh water flowed into the oceans causing a rise in seas levels. The ocean currents also reversed which drove much warmer waters deep into the oceans. As well as becoming warmer, the seas became more acidic. This caused the extinction of many benthic foraminifera and plankton with 35-55% perishing. This altered the food chain and some marine species, especially Corals and many types of invertebrates and shell fish perished.

The effects of these Global Warming Climate Change Events were highly beneficial to the development of Mammals. Contrary to the fears of modern day sceptics life on Earth flourished and expanded in all directions.

Explanations as to why this happened remain open-ended. CO_2 Carbon Dioxide levels rose during this period. This obviously contributed to Global Warming.

There was a lot of volcanic activity, nothing massive but rather sustained. It is possible that the combination of volcanic CO2 and Hydrogen Sulfide along with the volcanic ash could have started a 'greenhouse effect'. As the Planet continued to warm, Methane Clathrates might have unlocked methane gas from the ocean and land which would have further increased the global warming and would have acidified the seas. So far there appear to be no major meteor or comet impacts or craters dated to this time.



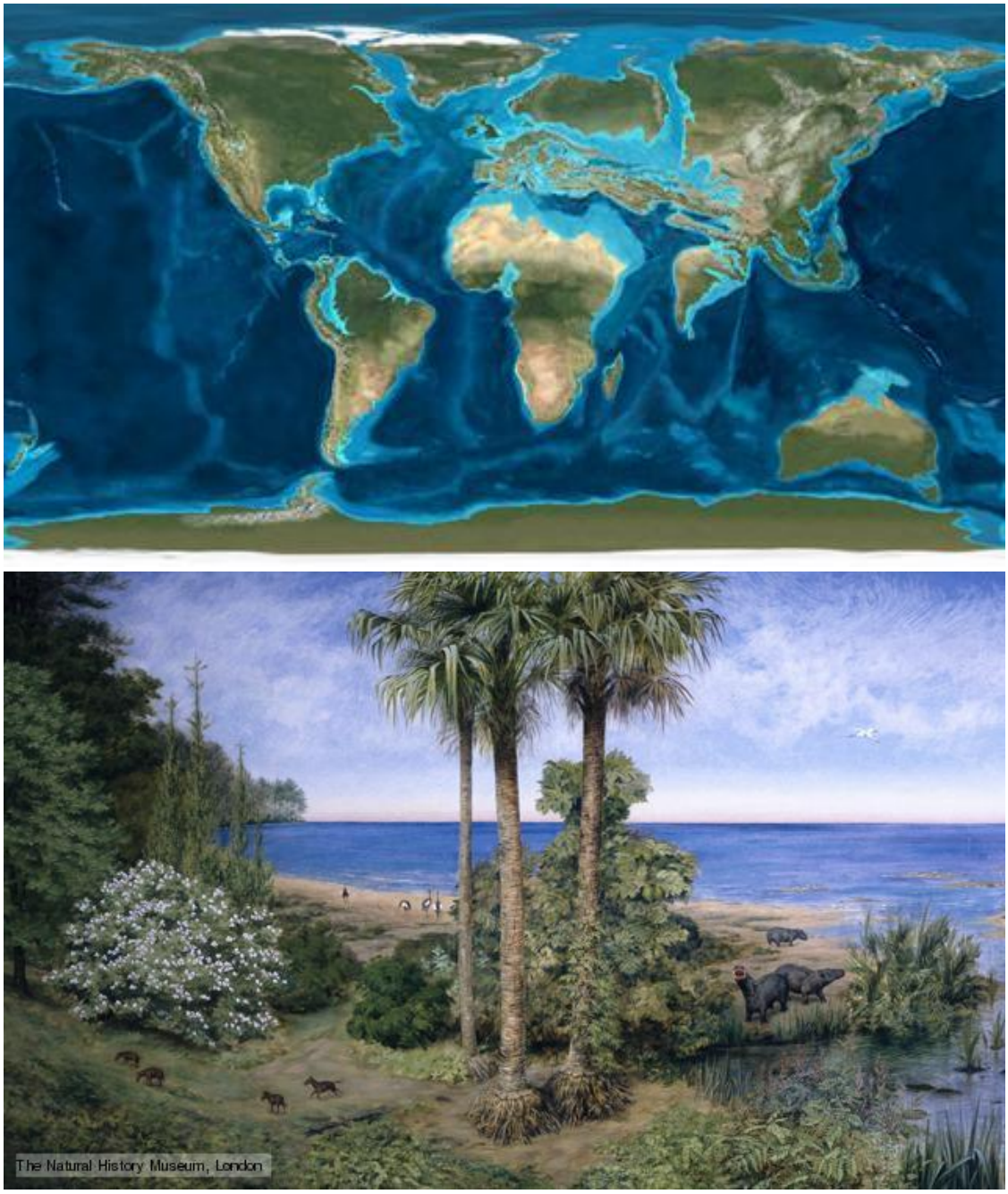
Orbital Eccentricity shows dramatic orbital shifts. Courtesy ACphysicsHl2010

The most sensible theory explains that the Earth's orbital eccentricity was a less eccentric orbit back then as it is today. The Earth goes through a regular 400,000 and 100,000 year orbital cycle between a nearly circular orbit and a highly elliptical one around the Sun. The circular orbit would result in a gradual and regular warming of the entire Planet as is happening today. Then as the Earth's orbit again became more elliptical, this would result in a period of natural cooling, which is exactly what happened at that time.

Eocene Epoch:

The Eocene Epoch 56-34million years ago starts with another major Climate Change: the Thermal Maximum Events which warmed the climate so very considerably that lush even tropical forests flourished right to the poles!

The oceans throughout the Globe remained very warm and high. As India begins to collide with Europe and Asia (still largely submerged) this creates the Himalayas, volcanic activity increased dramatically and Carbon Dioxide levels reach their peak.



The Eocene Epoch Globe and landscape courtesy BBC and The Natural History Museum of London

This resulted in a third hot Thermal Climate Change Event occurring at about 40 Million years. This is known as the Middle Eocene Climatic Optimum (MECO). Deep ocean temperatures raised an average of 4C/7+F degrees.

The most widely believed theory for the Eocene 'hothouse' is that the global warming, especially of the deep oceans released methane Clathrates buried deep beneath the ocean mud. This sudden release of Methane (CH_4) combined with the high Carbon Dioxide CO_2 created enough greenhouse gas to affect the entire world's temperatures!

For more information and images visit www.daleharvey.com

Europe, Greenland and Africa continue to separate from North and South America, increasing the width of the North Atlantic Ocean and allowing much broader circulation of ocean currents throughout the Atlantic. A land bridge and very shallow seas remain between Europe and North America allowing many species to spread between the two continents.

About 45 million years ago Australia breaks away from Antarctica, which heads over the South Pole. This allows cold ocean currents to circulate more directly and rapidly around the South Pole instead of being warmed as they were before the split.

Soon Glaciations and ice sheets cover Antarctica and cold currents stream northward into all the oceans resulting in retreating seas levels and a slow global cooling that would ultimately result in an Ice Age.

Flora:

Tropical temperatures allowed tropical Rain Forest to spread far into the Arctic and Antarctic regions. Subtropical forests covered Antarctica and Palm Trees grew in Alaska, Greenland and the Northern European Arctic Circle. Swamp Cypress and Dawn Redwoods were common there. Dense forests covered nearly the entire Earth.

Eocene Epoch Fauna and Flora courtesy www.anthrotools.org

As the climate began to cool, seasonal variations markedly increased and many trees adapted to the Climate Change by becoming Deciduous . Tropical species began to die out especially in the colder climates. This allowed grasses and more flowering species to develop along river banks and lake shores.

By the end of the Eocene Period climate was quite seasonal and cooler. Deciduous forests now dominated. Tropical Rain Forests were confined to warmer regions of Africa, Australia, India and South America. Antarctica still maintained some deciduous forests but much of the land was already turning into tundra.

Fauna:

Eocene fauna and landscape courtesy American Museum of Natural History

Stone fossil records, especially in Europe and North America, show the first evidence of 'modern' mammals and their relatives like Artiodactyls, even-toed animals with hoof-like feet whose relatives became Antelope, Camels, Cattle, Deer, Pigs, Sheep and such.

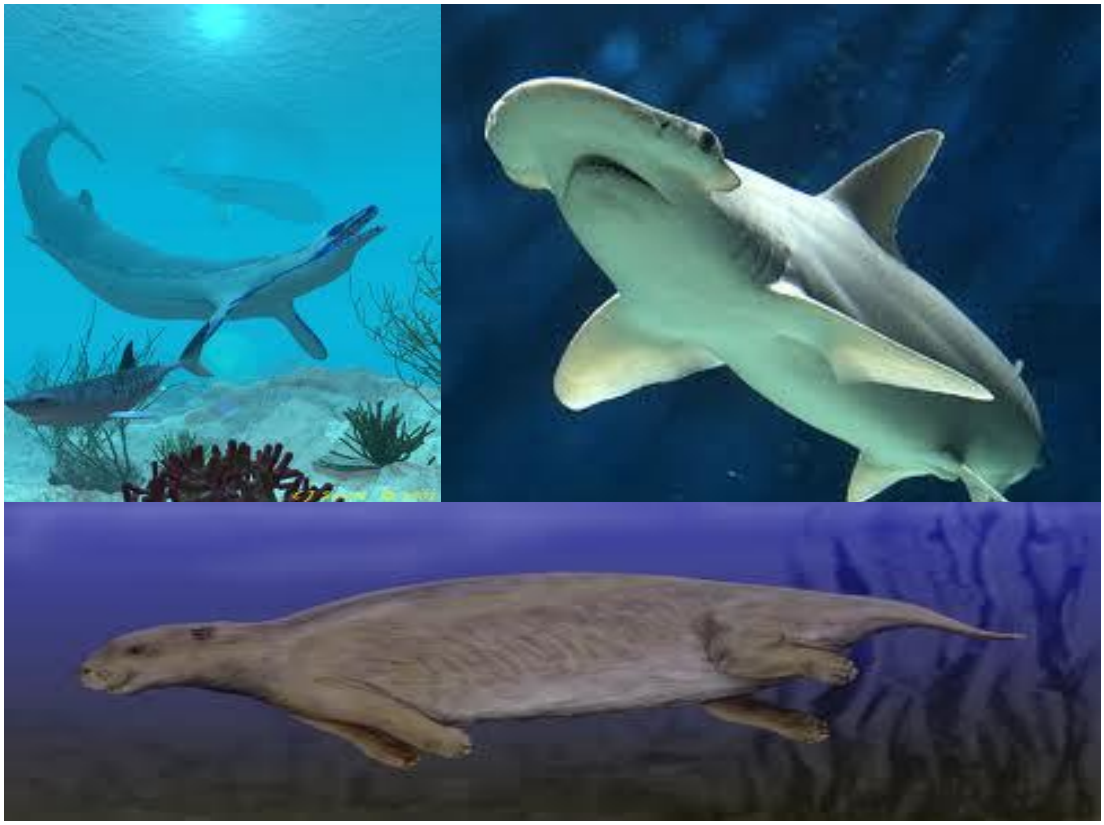
And Perissodactyls , animals with true hoofs like the Rhinoceroses and Tapirs. Both groups became prevalent. Hyrocotherium (Eohippus) was a small now extinct species whose relatives became the first Horses.

There were also many species of Bats, Marsupials, Rodents , and the earliest Proboscidians that would eventually adapt into the Mastodon and later modern relatives which include the Elephant.

Among some of the most profound arrivals were the Primates. These had long, thin legs; feet and hands capable of grasping, and teeth capable of chewing or eating much as modern Monkeys. Almost all species were smaller than the ones that preceded them or would replace them. This is thought to be a climate change adaptation to the tropical climate.

Also adapting to the opportunity of an easy meal upon the herbivores were the carnivorous ungulates like Mesonyx. These were fast Tiger or Wolf-like predators which were found mostly in North America.

Reptiles included many forms of Lizards, Turtles and Snakes like modern Pythons to over 10m/33+ft! Birds and Insects found in stone fossil relics closely reflect those of the modern age, but they were covered a much wider area often right up to the Poles.



Eocene Basilosaurus (left) courtesy Digital "I" Designs; Sphyrna, Bonnet head Shark (left) courtesy Marine Bio; Prorastomus (below) courtesy Wikipedia

Marine life in the tropical oceans was abundant. Many species of Fish and Whales flourished and the first true Octopus appeared. Sharks of many species predominated, including the first Carcharinid Sharks.

There were also early marine mammals like Basilosaurus, a large early species of Whale that more resembled a lizard snake and was a true Sea Serpent. Prorastomus, was one of the first Sirenians, whose modern relatives include the Manatee.

The Grande Coupure Mass Extinction Event:

The Grand Coupure or Eocene-Oligocene Mass Extinction Event abruptly ended the Eocene Period. Grand Coupure means "great break". This is reflected in stone fossil observations and geological research that 35/33.5 million years ago something happened that wiped out many entire species of Flora and Fauna, especially marine species. Also wiped out were most of the small Horses, clove-hoofed mammal species, almost all the European Primates and many Rodent species as well.

Massive Climate Change happened suddenly. The entire Planet cooled. Ice sheets quickly covered Antarctica and glaciations moved outward from the Poles

bringing a frigid Climate Change Event. Sea levels dropped dramatically, too. The world entered a great ice Age!

The Chesapeake Bay Impact courtesy Fox News.com and The Virginian-Pilot

Most likely cause was a series of near-simultaneous meteor impacts. The largest of these were documented massive craters dating from this time period at Popigai, Siberia, Toms Canyon about 90 miles off the coast of Atlantic City, New Jersey and Chesapeake Bay, just off the east coast of Richmond, Virginia.

The impacts off North America appear to have created a tsunami so high that it swept over the Blue Ridge Mountains!

Devastation to North America as well as much of Europe and Siberia was profound. This was further compounded by eruptions from the La Garita, Colorado super-volcano which continued erupting on a spectacular scale throughout much of the following Oligocene Period.

The Oligocene Epoch:

The Oligocene Epoch 34-23 million years ago witnessed a complete change in many species. Following the mass extinctions of many North American, European and Siberian species, other Asian species quickly migrated over the connecting land bridges and became dominant.

This included: Beavers, Hamsters, Hedgehogs, Hippos, Pigs, now extinct Opossum and Rabbit-like Mammals, ruminant mammals, Rhinoceros species, Reptilian relatives of the Alligator, Crocodile, Lizard and Snakes; many Amphibians and Insects as well as the most of the smaller Rodents and Marsupials. Primates of many forms continued to advance, develop and flourish throughout this Epoch.

The Oligocene landscape courtesy www.anthrotools.org

The tropical climate soon turned into a frigid Climate Change Event which continued to deepen through almost the entire Oligocene Period.

Global temperatures dropped more than 8C degrees resulting in massive glaciations, worldwide ice accumulation and a sea level drop of 55m/1870ft!

Courtesy BBC Nature Prehistoric Life

The La Garita, Colorado, San Juan Mountain super-volcano eruptions 40-25million years, include some of the most violent eruptions ever on Earth. The greatest of these events happened 28-26 million years ago. At least 7 major

erupts covered North America with volcanic ash all the way into the Caribbean Sea. The frequency and intensity of these eruptions certainly contributed to even deeper severe Climate Change.

The Rocky Mountains continue to build in western North America. The land bridge remains into Europe. As the African plate pushes north into the European plate the Alps continued rising. This further closes and isolated the Tethys Sea into almost the shape of the Mediterranean Sea today. South America completely detaches from Antarctica and heads north toward North America. Antarctica shifts over the South Pole. This further speeds the Antarctic Circumpolar Current which results in further continental and ocean cooling.

Flora:

As the climate cooled and became much more seasonal, the dense Tropical Rain Forest and Broad-Leafed Evergreen Forests faded and receded to the equatorial belt. In moderate climate regions evergreen and tropical trees were replaced with Deciduous Trees that soon predominated throughout the Temperate Zones. Beech and Pine remained very common and proliferated. In the subtropical warmer areas of North America, Cashews and Lychee trees were abundant. The first primitive Roses appeared and in swampy and wetter land Bulrushes, Ferns and Sedges were common. The Legumes of the Bean and Pea family rapidly spread.

Many open plains developed on most continents which quickly became massive grasslands. This is when grasslands and savannahs first took hold as a direct result of cooler, drier, seasonal Climate Changes. This would radically alter what life forms would predominate in the times to come.

Fauna:

Oligocene Horses courtesy Heinrich Harder and www.sussexvt.k12.de.us

The grasslands and woodland verges became the ideal environment for grazing and herding Mammals. The open landscapes allowed animals to become bigger than they had in the Paleogene.

Mesohippus was a small Horse commonly found in large herds throughout the North American plains. Archaeotherium were huge carnivorous Peccary. Entelodonts, known as Terminator Pigs were massive beasts that were omnivorous and would eat and catch almost anything. Hesperocyon was one of the earliest forms of Dogs. There were a variety of Camels and Oreodonts, sometimes called 'Ruminating Hogs' that were mostly about the size of heavy sheep or Cattle, while others were near amphibious and very like Hippos.

There were also a number of different Rhinocerotidae, the true Rhinoceroses. These lived mostly in Asia, Europe and western North America. Hyracodontidae, were fast-moving, muscular and somewhat cattle or Horse-like in appearance. It would later evolve into one of the largest mammals ever to exist, Indricotherium. This massive animal stood a full 7m/23.4ft and was 10m/33.4ft long and foraged from tree foliage much like the Giraffe. Amynodontidae were much more hippo-like herbivores that appear to be semi-aquatic.

Oligocene Epoch Hyaenodon courtesy www.prehistoria.piwko.pl

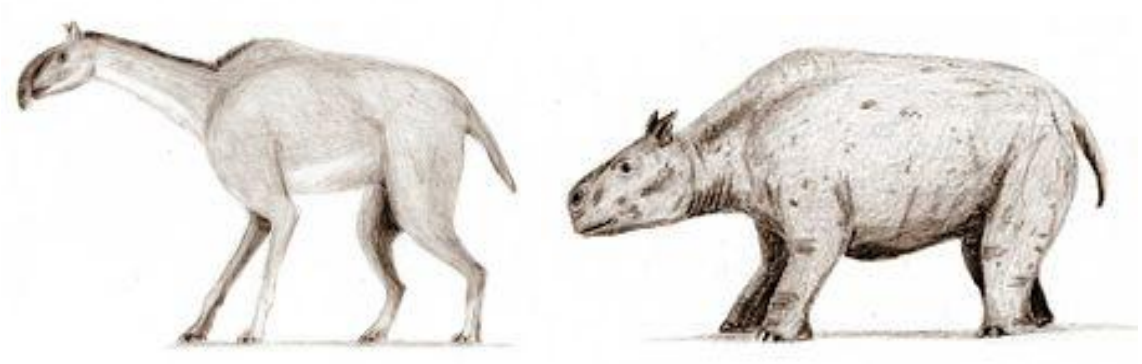
Another classic of the Oligocene Period was Hyaenodon. These assumed many forms from something not much bigger than a large cat or small dog to H. horridus, a large Hyena or Wolf-sized carnivore and impressive H. Gigas which could be 10ft/3+m long and weigh 500kg.

Hyaenodon of all sizes were voracious carnivores found everywhere except Antarctica, Australia and South America. While they were very fast and efficient predators, they were no match for Climate Change and the entire genera became victims of the less well-known Mid Oligocene Extinction Event.

South America evolved very different genera due to its isolation as a continent. Astrapotheres, appears to have resembled a small 3m/10ft long Mastodon or

Tapir. Litopterns was a Camel-Horse-like hoofed mammal. The Notoungulates were herbivorous hoofed animals in many forms from the size of Rabbits up to Toxodon, the size of a massive Rhinoceros but without any horns.

Pyrotheres were a cross between a small Mastodon, an Elephant, a Tapir and a Hippo with a trunk and tusks! Almost all of these were very distinct and most unusual creatures. All appear to have been quite passive herbivores. During the Oligocene Epoch these creatures thrived and multiplied rapidly.



Oligocene South American Litoptern, Macrauchenia (left) and Notoungulates, Taxodon courtesy Wikipedia

But they were often the victim of some fierce predators. Sebecosuchian was a reptilian terrestrial creature with a distinct Theropod Dinosaur appearance somewhat like a tall Crocodile.

And like Crocodiles, it may have spent part of its time in swamps and marshes along with the true Crocodiles. Phorusrhacidae, a clade of Terror Birds, were carnivorous, flightless Birds which included small Andalgalornis and giant 1-3/3-10ft tall Titanis. There were even carnivorous Marsupials like the Borhyaenids which remained quite dominant predators.

Marine:

The oceans are less well known but appear to have been rather similar to how they appear today. There were many sorts of Molluscs or Bivalves. During this Period the Cetaceans Dolphins, Porpoise and Baleen and toothed whales appeared. So did the more advanced Carcharhinid Sharks, plus the first Seals and their ancestors, known collectively as the Pinnipeds.

These are thought to have originated from a Bear or Otter-like ancestor and adapted to the colder Climate Changes by heading back into the seas. As the Ice Age deepened, the oceans became ever colder and cloudier. Marine life seems to have dramatically diminished.

The Mid Oligocene Extinction Event:

Climate Change caused another Mass Extinction of species. This was known as the Mid Oligocene Extinction Event. This was especially noticeable in North American land Mammals somewhere between 32-26 million years ago.

Many archaic species of Mammals and Plants worldwide very suddenly disappeared from all the stone fossil layers at this time.

This included: Archaeocete, the ancient four-limbed whales; Brontotheres, the ancient Rhinoceros, Horses Tapirs; Creodonts, ancient large Cat-like carnivores but larger in size than the modern Bear; Multituberculates among the first and longest-surviving of all Rodent clades including many types of burrowing and Squirrel-like creatures.

Most likely this was due to major changes in the circulation of colder ocean currents as the continents continued to shift. Further compounding this in North America were repeated huge eruptions of the La Garita, Colorado super-volcano which would have repeatedly blocked out sunlight and warmth; and toxified the air, soil and water; plus resulted in extensive acid rainfall.

This caused a further Global Cooling Event that resulted in greatly increased global glaciations and ice retention. Animal and plant species used to at least seasonal to subtropical warmth were suddenly subjected to the prolonged cold and deeply freezing temperatures. Growth and food chains were immediately disrupted. Many species died in such profound numbers that entire clades of animals became extinct.

The Neogene Period:

The Neogene Period, the Age of Grasses, picture courtesy of Robert Lawton

The Neogene Period lasted from 23 million to 2.588 million years ago. It is divided into the earlier Miocene Epoch and later Pliocene Epoch. The Miocene is further subdivided into six Ages and the Pliocene into two Ages.

During the Neogene Period, scientific data clearly demonstrates that the O2 Oxygen level was 8% higher and CO2 was double what it is today. Average surface temperature was 14-16C degrees, exactly as it is today. But instead of the high CO2 levels causing a 'Greenhouse Effect', the Planet did the very opposite and continued to cool and dry out! Soon massive ice sheets began to cover most of Antarctica and the North Polar Regions.

This puts in serious doubt the contention that rising CO2 Carbon Dioxide levels and associated pollutants are solely responsible for today's Global Warming.

In the Earth's past history while gases like Methane often trapped heat resulting in warming temperatures, Carbon Dioxide obviously can be present in either a cold or warm global environment.

And more often than not, excessive amounts of heavy air pollutants, especially heavy air pollution resulting from massive volcanic eruptions or bolide (comet or meteoric impact) actually block out the sunlight, causing temperatures to fall rapidly.

In today's situation at first the combination of excessive Methane (resulting from Humankind activities and the release of methane Clathrates from warming soils) combined with growing levels of Carbon Dioxide and air pollutants would trap sunlight within the near-earth atmosphere; resulting in a 'greenhouse effect'.

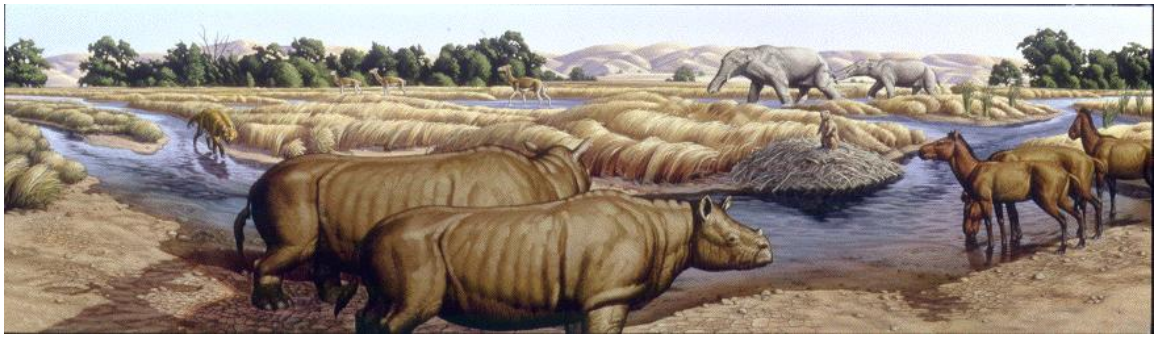
But as these pollutants thicken into more substantial clouding of the atmosphere, the very opposite should happen: sunlight is reflected off the cloud tops, the ground is deeply shaded by the clouds and the climate rapidly cools.

But if the climate were to continue to warm rapidly as it appears to be doing today, this strongly supports the Milankovitch Cycle Theory of Earth Orbital eccentricity. In this theory, Global Warming and Cooling Climate Change events are much more strongly linked to regular and rhythmic changes in the Earth's orbit around the Sun. Since the Earth's orbit is nearly circular now, the planet should continue to warm up. While during the Neogene Period, the Earth's orbit was much more elliptical which allowed for much more cooling.

So even though CO2 levels were much higher then during the Neogene Period than they are today and volcanic air pollution was still present then, too, the Earth continued to cool down rather than warm up!

The Miocene Epoch:

The Miocene Epoch 23million to 5.3 million years. The Planet continues to cool and became drier and windier with ice sheets forming at the Poles. Soon these ice sheets become permanent glaciations spreading outward and further cooling the nearby temperate regions. Mammals and Birds continue to evolve. Most other life forms remain relatively 'modern'. Seals and Whales spread. Kelp becomes predominant in the oceans. Grasses take over the plains creating ideal grazing conditions for a variety of herding mammal species, especially Horses.



The Miocene Epoch courtesy www.anthrotools.org

The continents had now drifted to almost where they are today. Australia and South America were quite isolated so developed different genus and species from the rest. The land bridge between South America and Antarctica submerged. This allowed the development of a powerful circumpolar cold ocean current that contributed to a colder, drier and much windier Southern Hemisphere climate. Grass lands were greatly promoted by this Climate Change and plant species began to migrate between the continents of the Southern Hemisphere.

While the land bridge between North and South America had not yet connected, by the end of the Miocene Epoch, many islands were forming that would soon unite these two massive continents. Mammal species were already island-hopping between the continents and this would soon become a mass exodus.
The Andes Mountains were rising as were the Rocky Mountains in North America, so were the Alps in Europe and the Himalayas as India continued to collide with Asia. This drastically altered weather patterns causing cooler, drier and windier weather.

As Africa collided with Eurasia between Turkey and Arabia, the Tethys Seaway continued to shrink and then disappeared between 19 and 12 million years ago. A great range of mountains uplifted in the western Mediterranean region. At the same time global cooling caused sea levels to fall substantially resulting in the Mediterranean Sea drying up. This is known as the beginning of what would become the great Messinian Salinity Crisis which occurred near the very end of

the Miocene Epoch. This resulted in remarkable and sudden Climate Changes throughout the Mediterranean region where the now dry Mediterranean Sea basin reach incredible atmospheric pressures and temperatures which drastically altered the surrounding climate throughout much of Europe and Asia with global weather impacts, especially in the North Hemisphere.

The cooling climate also resulted in drier conditions worldwide, especially throughout Africa and Australia.

Flora:

Miocene European landscape courtesy Mauricio Anton and the Science Photo Library

Colder Climate Changes resulted in greatly reduced Rain Forests now reduced to the tropical belt zone. Coniferous and Deciduous Forests also shrank as the climate continued to cool and become more arid.

Grasslands soon overtook them and grass species greatly diversified. This promoted the development of large herbivores and ruminant grazing mammals.

As a natural adaptation to these cooling Climate Changes about 7- 6 million years ago, grasses evolved which were much hardier and richer in silica. These grasses were better able to assimilate the higher levels of carbon dioxide.

And possibly as an adaptation to such aggressive grazing from a variety of Herbavores, they also became much less edible.

This caused a worldwide extinction of many of the archaic large herbivores. Their extinction opened the way for expansion of a variety of Horse species and many other rather similar mammals what would eventually become modern Cattle. In the oceans, Brown Algae became great marine oceans of Kelp. This became the home to near-modern marine life including Otters and Seals also Dolphins, Porpoise and Whales.

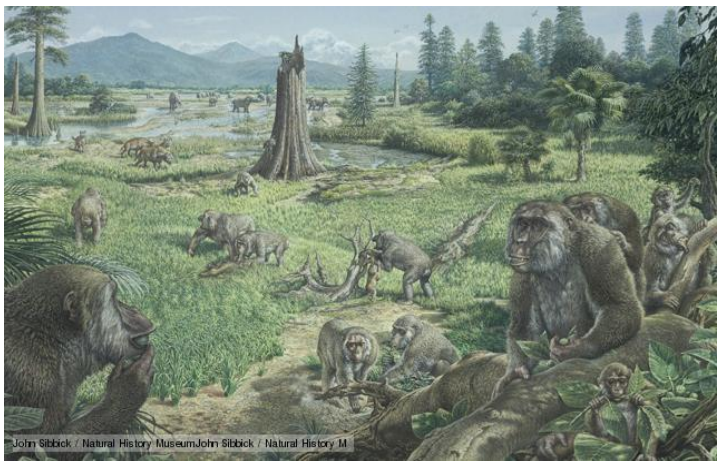
Fauna:

Miocene Epoch Aepycamelus (right) courtesy www.dinosaurs.about.com and Saber-Toothed Cat and Horses courtesy www.adias-uae.com

There were Camels in California and many other places, too. Also there was an adaptation and advancement of many Mammals rather similar to those living today. This included: Beavers, Cats and Nimravids (the False Saber-Toothed Cats), Deer, Dogs in many forms; a variety of Horses including three-toed Horses; the great horned Pigs Entelodonts and nearly modern Raccoons.

There were also a number of now extinct great Ground Sloths like Thinobadistes, which apparently 'island hopped' from their native home in South America to adapt and further develop distinctive species in North America. These were extremely large and quite resilient herbavores that often towered 3-4m/10-12ft tall and more.

Bird life included Cockatoos, Crows, Ducks, Owls, Plovers and so many more reached their greatest diversity during the Miocene Epoch. Most modern Bird species had arrived by the end of the Epoch. This was truly an Epoch that witnessed the near-modern adaptation and advancement of Bird life.



Miocene Ankaropithecus Apes courtesy John Sibbick BBC Natural History Museum.

For more information and images visit www.daleharvey.com

Primates continued to adapt and develop throughout the Miocene Epoch. By the end of the Miocene Epoch there were nearly 100 different species of Apes. Most of these seem to have been gregarious animals living in large communities or small family groups near the edges of forest and woodland settings near grasslands.

Marine:

In shallow waters and marshlands, the modern Alligator mississippiensis, evolved and ruled the swamps.

The great marine oceans of Kelp became the home to near-modern Crabs, Crustaceans and Shrimp; Otters and Seals; also Dolphins, Porpoise and Whales. There Sharks dominated like Megalodon a giant Shark that grew to 16m/52ft!

In shallower water there were marine Crocodiles and Dugongs plus many Amphibians, Frogs and Turtles.

Mid Miocene Extinction Event:

A Major Extinction Event occurred 14.8-14.5 million years ago as the Earth began to cool again more permanently. As this Climate Change moved closer to an Ice Age Event it saw the extinction of many Alligator, Chameleons, Cordylidae Lizards, Crocodile, and giant Turtles.

Also disappearing were: Entelodonts, the great Horned Pigs; Nimravids, the giant Cats; 15 species of Three-Toed Horses ; almost all the Oreodonts, the Ruminating Hogs and Hippo-Pigs also disappeared. Also leaving the Planet were the Borophagine 60 species of 'Bone–Crushing' Dogs; Gomphotheres, massive Elephant-like creatures and semi-aquatic and hornless Rhinos like Teleoceras and Aphelops.

Almost all of these diverse and powerful Miocene Epoch Fauna species and many more all became extinct. Pictures courtesy www.corzakinteractive.com Roz Gibson Prehistoric and www.catbg.net

In the oceans, the huge Sharks called Megalodon suddenly vanished along with many marine Birds, like the Plotopterids and Gavialosuchus; also large marine mammals like highly unique Desmostylians, and the Dugong-like Metaxytherium, and many early species of whales, which ranged from forms similar to the ones present today to the giant Whale Beast Cetotheres and the long-beaked River Dolphin Pomatodelphis.

On the sea floor and amongst the Kelp forests many Crustaceans also disappeared and including all the Miocene crab Tuminocarinus giganteus.

Pliocene Epoch:

Pliocene Epoch landscape courtesy of www.anthrotools.com

For more information and images visit www.daleharvey.com

The Pliocene Epoch extends from 5.332 million to 2.588 million years. This is the time when the first true Hominids appeared about 5.2 million years ago in East Africa.

Primates and herding and grazing mammals continue to develop and spread with the savannah grasslands.

Australopithecus (left) courtesy www.scientificpsychic.com; part of the skull fragments of Ethiopian 'Lucy' courtesy Ethiosun (center); Homo erectus courtesy www.picasaweb.google.com

Climate Change again brought cooler and drier conditions and seasonal variations much like today. Global temperatures at first rose and averaged 2-3C/3.6-5.6F degrees higher than today but then began falling.

Sea levels were 25m/62.5ft higher than now and then once temperatures began to cool again the seas levels continued to drop.

By the end of the Pliocene Epoch, the world was engulfed in the beginning of an Ice Age that continues into the modern period.

The Northern Hemisphere Polar glaciation and ice cap began to form, especially over Greenland. By the end of the Pliocene Epoch mid-latitude glaciation, especially in higher elevations had begun. A similar cooling continued in the Southern Hemisphere as well.

This Climate Change cooling resulted in the disappearance of many forests, especially Broad-leafed sub tropical Rain Forests. These were replaced by Grassland Plains and Savannas.

Continental Tectonic Plate Drift, during the Pliocene Epoch moved as much as 250 km to within 70 km of where the continents are today. Volcanic activity was profound in New Zealand, creating Banks Peninsula and Port Chambers.

The Southern Alps continued to rise, creating a dramatic Climate Change division between western and eastern South Island climates and the species that flourished there. South America became linked to North America through the Isthmus of Panama.

This created the great land bridge during the Pliocene, which allowed the Great American Interchange between North and South American species, which ultimately would result in the mass extinction of many species, especially those of South American origin.

As the Isthmus of Panama formed, it blocked the mixing of warm and cold ocean currents between the two continents. Warm Equatorial ocean currents were cut off. The Atlantic cooling cycle began.

Cold Polar Ocean currents quickly dropped temperatures in the now-isolated Atlantic Ocean. This resulted in another major Climate Change Event which significantly dropped global temperatures.

As the climate further cooled conditions became drier as well. Sea levels, while still quite high, continued to fall, by at least 10m/33ft. thus exposing the land-bridge between Alaska/North America and Asia.

Much more land was also exposed on the coasts of China and India, too. This gave further height to the Isthmus of Panama land bridge as well.

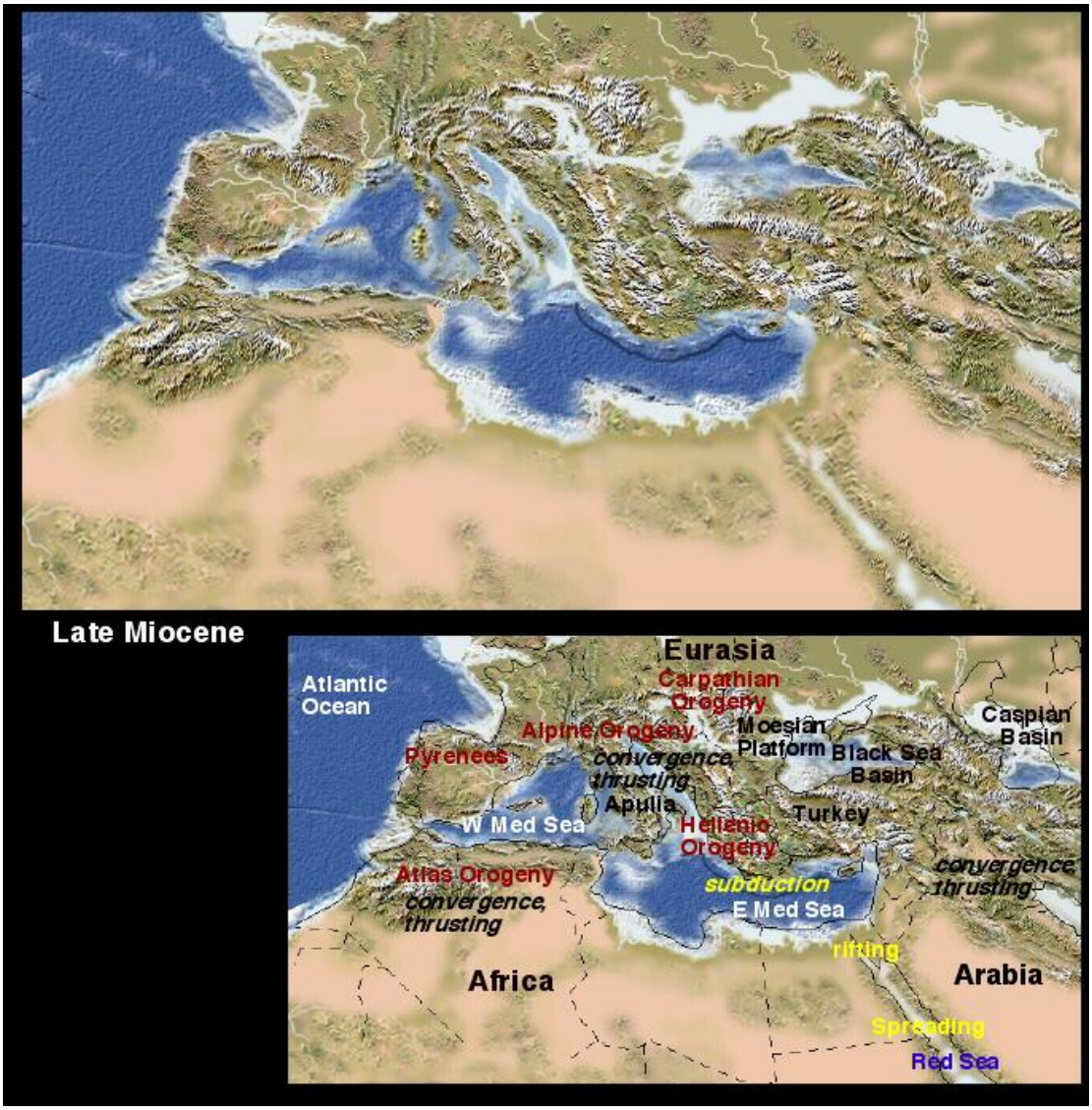
Africa collided with Europe squeezing out the once vast Tethys Ocean and creating the Mediterranean Sea, plus the Black, Caspian and Aral Seas of today.

The Messinian Salinity Crisis Climate/Environmental Change Event:

Throughout the Miocene epoch in the early Pliocene Epoch, the African/European collision resulted in the great Messinian Salinity Crisis.

The Mediterranean Sea was cut off at Gibraltar with the sudden rising of hilly and mountainous peaks.

This natural land barrier combined with the ever-cooler and drier climate plus lower seas levels lead to a dramatic drought east of the Gibraltar Ranges. The Mediterranean Sea nearly dried up!



The Mediterranean region at the Late Miocene/Early Pliocene boundary just prior to when the Gibraltar hills collapsed and re-flooded the entire region. Map courtesy University of Maryland Department of Geology.

The Miocene/Pliocene Messinian Salinity Crisis was caused as the African continent collided with Europe causing a convergent thrust of mountains and hills blocking off the western end of the Mediterranean Sea. Subduction at the southern and eastern ends caused a great salt basin to form. This radically altered the climate throughout the region.

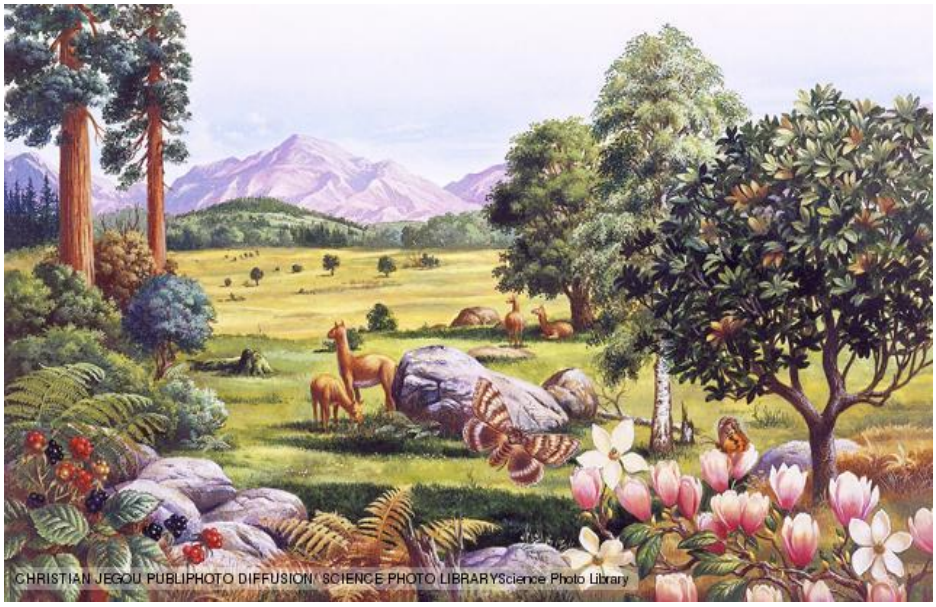
For a while there were two or more very briny salty lakes within the Mediterranean Basin. When the drought was at its worst, during the Late Miocene to Early Pliocene Epoch even these shallow lakes may have nearly dried up.

At its lowest point the Mediterranean Basin was much deeper and hotter than Death Valley. It lay between 2-3 miles below seas level. Air pressure in its centre

was oppressive and temperatures overall there rose 40C/72F degrees to top out at 80C/176F degrees! This baked and desiccated almost all life resulting in huge deposits of Gypsum found there today throughout the Pliocene geological strata.

Then suddenly, probably through violent tectonic forces in the Early Pliocene Epoch the hill and mountain barrier at the Straits of Gibraltar was breached and collapsed creating a huge cascading waterfall. This was probably a most cataclysmic event. The Atlantic Ocean again rushed in over the breach and quickly re-flooded the entire basin of the Mediterranean Sea!

Pliocene Flora:



Pliocene landscape courtesy Christian Jegoli and the Science Photo Library.

All tropical and sub tropical plant species declined to a band around the Equatorial zones. As the climate became cooler and drier, a change to seasonal climate changes resulted in the adaptation of widespread Deciduous and Coniferous forests. Tundra covered much of the North up to the developing ice sheets and was soon overwhelmed by ice throughout Antarctica. Grasslands and dry Savannahs, spread on most continents. Deserts appeared in Asia and Africa.

Fauna:

Both marine and continental faunas were essentially modern, although continental faunas were a bit more primitive than today. These all continued to adapt and evolve with the cooling Climate Changes.

The Pliocene Epoch is perhaps best known for the appearance of the first Hominins, known as Australopithecines . While some Palaeontologists believe

Australopithecines may have reached an evolutionary extinction, the Pliocene Epoch is considered the beginning of Human evolution.

Ground Sloth and Armoured Glyptodons (left) courtesy Hiddenway; Australopithecus courtesy Familie-Rebmann

The collision between North and South America resulted in the Great American Interchange, a great migration between formerly isolate species. This was the first time South America had emerged from isolation since the Cretaceous Period! Many docile South American Herbivores adapted to the increased predation from more aggressive species migrating from the Northern latitudes and increased in size to survive. But eventually most South American species went extinct. New predators had to do very little adapting to eat them. Most continental faunas closely resembled those of today.

Glyptodon during the Pliocene Epoch were hunted by early Hominids drawing courtesy Heinrich Harder.

In North America, Bear, Dogs, Elephant-type creatures known as Gomphotheres and Mastodonts, Opossums, Raccoon, Rodents and Weasels thrived.

They were joined by Armadillos like Pampatheres, and somewhat similar giant Glyptodonts which could reach the size of a Volkswagen Beetle. There were also many Ground Sloths, all of which migrated from their native South American homeland northward with the formation of the Isthmus of Panama land bridge.

In Eurasia most successful Mammals were: Antelopes, Bears, Camels, Cows, Dogs, Elephant species like Gomphotheres and Stegodonts; Hyenas, Hyraxes, the Rabbits and Shrews; many Rodent species; Saber Toothed Cats and Weasels all adapted to the Climate Changes and did very well.

In Africa successful species included: Antelope and many hoofed animals, Bear, Cats, Dogs, Civets, Cows, Elephants, Giraffes, Horses Hyenas, Pigs, Rhinoceros, Rodents among many other species.

Gomphotheres Mastodonts courtesy Mark Hallet; Homo Erectus and Stegodonts courtesy www.amazingdata.com

In Africa successful species included: Antelope and many hoofed animals, Bear, Cats, Dogs, Civets, Cows, Elephants, Giraffes, Horses Hyenas, Pigs, Rhinoceros, Rodents among many other species.

Africa is also where many if not most species of Primates continued their evolution, including Australopithecines one of the first Hominids like Homo Erectus, Ethiopian 'Lucy' and Australopithecus appearing in the late Pliocene.

Most South American species were over-run by the more aggressive North American species. North American Hog-nosed Skunks, Peccary Pig, Primates, Raccoons, and a variety of hungry, often egg-eating Rodents over-took Southern forms. The larger Camel-Llama-like Macrauchenids and Hippo-like Toxodonts, and similar large herbivores survived, some became carnivorous and many species migrated up into North America.

The Australian Marsupials remained the primary Mammal species there. These Marsupials amongst others included: Kangaroos, Possums, the modern Platypus

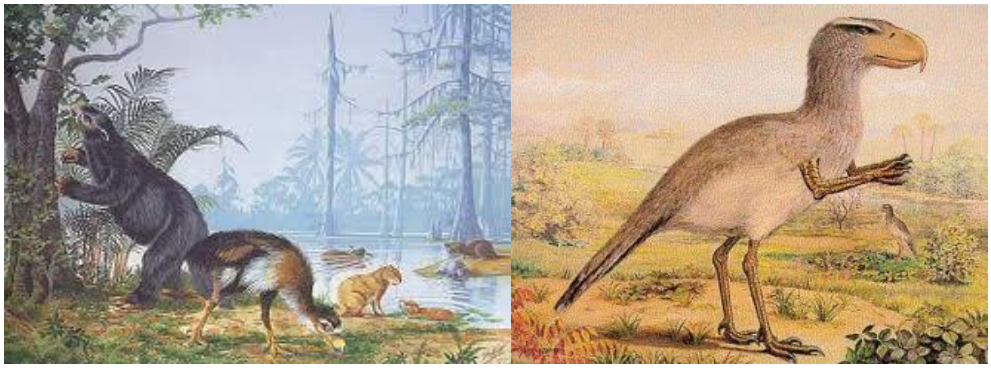
and Wombats. The first Rodents arrived. There also emerged the huge and most unique Wallabies known as the Diprotodonts. Another adaptation in Australia were the carnivorous marsupials such as the Tasmanian Devil-like Dasyuridae, the dog-like Tasmanian Tiger, Thylacine and the cat-like 'Pouch Lion, Thylacoleo.

Pliocene Epoch marsupial Diprotodon, suborder Vombatiformes which includes the modern Koala and Wombat picture courtesy www.carnivoraforum.com Thylacoleo, the Australian Pouch Lion, courtesy www.darwiniana.org

Birds:

Numerous Bird species continued to evolve into modern species. Many became migratory throughout the Pliocene Epoch as the climate became cooler and more seasonal. This allowed them to ride the air currents and sail along with the seasonal frontal weather systems much as Birds do today.

The great flightless Terror Birds, Phorusrhacids became less common in South America, possible because its eggs were being eaten by the invading Mammals, especially Rodents. But the largest of these, Titanis, migrated to North America where it quickly became a very successful predator. Its massive grasping claws were ideally suited for grasping smaller Mammal and Rodent prey.



Titanis, the Terror Bird, is viewed by some scientists as a rather benign predator while others consider this to be a near-reptilian predator with grasping clawed forearms. Pictures courtesy: www.dinorsoria.com and www.scienceblogs.com

Reptiles:

The evolution of Birds and Rodents lead to the increase in Venomous Snake genera. Rattlesnakes first appeared in the Pliocene. The modern Alligator that evolved during the Miocene continued to thrive. Their adaption and evolution continued into the Pliocene, except with a more northern range; specimens have been found in very late Miocene deposits as far north as Tennessee.

Giant tortoises still thrived in North America along with many near-modern Turtles. Madtsoid Snakes, similar to modern Boa Constrictors and Python were common in Australia.

Marine:

Most ocean species appeared much as they do today. These all appear to have been widely predated upon by Sharks. There were Dolphin, Porpoise, numerous species of Whale and many types of Fish, as well as a variety of shellfish and molluscs. Oceans were quite warm throughout much of the early Pliocene Epoch but were cooling. The Pliocene shallow seas were alive with Sea Cows, Seals and Sea Lions.

This gradual cooling eventually resulted in the Antarctic sheets and Arctic Ice Cap. This accelerated an even cooler, drier climate with increasing colder shallow currents in the North Atlantic and deep cold Antarctic currents further cooling the Southern Hemisphere.

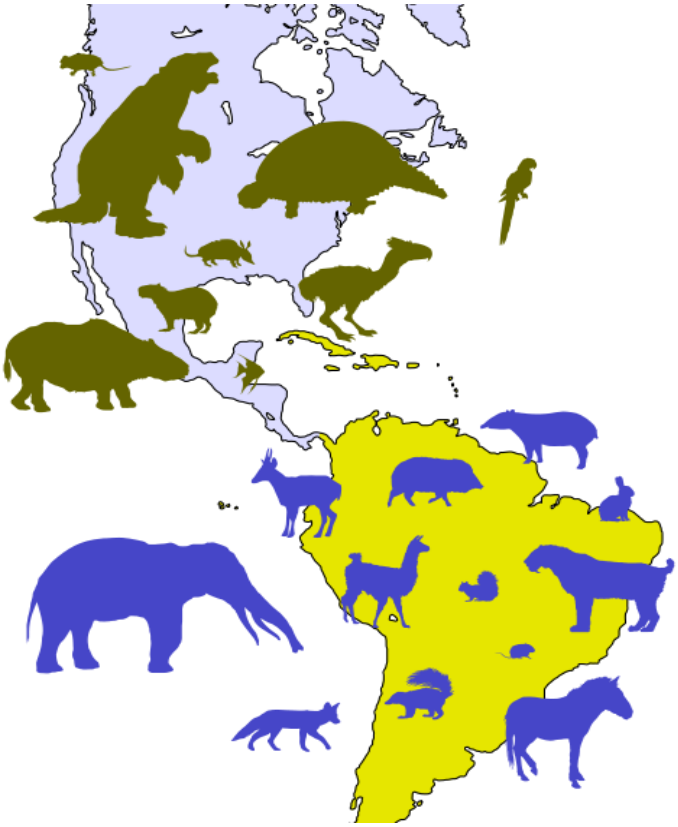
The formation of the Isthmus of Panama about 3.5 million years ago cut off the final remnant of what was once essentially a circum-equatorial current that had existed since the Cretaceous and the early Cenozoic. This completely changed the once-predominant flow and mixing of ocean currents and contributed to further cooling of the oceans worldwide.

The Pliocene Extinction Event:

Another Climate Change created the Late Pliocene Extinction Event. The Isthmus of Panama land bridge that came together during the Pliocene, allowed the Great American Interchange to begin. Ironically, this mass migration between species brought a nearly complete end to South America's distinctive Large Marsupial Predator population which included many Saber-Toothed Cats of various sizes and also the more vulnerable herbivorous Native Ungulate Hippo-Rhinoceros type faunas. All the Camel-Llama-like Litopterns and the smaller Notoungulates species along with most other South American native species were almost entirely wiped out.

This was partially due to migratory predation upon vulnerable species. But combining with continual predation, much of this Extinction Event was due to a continual cooling and drying Climate Change Event.

This increasingly colder climate killed many tender flora species which were the food source for the many Herbavores. Many grass species also began to adapt with the Climate Change and became much less palatable. As their food chain was disrupted, the Herbavores died-out, or became victims of predation.



The Great American Interchange resulted from the union of North and South America through the Isthmus of Panama. Olive green North America species migrated from South American ancestry; blue South American species migrated from North American ancestry.

The Antarctic Ice Sheet first began some 45.5 million years ago. Soon it expanded more rapidly to cover large parts of Antarctica around the Eocene-Oligocene Extinction Event 34 million years ago. Then completely overtook Antarctica from 20 million years ago and then expanded into the Southern Oceans and reached its near 'modern' dimensions 2.58 million years ago.

This greatly cooled the surrounding ocean currents which eventually killed massive numbers of Algae and Plankton. These were the food source for many Shellfish. And a variety of much larger Sea Mammals ate both the plankton and the shellfish. So in the Southern Oceans this abrupt and continuous change in the food chain eventually caused their Mass Extinction.

A true Ice Age, of which our Modern World is still technically a part, started about 2.58 million years ago at the end of the Pliocene Epoch. This is when cold currents and glaciations around Antarctica compounded with global cooling from an increasingly elliptical Earth orbit. This resulted in such widespread global cooling that soon great ice sheets began to spread over the Northern Hemisphere and small pockets of glaciation and ice sheeting overtook mountains and many higher elevations in almost every continent. North American declines in species and outright extinctions included: significant declining numbers of all hoofed Mammals like Camels, Deer and Horses.

All archaic Rhinos; all the three toed Horses including the Nannippus; the Oreodonts, the Ruminating Hogs, Peccaries and Pigs; Protoceratids, the Antelope-like Horned Deer; and Chalicotheres, the large and most unusual 'Gravel Beasts' plus the Borophagine Dogs, known as 'Bone-Crushing' Dogs all became extinct.

Pliocene Horses Dinohippus (left), Three-toed Nannippus (centre), leaf-eating Hypohippus (right) courtesy Audubon Society Magazine

Primates sharply declined in Eurasia. Alligators and Crocodiles died out in Europe as the climate cooled and possibly their eggs were eaten by Rodents.
It is interesting to note that most of the evolutionary history of early Hominins and the entire history of Humankinds' 'modern' civilizations have occurred during relatively cool and dry climatic periods in the Earth's history. We are literally born this way as an 'Ice Age' Species.

The Pleistocene-Quaternary Supernova Event:

Near the end of the Pliocene Epoch and the start of the Pleistocene-Quaternary Period roughly 3-2 million years ago, Astronomers believe the eccentric orbit of the Earth and our Solar System passed very nearby the Constellations Scorpio and Centaurus, our nearest neighbouring Star System.

At that very time a group of bright stars known as O and B stars , part of the Scorpius-Centaurus OB Association passed within 150 light-years of Earth. An exploding star or Supernovae possibly occurred in this star group then with an absolute magnitude as bright as an entire galaxy of 200 billion stars.

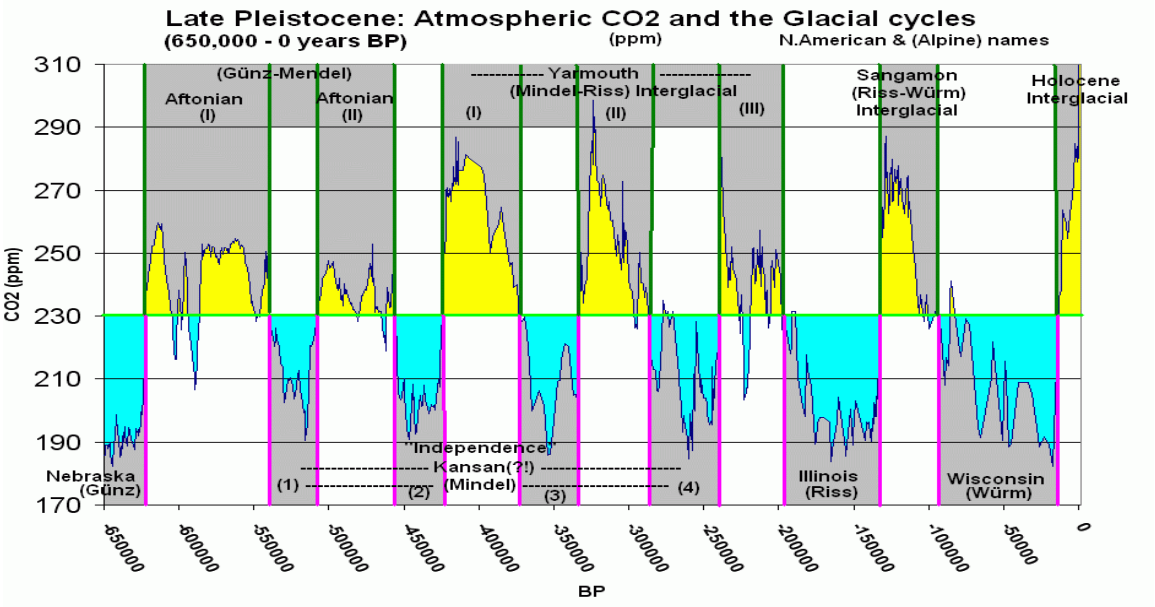
A Supernova of this size could have significantly damaged the protective Ozone Layer of Earth's atmosphere. The resulting intense infrared, ultraviolet and x-ray radiant light are thought to have further contributed to environmental stress.

The combination of increased solar radiation compounded by major Climate Change and migratory predation resulted in profound Mass Extinction Events occurring on land and in the seas all at the same time.

The Quaternary Period-Pleistocene Epoch:

The Quaternary Period-Pleistocene Epoch lasted from 2.588 million years ago to 11,700 years ago. It is followed by the Holocene Epoch which brings us to the present day. The end of the Pleistocene Epoch corresponds with the end of the last period of glaciation. It also represents the end of the Palaeolithic Age, also known as the Stone Age. Pleistocene is the first Epoch of the Quaternary Period or 6th epoch of the Cenozoic Era.

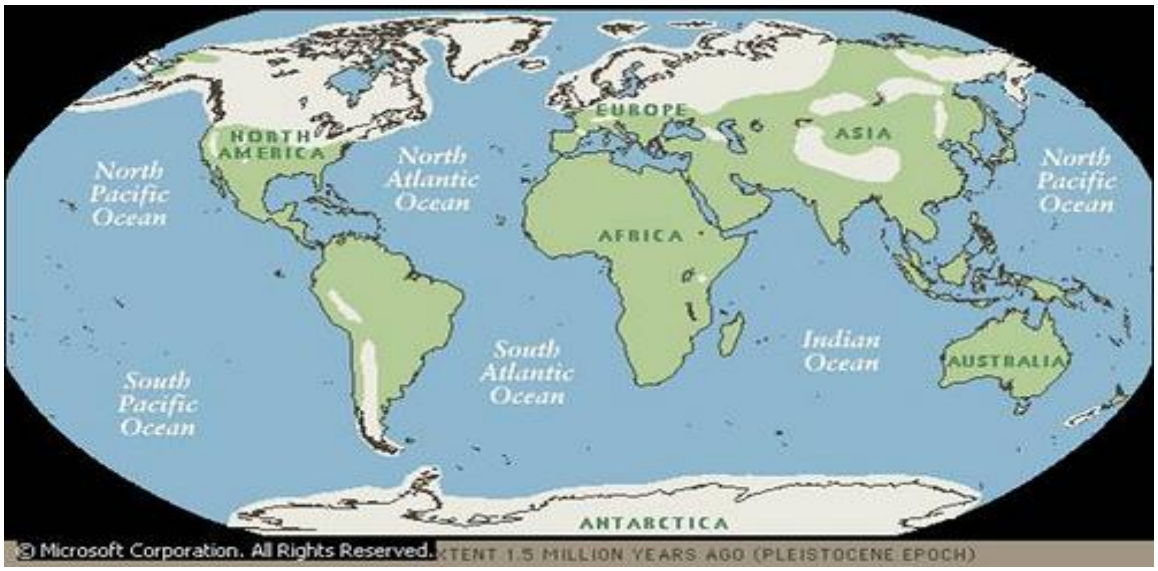
Tectonic plates and continents remain almost exactly as they are today. The climate remained an almost continuous El Niño. Trade winds in the South Pacific weakened and headed east. Warm air rising near Peru, caused warming ocean water to rise off Peru's west coast. Warm water also spread from the west Pacific and the Indian Ocean toward the east Pacific causing typical El Niño Climate Change events.



Rhythmic cycles of glaciation followed by rapid interglacial Warming Intervals (IWI) have characterized the entire Pleistocene Epoch up to the present day. The Earth is presently experiencing an interglacial Warming interval. Only time will tell if this warming period will continue through Anthropogenic (Human) activity or if the Earth's climate will again cool quite suddenly as it has so many times in the past. Late Pleistocene graph courtesy Wikimedia.

For more information and images visit www.daleharvey.com

The Pleistocene Epoch is perhaps represented one continuous and massive Climate Change Event. There were at least 11major Glaciation Ice Age Events at regular and rhythmic intervals of about 100,000 years apart and as many minor ones amounting to at least 20 glacial events. In between were profound and significant warming periods known as 'interglacial' events when glaciations rapidly retreated. In every instance, these interglacial warming intervals happened very suddenly within a few hundred years just as is happening today.



Pleistocene Globe and glaciations courtesy www.microsoftencarta-in-english.blogspot.com

At peak glaciation, more than 30% of the Earth's surface was covered with ice sheets. Many of the glaciers nearer the Polar Regions were 1500-3000m/4,900-9,800ft thick! Temperatures on the ice averaged -6C/21F degrees and 0C/32F degrees at the edge of the permafrost. This locked up so much fresh water that seas levels dropped 100m/300ft.

During the warming interglacial periods melting ice caused the seas to rise dramatically, swamping the coasts around the world. Apparently, each of these interglacial warming intervals came on very quickly, much as the present Global Warming Event is developing today.

Of considerable interest is the undeniable scientific evidence from CO2 Carbon Dioxide levels measured in Antarctic ice. They clearly demonstrate rhythmic and repeated cycles of 40-50,000 years with a larger oscillation of 80,000-100,000 years. These rhythmic cycles demonstrate dramatic and sudden rising temperatures that closely correlate with rising CO2 levels.

Then just as quickly temperatures and C02 levels plummet with renewed icing and major glaciation soon following. Then abrupt and very dramatic warming suddenly returns followed again by equally rapid and repeated glaciation.

This has happened many, many times without any apparent Human intervention at all! So it is not at all likely that Anthropogenic (Human) activity is mostly responsible for the current dramatic rise in temperatures and CO2 levels. While Anthropogenic activity surely must contribute some degree of warming influence, the many rhythmic falls and rises in both CO2 levels and temperatures has happened repeatedly over literally millions of year without Human intervention.

It would appear that the present dramatic warming trend combined with increasing CO2 levels and expansion of Human civilization is largely coincidental rather than causative. There is a much larger factor creating these dramatic and massive Climate Changes.

CO2 Carbon Dioxide and temperatures are very closely linked in these rhythmic cycles of cooling and warming. But it is obvious from the scientific data that rising CO2 levels do not produce rising temperatures as some would suggest as part of a 'greenhouse gas' effect. Both C02 Carbon Dioxide and temperatures are being influenced simultaneously by something else.

Because when CO2 levels and temperatures reach their peak, suddenly they both fall simultaneously. If high levels of CO2 were acting as a greenhouse gas trapping in solar radiation, then temperatures would not suddenly fall but would remain at a sustained higher level. They must be influenced by something else that dramatically affects them both simultaneously.

There is no question that the present day Anthropogenic Humankind influence of deforestation combined with the massive burning of fossil fuels may be contributing and further augmenting the effects of the recent Holocene Epoch very dramatic interglacial surge in both CO2 levels and temperatures.

But the actions of Humankind would appear to be only contributing and possibly accelerating a 'normal' trend when measured against the rhythmic cooling and warming cycles of the past 2.58 million years and especially the most recent 650,000 years. Way before Humankind's industrial civilizations existed these rhythmic Climate Changes and CO2 cycles were regularly occurring!

We are definitely in the midst of a rapid Interglacial Warming Internal right now!

The rhythmic nature of Glaciation followed by a series of interglacials, stadials and interstadials is also reflected in associated Climate Change Events which strongly supports the Milankovitch Cycles of Earth orbit eccentricity.

As the Earth's orbit becomes progressively more elliptical, the Planet has more time to cool and glaciation soon leads to an Ice Age. As soon as Planetary

alignment in the Solar System realigns the Earth's orbit into a circular one, the Planet begins to heat more evenly and temperatures rapidly warm up on a global level resulting in a sudden Interglacial Warming Interval.

The Earth's orbit has fairly recently returned to its circular state which always leads to global warming. And as any Gardener can tell you warmer temperatures speed decay and decomposition which produces great amounts of Carbon Dioxide, some Hydrogen and Methane. Thus between solar warming and the greenhouse gases produced by the increased decay, evaporation increases, so does humidity, rainfall and temperatures.

But Milankovitchs' Theory of orbital eccentricity cycles of the Earth must only be a major contributing factor to actual observed Climate Changes. These cycles are closely explained and predicted by the Milankovitch mathematical models.

But these models no do completely explain the sudden start and end of the Pleistocene Ice Age or the profound extent of repeated Ice Ages while others are less severe.

Obviously other Extraneous Events must be contributing factors to Climate Change which would include: Bolide Impact Events; Continental shifts in Tectonic Plates resulting in ocean and wind current-related Climate Changes; major changes in flora and fauna populations over the Planet including Anthropogenic contributions; changes in Solar Activity; Super Nova Events; and major sometimes sustained volcanic activity. All of these events have been scientifically proven as responsible for major Extinction Events.

Dependent upon when these Extraneous Events occur, they have the possibility of enhancing or counteracting the prevailing trend of the Orbital Eccentricity Cycle.

Thus a sudden cooling event like a major bolide collision or volcanic eruption that clouded the skies and cooled the Planet could slow down an Interstadial Climate Warming Event. And the activities of Humankind contributing to a 'greenhouse' Air Pollution Event could actually accelerate and possibly prolong an Interstadial Climate Warming Event as may be happening at the present time.

Potentially, if the Extraneous Events such as Anthropogenic Climate Change were significant and sustained their effects might completely override the previous rhythmic cyclical patterns of the past.

Thus it is possible that the activities of Humankind might not only accelerate the natural global warming cycle but might so sustain the warming as to diminish or

over-ride the natural cooling cycle which should occur perhaps a thousand years or more ahead.

Milankovitch Cycles within the Pleistocene and Holocene Epochs, predict glaciation once every 100,000, 40,000, and 20,000 years, based on calculations of the Earth's orbital variation. Scientific studies of Oxygen isotope cores also support this theory of the natural cyclical Climate Change Events for the Pleistocene Epoch.

Comparing this natural orbital cycle with our present interglacial interval (known as the Holocene, Postglacial, or the Present Interglacial interval) to that of the previous interglacial warming intervals, it would appear that CO2 levels and average global temperatures will continue to rise.

They should be soon reaching their peak and then begin to slowly subside if past cyclical patterns over the past 2.58 million years are to continue.

So this would mean that CO2 levels and temperatures will remain high, or get even higher in the short term: meaning at least several hundred years or perhaps up to a thousand years or much more of continued warming.

Even once levels begin to fall; it would take a long time before this warming cycle would again return to substantial glaciations.

Therefore melting of sea ice should continue, causing significant rises in ocean levels around the world for perhaps several hundred or possible more than a thousand years before the cycle reverses which would lead to another period of glaciation.

Certainly, every time this has happened repeatedly in the past, all glaciations and polar ice caps have melted completely. Sea levels have risen greatly, forcing populations nearby to shift to higher ground.

But this has not always caused their demise. Grasslands and forests have spread right up to continental regions surrounding the poles. Tropical and warm temperate climates have spread into now traditionally colder climates and warmth has predominated worldwide.

In many instances the increased evaporation has produced larger storms and greater turbulence with much more significant rainfall event that have allowed now arid and dry or desert areas to bloom and flourish. Thus lands now uninhabitable due to excessive cold or drought become productive. This offsets those lands inundated by rising sea levels.

Fauna and Flora of the Pleistocene Epoch:

Most Fauna both continental and marine were relatively modern as were the Flora.

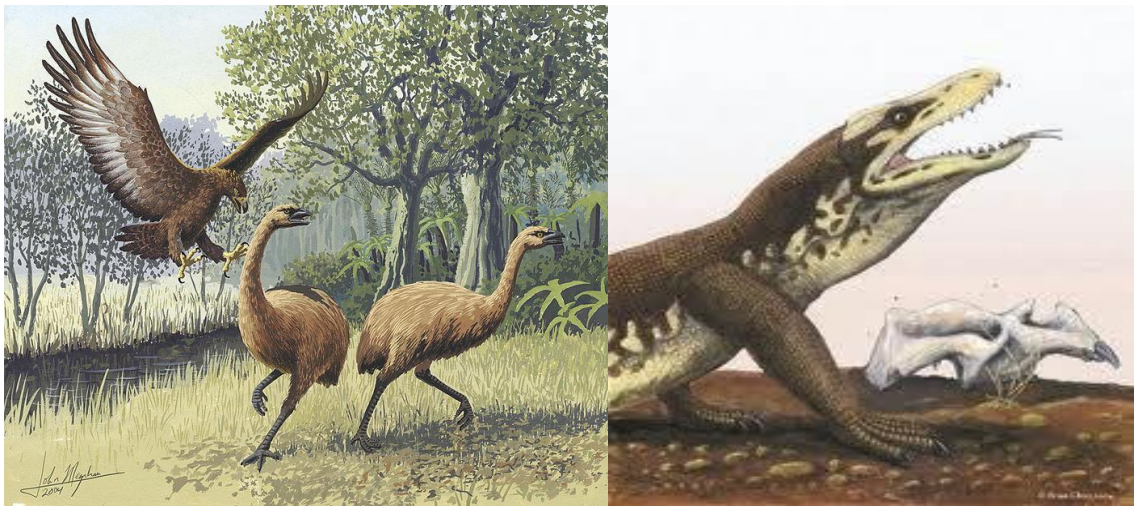
Pleistocene Landscape pictures courtesy of www.anthrotools.com

North America and Asia/Siberia supported Cave Lions and Saber-toothed Cats which often predated upon Reindeer, Tarpans (an extinct species of wild Horse) and sometimes Musk Ox and near-modern Horses.

There were massive Woolly Mammoth, Woolly Rhinoceros and Erethizon dorsatum (Porcupine) the largest Neotropic migrant that adapted and survived the long journey to temperate North America from warmer South America.

In South America there were Megatherium , the Giant Ground Sloths and two types of large armoured Glyptodon, the near relations to the modern Armadillo.

Tapirus bairdii, the Tapir, became the largest surviving Nearctic migrant to South America.



Pleistocene Haast Eagle attacking New Zealand Moa courtesy Wikipedia; Megalania largest terrestrial Lizard, courtesy www.carnivoraforum.com

Australian and New Zealand species remained relatively unchanged. With the exception of the giant marsupials, such as the rhino-sized wombat-related Diprotodon and the giant monitor lizard Megalania

This was also the time that witnessed New Zealand's giant flightless bird Dinornis maximus or Moa, an herbivorous bird that reached a height of 3 metres/10ft.

The Haast Eagle, the largest ever known true raptor was a great majestic bird with a wing-span of 2.6-3m/8ft.6in-9ft.10in. and often much larger. It could easily fly 50mph/80kmph and preyed largely on the Moa, especially in New Zealand's South Island.

The last Haast Eagles (Pouakai) are thought to have become extinct around 1400 AD but European settlers have records of some sightings into the early 19th Century. Unfortunately, as the Southern forests were cleared and the Moa were methodically hunted to extinction by the Maori, this eliminated the Haast Eagles' nesting areas and major food source and soon this great Eagle also became extinct.

Human Evolution:

Humankind continued to evolve in Africa during the Pleistocene. The Paranthropus species continued along with early human ancestors, Homo erectus. The Middle and late Palaeolithic Stone Age saw the appearance of new types of humans, and the development of more elaborate tools.

After the retreat of the Riss Glaciation migrations began out of Africa to ice-free lands in Europe and Asia. It is thought that Modern Man assimilated with more archaic Hominid species as they dispersed, creating the beginnings of cultural and racial lineages.

Paranthropus and their Pleistocene landscape courtesy www.wired.com and www.afrol.com

The Pleistocene-Quaternary Glaciation and Quaternary Extinction Events:

As glaciations advanced and temperatures plummeted, profound Climate Changes disrupted food supplies and living spaces. At peak glaciation, upwards of 30% of the continents were covered in ice sheets; huge areas became depopulated.

Much of the remaining life continued around the Equatorial belt. Many species trapped in colder climates either adapted or became extinct.

It is thought that Hominid species and Homo sapiens now began to predate upon many vulnerable species possibly leading to their extinction.

Palaeolithic stone artefacts and hunting Neanderthals both pictures courtesy www.markville.ss.yrdsb.edu.on.ca

At the end of the Pleistocene Epoch, also the end of the Palaeolithic (Stone) Age, about 12,000-11,700 years ago, Paleo-Indian people arrived in the Americas and were already widespread though Africa, Asia and Europe. As the last glacial period came to an end, and temperatures began to warm, surprisingly many large mega fauna of both North and South America went extinct. This is known as the Quaternary Extinction Event.

This massive extinction included: all the Armadillo-like Pampatheres and Glyptodontids; the Ground Sloths; Equids Horses; Proboscid Elephant relatives. Also disappearing in both continents were all the Saber-toothed Cats, Smilodon, including all the Cave Lions, Lions and Dire Wolf species. In South and Central American Notoungulates, Hippo-Pigs, and Litopterns , Camel-Llamas all suddenly disappeared.

North America lost all the Antilocaprid, the native American Antelope, Giant Beavers, Bovid Shrub Ox, Native Cheetahs and the Saber-toothed Scimitar Cats, and Dholes, the Fox Dogs. Also disappearing were the Giant Stag Moose,

Cervid, all the Tapir species Tapirid and Tayassuid ungulates, the many species of Giant Peccary and many, many more.

This extraordinary Mass Extinction event killed off almost all the larger animal species and this happened around the World. But in a rather suspicious pattern from Africa and then Eurasia plus Australia; then through the Mediterranean and into Europe; then North America and almost 400 years later in South America; finally much later in the islands of the Pacific.

Numerous scientific investigations and observations rule out climate change as being the sole cause or bolide (cluster comet) impact or disease as was once thought.

Palaeolithic Stone Age civilization and landscape courtesy www.xtimeline.com and www.squidoo.com

The common thread to all these extinctions is Humanoid migration. Extensive Archaeological scientific research supports the observation that as Humanoids migrated out of Africa and spread northward both East and West throughout Eurasia and then began the settlement of the Americas almost everything edible appears to have either dwindled in numbers of disappeared entirely.

In fact in every continent, shortly after Humans arrived, almost everything else disappeared or dwindled in numbers.

It would appear that from its earliest origins, Humans have been a rather profoundly consumptive and destructive force on the Planet.

Further evidence shows that on many isolated large islands far enough offshore from newly occupied territory to escape immediate human colonization, mega-fauna species sometimes survived for many thousands of years after they or related species became extinct on the mainland; for example the Giant Kangaroos in Tasmania and Tortoises of the Galápagos Islands; Ground Sloths on the Antilles and Woolly Mammoths on Wrangel Island and Saint Paul Island.

Late Pleistocene landscape in northern Spain. All these species were driven to eventual extinction by Climate Change and Human predation. Pictures courtesy Prehistoric Mammals, National Geographic Society, Washington, D.C.

This pattern of extinctions has followed Humanoid settlement around the world with the later Extinction Events in the Mediterranean Islands like Crete; and Hawaiian Pacific Islands plus New Zealand about 1500AD; Madagascar starting 2000 years ago and the Indian Islands about 500 years ago. As soon as Humanoid settlement arrived almost everything else edible, large and obvious soon began to dwindle in numbers or perish!

The Holocene Epoch:

Holocene Epoch 10,000 B.C. courtesy The Evolution of Man, e-ducation.net

The Holocene Epoch began (depending upon the research/reference source) 12,000/11,700/10,000 years ago to the present.

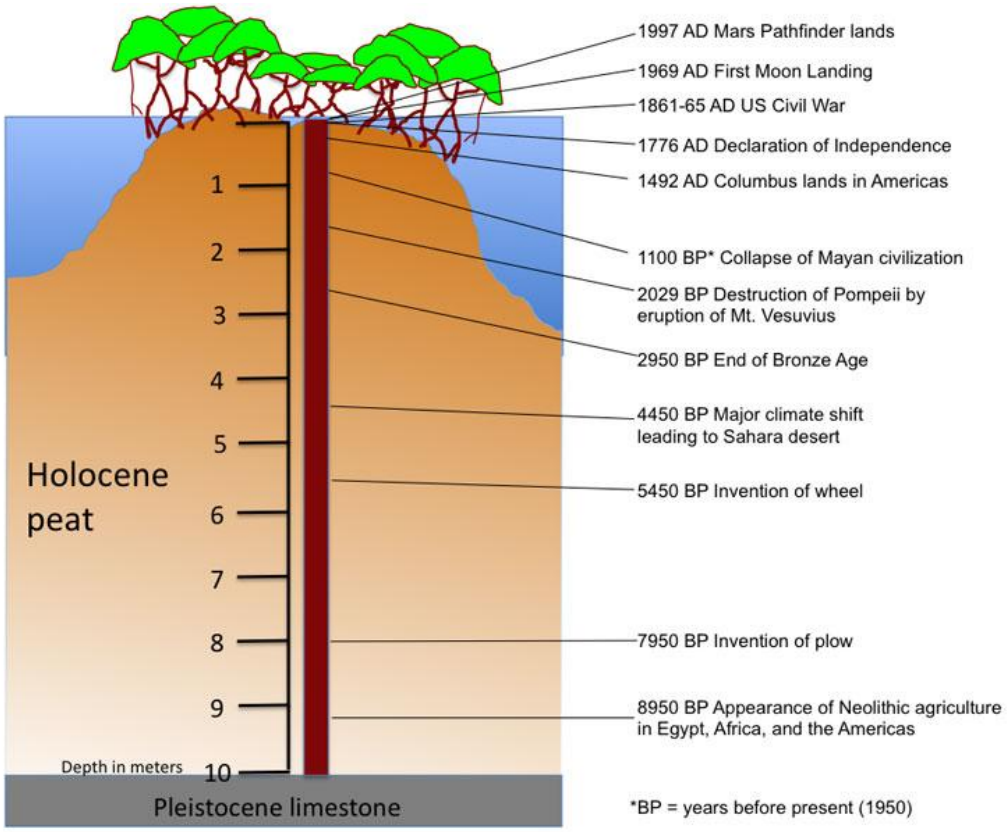
The Holocene is part of the 'modern' Quaternary period. The last major Pleistocene glaciation: the fast-diminishing Current Ice Age has just ended and

the current warming period has just begun. This current warming phase is known as MIS 1 which is considered an Interglacial period of rapid and sustained warming.

The first hints of real warming started nearly 20,000 years ago with the most dramatic rising sea levels and temperatures 15,000-8,000 years ago. From then on, sea levels and temperatures have continued to rise but only very slowly. Even though the climate has continued to warm up through most of the Holocene Epoch by an average of about 6C/10.8F degrees, overall the climate has remained rather cold when viewed in the perspective of Geological Time.

The average global temperature today is approximately 14-15C/57.2-59F. For much of Earth's long history average global temperatures have averaged 22C/71.6 and occasionally considerably higher.

The rapid warming Climate Change temperatures and sea level rises usually occurring in an Interglacial Event were dramatic during the early Holocene Epoch. Approximately 22, 000 years ago (+/-3,000 years) sea levels were nearly 130 m/434.2ft lower than today.



Above: Chronology of selected events that occurred over the time period recorded in mangrove peat cores collected on Belizean islands. The peat record spans almost the entire Holocene Epoch (10,000 years) and shows how these mangrove islands have built vertically as sea level rose during this time period. Courtesy United States Geologic Service.

For more information and images visit www.daleharvey.com

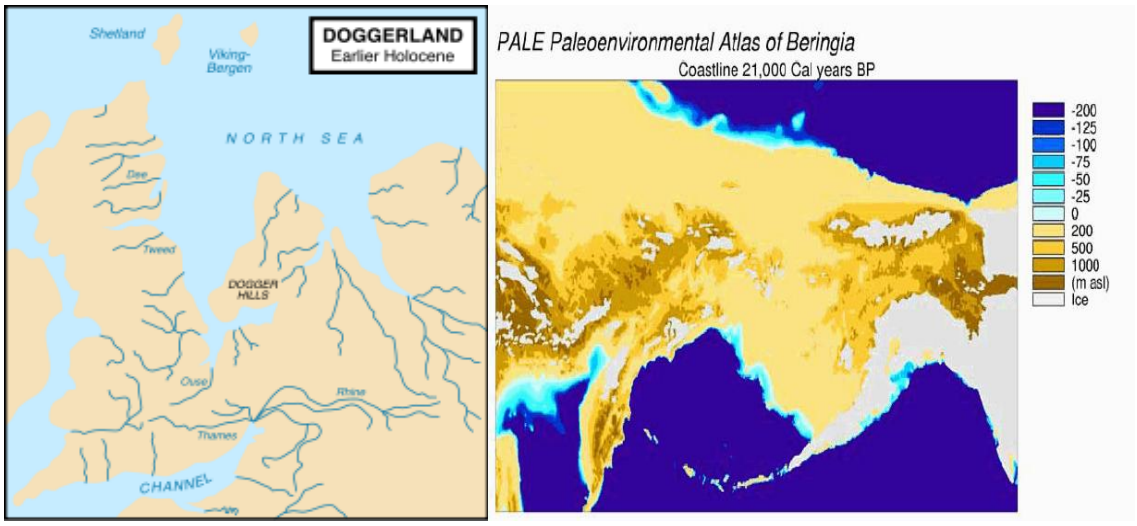
Dramatic rises in seas level and average global temperatures followed until 8,000-6,000 years ago. Then the climate moderated. And only very recently have temperatures again begun to rapidly rise.

This rise has been spotty more than global. Even this rise has elevated the average global temperature little more than 1C degree. CO2 Carbon dioxide levels showed a similar trend and are now rocketing as would be expected with the repeated Rhythmic Geological Glacial Pattern for the past 2.58 million years and especially throughout the last 650,000 years.

The Holocene includes the entire history of the Humanoid species and its impact upon the Earth. Continental plate tectonics moved the landmasses less than a kilometre. However, significant ice melt from the glaciations caused world sea levels to rise about 35 m (110 ft) in the early part of the Holocene.

Most of this rapid sea level rise happened several thousand years ago before the current Global Warming cycle supposedly caused from Human activity. This temperature increase and sea level rise caused inland seas through much of Ontario and Quebec in Canada; and the region from Michigan through Vermont in New England.

Land masses from 40 degrees north latitude that had been compressed by the massive glaciers rose 180 m/600 ft in what is called post-glacial rebound. This started in the late Pleistocene and has continued to the present day. The heavily glaciated North American Tyrrell Sea melted and rebounded to create today's Hudson Bay. This same post-glacial rebound pushed up the Scandinavia region creating the Baltic Sea.



Early Holocene: Doggerland and the Thames land bridge (left) and (right) Beringia land bridge between Alaska and Siberia. Both were inundated by rising seas in the Early Holocene. Courtesy Wikipedia and NOAA Government.

In Western Europe Doggerland and the Thames land bridge connected the United Kingdom and Europe during the early Holocene Epoch about 9,000 years ago. This was a rich hunting ground abounding in fauna and flora. As sea levels rose, the North Sea and English Channel eventually connected 6,200-5,000 years ago first cutting off Doggerland from England.

Then there were a series of suspected tsunamis generated by at least three massive undersea landslides off the coast of Norway known as the Storegga Slides. These swept over much of the coastal North Sea inundating Scandinavia, much of Great Britain and most if not all of Doggerland. Combined with continuing rising seas levels soon all of Doggerland was eventually flooded and sank into the sea.

It is possible that there may be a connection between the subsidence of Doggerland with the recent findings in Southern Spain . Scientists believe that they may have discovered the legendary City of Atlantis buried deep in the marshlands of Southern Spain. Possibly related earthquakes/volcanic events or the same earthquake seismic pulses causing the flooding of Doggerland might also have been what overwhelmed Atlantis with a similar tsunami event sweeping in from the South.

So the present day near-hysteria about rising sea levels is nothing at all new. Rising sea levels, along with rising CO2 levels and temperatures have followed the evolution of Humankind and are a certain fact as part of near-recent geological time and Human evolution. For at least the past 60,000/40,000 years, sea levels radically, rapidly and rhythmically rose and fell with each period of glaciation and Interglacial Warming Event.

Many Geologists and Scientists maintain that this has been a regular occurrence throughout the entire Pleistocene Epoch from as far back as 2.58 million years ago and probably throughout geological time. There just hasn't been such a radical change in Humankinds short developmental history on the Planet.

During cold periods of glaciations, sea levels dropped. This created substantial land bridges throughout the world. For example up to 14,000 years ago Australia was connected to New Guinea and Tasmania. Europe was connected to the United Kingdom through the fertile Doggerland land passage.

Southern China was connected to Borneo, Java and Sumatra right into Southern Asia. Northern Asia was substantially connected through the huge, sometimes glaciated Bering Land Bridge, known as Beringia, through Siberia connecting it with Alaska/Western Canada into the Americas. This resulted in the colonization of the American continents.

Only with the most recent major sea level rises about 6,000 years ago did all of these major land areas and bridges become submerged. So when examining the evolution of Humankind, inundation by rising sea levels has been a fact of evolutionary life. These major Climate Changes did not destroy civilization, but help it to evolve!

Early Holocene/Mesolithic Epoch when fishing first began 10,00-9000 B.C. This scene is of the Lepenski Vir a Mesolithic community on the Danube River near the Hungarian Plains. Courtesy http://e-dication.net

When examining the climate and sea levels around the Holocene Epoch starting 12,000/10,000 years ago. This is roughly the time that 'modern' Humankind evolved into its present species.

The Holocene Epoch started with a period of sudden Global Warming (IWI or Interglacial Warming Interval)) near the end of the Pleistocene Epoch. This melted much of the ice sheets causing a rapid rise in sea levels. Humankind and many Mammal species flourished and prospered.

Then the climate gradually cooled in what is known as the Younger Dryas, "Big Freeze' 12.8-11.5 thousand years ago. CO2 and temperatures fell and sea level rises slowed greatly during this 1300-1400 year period. A similar cold period with the same results, known as the Huelmo/Mascardi Cold Reversal, started in the Southern Hemisphere 550 years before the Younger Dryas in the Northern Hemisphere. This globally slowed the rising sea levels. During this time of falling CO2 levels, falling temperatures and sea levels many more extinctions occurred.

Then the Hypsithermal Global Warming (IWI) followed 9,000 years ago with rapidly rising temperatures, CO2 levels and correspondently more sea level rises. While overall average global temperatures were still lower than today, they were much higher at the Poles. Humankind continued then to expand, flourish and begin to migrate extensively to populate new territories.

The Hypsithermal Global Warming event so changed the climate that the Sahara and Middle East became green and verdant. This possibly led to the legends of the 'Garden of Eden' idealized in this image. Courtesy www.prabhupadanugas.eu

This Hypsithermal Global Warming Event (IWI) ended about 5, 500 years ago, when the earliest human civilizations in Africa and Asia were beginning to advance. This period of Global Warming so changed the weather that it created the 'Green Sahara' , a very fertile time where abundant life and lakes dotted the now Sahara Desert and much of the Mediterranean and Middle East: time of the 'Fertile Crescent and 'Garden of Eden'. Temperature rises were most noticeable at the Poles rather than the warmer latitudes. There as in many other places the Climate Changes were more related to increased precipitation and storm events.

Climate then again descended from near modern temperature levels into the Neoglacial around 5,000 years ago. This resulted in much cooler and drier Climate Changes. But because sea temperatures were warmer and this period

of cold weather was quite short, sea levels did not drop but remained nearly stationary. However more extinctions occurred especially in Mammals that were probably hunted to (near) extinction by Humans is search of food during the difficult Neoglacial Climate Changes

Then the climate changed again to a slightly warmer period from about 950-1100/1250 known as the Medieval Warm Period (IWI). Average global temperatures again rose to higher than they had been before the advent of the 20th Century Climate Changes. Human civilization again began to expand and flourish. Exploration and settlements of new lands continued at a remarkable rate.

Times of Famine, Pestilence, Plague and Wars are often associated with periods of colder Climate Changes within the history of Human civilization. Picture courtesy National Geographic Society.

This was followed by the Little Ice Age. Temperatures fell dramatically with intermediate thawing and refreezing from the very mid-late 13th into the 14th Century. And again with deepest cold periods around 1650, 1770 and 1885.

As the Little Ice Age descended upon civilization, history shows this to be a very dark and difficult time: the Great Famines killed millions in Europe 1315-1317; this was the time of the Black Death Plagues; the Hundred Years War between England and France; the Bulgarian-Ottoman Wars; significant wars in Asia,

especially China; the peasant Revolt in England, the Black Plague of London 1665-1666 and so much more.

Then as the climate began to moderate and warm once again the Renaissance began. And each time that Climate Change brought warmer conditions civilization again began to flourish and prosper!

Space exploration and urban development characterize the latest period of Global Warming. Pictures courtesy www.dailygalaxy.com

Now in the past Century the climate is beginning to warm again. In recent decades the increase in CO2 levels and temperatures has been dramatic: "unprecedented" according to some Climatologists.

And this has also been another time of the most dramatic advancements that Humankind has ever witnessed during its evolutionary history!

It would appear from recent historical records over the past several thousand years, as well as vast quantities of Archaeological and Geological data going back through many millions of years of life's evolution that periods of Global Warming Climate Change (IWI) are extremely beneficial to Human development and evolution

As has been pointed out in the important research document 'Global Climate Cooling Facts': "More People Die from the Cold than from Heat and no Place on Earth is too Hot for Humans."

And all these very rhythmic rises and falls in temperature strongly support the Milankovitch cycle of Earth orbit eccentricity. When all contributing factors are correlated, the Earth's orbital pattern around the Sun appears to have the strongest influence on average global temperatures which effect both climate and sea levels.

Even though the world climate is presently experiencing a period of dramatic and sudden global warming, this would be expected as a very 'natural' cycle in the

Milankovitch Cycle Theory of Earth orbit eccentricity. The Solar Maximum Theory further supports the idea of rhythmic natural cycles based on the rate of solar activity which also is high at the present time. As the Earth's orbit again returns to a more elliptical shape and solar activity diminishes, temperatures are likely to cool just as quickly as they have warmed.

The majority of more conservative scientific thinking would maintain that there is not yet sufficient statistical evidence to suggest that the Earth has passed out of the Quaternary Ice Age . Because following every period of glaciation for literally millions of years the Earth has experienced many repeated rhythmic patterns of dramatic and very sudden heating (IWI) like what is happening now followed by sudden cooling, lowering CO2 levels and returned glaciation.

And in the past with every such cycle, average global C02 Carbon Dioxide, sea levels and temperatures all dramatically rose during those geological warming Climate Change Events (IWI), but without any anthropogenic influence from Humankind!

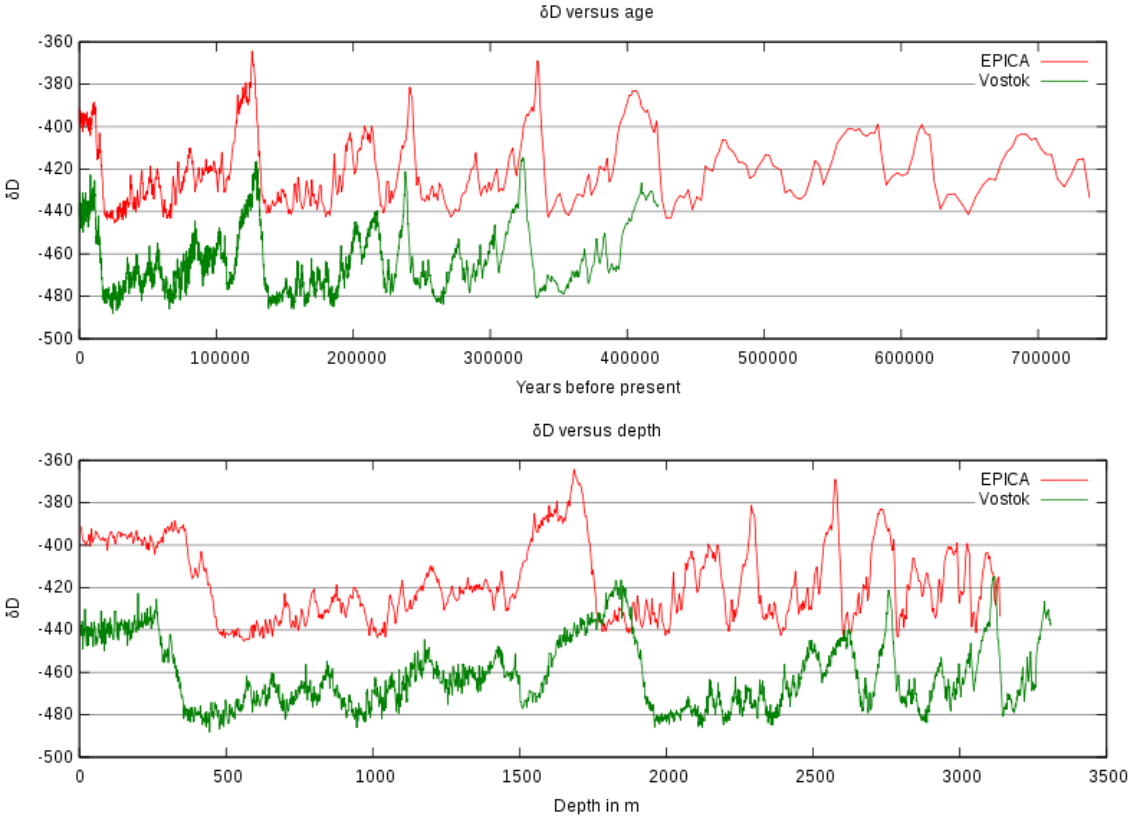
Present trends of rising temperatures and especially CO2 levels may appear dramatic. CO2 levels are certainly at "historic' levels as witness by Humankind in their brief existence on the Planet. However, temperature trends will need to continue for some time before they reach the level of the Eemian Stage, which peaked at roughly 125 000 years ago. At that time global average temperatures were 1-2C/1.8-3.6F warmer than the present Holocene Epoch. Sea levels rose an additional 4-6m/13-20ft higher than today.

If geological conditions continue on the same cycle as they have the Earth should be nearing its peak within this Interglacial Warming Interval. See illustrated chart: 'Late Pleistocene Atmosphere CO2 and Glacial Cycles' pp83 and also in Reference Section.

The additional atmospheric heating created by Anthropogenic (Human) activity is of unknown consequence. While it may help sustain a warm atmosphere, it is unlikely to have much impact once the Earth's orbital cycle again becomes elliptical and begins to cool.

When will this occur? That is the question everyone wants answered and is as elusive as the secrets of life itself. Perhaps it will last 100 years; perhaps 1,000 years.

What does appear likely is that the Interglacial Warming Interval (IWI) is likely to continue for some time yet. Thus the effects of Climate Change are likely to continue for the foreseeable future.

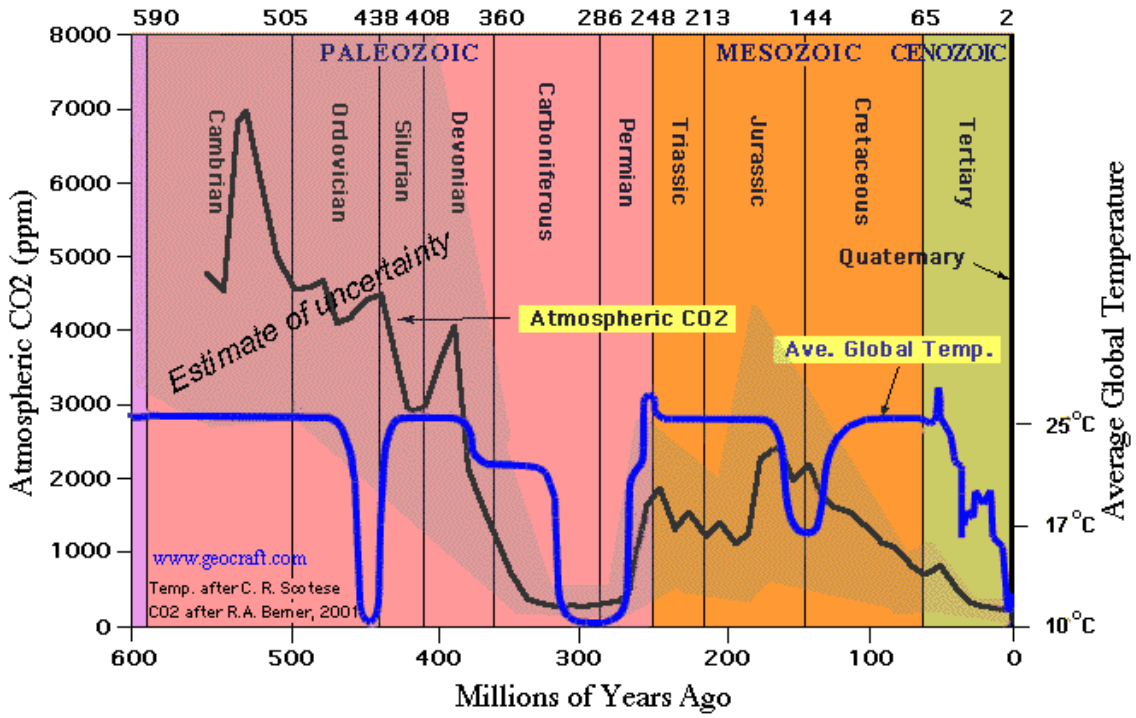


Two ice core temperature records; the Eemian is at a depth of about 1500-1800 meters in the lower graph. Notice how dramatic and suddenly the temperatures rose just like what is happening today. Also notice how frequently and rhythmically similar Climate Change patterns have repeated throughout geological history. Graphs courtesy Wikipedia.

Once again convincing and very well supported scientific data witness that the Earth has been repeatedly much warmer with higher CO2 Carbon Dioxide and sea levels than we have yet to experience today. Today's global climate falls much closer to the global minimum than its maximum!

Therefore, it is much more likely that average global temperatures are going to rise further than to fall. Rising temperatures almost always result in rising CO2 Carbon Dioxide levels. Because rising temperatures contribute to faster rates of decomposition, associated greenhouse gases like Methane also tend to increase. Human activity is going to contribute even more to this atmospheric pollution. So most certainly CO2 and greenhouse gases are going to increase in the atmosphere.

Even if every possible environmental measure of protection were instituted immediately, which appears to be far beyond the scope of humanity's control, there are still more than 7 billion inhabitants, not to mention their livestock and the billions of creatures of the Natural world contributing to the atmospheric mix on a daily basis. A warmer environment tends to increase proliferation of species so this will further increase both pollution and rising temperatures.



Global Temperature and Atmospheric CO2 over Geologic Time. Late Carboniferous to Early Permian time (315 mya -- 270 mya) is the only time period in the last 600 million years when both atmospheric CO2 and temperatures were as low as they are today (Quaternary Period). Graph and research courtesy Temperature after C.R. Scotese http://www.scotese.com/climate.htm CO2 after R.A. Berner, 2001 (GEOCARB III)

Some people are predicting a continuous and rapid warming which is sometimes referred to as a Super-Interglacial Event. While dramatic, if this occurred, it would hardly be out of the ordinary realm for geological climate changes.

Matter of fact, it is exactly what scientific data collected over all the ages of geological time would predict will happen. It is just that these changes have not occurred during modern Human habitation on the Earth.

In many past geological ages, average global and regional temperatures were so much higher that forestation spread well into the Arctic Circle. Air and ocean temperatures plus CO2 Carbon Dioxide levels frequently averaged higher than they are today. Throughout more than half of Earth's Geological History, sea levels were 4-6m/13-20ft higher than they are today. At their highest point, nearly 400m higher than today! So it is very likely that sea levels will continue to rise still further in the times ahead.

A Super-Interglacial Climate Change Event, while dramatic, would still remain within very 'normal' limits of what has occurred in the Earth's past geological history over the past 650,000 years. And certainly would not be significant enough of a deviation to consider that the present Quaternary Ice Age cycle has ended. It will take a lot more heat to actually end the present Ice Age!

During the Ordovician Period, parts of the Silurian and Early Devonian Periods plus the late Jurassic and most recently the Cretaceous into the Tertiary Period, sea levels averaged at least 65-80m/217-267ft higher than today. Carbon Dioxide CO2 and average global temperatures also were very much higher than they are today.

Global temperatures and CO2 levels through geological time clearly demonstrate through stone fossil records and masses of scientific data that our world today is still experiencing a very cool geological period! The Late Ordovician and Late Carboniferous to Early Permian Period, 315-270 million years ago, are the only geological time periods in the last 600 million years when both atmospheric CO2 and temperatures were as low as they are in today's Quaternary Period!

In other words, Humankind best adapt and prepare for potentially Warming Climate Change Events (IWI) followed by further cooling trends. The Earth's historical and stone fossil records are witnesses to the truth of life on this Planet: Climate Change is an Inevitable Consequence of Life on Earth!

Humankind is actually a 'cold climate' species that has adapted and developed through mostly a very cool or near Ice Age climate in the Earth's history. Possibly that explains why Humankind and other warm-blooded mammals have developed so successfully through the recent geological cooler climate stages.

Now the Earth's natural cycles are making an inevitable, natural and very predictable Climate Change toward a warmer climate with increasing CO2 levels. Warmer climates natural speed up decomposition of organic materials and the release of CO2 and other greenhouse gases, especially Methane.

This is not meant to discount that the habitation of Humankind and its activities as a civilization have not contributed perhaps greatly toward this result. Anthropogenic influences on climate and weather are a certainty.

While there is a school of thought within Humankind that would somehow separate itself from all the rest of 'Nature', Humankind is indeed simply another life form adapting to an ever-changing Earth. We are a natural part of Nature and were Born this Way to contribute to natural cycles as a species.

Humankind as a species appears to be acting upon the Earth almost as an element of Nature itself. This is known as an Anthropogenic Effect. As a consequence of our species collective interaction with the Planet, Carbon Dioxide CO2, Methane and other 'greenhouse' gas levels plus temperatures are again beginning to rise as they should in a predictable and rhythmic natural cycle.

Are we the cause or the effect of rapid and sustained Global Warming? Whichever, or both, we are part of a natural cycle of evolution that has occurred repeatedly throughout the ages of geological history. Every geological age has had different players but the results have always been part of the same inevitable rise and fall.

It really doesn't matter if one takes the point of view that we are 'created in the image of God' or a product of natural selection. Either way the 'heavenly inspired' or 'logically deducted' choices that Humankind are making as a species and their Anthropogenic consequences represent the natural evolution of the Human species in its relationship with the ever-changing evolution of the entire Planet.

The likelihood of warming Climate Changes (IWI) ahead in the near future appears inevitable. All theorists of almost all persuasions see this in the geological road ahead. But what happens beyond that point will prove itself as evolutionary history unfolds. One cycle inevitably gives way to the next.

One thing is almost certain: the probability of altering this natural Climate Change cycle is about as likely as changing the eccentric orbit of the Earth or the shining of the Sun itself or even controlling 'Human nature'!

Ahead is most certainly a period of increased CO2, Methane and 'greenhouse' gas levels; and rising temperatures, especially near the Poles.

This will alter the climate dramatically in some regions and probably shift some ocean currents as well. There will be a continued melting of glacial and mountain ice sheets resulting in increasing sea levels. In ages past, these glaciations have melted entirely for a long enough duration that forestation, sometimes even subtropical vegetation flourished within the Polar Regions.

And there certainly will be consequences as there are to every change. The massive pressure caused by the increased depth of the oceans will shift the balance of the tectonic plates.

Wherever this oceanic pressure is extreme, tectonic plates are likely to begin shifting the position of continents more rapidly as they have in the past. And of course the additional pressure will result in related and possibly increased seismic and volcanic activity.

This is very likely what was recently witnessed in the Southern Hemisphere's Summer 2011. Christchurch, New Zealand: increased fresh water and rising seas from the Summer melting of Antarctic Ice Cap created excessive pressure upon the edge of the Pacific tectonic plate beneath Christchurch.

When combined with the intense forces of the Perigee node Eccentric Orbital cycle of the Moon directly overhead this resulted in a dramatic and sudden shift in the Australian and Pacific tectonic plates causing a major earthquake of unprecedented proportions. A similar scenario also occurred around the same time causing major earthquakes in Argentina and Chile followed by a major and prolonged volcanic eruption.

This resulted in many thousands of lesser earthquakes and major subsidence of the land near the coast in Christchurch. Tectonic shifting then redistributed the plate pressure northward and very soon massive earthquakes resulted in the devastating tsunamis in Japan. Then like toppling dominos the shifting tectonic plates caused an impressive series of global earthquakes to the west in China then central Asia, the Middle East; and from Japan to the east in Alaska, back down to Chile and Argentina.

And corresponding volcanic eruptions in Indonesia, Japan, Russia, Italy, Spain, Iceland, the Canary Islands and Africa and also around the other side of the Pacific Tectonic Plate in Costa Rica, Nicaragua and then Chile as the tectonic shock waves shifted rhythmically around the Planet.

As the climate continues to warm, melting more glacial ice sheets, this tectonic and volcanic activity is bound to continue. And as the massive increasing weight of the oceans bears down on the edges of the various tectonic plates this will possibly increase movement of the plates resulting in a gradual shift in the continents as has happened nearly continuously in the past.

The changing balance in fresh water, sea water, cold and warm currents combined with subtle changes in continental positions also eventually will change ocean currents and prevailing weather conditions.

In similar Interglacial and other Warming Geological Periods (IWI) in the past, as temperatures increase, so will convective rising heat and evaporation resulting in greater climatic variations and seasonal extremes.

This will result at first with more intense precipitation and storm events in some places, especially around cold and warm air convergent zones. As the climate further warms more evenly to subtropical levels weather patterns usually moderate.

All of these factors combined could result in some areas along many populated coastlines and low-lying islands being inundated by flooding and shallow seas while other locations will become deserts. Ironically, if geological conditions repeat their past patterns many desert areas will once again become green and

verdant. But in a similar scenario to what has occurred with the 2005 flooding of New Orleans, entire populations, especially those living on coastal margins and islands could potentially be displaced.

This does not have to result in the destruction of Humankind or civilization. Far from it! On the contrary, were Global Warming to continue, this would almost certainly result in another expansion and further evolution of the Human Species. Humankind and Mammal species historically flourish during times of sustained climatic warming.

Changing weather patterns and warmer climates will open new lands to settlement that are presently too arid and dry or intolerably cold. Life will most surely advance!

The facts are certainly set in stone with billions of years of geological history as their testament: Climate Change and associated Geological Changes are inevitable and happening now.

Those that are going to survive will adapt to the changes. Those species that can't or won't adapt or move on, will eventually be swept away and will become extinct species like most of the creatures that once lived on this Planet.

But Nature is often referred to as our 'Mother': a mostly nurturing and supportive force. We are indeed a product of Nature. Therefore these Climate Changes are much more likely to be gradual and sustainable for our species rather than always drastic and violent.

Nature almost always provides warning signs in many forms that guide those who are alert and sensitive to the impeding changes and events ahead. Dark clouds and rumbling thunder warn of an approaching storm. Earthquakes usually occur before an imminent subsidence or volcanic activity.

Short of a cataclysmic Human-induced Nuclear Holocaust or an unexpected Bolide impact, or unlikely violent volcanic event, it is very unlikely that any drastic and extreme Climate Change Event will occur in the near future that might wipe out the Human species.

It is much more likely that these Climate Changes will continue to occur quite gradually or with extreme events on a local or regional scale. This will allow time to adapt and adjust to changing circumstances.

We are blessed with each day we have here on Earth! It would be best to use these days wisely; adapt to the changes and build for our future.

Holocene Major Extinction Events:

The Holocene Epoch has been a time of major extinction events. And those extinctions continue to this day. The Holocene Epoch has already witnessed a major extinction event especially of large Mega-fauna mammals which included most of the Cave Bears and Short-Faced Bears, Glyptodons, the Armadillo-type creatures; also all the Ground Sloths , Irish Elk Mammoths, Mastodons, Saber-Toothed Cats which all began to disappear late in the Pleistocene and continued into the Holocene.

Giant Ground Sloths (left) and all these other Holocene species (right) and especially the larger Mega-Species Mammals have become extinct along with many thousands of other species in fairly recent times. Mass Extinctions at the present rates could be pushing 140,000 species a year! Pictures courtesy www.realaspen.com and www.skywalker.cochise.edu

Even Neanderthals Humanoids also became extinct during this period. Some theorize that a series of meteor impacts and related mega tsunamis may have contributed to their extinction. But this is unlikely as no trace of an associated impact crater has been found to support this, nor any rational pattern of associated extinctions in other species.

It is more likely that Neanderthals along with Homo erectus were overwhelmed or most likely assimilated by more advanced related Humanoid cultures during this time. Some genetic DNA research disagrees with this.

They suggest that we Homo sapiens perhaps share an ancient ancestor in common or were an entirely separated species possibly resulting from an advancing genetic mutation. But the similarities between Neanderthals and Cro-Magnon Man are undeniable and certainly outweigh their differences. There are distinct differences in physical appearance and especially in their habits and culture.

But these could well have occurred over time due to some form of environmental interaction and/or genetic adaptation to Climate Change.

Several interesting theories suggest that Cro-Magnon Man was actually produced from the Neanderthal species or around the same time that Neanderthals existed through genetic engineering by an advanced Alien Culture.

This would explain why Neanderthals lived in caves with a very limited and primitive culture.

And very suddenly a much more erect, taller and radically different Cro-Magnon species suddenly appeared with an advancing culture, much more active and exploratory minds, living in dwellings and worshiping the
Heavens and the sky.

According to these theorists, modern Homo sapiens, is also a product of similar Alien genetic cloning experiments.

Neanderthal (left) and Cro-Magnon skulls and physical characteristics show a marked degree of genetic development between the two. Courtesy www.holypal.com and www.news.softpedia.com

But the genetic advancement of the Human species, no matter how it occurred, resulted in catastrophe for almost everything else.

Once the Human Species 'advanced' and began to 'civilize', its impact was profoundly predative on its environment. Almost all the native Camels and Horses of North America were extinguished, eventually a large percentage of the Bison as well.

Soon many of the Mega-Mammals species reached their end. But the extinctions haven't stopped there and include: Amphibians, Arthropods, Birds, and Insects, a wide range of smaller Mammals and Plants and Reptiles.

From 1500 AD to the present day the number of known extinctions numbers at least 875 genera! This number seems to be continuing unabated. According to

the theory known as the Species Area Curve research suggests that the present rate of Mass Extinctions could be pushing 140,000 species each year. Consequently, this means that we are presently within a profound period of Mass Extinction! And it would appear that we are the cause!

The Anthropocene Epoch, A Look into Our Future:

Earth lights at night now illuminate nearly the entire Planet as seen from space. North America (top),Tokyo (below left) Chicago (below right) Courtesy www.nasa.gov See reference section of this paper "Lights of Earths Cities at Night' for more incredible images.

In recent years scientists and climatologists have put forward a proposal that the Earth has actually entered a new Geological Epoch which is being called the Anthropocene Epoch i.e. the 'New Human' Epoch. The proposal is still under study but likely to be accepted if present Climate Changes and the impact of Humankind continues its present course of development.

Some scientists maintain that the Anthropocene Epoch actually started, and almost completely overlaps what is presently called the very late Pleistocene Epoch and the entire Holocene Epoch. For it is this geological period of time that Human civilization developed and began to impact the Planet.

For the sake of speculation, let us assume that the Planet has entered a new Epoch and that Humankind is actually greatly impacting the global atmosphere and climate as significantly as many professional Climatologists suggest.

Throughout the past 650,000 years or much more of geological time, the Earth has experienced rhythmic glaciations and Ice Ages interrupted by rapid Interglacial Warming Events. If this rhythmic pattern were to continue, then the Planet now should be reaching the near peak of an interglacial warming interval cycle (IWI).

This would bring high and still rapidly rising CO2 Carbon Dioxide and greenhouse gas levels and rising average global temperatures and sea levels. This trend is augmented further now as it combines with the increased Solar Maximum cycle which is also reaching its peak.

The hypothetical Anthropocene Epoch is suggested to have begun around the end of the final Quaternary-Pleistocene Glaciation Climate Change Events 14,000 -11,000 years ago. This is when the last period of glaciation started to retreat as the climate again began to warm up. That would mean that the Holocene Epochs' sudden and fairly sustained warming Interglacial Period allowed the advancement and development of Human activity that was conveniently propelled forward by the Earths' eccentric orbit cycles and solar cycles.

This advancement of Humankind resulted in the extinction of many other species that might have otherwise competed for the same resources. As Anthropocene activities have increased and spread around the globe, this activity (mostly our pollutants) has enhanced the consequences that would normally be expected from the natural rapid warming in the rhythmic interglacial cycle. Humankind has actually worked within the natural environmental parameters that initially supported the species to create an environment that was suitable to the expansion of itself as an advancing species.

Now if the natural climatic cycles continue as they should, this present-day interglacial warming interval (IWI) should reach its natural peak in the relatively near future. If the natural rhythmic cycles of the past were to persist, the Earth's eccentric orbit will once again become elliptical: average global temperatures should begin to fall, resulting in lower CO2 and greenhouse gas levels and falling

sea levels; as the world again heads into a long-term colder climate. But if this hypothetical scientific suggestion of an Anthropogenic Epoch is correct, the current warming trend would continue to escalate and would not end with a rhythmic cooling as it has so many times in the past. The profound impact of Human activities on the Earth's climate would counteract and over-ride the effects of the natural cyclical rhythmic cooling trends ahead.

Instead, due to Human Anthropogenic intervention, the Planet's natural cooling trend might be much less or world climates could possibly remain mild or warm instead of dramatically cooling. The climate might even continue to warm up; CO2 levels could continue to rise; glaciations and all Polar Cap ice sheets will certainly melt; sea levels would reach their maximum. The Anthropogenic Epoch would witness a major warming Climate Change Event (IWI) overtaking the Planet. Such a trend would certainly be within the climatic range parameters scientific research has observed on the Planet during earlier geological ages.

This warming and its consequences would then distinguish the Anthropocene Epoch as one distinctly different than the proceeding Epoch: the Pleistocene Epoch time of rhythmic glaciations and interglacial warming would have ended and Humankind will enter an Epoch of Anthropogenic 'greenhouse' Earth. Most surely the times ahead will be the great witness to the possible truth here.

Because Archaeological, Geological and Historical records all concur that those geological periods of sustained warming Climate Change (IWI) are beneficial to Human and Mammalian development, it might be reasonable to conclude that the activities of Humankind will continue unabated. In an Anthropogenic Greenhouse Earth Epoch, population and encroachment over the land will continue and possibly even geometrically increase in the foreseeable future.

The idea that people will 'work together' to solve and control climate change or that Humankind will change its behaviour and patterns of living seems unlikely unless it is forced upon them by catastrophe. Even then, Humankind appears to be very much a creature of habit. And most of them are highly resistant to changing their patterns of behaviour.

So they will most likely continue doing exactly what they have done in the past, unless they receive positive and realistic guidance, which seems sadly lacking.

In actual fact, most of Humanity who are at least partially responsible for these Climate Changes are largely unaware that they are causing the problem. And those populations from the most highly educated nations seem unable or unwilling to alter their activities or levels of consumption. And even if they did, it is highly likely that the combined activities of the rest would overwhelm them.

The plans for downtown Dubai, one of the world's largest shopping malls. Thousands of other metropolitan centres are fast sweeping over the Planet. Picture courtesy www.ecopolis.org

Climate Change Theory suggests that the major causes of CO2 'greenhouse' gases, methane emissions and increased atmospheric water vapour that are supposedly causing Global Warming/Climate Change are largely produced from Humans and the animals they farm. Much of this is due to the continual breathing and defecating of more than 7 billion people and many more animals. This combines with their daily anthropogenic activities that define Humankind as a 'productive' civilization. Such activity is very unlikely to stop until most of Humankind ceases to exist.

Humanity is a highly consumptive species with a unique ability to 'fowl its own nest', Even if the politically correct terminology of the day calls this "fowling" a "carbon footprint". It should be obvious that even the most 'enlightened' and well educated Climatologists, Environmentalists, Media Personalities, Professionals, Politicians and Scientists; those passionate souls who are fully aware of the profound impacts of impending climate change, are themselves still contributing on a regular basis to the 'causes' of Climate Change. In many cases they are contributing even more than the average!

Everyone is contributing toward this supposed Anthropogenic Global Warming by: driving vehicles that burn fossil fuels; flying in airplanes that are significantly polluting the atmosphere; using large amounts of electricity that heat and light their homes and offices, power the indispensable machines they need for their 'comforts' and 'quality of life-style' and for communication in the 'information age' and for the 'success' of their daily lives.

All 7 billion of them are producing steam and water vapour from their related activities. And each and every one of them plus all their animals and pets keep on breathing and defecating. That is before they even start their daily activities which eventually results in consuming more things and producing more children that will do the same!

This mass of people would amount to just a few grains of sand on the ever-expanding beach of Humanity. Picture courtesy www.mylot.com

Today 7 Billion people are daily consuming large amounts of agricultural products and a wide assortment of foods. This requires the raising and killing of animals and plants and/or the industrial processing of products which also produce as a bi-product CO2, a variety of 'greenhouse gases' like Methane, Sulphur Dioxide and water vapour.

All 7 billion Human defecate frequently which soon decomposes into more CO2, Greenhouse gases and Methane.

Multiply by 6 billion times what is pictured here to estimate what is consumed by Humanity every month! Pictures courtesy http://www.retailcustomerexperience.com and www.astudentofenglish.blogshot.com

Humans continue to buy, process and use products made from a wide assortment of chemicals and minerals, glass, metals, paints, paper, plastics, precious stones, wood. All these products also produce pollutants. Humankind and their animals consume large quantities of water; Humans burn large

quantities of organic and non-organic materials for energy, fuel, heating, lighting, and transportation. The list is almost as infinite as the billions of Human Beings that continue to breed, consume and expand across the Planet.

In fact the World's economies are based around the processing and purchase of food stuffs and manufactured goods. By their very existence the Human species and its industries of commerce demand the consumption of natural resources that must be transformed and transported around the world for a Global Market.

By definition each and every stage of this essential process that defines our success as a modern Human Civilization produces the pollutants that are supposedly creating the present Global Warming 'Crisis'.

It is fundamentally extremely difficult to change Human behaviour, let alone expect an entire reversal of the way Humans society functions and lives. Therefore, it is much more likely that, in the short-term, Humankind will continue to consume all fossil fuels until they are eliminated. Then they will adapt and move on to other sources of energy. They will continue to procreate and each new Human being will continue to contribute to the warming of the Planet with every breath they take and everything they consume.

As they seek the essential 'creature comforts' which contribute to their simple survival and enhance their 'quality of life', they will continue to produce as bi-products the very factors that continue the pollution of the environment. This will result in consequential rises in CO2 Carbon Dioxide, green house gases, Methane and other air pollutants which will result in further rises in temperature, resulting in further glacial and polar ice cap melting and rising ocean levels.

Pictured here is a future Sea City as envisioned by Michio Kaku for 2057. This model seems to have almost eliminated a green world. Image courtesy of www.kandaka.com

This future city design addresses issues of climate change and rising sea levels with solutions that also combine botanical balance with urban development. Picture courtesy H & H Art

Rising sea levels will continue to alter ocean currents and the pressure on tectonic plates causing them to shift. As land masses shift, the global placement of the continents will continue to further alter ocean currents.

This will alter the world's weather patterns and change local and region climate. In past geological periods of sustained warm weather, life has flourished even near the Poles and over most of the colder temperate zones.

Sometimes, altered and shifting climate patterns bring rain to desert areas producing abundance where once there was famine.

As Humanity expands, and sea levels rise, there will be the need for new land to populate and this is where they will find it along with additional natural resources.

As civilization continues to flourish and adapt to the changing warmer world, Archaeological, Geological and Paleontological history would suggest that the Human species will continue to not only adapt, but further evolve.

This is what has classically happen with almost every major Climate Change or Extinction Event: the lucky and smart, adapt, evolve, improve and survive.


In the future Humankind will possibly seek out valuable resources from other Planets and celestial bodies. The Human species is very likely to adapt and possibly change into a new species once Humankind permanently moves into Space. Picture of Mars Miners courtesy www.popsci.com and planetary graphic courtesy Oman Daily Observer and NASA.

When resources become scarce, the species will seek out new ones. Those resources might be here on Earth, or perhaps as we continue to evolve and master our ability to fly, Humankind may begin to colonize, consume and harvest the resources from other Worlds. It is in these times of future advancement and colonization that we might unsuspectedly come upon our distant relations. Perhaps even meet those People who had a hand in creating us in the first place. We might even evolve into a new species.

The Future Times from a Religious Point of View:

The Bible is a profoundly important text to western and world culture. In the last book of the Bible, Revelations speaks of the dreams and visions great prophets have had about the times ahead.

Indeed their visions have described in great detail the past Century of Warfare that according to some statistics destroyed over one third of Humankind through associated conflict, disease, genocide, poverty and other forms of cruelty as the Human Species predated upon its environment and itself. This has truly been a time where the world witnessed Apocalypse.

Revelations 20: 8 describes the ascent of Humankind in the future to number, “as many as the grains of sand on the sea shore. They spread out over the earth” Rev. 20:9 “But fire came down from heaven and destroyed them.” Rev. 20:11 “Then I saw a great white throne and the One who sits on it. Earth and heaven fled from His presence and were seen no more”.

Rev. 21 and 22 speaks of those times ahead long after this present era of fear and warfare has ended. It appears to be a time when Humankind is transformed perhaps here on a very changed Earth or maybe even on another planet.

Revelations: 21:1 “Then I saw a new Heaven and a new Earth. The first heaven and the first earth disappeared, and the sea vanished, there was no more sea. And I saw the Holy City, the New Jerusalem, coming down out of heaven (out of the clouds).”

New Jerusalem is then described in Rev.21:10-11 “the holy city coming down out of heaven from God, and shining with the glory of God. The city shone like a precious stone.” Other passages say, “gleaming like jewels in the night”.

The great shining city that descends from the clouds is then described in detail much like a science fiction space station or ultra modern environmentally balanced and perfect urban environment and landscape supporting a highly civilized Humanity!

Some theologians maintain that our present modern cities ‘gleam like jewels in the night’ and that these past prophetary visions might well have been about what we have already become as a species today!

Rev21:23 “The city has no need of sun or moon to shine on it, because the glory of God shines on it, and the Lamb is its lamp. The peoples of the world will walk in its light, and the kings of the earth will bring their wealth into it”.

And remembering the ancient passages passed down from the very beginnings of time, Genesis 1:26 “then God said, “And now we will make human beings; they will be like us and resemble us.” Genesis 1:27 “So God created human beings, making them to be like himself.” Perhaps now we have truly become that which we were created originally to be.

And soon afterward remembering God’s comments concerning man’s ‘original sin’ Genesis 3:22 “Then the Lord God said, “Now the man has become like one of us and has knowledge of what is good and what is bad (knowledge of everything). He must not be allowed to eat fruit from the tree of life, and live forever.” But we did gain that knowledge and even now we seek the answers to eternal life. So with that knowledge perhaps Humankind has already advanced to a level that puts our Species on a course for a much higher level of development than that which we live today.

And now in this future time ahead, when shining New Jerusalem descends from the clouds, Rev 21:3 “I heard a loud voice speaking from the throne: “Now God’s home is with mankind! He will live with them, and they shall be his people. God himself will be with them, and he will be their God. He will wipe away all the tears from their eyes. There will be no more death, no more grief or crying or pain. The old things have disappeared”.

This suggests that in the future, Humankind is actually going to transcend and uplift itself to become a much more balance, harmonious and highly civilised species. These Biblical passages suggest that we almost become godly by present living standards, and certainly when compared to the living conditions during Biblical times.

By the simple law of averages and what we know to have occurred here on Earth in the past, it seems much more logical that we would achieve this end here on Earth than in some other realm. But there are certainly still some missing pieces yet to fit into place before an accurate picture of our future is revealed.

The profound passages about 'fire falling from the skies' is indeed reminiscent of what has destroyed so many species in the past through bolide (asteroid, comet, meteor impacts). Or could this imply that Humankind eventually becomes so predative upon itself that there is some sort of nuclear annihilation? Perhaps those advanced human colonies living in space make war upon those remaining with the Planet? Surely time will witness the truth.

Some scientifically-minded theologians think that perhaps there is an 'Alien' intervention that rescues the better part of our species. One reason for this supposition is that God is referred to not in Spirit but "himself will be with them". One interest theoretical interpretation of these Scriptures and visions suggests that we overcome the issues of Climate Change. As the climate warms, we quickly expand across the entire Planet and truly advance as a species.

Through the 'gift' of knowledge, we master space flight and soon create great colonies and cities both in space and also on other worlds such as Mars: a new heaven and earth without a sea. We soon discover and begin to interact with other Alien civilisations that have from the very beginning been influencing our development as a species. Collectively, we advance as a new hybrid species creating a remarkable culture in space.

Then an asteroid swarm is detected heading toward Earth. A giant inter-planetary mother ship i.e. New Jerusalem, descends from the heavens to Earth to collect all that is valuable here especially pertaining to knowledge and personnel. It then returns to the new colonies with all that remains from this Planet as fire rains down upon the Earth. Thus a new hybrid civilisation of Humankind begins on a brave new world.

Obviously, whatever happens does eliminate the chaotic and troublesome times in which we live and improves them remarkably with a beautiful, bountiful and productive world built around much higher forms of intelligence, knowledge and uplifting social values that are still so unfortunately uncommon today.

Pictured here are two artistic interpretations of the future 'New Heaven and New Earth'. General consensus from a religious perspective shows the Earth as a much-improved place with a benevolent climate, abundant resources and harmony amongst Humankind and their environment. Pictures courtesy www.andrewcorbett.net and www.JimmyAkin.org

Rev22:1 "The Angel also showed me the river of the water of life, sparkling like crystal, and coming from the throne of God and the Lamb and flowing down the middle of the city's street. On each side of the river was the tree of life, which bears fruit twelve times a year, once each month; and its leaves are for the healing of the nations. Nothing that is under God's curse will be found in the city.

The throne of God and the Lamb will be in the city, and his servants will worship him. They will see his face, and his name will be written on their foreheads. There shall be no more night, and they will not need lamps or sunlight, because the Lord God will be their Light and they will rule as kings forever and ever."

So What Happens Next?

The biggest myth about Climate Change is to assume that it doesn't exist. Assuming that everything is going to remain as it has been within living memory is nearly a suicidal misconception. Near continual change is all that does exist!

No two days are ever exactly the same nor are the weeks, months, seasons or years. Everything is in a constant state of change. The evidence is unmistakably clear that the Earth and all of us living here are in the midst of a major period of Climate Change right now!

The evidence of climate change since the beginning of Earth's history is undeniable. Perpetual change is a 'fact of life' since the beginning of time on this Planet. Any attempt to stop it is futile. And it would appear that the very fact of our existence, just like the plants and animals that came before us, is the result

of this inevitable change and shift in the order of things. We and everything we take for-granted in our entire world are products of Climate Change!

We are irreversibly and undeniably linked with the Kingdom of Nature. All of Humankind is part of its constant and inevitable flow of adaptation and change, its rebirth and extinction. To separate ourselves from this universal cycle as if we were 'above' it or somehow immune from its consequences would be so foolishly unrealistic that it would almost certainly spell our doom.

History supports that it is almost always those creatures that are unaware of their true surrounding circumstances, which are unable or unwilling to flow with the tide of time and therefore become extinct.

Fossil and stone records don't lie. That is something people do. It appears to be a 'learned behaviour' that is possibly at the heart of the Biblical reference to Humankind 'tasting from the Tree of Knowledge'. It was never knowledge that was at fault, but what people did with it.

And today the evidence is undeniable. The world's climate is changing. As it always has and will continue to do eternally! This is all a 'natural' part of the continual ebb and flow of eternally shifting seasonal tides. Our entire world as we once knew it to be has already changed within living memory beyond recognition. And those changes have only just begun. And they will never end.

If one is a Spiritual being that believes in the 'signs' around them or believes only in oneself, the undeniable truth is hauntingly clear and shouts louder at us all with each and every cataclysmic event, which are happening with increased frequency around the world today. We are entering a New Age and things are changing. How we react to these changes will literally spell our survival or our doom.

Today it seems that everyone has an 'agenda' a 'special interest' a 'dedication' or 'commitment' to a 'cause' or something they feel is 'important' to them. Most of these self-interests appear to involve being 'realistic' about the 'facts of life' as they would like to see them to be in their own private view of the Planet. After all, we each see the world through 'different eyes'. Unfortunately, sometimes this is just another way that Humans lie to themselves rather than gracefully accept reality as it really is.

But the real facts of life reveal that mass extinctions are an inevitable part of changing times. Most species either do not understand how, or staunchly refuse to adapt, alter and change the way they exist. Because that is "how things are" and "how they always will be". Yet the evidence is set in stone that everything

changes. It is only those adaptable, clever, flexible and sometimes just down-right lucky ones that survive and live to see another day. For the rest, this time ahead may well be forever immortalized in future archaeological and fossil records as their tombstone!

When looking for clues as to what to do next. Which way will be the successful path that will result in guaranteed survival and a successful future in these most uncertain times, I would put my best hopes for proper guidance and a solution on the miraculous world of plants and the Kingdom of Nature.

For it is with Nature and the animal and plant Kingdoms that we have our closest ties to Eternal Life. Within that Kingdom is where we belong! So it is most likely that from within that Kingdom we will find the guiding Lights to illuminate our future path.

Genesis 2:8 “The the Lord God planted a garden in Eden, in the East, and there he put the man he had formed. He made all kinds of beautiful trees grow there and produce good fruit. In the middle of the garden stood the tree that gives life and the tree that gives knowledge of what is good and what is bad.”

Genesis2:15 “Then the Lord God placed the man in the Garden of Eden to cultivate it and guard it.”

For most of Humankinds’ entire history we have maintained a strong and interdependent reliance on the Kingdom of Nature and especially the Kingdom of Plants. The Kingdom of Plants and the animals supported by this Kingdom are at the very foundations of Human civilization. Without their nurturing and support throughout eons of time Humankind might not have ever existed at all. And it is with their support today that we as a Species advance and prosper.

Today most of Humankind so disregards them that they are trampled under-foot in the name of ‘progress’. Yet these adaptable and clever species were amongst the very first to inhabit the Earth. They have witnessed every change that has come and gone with increased and renewed vigour. It is the Plant Kingdom and the Kingdom of Nature that provides us with our clothing, food, fuel, medicines and the very air we breathe! They are truly the hardiest and ‘wisest’ long term survivors that have adapted to every Climate Change on the Planet.

Yet few people today seem to appreciate the gifts the Kingdom of Nature so freely provides for us. Even fewer people ever search for the remarkable secrets this Kingdom will provide that might actually save our Species and our world from mass extinction. Like misguided, self-centred children we blindly crash head-long into all the multitude of fantasies and down-right lies which we call our ‘lives’.

These life choices are often at the expense of Nature and Natural balance. Being none the wiser for what may be about to befall upon us all if we truly loose our balance as a Species.

And yet the answers are so clear to the wonderful world of the caring and wise souls which include amongst others many Agriculturists, Archaeologists, Botanists, Environmentalists, Farmers, Foresters, Gardeners, Geologists, Horticulturists, Nature Lovers, Palaeontologists, the Spiritually aware and well-balanced individuals and numerous other wise folk all around the world. For them, there is a much more balanced and sensible approach to living that will not only transform one's entire life, but can transform our entire world community if enough of us embrace it.

Living in an environmentally balanced, caring and responsible manner does not have to include draconian limitations to a high standard of living and a better quality of life. And certainly the changes that Humankind will need to make in order to positively adapt and survive have little to do with returning to the 'old ways'. Earth's natural time clock never runs backwards: the past is gone forever. This is about integrating all the finest points that have already been achieved in Human history into something better and more specialized to suit the times ahead.

One thing that fossil stone records reveal is that there is definitely no turning back for second chances. Once any particular geological age is finished, those exact conditions never return again. And once a civilization or species reaches its natural end, it never returns, but is soon replaced by something perhaps similar but more adaptable and ideally specialized to the changing times.

Humankind, once a 'hunting and gathering' and then an 'agrarian' species has now become largely transformed into an urban civilization. Most of the world's population now are detached from the land that feeds them. This detachment desensitises people from the world of Nature that actually supports them.

Thus it becomes increasingly difficult for many urban dwellers to adapt and appreciate the natural changes that are ebbing and flowing around them. They miss the natural ebb and flow signals provided by Nature that always surround those that work with the Earth and guide their way ahead. At that point people begin to play more the role of victim against Nature's changes rather than an intuitive and sensitive partner working within the natural flow of things.

Yet by adopting a more inclusive approach to living this could quickly change. Why not start by incorporating the best practices of our agrarian forbearers into an urban environment? By creating a green urban lifestyle, we have the best

opportunity of adapting a balanced, caring and healthy lifestyle where we remain more sensitive to the changes happening in the natural world around us.

Plant a Garden!

Just imagine if all 7 billion people on Earth today each planted a garden. Each of us would be affected by the immediate interaction of Nature around them. And everyone could potentially live within a small personal patch of paradise.

What a profound change this would bring to the attitudes of every individual as well as our collective consciousness in regard toward Nature and how we relate to ourselves and all other living things. This would put us all much more in resonance with the world that supports us.

This gives us the best chance to hear the 'whispers' of nature and witnesses the signs as the inevitable changes ahead transform our world, with us or without us.

The award-winning gardens at the Sanitarium factory in Christchurch, New Zealand, have become a popular feature of the city.

Such 'green urban' changes would include much greater emphasis on environmental education and training, reintroducing botanical arts, natural and advanced sciences plus gardening into the school curriculum.

In order to truly change, Humankind must literally 'grow' a new and much improved green generation who appreciate, respect and understand their natural

surroundings. It would mean incorporating all of this knowledge into our daily lives, including business and industry plus instituting a wide range of recycling schemes into manageable and sustainable aspects of daily living.

We would strive to create much greener and more botanically bountiful urban environments where town and country becomes one and the same environment.

Embrace Industry, Research and Science:

Modern society should further embrace industry, research and science to discover new answers to overcome old problems and more quickly learn and understand the climate changes happening around us.

This way civilization could be alerted and made much better prepared to cope with these changes.

Industry and technology should be advanced and encouraged in a balanced and sustainable manner to transform the raw materials needed into the products necessary to build, rebuild and sustain our growth through the changing times ahead.

Profound Climate Changes sometimes produce catastrophic and profound events.

If modern Civilization is to advance, overcome and rebuild after such calamities, the industrial and technological infrastructure must already be set in place to mass produce the products necessary to undertake such massive projects, like rebuilding entire cities and reinforcing existing ones.

If we limit industrial and technological expansion, we reduce our possibilities of advancement and survival.

A warmer climate most likely will increase development and growth of our Species. New lands will open up for habitation and traditional habitats may need to be fortified or rebuilt to overcome adverse effects of these changes.

We must plan in advance and prepare for these events.

The activities of Humankind as an agent of Nature may be in some part contributing and responsible for these Climate Changes.

We are also an agent of change that holds the key to future adaption and finding the solutions for our survival.

Urban and suburban spaces of almost any size are easily transformed into attractive and bountiful environments. Raised beds can transform concrete and contaminated land into productive spaces that balance and uplift their surroundings and create healthier lives more in harmony with Nature. Imagine how much food could be raised if much of the lawns and open space around living areas became productive gardens. Picture courtesy www.pathtofreedom.com

A Positive Attitude Attracts Success.

Civilization could adopt a positive attitude toward inevitable Climate Change and find ways to adapt and flow with it rather than attempt to deny or resist the inevitable. Nothing ever stays the same for long.

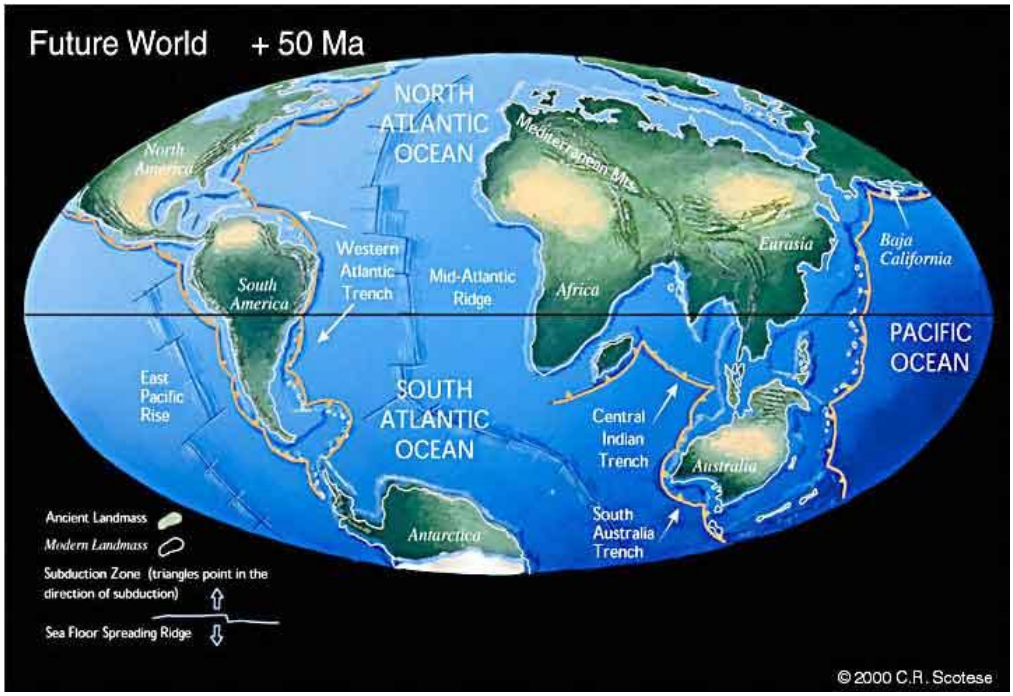
And the times ahead are bound to bring unforeseen and unusual climatic and geological events perhaps never experienced before in the short span of Human history.

But change in and of itself is nothing more than that: a change in circumstances. Some will find this threatening, perhaps even life threatening. But others will find opportunity there. For every action there is a reaction and a negative plus positive balance to this ebb and flow. These new and changing times will usher in a brave new world for at least as many as see the finish of their way of life.
An accepting, inquisitive and open mind will often see what established traditional approaches might overlook.

This is especially important when reading and sensing the signals and signs provided by Nature that are meant to alert and prepare us for future change events. Those that recognise and ride the waves of inevitable change will be carried along with the flow and adapt successfully, while those that resist the waves of change will be swept away.

As the inevitable consequences of the present Climate Changes gradually but slowly become more pronounced, there will be obvious changes to both sea level and possibly current flow and weather patterns. Low lying coast margins and islands are obviously at greatest risk from both rising sea levels and storm or tectonic surges. Rising sea levels also produce massive additional pressure upon many of the continental tectonic plates around the world. This will most likely produce substantial tectonic and volcanic activity, especially near active fault lines and possibly in places that have had little activity in the recent geological past. This is the time to prepare and make necessary changes.

Rising sea levels could change forever some of the world's most endeared and famous landmarks. But will open the emergence of others. Pictures courtesy H & H Art



If present-day tectonic plate motions continue as expected, eventually the Atlantic Ocean will widen, Africa will collide with Europe closing the Mediterranean, Australia will collide and begin to merge with S.E. Asia, and California will slide northward up the coast toward Alaska. Many island nations will submerge. Map courtesy the amazing Paleomap Project www.scotese.com

For more information and images visit www.daleharvey.com

As the Earth's climate continues to globally warm up, especially near the polar regions, rising convective air currents combined with evaporation and possibly changing continental drift and ocean currents will cause many now arid desert areas to bloom and become productive. The effects of Climate Change may prove to be highly beneficial in many regions of the world that are today too arid or cold for successful habitation. This picture was taken in the Sahel region of Niger, North Africa where warming temperatures and increasing precipitation are causing vast areas of desert to become lush again. This is proving to be a boon to people living in the driest regions of the continent. Picture courtesy www.nationalgeographic.org

Wildflowers bloom outside San Luis Obispo, Ca. in a once very arid and unproductive region that is now much more verdant where the community now actively promotes the blooming, greening and enhanced productivity of the Planet. Picture courtesy www.nationalgeographic.com

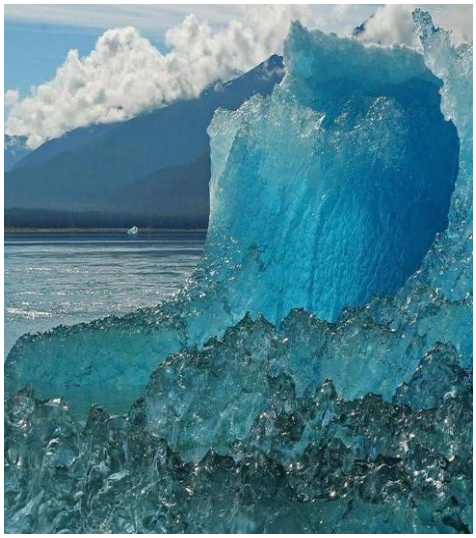
For more information and images visit www.daleharvey.com

Anticipate and Expect Many More Changes Ahead.

Weather pattern changes are already occurring and this trend of increasing extremes, very changeable conditions and gradual warming should continue for some time ahead. Then there will be a sudden reversal and the climate could become colder again as an elliptical Earth orbit returns. Geological records reveal that during Interglacial Warming Intervals such as the one the world is experiencing now, the greatest sustained warming, most increased precipitation and unusually severe weather events more frequently occur nearer the poles and colder temperate zone regions, especially in the Northern Hemisphere.

The mixing of warm and cold air currents becomes much more pronounced. This can result in abrupt and dramatic changes in temperature and weather including shifts in 'traditional' seasonal climate and weather patterns. This can sometimes result in dramatic seasonal events like 'snow in summer' and unusually warm winter weather conditions followed by an equally dramatic 'record-breaking' reversal in weather events and patterns.

Temperature increases nearer the subtropical and Equatorial Zones in past Interglacial Warming events are often less extreme or pronounced. But the geographical positioning of near-Equatorial South America and to a lesser extent, Africa, is predicted to produce substantial temperature increases. These Equatorial zones can also expect to see increasing or persistent drought in some regions sheltered from prevailing wind currents; and more often increasing humid, wet weather events and stronger storms in more exposed regions.



Glaciers that have for many thousands of years deeply filled and completely dominated this entire mountain valley have recently almost vanished. Ice sheets that cover many Arctic and Antarctic regions are fast disappearing as they melt rapidly into the sea. Pictures courtesy: Barbara Rhyne Tucker and H & H Art.

And of course there is the threat of rising sea levels, which can inundate shorelines, swamping low-lying islands. This becomes especially problematic whenever unusually high (King/Spring) tides augment the tidal surges that commonly occur during cyclonic and monsoonal seasonal events.

In past ages, Interglacial Warming Intervals have resulted in all polar ice sheets melting and the land becoming green and forested. Sometimes ferns and palms have grown far into the Polar Regions! This could open up entirely new areas for habitation and most certainly for the interbreeding and migration of botanical species and wildlife. The tropical equatorial regions remain largely unchanged but sustained warmer temperatures and a further moderating climate expands into the subtropical and temperate regions. Ocean currents often change drastically which also alters climate patterns of surrounding coastlines.

Traditionally as global temperatures increase, so does evaporation and rising air currents. This could magnify the intensity of storms in some cases; produce more intense and widespread rainfall in other places. And sometimes changing air and ocean currents produce drought in traditionally wet zones and rain over desert areas like what happened to the 'green' Sahara when several times during past (IWI) Climate Changes, the desert became productive and verdant. Already today's climate is changing so much that this is starting to happen and large areas of arid land are again becoming green!

During Interglacial Climate Changes (IWI) such as the one occurring at the present time, the climate warms up especially around the Arctic and Polar Regions and becomes so moderate and temperate that all glacial ice sheets often completely melt and the Polar Regions become green and sometimes forested. Life becomes abundant and prosperous in areas that were once buried under ice sheets! This is already happening on Lofoten Island, Norway. Picture courtesy www.neatorama.com

For more information and images visit www.daleharvey.com

Consequently, all these Climate Changes will mean no more than that: change. Change can spell the end for some things and ways of life, which will disappear forever, some for better; some for worse. And change always opens the door of opportunity for many others.

In each and every Climate Change before, this has been the time when new successful adaptations and species emerge and begin to thrive. The Human species may well adapt by changing itself!

And for Humankind and the wide world of Mammals, geological evidence clearly shows that every, even short-lived and small, warming Climate Change event in the past has always been a time of increased development, expansion and prosperity. This present Interglacial Warming Event is just a bigger and longer-lasting opportunity.

So there is every reason to speculate that the times ahead will be equally as advantageous. Change can be a very fortunate and good thing!

A Special Request.

So I sincerely ask of you, especially those of you in positions of authority and power, to act in a caring, moral and wise way. Reconsider your alternatives, as how you are historically remembered depends on your choices and decisions made today.

All of our futures depend upon it and we trust you to lead responsibly and with the wisdom with which we credit you.

And to all of you younger Generation, who are so caring and creatively talented; full of hope and love; expecting the promise of a happy, productive and wonderful life ahead of you: make the changes now that you know in your heart you should no matter what others around you think.

You have the right to this freedom and independence. You were ‘born this way’! You have been born here exactly at this moment in time to make a difference.

Your Generation are the heroic participants in a massive evolutionary Species change presently transforming this Planet. The outcome will change forever the destiny of Humankind and this Planet.

Each of you potentially has a very special purpose! And your very existence depends on how you act today if you plan to see a brighter tomorrow. It is useless wasting time in blaming others.

Spend the time wisely broadening your horizons, mastering your world, understanding Nature so that you will be prepared and rewarded with the insight and vision to secure your future happiness and survival.

When I see the world today, I am deeply touched by its confusion, sorrow and suffering: it is so sad to witness all the ridiculous anger, crime and greed and warfare. For I know that this is a needless waste of energy and time.

But even worse, these destructive attitudes are crushing into Mass Extinction a multitude of innocent victims around the world like so much Carboniferous vegetation.

What comes to mind are the immortal words of a great and inspiring person who was once martyred for His sincere beliefs:

“Father, forgive them, for they know not what they do.” Luke 23:34

But that spirit of forgiveness is hardly enough to put right the challenges standing before us. It is only the emotional and intellectual release necessary for all of us as a Species to break the chains of the past.

With the past released, we can all move ahead in a spirit of celebration and union knowing that when we all work together we can master and overcome all obstacles and prosper.

As a species, Humankind must adapt and evolve with these changing times or potentially face extinction. We will! It is no longer sufficient to say we ‘did not know’, because we all do know better than that now.

We must master our world, learn to appreciate and understand it, become sensitive to Natures’ ebb and flow with the changes it brings and move on to better, brighter days.

When looking at the impending potential Climate Changes and challenges facing Humankind today. When considering the knowledge of what the Earth’s great and long Archaeological and Geological history has revealed about our ancient past and our remarkable road of adaption and evolution.

It should be clear and obvious:

This is not the ‘end’ it is just the beginning

“God doesn’t make mistakes”, Lady Gaga.

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We are a world in union with Nature. While much is said about saving the Planet, it is often Nature that saves us, sometimes in silent and unexpected ways.
Here is a fine example of Nature helping Man. Please consider the story of George Rogers' Mighty Black Oak Tree:

BLACK OAK

Quercus Kelloggii
Quercus kelloggii, the California Black Oak or Kellogg Oak

George Rogers' 'Mighty Black Oak' Tree.

This majestic Black Oak growing in Middletown, California is a noble survivor that is at least 450 years old. According to professional Arborists, it sprang into life around 1561. Columbus had not long before discovered America and Balboa the Pacific. Cortes had only recently conquered the Aztec nation and Pissarro the Incas. De Soto had just explored the Mississippi River. By the time the first 'New World' colony was established at Roanoke, Virginia, this Oak was already 26 years old. This tree was already fully mature and feeding the Indigenous Indian Tribes when it witnessed the end of the great Native American Indian Nation.

It witnessed brush fires, droughts, earthquakes, the gold rush, the Mexican-American War and violent storms. It was already 289 years old when California first became a state and has survived the tests of time throughout the entire history of the USA and our modern world.

Through its centuries of clever adaptation and service this Black Oak has been the willing host for Pacific Mistletoe (Phoradendron villosum). It graciously

provided food, nesting, protective shade and shelter to hundreds of generations of Birds, especially Mountain Quail, Stellar Jays, Woodpeckers and 68 species of native Birds. Possibly American Black Bear, a variety of livestock, Mule Deer, feral Pigs, many Rodents and Tree Squirrels also would have found comfort, food and protection here.

In more recent years this mighty Black Oak Tree was a symbol of reliability, service and strength on the property of Mr. George Rogers.

It stands proudly as a protective sentinel in George's front yard where it can be admired from the windows of his home. And then by a turn of fate this majestic Oak became a symbol of hope, inspiration and living renewal that George feels helped save his life.

As George remembers:
"This tree is what I used for my business logo."

"Black Oak Heating AC & Sheet Metal"

"It is a business I no longer have" he said, as he tells us the inspiring story of what this Oak did for him:

"This Oak Tree has affected my life's existence. Its longevity, adaptability, perseverance, and appearance have inspired me to be who I am today."

"You see I'm a cancer survivor. This Oak Tree stands for being able to survive!"

According to his Doctors, George's condition was caused by his prolonged exposure to Agent Orange during his years of dedicated Military Service in the Vietnam Era. After an otherwise healthy and strong life, George developed highly malignant bone cancer in his jaw. His only hope of survival was to have the malignant jaw bone removed and replaced with his leg bone. "I became one of the few who has survived this ordeal at 60 years old."

The gruelling surgery took 17.5 hours. He spent eight days in ICU and another 10 days in the recovery ward. His face was swollen nearly round and unrecognisable. He had a large wound on his leg from where the bone had been removed. His neck and throat had to be cut open in order to replace his jaw so this meant even breathing was difficult and feeding had to be through a tube.

Afterward, his very talented Surgeons confided to him that the cancer was progressing so fast that operating one more week later would have been too late. But they warned George that healing from the surgery was the "easy part"

“Chemo and Radiation treatments, lifetime maximum dosages of each, were the hard part. I never thought you could see death, but talk about looking it in the eye.” And then “as far as adaptability is concerned, I had to learn how to eat with a 1/2 inch wide opening between my teeth. Finally getting solids in after 1 year of liquids was a real challenge. I had very little taste and most saliva glands destroyed but I persevered.”

Through such challenging times people often reflect on those things that are truly the most important and meaningful in one’s life.

“This Oak Tree has been an inspiration to me.” If that great Oak could endure and survive the large burl, much like a cancer, on its trunk, then George felt he could survive his cancer.

“My surgeons were very talented and (today) I don't have too many noticeable irregularities.” George’s thoughts so often returned to the large burl on trunk of the Oak Tree. If the mighty Oak could survive that burl, so could he. That thought continually renewed his spirit and kept him going and healing.

Every day was a challenge. He had to endure a chain running through his jaw and wearing his “Hannibal Lector radiation mask”, and also had to struggle to survive the massive disability caused by so much radiation and the Chemotherapy.

“When I was done with these I was so weak that they had to carry me from the car to the house where I sat in my chair for around 6 weeks with only enough strength to visit the restroom. Feeding food formula was my only nutrition for one year. Learning how to drink it from a straw instead of through a nasal tube to my stomach was a tough one because I could still taste and that stuff tasted pretty bad. “

George’s determination, highly positive attitude and resilience pulled him through. And his Black Oak Tree stood strongly there by his side as a sentinel of courage and strength throughout his ordeal continually inspiring and refreshing his spirit. But even the great majestic Black Oak survives through the fertile land, firm foundations and protective environment that support its growth. Likewise George remembers with greatest gratitude those who stood beside him and protected him during both the great times and his darkest hours:

“And all this could not have been accomplished without the help of the closest and dearest to me”. My Wife, Regina, has been an inspiration to me. She has given me a true appreciation for everything and has kept us going through thick and thin.”

“Thanks also for the love and support from Regina’s Mother, Lorene, her brother Tim and younger Sisters Gail and Carol.”

“I am eternally grateful to Regina’s Family and my Sister-in-Law, Gail Hoban and her wonderful Family, they are all now my Family. They have known me going on fifty years and their whole Family have accepted me as part of their Family. They all accept me as a Son and Brother. This is something I deeply appreciate because my whole Family has passed away, including three younger Brothers, my Mother and Father, too.”

George would never forget his Friends, “And also all my Friends who have stood by me every step of the way. Thank you all from the bottom of my heart. God Bless Them. God Bless Them All!”

Throughout it all George’s mighty Black Oak Tree remained a focus of inspiration just beyond the windows in the yard. As a symbol of endurance and strength it kept him going and provided the determination he needed to grow stronger every day. George reflects today, “I can remember vividly ringing the victory bell for completing my ordeal. They told me not many people make it through max of (Chemo, Radiation and Surgery) each at the same time.”

“I assimilate it to the 450 year old Black Oak in my yard as to my reason for survival. The Oak being bombarded with constant obstacles in order to survive, weather, pests, disease, and drought to name a few. That's what I think my experience entailed.”

“Any way we had to move to a cancer treatment center that was close. A trip I would not have survived living in Middletown, Ca.” So George, his devoted Wife and Family said ‘good-bye’ to their property and the great majestic Black Oak.

“Yes, let me say this again with the greatest of gratitude: this Oak Tree has been an inspiration to me and my Dear Wife and Family who have given me a true appreciation for everything and has kept us going through thick and thin. We truly miss not see it's majestic presence.”

But George Roger’s Mighty Black Oak Tree has become an intimate part of his life and his memories forever, as it has for countless other living souls who have been encouraged, feed, inspired, protected and sheltered within its majestic canopy throughout at least 450 years!

Long may it live on as a symbol of courage, protection and strength on this Living Earth.

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Post Script

George wrote back recently to add: “Doctors tell me this cancer usually manifests itself from smoking or heavy drinking. Two things I have never done. But I was exposed to Agent Orange on a constant basis for nine months when I was in the service. It causes cancer that can surface any time your body’s resistance is low. It's also been 3.5 years since I have filed a claim with the military to no avail.”

“Life can be a tough struggle but I have learned to appreciate every day to the fullest. You just have to have a reason for survival.”

Your dear friend

Geo

George Rogers happy, healthy and strong at home today.

Dale wrote back to George:

Bless your heart George! You are indeed a Heroic Survivor. Yes, yours is truly a miraculous story of survival.

You are indeed an inspiration, George, as well as a true and Noble Survivor, much like your cherished Mighty Black Oak Tree.

And thank you so much George for providing the inspirational force behind this paper on Climate Change.

Your Friend always,
Dale

George Rogers is probably happily fishing today.

ACORNS.

Native American Indians of California frequently include acorns in the Indians' diet. There are many kinds of Oak trees, and acorns varied in size and shape. Black Oak acorns were the favourites among Northern California Indians. Tan Oak acorns came next, and White Oaks last. As the acorns were gathered each variety was kept and stored separately. The preparation of acorns as food was the same for each variety.

Acorn preparation was often the responsibility of elderly women and even the blind. First the acorns were soaked overnight. This caused the hard outer shell to split open. The hard outer shell was removed and the kernels were picked out. Then the nut meats were spread out over open baskets where they were allowed to dry thoroughly. Once the nut meats were dry enough, they were crushed in a stone mortar and ground down into fine Acorn Flour Meal.

Once the Acorn Flour Meal was finely ground, it was rendered further through leaching. This removed the bitter taste caused from the tannic acid in the nuts. To do this the Indians prepared a frame of closely overlapping and often woven small branches or twigs of Incense Cedar (Calocedrus decurrens, California Incense-Cedar).

The twigs were laid overlapping, like roofing shingles, or woven like a mat. The Acorn Flour Meal was spread out over this frame. Water was poured through the Acorn Meal several times until the Meal turned a pinkish colour, which meant the tannins had cleared. The Incense Cedar leaves and twigs enhance the flavour of

the Acorn Meal giving it an aromatic spicy taste. Then the Acorn Meal was dried in open baskets or on woven mats and stored until time for it to be used.

To create Acorn Soup this Flour Meal was mixed with broth or water to create a thin gruel. This was then heated and eaten fresh. Or could be used as the stock base to which other meat or vegetables could be added.

Some Indian Tribes also made Acorn Bread. This classic Indian Acorn Bread has a nutty flavour enhanced by the Incense Cedar and is remarkably sweet!

The Acorn Meal was mixed with a little broth or water and worked into a firm paste. This was then shaped into round loaves.

Before baking these round loaves were a pale brick-red colour. If these loaves were being baked in ashes or hot coals the Acorn Bread was wrapped in Fern leaves.

These were then buried in the hot ashes where they slowly baked in the radiant heat which turned the bread black. The fern prints remained on the outside, looking much like a piece of coal or black stone with fossil markings.

Red clay was added to the Acorn Meal by some Indian Tribes. The red clay was added to further stiffen the dough in proportions of 1 part clay to 20 parts Acorn Meal.

Apparently the Iron in the red clay helps counteract the over-abundance of Acorn protein present in the nut. This further reddened the cooked bread and also makes the Acorn Bread much more digestible and nutritious. Bon appétit!

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REFERENCE SECTION

Additional Information and Reference Sources:

Biological Plant Time Line of Plant Evolution through Geological History: Life on Earth may be as much as 4000 million years old and single celled plant organisms were amongst the first things here.

The evolution of single-celled organisms has eventually diversified to produce the nexus of living creatures found on the Earth today. This paper summarises the evolutionary history of plant life development on Earth from its beginnings to the present day. http://en.wikipedia.org/wiki/Timeline_of_plant_evolution

Bolide/Meteor Impacts:

The random impact of meteors and Comets is much more common than once thought. Geological evidence now suggests that many of the Earth's terrestrial features and some coastlines have been shaped by their impacts.

The larger of these impacts is theorized to have produced so much ejectae thrown high into the Stratosphere as to drastically and near immediately produce Climate Changes so severe that they have lead to Mass Extinctions and long-term climate and environmental changes on the Planet.

Massive bolide impacts such as this one pictured here are more common than once thought. They can create huge craters like the Barringer Meteor Crater in Arizona. Such impacts have historically produced Climate Change events almost instantaneously. To see these and other pictures and for more information please see: http://en.wikipedia.org/wiki/Impact_event

Dansgaard-Oeschger Event Theory parallels the Milankovitch Theory of Earth's orbital eccentricity (see further on in this Additional Information and Reference Sources).

The data presented here suggest very regular and rhythmic cooling and warming cycles throughout geological time.

These rhythmic cycles are strongly correlated to Solar Sun Cycle Maximum & Minimum activity as much as orbital eccentricity. This theory also suggests that possibly an internal mechanism within the Earth is responsible for these rhythmic and period changes.

This data basically over-rides the premise of Global Warming being due entirely, if at all to CO2 Carbon Dioxide and 'greenhouse' gas emissions.

Dinosaurs and Humankind:

Dinosaurs have traditionally been viewed by Science as sometimes aggressive, cold-blooded, often lumbering and stupid creatures.

Yet there are other views about this. Some theories even link genetic traits between Humankind and Dinosaurs or their demise to parallel worlds and extraterrestrial events
Humankind is a very young species here on Earth. It seems to be a common characteristic amongst the inexperienced and young to adopt a rather arrogant and centralist point of thinking until they grow older and wiser.

These paradigms of thinking help to simplify a remarkably complicated, magical and timelessly vast world; and an infinite universe far beyond contemporary Human conception. Among such paradigm thoughts are 'dumb, stupid animals' or 'plants can't think' i.e. 'stupid as a vegetable'; 'bird brained'.

How ironic then that supposedly highly intelligent and rational, perhaps even 'scientific' minds may have trouble understanding the simple behaviour of their pets. Or how to keep a common plant alive, let alone grow a vegetable! .

Yet each of these supposedly 'stupid' species has adopted a unique intelligence that has allowed their relations to adapt, cope, increase and successfully survive through the countless ages. Will our species survive as long?

Already Humankind quakes with fear at the prospect of adapting and coping with inevitable Climate Changes. And these are quite small changes when compared to the massive climate extremes that have rhythmically occurred throughout the geological past ages.

Plus the most recent 'modern' Climate Changes appear to be largely caused, if one were to believe our paradigm way of thinking, by Humankind soiling its own nest i.e. destroying and polluting our natural environment. Even most 'dumb' animals or plants cope and know how to live better than that!

This same paradigm thinking would suggest that without our assistance and care all the 'helpless' creatures of this Earth would not have a chance of survival.

But actual fact is set in the stones of primordial history. It is more likely that these 'dumb' animal and plant species will adapt and survive a major Climate Change Event better than us. Matter of fact, when examining the recent geological record of Mass Extinctions almost surely the result of Human predation, it would appear the living remaining species would be much better off if Humankind was not

around at all! Paradigm thinking often assumes that we are the center of the entire universe. We are not. This is a near infinite universe.

So there must be a near-infinite number of living species in various stages of decline and development that span the ages from before time to the infinite beyond our scope of discovery and understanding.

Humankind is but one link in an infinite chain of life. Only a few years ago, 'modern thought' denied the possibility of any other solar system in the entire universe other than our own! And of course, no other life forms other than us.

Now Modern Astronomy is discovering hundreds of planets. And some Astronomers are considering that possibly almost every twinkling star in the heavens has a planetary system.

Amongst the billions of visible stars and their 'invisible' planets, there must be the potential for as many life forms.

Now scientific thought is entertaining the possibility of extraterrestrial life forms. And in the continuum of living possibilities, there must be the possibility of life forms much more advanced than our own species.

Along these lines of thinking, one interesting clue worth significant future research might be found in the Christian Bible Book of Genesis in the ancient story of creation.

Chapter 1 Genesis verse 26 is interesting: "Then God said, "And now we will make human beings; they will be like us and resemble us.

They will have power over the fish, the birds, and all animals, domestic and wild large and small" So God created human beings, making them to look like himself.

He created them male and female" Again later in Genesis 3:22: "Then the Lord God said, "Now the man has become like one of us and has knowledge of what is good and what is bad.

He must not be allowed to eat fruit from the tree of life, and live forever," Then in Genesis 6:1-5 "When mankind had spread all over the world, and the girls were being born, some of the supernatural beings (i.e. sons of the gods or sons of God) saw that these girls were beautiful, so they took the ones they liked. Then the Lord said, "I will not allow people to live forever; they are mortal. From now on they will live no longer than a hundred and twenty years."

In those days and even later, there were giants on the earth who were descendants of human women and the supernatural beings. They were the great heroes and famous men of long ago."

Ironic that there are so many legends and myths about 'Giants' all in very ancient times throughout so many diverse civilisations and cultures. Most of these involve rather fearsome and terrifying giants, mostly in superhuman-like form, often with massive heads, sharp claws or teeth that tore their prey apart.

Most all of these legends carry rather similar accounts of what these giants looked like. And these legends were passed down through each culture, independent of those in other cultures.

The Bible and these many legends and myths can't all be mistaken. Any student of Anthropology will remind you that myth and legends almost always distort and embellish upon the specific details in order to tell a story or make a point.

But the one big reason why each legend is passed down through the generations is that each story contains an essential 'fact 'or 'truth' about something astounding or remarkable that once happened.

Whatever it was is so essential and important to remember that the story is passed on from one generation to the next. In this case, it seems quite obvious that these accounts are meant to remind us that once Giants roamed the Earth!

Are these 'Giant' legends and ancient myths the means of explaining the bones of Dinosaurs they once discovered in the very ancient past?

Palaeontologists maintain that the first dinosaur bones were discovered around 1676 and the first fossil skeletons were discovered in the 19th Century. Certainly the ever-increasing array of Dinosaur skeletons being unearthed by modern Palaeontologists today is vindication of the legends that Giants once lived here.

Perhaps we need to re-examine the paradigms that have so long been accepted as 'fact'? Are these bones the "supernatural" "giant' beings mentioned in Genesis 6:4 "in those days, and even later, there were giants on the earth who were descendents of human women and the supernatural beings. They were the great heroes and famous men of long ago."Modern genetic scientific research does classify Humankind as a Synapsid which puts us in a direct but very distant genetic lineage to the ancient Dinosaurs.

But carbon-dating and archaeological findings so far would suggest that the 'dumb' Dinosaur 'giants' with tiny brains have only the most remote lineage. They

maintain that Humankind arrived much later in the evolutionary chain. But if the Biblical quote, fully sanctioned by the Church, and all these other 'giant' legends were myths created to explain Dinosaur bones, then the creatures were hardly stupid, they were "famous" and "great heroes" whose genera ruled the world for millions of years and today have evolved to fly as Birds and walk as Humankind!

In the past, this Biblical passage in Genesis and all the other many folk tales, legends and stories have often been summarily dismissed by modern science as 'myth'.

Yet as more evidence is being accumulated, the notion of Dinosaurs being 'stupid' now appears to be yet another convenient paradigm of thinking, not far removed from the once staunchly accepted view that the Earth was flat!

It is becoming increasingly clear from the wealth of scientific evidence, multitudes of legends and myths plus even Biblical Scripture that something amazing must have happened on the Earth way back then.

In the Biblical Creation story, when Lord God commented about Adam and Eve eating from the Tree of Knowledge the quote in Biblical Scriptures reads: Genesis 3:22 " Then the Lord God said, "Now the man has become like one of us and has knowledge of what is good and bad.

He must not be allowed to eat fruit from the tree of life, and live forever." Who are 'us'? And they live 'forever' because they have 'knowledge' after eating from the 'Tree of Life'!?

Because today's Biblical Scholars and modern Science have no answers to this question, the common response is to paradigm-answer this away as: 'God's Angels' or even worse: 'It is a mystery'. But clearly if the Holy Scriptures are to be believed, the Almighty Lord God was not alone out there.

If one were to take these passages literally, then He is accompanied by other Great Beings who have knowledge about the essence of life itself that gives them the power to live forever. And since modern science has now discovered a potentially infinite number of planets with potentially an infinite number of life forms. Mathematical Probability Theory would maintain that our Human species lies somewhere near the middle of evolutionary forms.

This suggests that many other highly intelligent Life Forms should exist and have successfully evolved for much longer than we have. If Humankind is inexplicably drawn to space exploration and inter-galactic travel, these other Life Forms have probably already mastered this science.

And if Genetic and Medical Science is now discovering the magic of genetic cloning as a method of evolutionary development and reproduction of any species, probably these advanced Life Forms have mastered this science, too.

So were the Dinosaurs and perhaps even chapters in Human evolutionary development part of an extra-terrestrial cloning experiment? It might have been. Such an intervention would certainly explain many of the Paleontological 'missing links' in the development and evolution of species.

For please recall in the same Biblical creation story, once Lord God had 'created' the heavens and the Earth, Genesis 1:26 "Then God said, "and now we will make human beings; they will be like us and resemble us.

"They will have power over the fish, the birds and all animals, domestic and wild, large and small." So God created human beings, making them to be like Himself. He created them male and female, blessed them, and said, "Have many children, so that your descendents will live all over the earth and bring it under their control.

I am putting you in charge of the fish, the birds, and all the wild animals.1:29 I have provided all kinds of grain and all kinds of fruit for you to eat; but for all the wild animals and for all the birds I have provided grass and leafy plants for food".

No one seems to have any trouble accepting this second part of the very same passage as gospel truth. Especially so is the part about having 'control and 'power' over everything on the Earth. This very passage and others similar to this have been used incessantly in modern times to justify Humankinds' reckless slaughter of everything in their environment around them as they have for centuries!

And seldom does anyone deny the credibility of this passage! And how were these Human beings created? According to Genesis 2:7 "Then the Lord God took some soil from the ground and formed a man out of it; he breathed life-giving breath into his nostrils and the man began to live." And plants and animals? Genesis 2:19 "So he took some soil from the ground and formed all the animals and all the birds. Then he brought them to the man to see what he would name them;"

And Women? Genesis 2:21 "Then the Lord God made the man fall into a deep sleep, and while he was sleeping, he took out one of the man's ribs and closed the flesh. He formed a woman out of the rib and brought her to him. 2:23 Then the man said, "At last, here is my own kind—Bone taken from my bone, and flesh from my flesh. 'Woman' is her name because she was taken out of man."

If one did not know where this classic passage came from and had to guess. Guaranteed many people might decide this was written by a school child whose father was an advanced Scientist working with Genetic Engineering! And perhaps this is what happened during a past age.

Or perhaps several times with both the development of Dinosaurs and the evolution of Humankind and its culture as well.

Whatever they are, however they got here, the Dinosaurs are indeed one of the most spectacular creations ever to walk the Earth. The proof is found today in multitudes of fossilized bones found around the world.

And to make this discovery even more profound is the modern scientific evidence that strongly suggests a genetic link between Dinosaurs and modern day Birds, Mammalian Vertebrates and even Humans!

These creatures were so adaptable and smart that from their earliest arrival as Reptiles of the Mid/Late Permian Period, they continued to adapt and flourish through endless Climate Changes; even surviving at least two major Extinction Events and ruled in related geneses for 195 million years.

And then after the Cretaceous-Palaeogene Extinction event their descendents rose like the proverbial Phoenix from the ashes of destruction and transformed into Mammalian Vertebrates and the Birds that fly through our skies today. How absolutely incredible and inspiring!

Hardly what one would consider ‘stupid’! What they truly represent, who they really were is still an open question for advanced research and discussion. The potentials of knowledge and life appear to be infinite as the beings that surround us here on Earth and in the Heavens.

Most likely we will soon learn much more from continuing scientific exploration and perhaps even with the next extraterrestrial visitation from the Heavens.

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El Nino/La Nina Climate Change Events are a common form of Climate Change happening in a rather regular cycle every two to seven years. Geological research suggests that these regular Climate Change Events have been occurring with some regularity since at least the Holocene Epoch 10,000 years ago and possible throughout the previous Pleistocene Epoch as well.

The rhythmic cyclical nature of these events suggests a correlation between the eccentric orbit of the Earth and its rhythmic 'wobble' on its axis, combining with the Solar Maximum/Minimum cycle.

There is also speculation that the development of the land bridge between North and South America during the Late Pliocene Epoch (2.588-3 million years ago) may have so profoundly cut off the circulation of the associated cooler Atlantic and warmer Pacific Ocean currents as to have been the major contributing factor to the start of this phenomenon.

The El Nino/La Nina Climate Change events result in variations in the ocean surface temperatures of the tropical eastern Pacific Ocean. The warming phase is known as El Niño and the cooling phase, La Niña.

This also results in a corresponding change in air surface pressure in the tropical western Pacific which is known as the Southern Oscillation.

During the warm ocean phase (El Niño) the eastern Pacific Ocean, especially near the Equatorial Zones becomes unusually warm while the western Pacific Ocean temperatures remain cooler than average. This massive warming suggests that the Earth's axis tilt or 'wobble' favours warming in that region of the Planet.

As South Pacific Ocean currents pushing east hit the continental 'wall' of coastal Central and South America they begin to pile up, becoming very warm, and then back up and recirculate moving from east to west warming the ocean waters near the Equator.

This results in steamy, wet lower pressure in the warmer waters of the east and higher air surface pressure with cooler temperatures and drier conditions in the western Pacific.

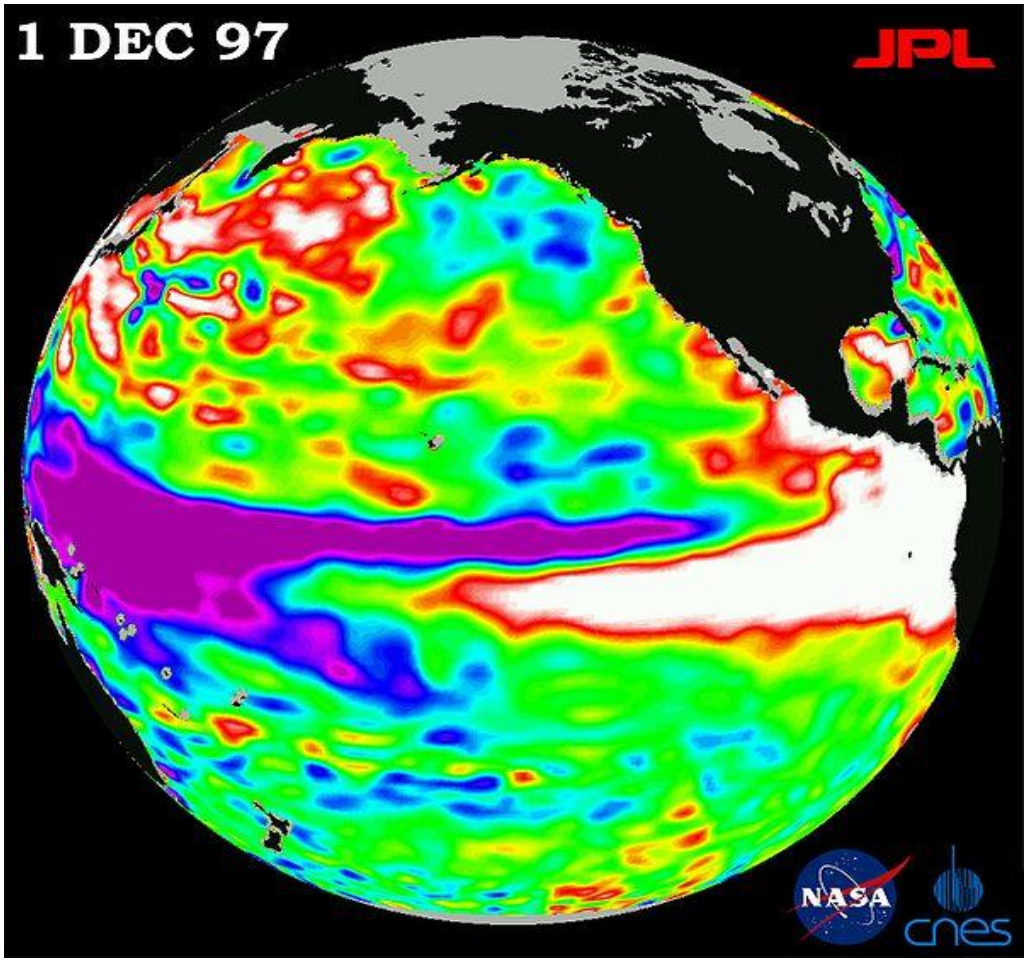
During the cold ocean phase, (La Niña), eastern Pacific Ocean temperatures remain cooler than average while western Pacific waters warm up resulting in low air surface pressure and more monsoonal wet and sometimes changeable or turbulent weather in the western Pacific Region. This is enhanced when the Earth's 'wobble' coincides with a Solar Maximum cycle which favours warming over the western Pacific.

The consequences of the El Nino/La Nina Southern Oscillation (ENSO) profoundly affect weather patterns in many parts of the world: bringing drought and heat to some, shifting cyclone patterns and cold, stormy wet weather to others.

Then as the Southern Oscillation shifts, the weather patterns make a corresponding shift as changing air pressure combined with evaporation rates from the changing heating patterns altering weather patterns.

This means drier weather occurring within the high pressure zones and stormy, often changeable or unstable and wet conditions around the edges of the high pressure and throughout the low pressure zones.

This satellite thermal image courtesy of NASA shows the ocean temperatures occurring in the



Pacific Ocean during the strong El Nino phase experienced during 1997. White represents high ocean temperatures shading down to blue/purple for colder than average ocean temperatures. For more information please see: http://en.wikipedia.org/wiki/El_Ni%C3%B1o

Evolutionary Biology: "Climate Change Triggered Rise and Fall of Six Waves of Mammalian Species Over Past 65 Million Years." A research paper from Brown University Professor of Evolutionary Biology Christine Janis strongly supports the idea that Climate Changes through geological time have so greatly affected and altered the natural environment as to have enhanced the development of mammalian species and has also lead to their extinction.

Evolution of Teaching: The Evolution of Life, Waikato University
This University of Waikato teaching study is a very helpful research document for Southern Hemisphere researchers. It traces the evolution of life through all geological ages from a Southern Hemisphere perspective.
http://sci.waikato.ac.nz/evolution/EvolutionOfLife.shtml

For more information and images visit www.daleharvey.com

Geological Time Lines:

Almost every geological time line has been differentiated by a major climate change and often a mass extinction event.

<table>
<tr><th>Eon</th><th>Era</th><th>Period</th><th>Epoch</th><th>Old Periods</th></tr>
<tr><td rowspan="12">Phanerozoic Eon
543 mya to Present</td><td rowspan="7">Cenozoic Era
65 mya to Present</td><td rowspan="4">Neogene</td><td>Holocene</td><td rowspan="2">Quaternary
1.8 mya to Present</td></tr>
<tr><td>Pleistocene</td></tr>
<tr><td>Pliocene</td><td rowspan="5">Tertiary
65 to 1.8 mya</td></tr>
<tr><td>Miocene</td></tr>
<tr><td rowspan="3">Paleogene</td><td>Oligocene</td></tr>
<tr><td>Eocene</td></tr>
<tr><td>Paleocene</td></tr>
<tr><td rowspan="3">Mesozoic Era
248 mya to 65 mya</td><td colspan="3">Cretaceous 144 mya to 65 mya</td></tr>
<tr><td colspan="3">Jurassic 206 to 144 mya</td></tr>
<tr><td colspan="3">Triassic 248 to 206 mya</td></tr>
<tr><td rowspan="6">Paleozoic Era
543 to 248 mya</td><td colspan="3">Permian 290 to 248 mya</td></tr>
<tr><td colspan="3">Carboniferous 354 to 290 mya</td></tr>
<tr><td colspan="3">Devonian 417 to 354 mya</td></tr>
<tr><td colspan="3">Silurian 443 to 417 mya</td></tr>
<tr><td colspan="3">Ordovician 490 to 443 mya</td></tr>
<tr><td colspan="3">Cambrian 543 to 490 mya</td></tr>
<tr><td rowspan="3">Precambrian Time
4,500 to 543 mya</td><td colspan="4">Proterozoic Era 2,500 to 543 mya</td></tr>
<tr><td colspan="4">Archaean 3,800 to 2,500 mya</td></tr>
<tr><td colspan="4">Hadean 4,500 to 3,800 mya</td></tr>
</table>

This chart courtesy of http://www.fossils-facts-and-finds.com/index.html

For more information and images visit www.daleharvey.com

Geological Time Scale:

This graph shows all Earth's many ages and phases of development through geological time as used by Geologists. This paper contains a spiralling scale model of geological time, a Paleomap of continental drift and also the following very well-defined Table of Geologic Time. This comprehensive chart courtesy: http://en.wikipedia.org/wiki/Geologic_time

The following table summarizes the major events and characteristics of the periods of time making up the geologic time scale. As above, this time scale is based on the International Commission on Stratigraphy. (See lunar geologic timescale for a discussion of the geologic subdivisions of Earth's moon.) This table is arranged with the most recent geologic periods at the top, and the most ancient at the bottom. The height of each table entry does not correspond to the duration of each subdivision of time.

The content of the table is based on the current official geologic time scale of the International Commission on Stratigraphy with the epoch names altered to the early/late format from lower/upper as recommended by the ICS when dealing with chronostratigraphy

Geologic time scale

Supereon	Eon	Era	Period	Epoch	Age	Major events	Start, million years ago
Cambrian	Phanerozoic	Cenozoic	Quaternary	Holocene	chrons: Subatlantic · Subboreal · Atlantic · Boreal · Preboreal	The last glacial period ends; rise of human civilization. Quaternary Ice Age recedes, and the current interglacial begins. Younger Dryas cold spell occurs, Sahara forms from savannah, and agriculture begins, allowing humans to build cities. Paleolithic/Neolithic (Stone Age) cultures begin around 10000 BC, giving way to Copper Age (3500 BC) and Bronze Age (2500 BC). Cultures continue to grow in complexity and technical advancement through the Iron Age (1200 BC), giving rise to many pre-historic cultures throughout the world, eventually leading into Classical Antiquity, such as the Roman Empire and even to the Middle Ages and present day. Little Ice Age (stadial) causes brief cooling in Northern Hemisphere from 1400 to 1850. Also refer to the List of archaeological periods for clarification on early cultures and ages. Mount Tambora erupts in 1815, causing the Year Without a Summer (1816) in Europe and North America from a volcanic winter. Following the Industrial Revolution, Atmospheric CO_2 levels rise from around 280 parts per million volume (ppmv) to the current level of 390 ppmv.	0.011430 ± 0.00013
				Pleistocene	Tarantian · Tyrrhenian Stage · Eemian · Sangamonian	Flourishing and then extinction of many large mammals (Pleistocene megafauna). Evolution of anatomically modern	0.126 ± 0.005*

					Ionian	humans. Quaternary Ice Age continues with glaciations and interstadials (and the accompanying fluctuations from 100 to 300 ppmv in atmospheric CO_2 levels), further intensification of Icehouse Earth conditions, roughly 1.6 Ma. Last glacial maximum (30000 years ago), last glacial period (18000–15000 years ago). Dawn of human stone-age cultures, with increasing technical complexity relative to previous ice age cultures, such as engravings and clay statues (e.g. Venus of Lespugue), particularly in the Mediterranean and Europe. Lake Toba supervolcano erupts 75000 years before present, causing a volcanic winter that pushes humanity to the brink of extinction. Pleistocene ends with Oldest Dryas, Older Dryas/Allerød and Younger Dryas climate events, with Younger Dryas forming the boundary with the Holocene.	0.781 ± 0.005*
					Calabrian		1.806 ± 0.005*
					Gelasian		2.588 ± 0.005*
			Neogene	Pliocene	Piacenzian/Blancan	Intensification of present Icehouse conditions, present (Quaternary) ice age begins roughly 2.58 Ma; cool and dry climate. Australopithecines, many of the existing genera of mammals, and recent mollusks appear. *Homo habilis* appears.	3.600 ± 0.005*
					Zanclean		5.332 ± 0.005*
				Miocene	Messinian	Moderate Icehouse climate, puncuated by ice ages; Orogeny in northern hemisphere. Modern mammal and bird families become recognizable. Horses and mastodons diverse. Grasses become ubiquitous. First apes appear (for reference see the article: "Sahelanthropus tchadensis"). Kaikoura Orogeny forms Southern Alps in New Zealand, continues today. Orogeny of the	7.246 ± 0.05*
					Tortonian		11.608 ± 0.05*
					Serravallian		13.65 ± 0.05*

					Langhian	Alps in Europe slows, but continues to this day. Carpathian orogeny forms Carpathian Mountains in Central and Eastern Europe. Hellenic orogeny in Greece and Aegean Sea slows, but continues to this day. Middle Miocene Disruption occurs. Widespread forests slowly draw in massive amounts of CO_2, gradually lowering the level of atmospheric CO_2 from 650 ppmv down to around 100 ppmv[20].	15.97 ± 0.05*
					Burdigalian		20.43 ± 0.05*
					Aquitanian		23.03 ± 0.05*
			Paleogene	Oligocene	Chattian	Warm but cooling climate, moving towards Icehouse; Rapid evolution and diversification of fauna, especially mammals. Major evolution and dispersal of modern types of flowering plants	28.4 ± 0.1*
					Rupelian		33.9 ± 0.1*
				Eocene	Priabonian	Moderate, cooling climate. Archaic mammals (e.g. Creodonts, Condylarths, Uintatheres, etc) flourish and continue to develop during the epoch. Appearance of several "modern" mammal families. Primitive whales diversify. First grasses. Reglaciation of Antarctica and formation of its ice cap; Azolla event triggers ice	37.2 ± 0.1*
					Bartonian		40.4 ± 0.2*
					Lutetian		48.6 ± 0.2*

					Ypresian	age, and the Icehouse Earth climate that would follow it to this day, from the settlement and decay of seafloor algae drawing in massive amounts of atmospheric carbon dioxide, lowering it from 3800 ppmv down to 650 ppmv. End of Laramide and Sevier Orogenies of the Rocky Mountains in North America. Orogeny of the Alps in Europe begins. Hellenic Orogeny begins in Greece and Aegean Sea.	55.8 ± 0.2*
				Paleocene	Thanetian	Climate tropical. Modern plants appear; Mammals diversify into a number of primitive lineages following the extinction of the dinosaurs. First large mammals (up to bear or small hippo size). Alpine orogeny in Europe and Asia begins. Indian Subcontinent collides with Asia 55 Ma, Himalayan Orogeny starts between 52 and 48 Ma.	58.7 ± 0.2*
					Selandian		61.7 ± 0.3*
					Danian		65.5 ± 0.3*
		Mesozoic	Cretaceous	Late	Maastrichtian	Flowering plants proliferate, along with new types of insects. More modern teleost fish begin to appear. Ammonites, belemnites, rudist bivalves, echinoids and sponges all common. Many new types of dinosaurs (e.g. Tyrannosaurs, Titanosaurs, duck bills, and horned dinosaurs) evolve on land, as do Eusuchia (modern crocodilians); and mosasaurs and modern sharks appear in the sea. Primitive birds gradually replace pterosaurs.	70.6 ± 0.6*
					Campanian		83.5 ± 0.7*
					Santonian		85.8 ± 0.7*
					Coniacian		89.3 ± 1.0*

					Turonian	Monotremes, marsupials and placental mammals appear. Break up of Gondwana. Beginning of Laramide and Sevier Orogenies of the Rocky Mountains. Atmospheric CO_2 close to present-day levels.	93.5 ± 0.8*
					Cenomanian		99.6 ± 0.9*
				Early	Albian		112.0 ± 1.0*
					Aptian		125.0 ± 1.0*
					Barremian		130.0 ± 1.5*
					Hauterivian		136.4 ± 2.0*
					Valanginian		140.2 ± 3.0*
					Berriasian		145.5 ± 4.0*
			Jurassic	Late	Tithonian	Gymnosperms (especially conifers, Bennettitales and cycads) and ferns common. Many types of dinosaurs, such as sauropods, carnosaurs, and stegosaurs. Mammals common but small. First birds and lizards. Ichthyosaurs and plesiosaurs diverse. Bivalves, Ammonites and belemnites abundant. Sea urchins very common, along with crinoids, starfish, sponges, and terebratulid and rhynchonellid brachiopods. Breakup of Pangaea into Gondwana and Laurasia. Nevadan orogeny in North America. Rantigata and Cimmerian Orogenies taper off. Atmospheric CO_2 levels 4–5 times the present day levels (1200–1500 ppmv,	150.8 ± 4.0*
					Kimmeridgian		155.7 ± 4.0*
					Oxfordian		161.2 ± 4.0*
				Middle	Callovian		164.7 ± 4.0
					Bathonian		167.7 ± 3.5*
					Bajocian		171.6 ± 3.0*

					Aalenian	compared to today's 385 ppmv).	175.6 ± 2.0*
				Early	Toarcian		183.0 ± 1.5*
					Pliensbachian		189.6 ± 1.5*
					Sinemurian		196.5 ± 1.0*
					Hettangian		199.6 ± 0.6*
			Triassic	Late	Rhaetian	Archosaurs dominant on land as dinosaurs, in the oceans as Ichthyosaurs and nothosaurs, and in the air as pterosaurs. Cynodonts become smaller and more mammal-like, while first mammals and crocodilia appear. *Dicroidium* flora common on land. Many large aquatic temnospondyl amphibians. Ceratitic ammonoids extremely common. Modern corals and teleost fish appear, as do many modern insect clades. Andean Orogeny in South America. Cimmerian Orogeny in Asia. Rangitata Orogeny begins in New Zealand. Hunter-Bowen Orogeny in Northern Australia, Queensland and New South Wales ends, (c. 260–225 Ma)	203.6 ± 1.5*
					Norian		216.5 ± 2.0*
					Carnian		228.0 ± 2.0*
				Middle	Ladinian		237.0 ± 2.0*
					Anisian		245.0 ± 1.5*
				Early	Olenekian		249.7 ± 1.5*
					Induan		251.0 ± 0.7*

		Paleozoic	Permian	Lopingian	Changhsingian	Landmasses unite into supercontinent Pangaea, creating the Appalachians. End of Permo-Carboniferous glaciation. Synapsid reptiles (pelycosaurs and therapsids) become plentiful, while parareptiles and temnospondyl amphibians remain common. In the mid-Permian, coal-age flora are replaced by cone-bearing gymnosperms (the first true seed plants) and by the first true mosses. Beetles and flies evolve. Marine life flourishes in warm shallow reefs; productid and spiriferid brachiopods, bivalves, forams, and ammonoids all abundant. Permian-Triassic extinction event occurs 251 Ma: 95% of life on Earth becomes extinct, including all trilobites, graptolites, and blastoids. Ouachita and Innuitian orogenies in North America. Uralian orogeny in Europe/Asia tapers off. Altaid orogeny in Asia. Hunter-Bowen Orogeny on Australian Continent begins (c. 260–225 Ma), forming the MacDonnell Ranges.	253.8 ± 0.7*
					Wuchiapingian		260.4 ± 0.7*
				Guadalupian	Capitanian		265.8 ± 0.7*
					Wordian/Kazanian		268.4 ± 0.7*
					Roadian/Ufimian		270.6 ± 0.7*
				Cisuralian	Kungurian		275.6 ± 0.7*
					Artinskian		284.4 ± 0.7*
					Sakmarian		294.6 ± 0.8*
					Asselian		299.0 ± 0.8*
			Carbon-iferous Pennsy-vanian	Late	Gzhelian	Winged insects radiate suddenly; some (esp. Protodonata and Palaeodictyoptera) are quite large. Amphibians common and diverse. First reptiles and coal forests (scale trees, ferns, club trees, giant horsetails, *Cordaites*, etc.). Highest-ever atmospheric oxygen levels. Goniatites, brachiopods, bryozoa, bivalves, and corals plentiful in the seas and oceans. Testate forams proliferate. Uralian orogeny in Europe and Asia. Variscan	303.9 ± 0.9*
					Kasimovian		306.5 ± 1.0*
				Middle	Moscovian		311.7 ± 1.1*

				Early	Bashkirian	orogeny occurs towards middle and late Mississippian Periods.	318.1 ± 1.3*
			Carbon-iferous Missis-sippian	Late	Serpukhovian	Large primitive trees, first land vertebrates, and amphibious sea-scorpions live amid coal-forming coastal swamps. Lobe-finned rhizodonts are dominant big fresh-water predators. In the oceans, early sharks are common and quite diverse; echinoderms (especially crinoids and blastoids) abundant. Corals, bryozoa, goniatites and brachiopods (Productida, Spiriferida, etc.) very common, but trilobites and nautiloids decline. Glaciation in East Gondwana. Tuhua Orogeny in New Zealand tapers off.	326.4 ± 1.6*
				Middle	Viséan		345.3 ± 2.1*
				Early	Tournaisian		359.2 ± 2.5*
			Devonian	Late	Famennian	First clubmosses, horsetails and ferns appear, as do the first seed-bearing plants (progymnosperms), first trees (the progymnosperm *Archaeopteris*), and first (wingless) insects. Strophomenid and atrypid brachiopods, rugose and tabulate corals, and crinoids are all abundant in the oceans. Goniatite ammonoids are plentiful, while squid-like coleoids arise. Trilobites and armoured agnaths decline, while jawed fishes	374.5 ± 2.6*
					Frasnian		385.3 ± 2.6*
				Middle	Givetian		391.8 ± 2.7*
					Eifelian		397.5 ± 2.7*

				Early	Emsian	(placoderms, lobe-finned and ray-finned fish, and early sharks) rule the seas. First amphibians still aquatic. "Old Red Continent" of Euramerica. Beginning of Acadian Orogeny for Anti-Atlas Mountains of North Africa, and Appalachian Mountains of North America, also the Antler, Variscan, and Tuhua Orogeny in New Zealand.	407.0 ± 2.8*
					Pragian		411.2 ± 2.8*
					Lochkovian		416.0 ± 2.8*
					no faunal stages defined	First Vascular plants (the rhyniophytes and their relatives), first millipedes and arthropleurids on land. First jawed fishes, as well as many armoured jawless fish, populate the seas. Sea-scorpions reach large size. Tabulate and rugose corals, brachiopods (*Pentamerida*, Rhynchonellida, etc.), and crinoids all abundant. Trilobites and mollusks diverse; graptolites not as varied. Beginning of Caledonian Orogeny for hills in England, Ireland, Wales, Scotland, and the Scandinavian Mountains. Also continued into Devonian period as the Acadian Orogeny, above. Taconic Orogeny tapers off. Lachlan Orogeny on Australian Continent tapers off.	418.7 ± 2.7*
					Ludfordian		421.3 ± 2.6*
					Gorstian		422.9 ± 2.5*
					Homerian/Lockportian		426.2 ± 2.4*
					Sheinwoodian/Tonawandan		428.2 ± 2.3*
					Telychian/Ontarian		436.0 ± 1.9*
					Aeronian		439.0 ± 1.8*
					Rhuddanian		443.7 ± 1.5*
			Ordovician	Late	Hirnantian	Invertebrates diversify into many new types (e.g., long straight-shelled cephalopods). Early corals, articulate brachiopods (*Orthida*, *Strophomenida*, etc.), bivalves, nautiloids, trilobites, ostracods, bryozoa, many types of echinoderms (crinoids, cystoids, starfish, etc.), branched graptolites, and other taxa all	445.6 ± 1.5*
					other faunal stages		460.9 ± 1.6*
				Middle	Darriwilian		468.1 ± 1.6*

					other faunal stages	common. Conodonts (early planktonic vertebrates) appear. First green plants and fungi on land. Ice age at end of period.	471.8 ± 1.6*
				Early	Arenig		478.6 ± 1.7*
					Tremadocian		488.3 ± 1.7*
			Cambrian	Furongian	other faunal stages	Major diversification of life in the Cambrian Explosion. Numerous fossils; most modern animal phyla appear. First chordates appear, along with a number of extinct, problematic phyla. Reef-building Archaeocyatha abundant; then vanish. Trilobites, priapulid worms, sponges, inarticulate brachiopods (unhinged lampshells), and many other animals numerous. Anomalocarids are giant predators, while many Ediacaran fauna die out. Prokaryotes, protists (e.g., forams), fungi and algae continue to present day. Gondwana emerges. Petermann Orogeny on the Australian Continent tapers off (550–535 Ma). Ross Orogeny in Antarctica. Adelaide Geosyncline (Delamerian Orogeny), majority of orogenic activity from 514–500 Ma. Lachlan Orogeny on Australian Continent, c. 540–440 Ma. Atmospheric CO_2 content roughly 20–35 times present-day (Holocene) levels (6000 ppmv compared to today's 385 ppmv)	496.0 ± 2.0*
					Paibian/Ibexian/ Ayusokkanian/Sakian/ Aksayan		501.0 ± 2.0*
				Middle	other faunal stages/Albertan		513.0 ± 2.0
				Early	other faunal stages/ Waucoban/Tommotian/ Atdabanian/Botomian		542.0 ± 1.0*

Precam-brian	Proter-ozoic	Neo-proterozoic	Ediacaran	Good fossils of the first multi-celled animals. Ediacaran biota flourish worldwide in seas. Simple trace fossils of possible worm-like *Trichophycus*, etc. First sponges and trilobitomorphs. Enigmatic forms include many soft-jellied creatures shaped like bags, disks, or quilts (like *Dickinsonia*). Taconic Orogeny in North America. Aravalli Range orogeny in Indian Subcontinent. Beginning of Petermann Orogeny on Australian Continent. Beardmore Orogeny in Antarctica, 633–620 Ma.	630 +5/-30*
			Cryogenian	Possible "Snowball Earth" period. Fossils still rare. Rodinia landmass begins to break up. Late Ruker / Nimrod Orogeny in Antarctica tapers off.	850
			Tonian	Rodinia supercontinent persists. Trace fossils of simple multi-celled eukaryotes. First radiation of dinoflagellate-like acritarchs. Grenville Orogeny tapers off in North America. Pan-African orogeny in Africa. Lake Ruker / Nimrod Orogeny in Antarctica, 1000 ± 150 Ma. Edmundian Orogeny (c. 920 - 850 Ma), Gascoyne Complex, Western Australia. Adelaide Geosyncline laid down on Australian Continent, beginning of Adelaide Geosyncline (Delamerian Orogeny) in that continent.	1000
		Meso-proteroz oic	Stenian	Narrow highly metamorphic belts due to orogeny as Rodinia forms. Late Ruker / Nimrod Orogeny in Antarctica possibly begins. Musgrave Orogeny (c. 1080 Ma), Musgrave Block, Central Australia.	1200

			Ectasian	Platform covers continue to expand. Green algae colonies in the seas. Grenville Orogeny in North America.	1400
			Calymmian	Platform covers expand. Barramundi Orogeny, McArthur Basin, Northern Australia, and Isan Orogeny, c. 1600 Ma, Mount Isa Block, Queensland	1600
		Paleo-proterozoic	Statherian	First complex single-celled life: protists with nuclei. Columbia is the primordial supercontinent. Kimban Orogeny in Australian Continent ends. Yapungku Orogeny on Yilgarn craton, in Western Australia. Mangaroon Orogeny, 1680–1620 Ma, on the Gascoyne Complex in Western Australia. Kararan Orogeny (1650-Ma), Gawler Craton, South Australia.	1800
			Orosirian	The atmosphere becomes oxygenic. Vredefort and Sudbury Basin asteroid impacts. Much orogeny. Penokean and Trans-Hudsonian Orogenies in North America. Early Ruker Orogeny in Antarctica, 2000 - 1700 Ma. Glenburgh Orogeny, Glenburgh Terrane, Australian Continent c. 2005–1920 Ma. Kimban Orogeny, Gawler craton in Australian Continent begins.	2050
			Rhyacian	Bushveld Igneous Complex forms. Huronian glaciation.	2300
			Siderian	Oxygen catastrophe: banded iron formations forms. Sleaford Orogeny on Australian Continent, Gawler Craton 2440–2420 Ma.	2500

Precam-brian	Archean	Neoarchean	Stabilization of most modern cratons; possible mantle overturn event. Insell Orogeny, 2650 ± 150 Ma. Abitibi greenstone belt in present-day Ontario and Quebec begins to form, stablizes by 2600 Ma.	2800
		Mesoarchean	First stromatolites (probably colonial cyanobacteria). Oldest macrofossils. Humboldt Orogeny in Antarctica. Blake River Megacaldera Complex begins to form in present-day Ontario and Quebec, ends by roughly 2696 Ma.	3200
		Paleoarchean	First known oxygen-producing bacteria. Oldest definitive microfossils. Oldest cratons on Earth (such as the Canadian Shield and the Pilbara Craton) may have formed during this period. Rayner Orogeny in Antarctica.	3600
		Eoarchean	Simple single-celled life (probably bacteria and archaea). Oldest probable microfossils.	3800

	Hadean	Early Imbrian	Indirect photosynthetic evidence (e.g., kerogen) of primordial life. This era overlaps the end of the Late Heavy Bombardment of the inner solar system.	c.3850
		Nectarian	This unit gets its name from the lunar geologic timescale when the Nectaris Basin and other greater lunar basins form by big impact events.	c.3920
		Basin Groups	Oldest known rock (4030 Ma. The first life forms and self-replicating RNA molecules evolve around 4000 Ma after the Late Heavy Bombardment ends on Earth. Napier Orogeny in Antarctica, 4000 ± 200 Ma.	c.4150
		Cryptic	Oldest known mineral (Zircon, 4406 ± 8 Ma). Formation of Moon (4533 Ma), probably from giant impact. Formation of Earth (4567.17 to 4570 Ma)	c.4570

This entire chart, graph and contents courtesy http://en.wikipedia.org/wiki/Geologic_time

For more information and images visit www.daleharvey.com

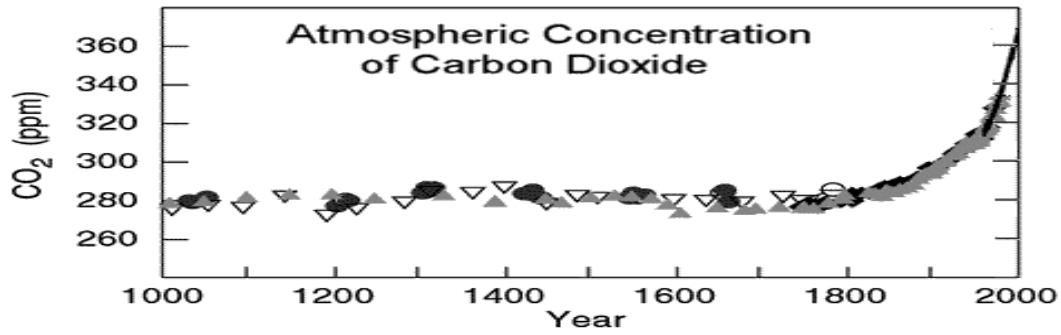
Geologic and Biological Timeline of the Earth:
A convenient summary of geological events and biological development on the Earth.

Complete with handy data and illustrations.
http://www.scientificpsychic.com/etc/timeline/timeline.html

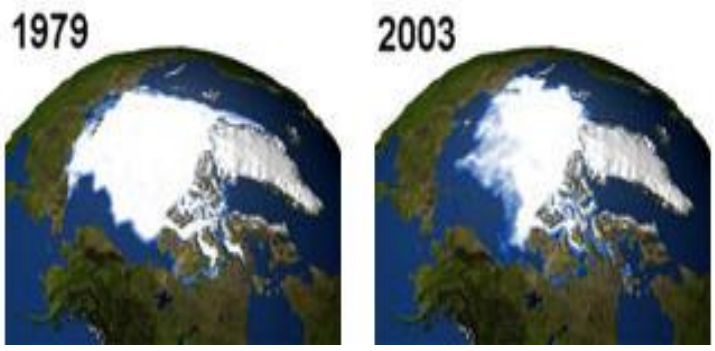
The following excerpt comes from this informative reference source and is entitled 'The Earth's Near-Term Future'.

"Human industrial activity that relies on burning fossil fuels, such as coal and petroleum products, has been generating the greenhouse gases carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), in large quantities since about 1750. The chart below shows the levels of atmospheric carbon dioxide during the last millennium and its sharp rise during the last century.

Atmospheric models predict that elevated greenhouse gases will cause global warming and influence weather patterns that will melt polar ice and destroy the habitat of animals such as the polar bear. The increase of global temperatures will also reduce the amount of snow deposited on mountains thus decreasing the flow of water in rivers which are now used for navigation, irrigation, and as sources of potable water. Carbon dioxide will also increase the acidity of sea water and threaten coral reefs and shell-building oceanic life forms.



Today, the concentration of atmospheric carbon dioxide is 380 parts per million (ppm) and the North Pole's mean annual temperature is -20°C. Analysis of core sediments in the Arctic Circle indicate that 55 million years ago, the carbon dioxide concentration was 2,000 ppm and the North Pole's temperature averaged 23°C



(73.4°F). Satellite images by NASA show approximately a 20% reduction in the Earth's minimum ice cover between 1979 and 2003. Arctic perennial sea ice has been decreasing at a rate of 9% every ten years. At this rate, the summertime Arctic Ocean will be ice-free before the year 2100.

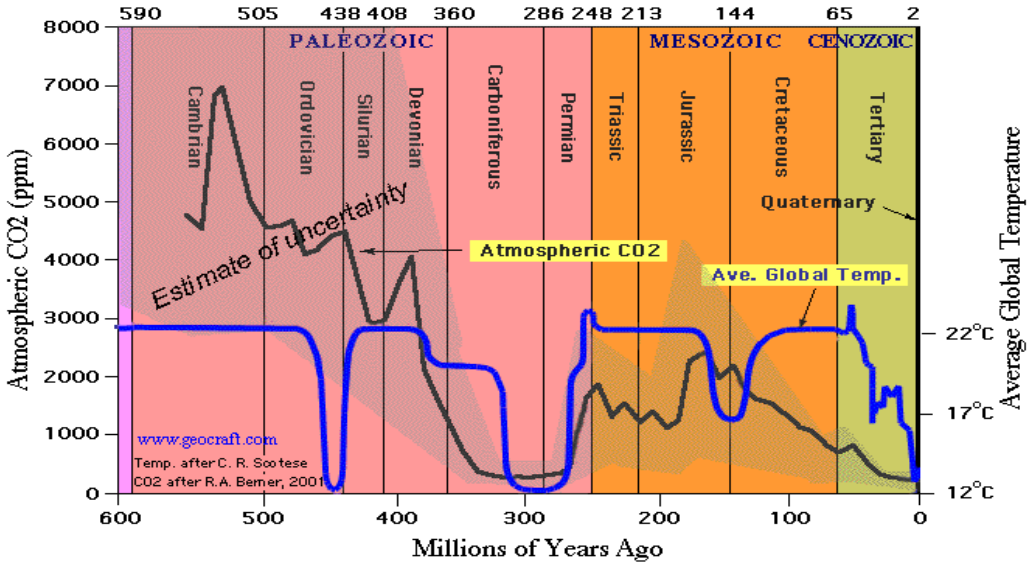
There is a large amount of water stored as ice over the landmasses of Greenland and Antarctica. If the ice sheets melt, the resulting rise in global sea level will flood many coastal areas around the world.

The Greenland ice sheet contains enough water to increase the global sea level by 24 feet (7.3 meters), the West Antarctic ice sheet could raise sea level by 19 feet (5.8 meters), and the East Antarctic ice sheet could raise the sea level globally by 170 feet (51.8 meters). The combined effect of melting all the ice on Greenland and Antarctica would result in a sea level rise of 213 feet (65 meters)."

The previous excerpt was courtesy: http://www.scientificpsychic.com/etc/timeline/timeline.html

Global Temperature and Atmosphere C02 Levels over Geologic Time

This Geological and Scientific study demonstrates that both CO2 Levels and Average Global Temperature, while beginning to rise dramatically still remain at their **lowest rates** now as any other time in the Geological history of the Earth.



The fact that present CO2 levels and Average Global Temperatures are still at their lowest levels as compared through geological time, almost certainly these levels will rise in the future; resulting in a corresponding global rise in sea levels. This graph and data entitled Plant Fossils of west Virginia, Climate During the Carboniferous Period courtesy: http://www.geocraft.com/WVFossils/Carboniferous_climate.html

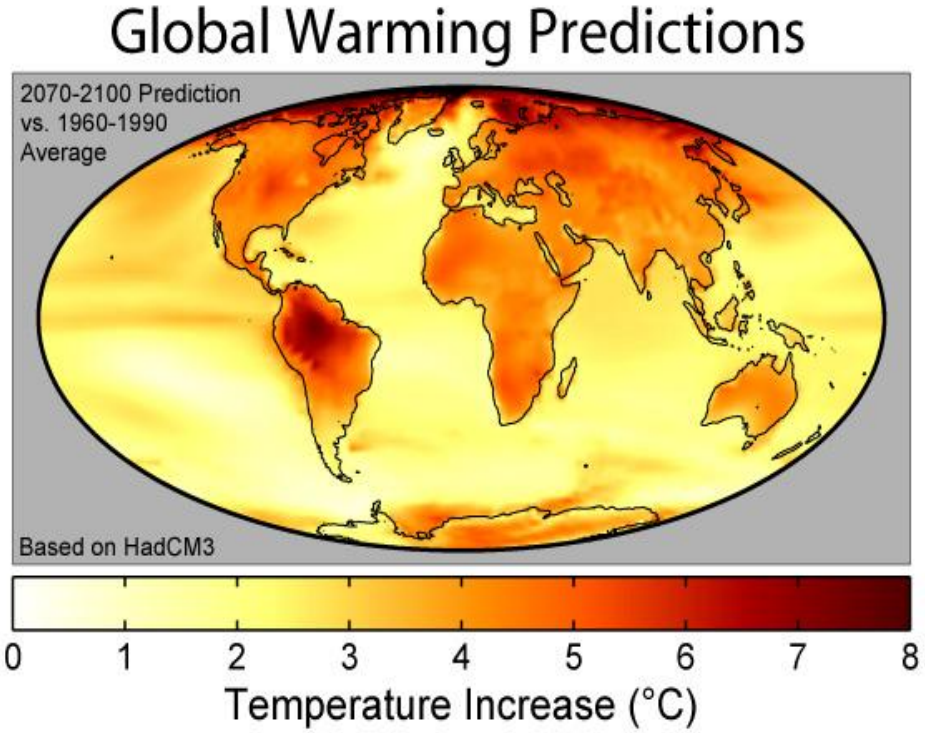
Global Warming: http://en.wikipedia.org/wiki/Global_Warming Documents the present rate of Global Warming updated to November 2011. Scientific data clearly maintains that the present Holocene Epoch is entirely part of an Interglacial Warming

Climate Change Event with rather sustained and then rapid warming trends combined with rising CO2 levels and seas levels.

Opening the data to include a much wider span of geological time frame reveals a much more regular and rhythmic fall and rise in CO2, Methane, Temperatures and sea levels which has occurred many times before. The HadCM3 computer models used to predict further global warming and subsequent Climate Change closely reflect what has happened before during past Interglacial Warming Phases on the Earth. Humankind has not been present as a species on the Planet long enough to witness one of these Interglacial Warming Phases.

The Anthropogenic (Human) influence on the Earth's natural environment is unmistakable. Ironically, it would appear that Humankind's activities are acting as a 'natural agent' producing near identical results to what have occurred in past geological ages when Humans were not here but other life forms were predominant and produced somewhat similar effects.

The rapid expansion of the Human Species and its anthropogenic activities could yet push the Global Environment into a new and very different period of sustained Climate Change with associated warming, atmospheric and meteorological changes and increased tectonic activity that ultimately re-defines these times as the (beginning) of a new Anthropogenic Epoch.

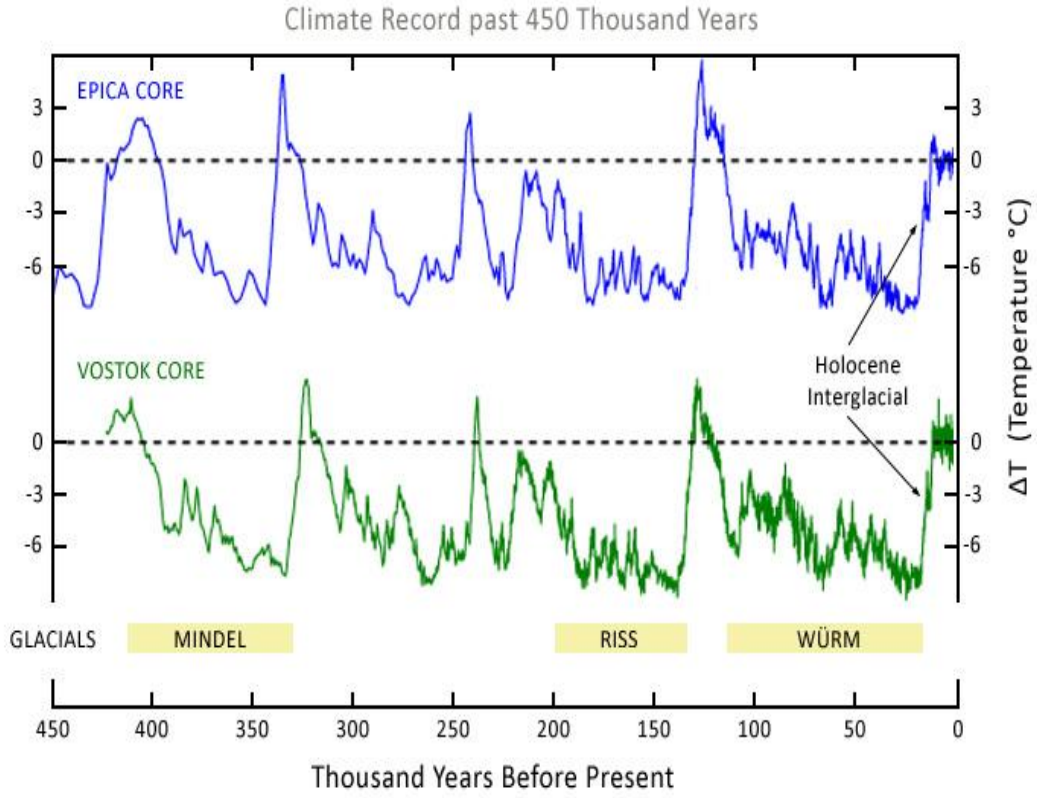


This is the HadCM3 computer model for Climate Change within the 21st Century. This model assumes that Humankinds business activities and civilization continues on its present course without change. Chart courtesy http://en.wikipedia.org/wiki/Global_warming

For more information and images visit www.daleharvey.com

Ice Ages: There have been at least five major Ice Ages, including the one presently occurring on the Earth (see Quaternary Glaciation further in this reference section).

Much research has been done on the various Ice Ages and their causes. The world is in the warming phase of an Ice Age now and Humankind is largely a warm-blooded adaptive product of the previous to recent Quaternary Ice Age.



Through 'recent' geological time over at least the past 650,000 years the Earth's climate has experienced repeated Glaciation and Ice Ages followed by periods of rapid Interglacial Global Warming Intervals (IWI).

This Glaciation Cycle is shown here on the Late Pleistocene CO2 and Glaciation chart, which clearly shows that rapid falls and rises in CO2 Carbon Dioxide levels and average world temperatures resulting in glaciation and Global warming Events have happened repeated and rhythmically without Anthropogenic (Human) influence.

For more detail please research:
http://essayweb.net/geology/quicknotes/iceage.shtml

Largest Prehistoric Organisms.
This fascinating website courtesy of Wikipedia outlines the largest prehistoric species that ever roamed the planet. This includes a profound listing of a remarkable number of truly incredible species that once lived here, sometimes for many millions

of years: almost all of them and their descendants are now extinct primarily through various types of Climate Change.

Please see: http://en.wikipedia.org/wiki/Largest_prehistoric_organisms

Lights of Earth's Cities at Night: a tour from space at night by NASA .

USA and North America as seen from space. Image courtesy www.nasa.gov.

This is a profound series of images and video taken from the International Space Station showing the lights of Earth's cities at night.

Commentary describes how the lights of cities in various regions of the world are easily identifiable by their differing coloured lights as well as from the shapes these lights create.

Because of the patterns of civilization, technological and urban development in each region around the globe, the light 'signature' each region puts off is uniquely identifiable even from space!

It is only when one observes the extent of Human habitation around the globe as seen at night, that it is possible to begin to appreciate the profound and vast Anthropogenic impact the Human civilization and its quickly multiplying population is having on the Planet.

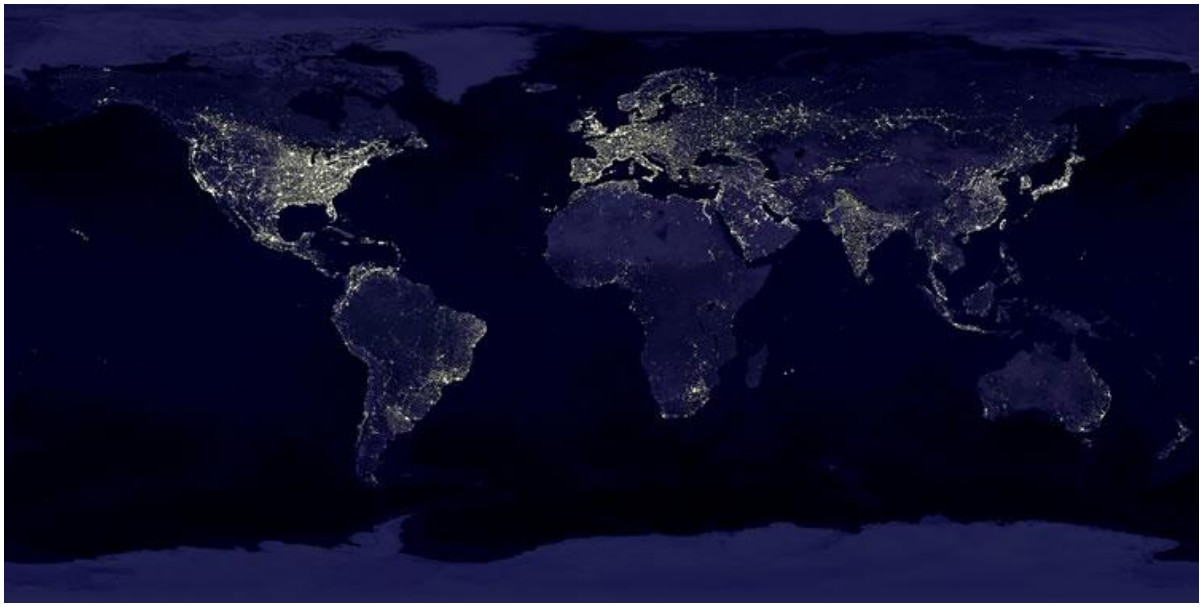
Especially when considering that even the very smallest twinkling light as seen from space actually represents many thousands of people consuming the resources of the

Planet. The larger light complexes represent millions more people doing the same thing every day!

Please see: http://eoimages.gsfc.nasa.gov/ve/1438/earth_lights.gif

More remarkable images:
http://earthobservatory.nasa.gov/Features/CitiesAtNight

An awesome tour of Cities at Night as photographed from the International Space Station: http://www.youtube.com/watch?v=eEiy4zepuVE&NR=1



World map of the Earth's cities at night. Courtesy: http://geology.com/articles/satellite-photo-earth-at-night.shtml

Just suppose that the 'Living Earth' was considered to be represented by an Orange or similar spherical fruit.

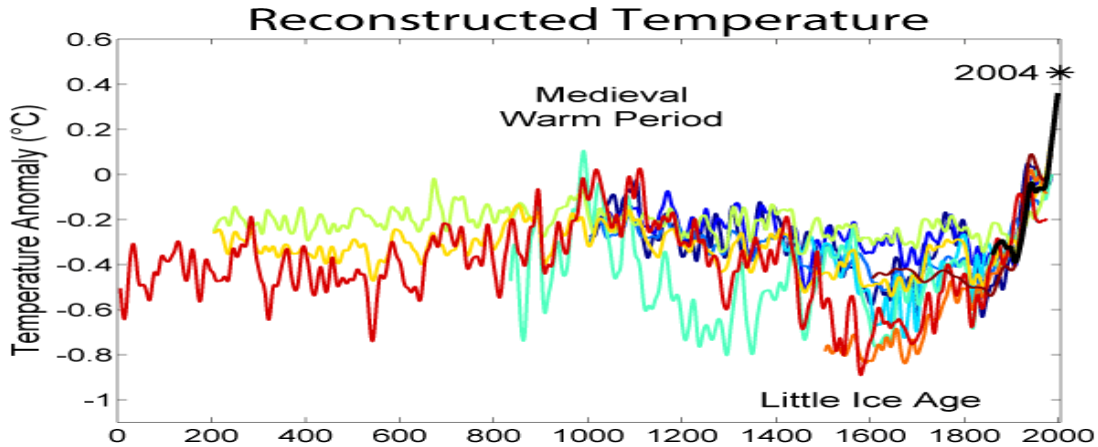
And Humankind are represented as small, soft-bodied creatures living in hard-shell-like compartments sucking the juices (like green 'renewable' resources, oil, minerals and water, etc.) out of the land, like Scale Insects do to the fruit.

Laying the map of the World's cities over the top of the surface of the Orange as if each group of lights was a single scale insect, the resultant pattern of city lights/scales insects would surely look like a major infestation sweeping over the Earth/fruit.

Take such an infested fruit into any garden centre or nursery and they would certainly recommend something possibly toxic that would 'eliminate' the 'disease' problem. What is presently considered 'Climate Change' here on Earth, may actually be a mechanism within the Living Earth that attempts automatically to correct such 'disease' infestation problems similar to what is suggested in Dansgaard-Oeschger Event Theory i.e. the Earth goes through regular and rhythmic Climate Changes cycles 'deliberately' as a method of cleansing and eliminating such parasites which allows the Planet to return to a balanced 'natural' stasis to renew and replenish the Planet.

For more information please research:
http://en.wikipedia.org/wiki/Dansgaard-Oeschger_event

Little Ice Age clearly demonstrates that when average global temperatures fall so does Human civilization into times of famine, pestilence, plague and warfare.



Temperature comparison over the past 2000 years. For a more detailed discussion please research: http://en.wikipedia.org/wiki/Little_Ice_Age

For more information and images visit www.daleharvey.com

Mass Extinctions: Mass Extinction Events are rather common. It is thought that over 90% to 95% of all the creatures that have ever lived on Earth are now extinct. Most of these extinctions are due to dramatic Climate Changes and Mass Extinction Events.

Please see:
http://science.nationalgeographic.com/science/prehistoric-world/mass-extinction
http://en.wikipedia.org/wiki/Cambrian%E2%80%93Ordovician_extinction_event

Milankovitch Cycle of Orbital Eccentricity:
This Theory explains today's observed Climate Changes and Global Warming as a natural part of the rhythmic cooling and warming cycles of the Earth's climate through Geological Time.

Included are graphs which reflect past Climate Change trends.

Also included here is a graph of rhythmic Climate Change Cycles that might occur through Earth Orbital Eccentricity.

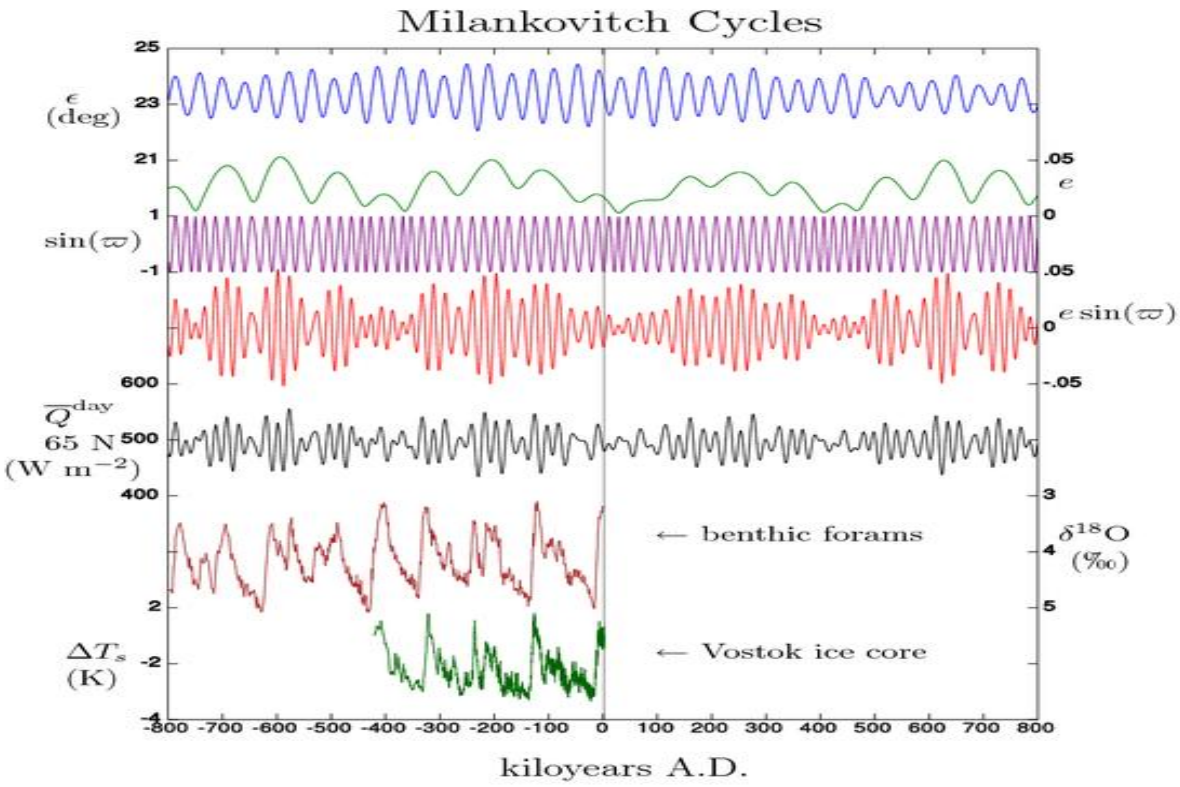
For further reference: http://en.wikipedia.org/wiki/Milankovic_cycles

This theory recognizes the potential for the natural and rhythmic Climate Change events to be over-ridden by the Anthropogenic influences of Humankind's civilization.

But overall this model shows rather regular and rhythmic warming and cooling cycles continuing for at least the next thousand years and possibly for many millennia to come.

The Natural Orbital Eccentricity of the Earth is well explained by the fascinating Milankovitch Theory of Earth's Orbital Cycles which provides mathematical evidence suggesting that the reason for today's 'Global Warming' and observed 'Climate Change' has much less to do with Human behaviour than it does to the eccentric orbit of the Earth around the Sun which regularly shifts from a highly elliptical orbit to a nearly circular orbit.

Please research:
http://en.wikipedia.org/wiki/Orbital_eccentricity



Throughout all of Earth's history there have been many major climate changes and mass extinction events at rather regular intervals. Sometimes these have been exacerbated by bolide impact events or volcanic activity.

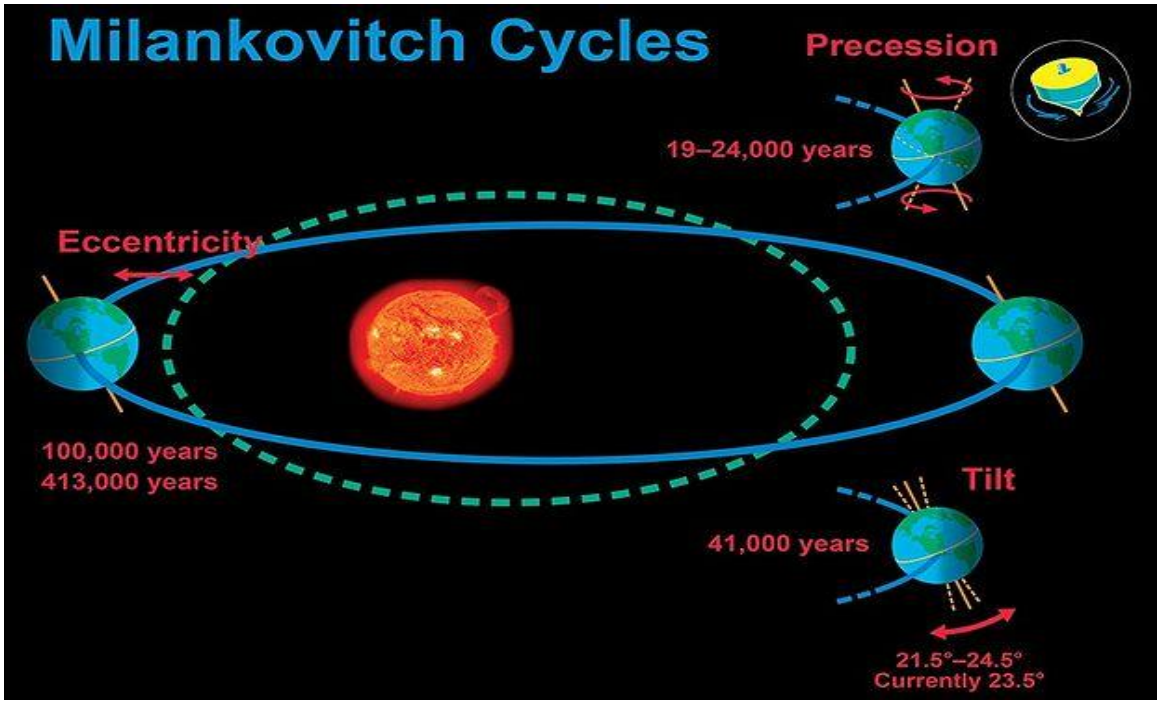
According to Orbital Eccentricity Theory, the Earth completes one cycle of precession every 26,000 years.

The Earth rhythmically revolves through a roughly 100,000 and 400,000 year orbital cycle between a near circular and then highly elliptical orbit.

These orbital phases occur when the Earth's orbit is strongly influenced by the gravitational pull of Jupiter and Saturn combined with the influence of the Moon and smaller Planets as they rotate within the Solar System around the Galactic Centre.

When the combined gravitational pull upon the Earth is strongly skewed to one side, the Earth's orbit quickly adopts an elliptical shape.

When the combined gravitational pull of the Planets is balanced, the Earth's orbit assumes a circular shape.



One full orbital cycle is completed roughly every 413,000 years. And throughout this cycle Earth's rotation on its axis rhythmically varies between 22.1-24.5 degrees. At present the Earth is revolving at a tilt of 23.44 degrees, and this tilt is decreasing.

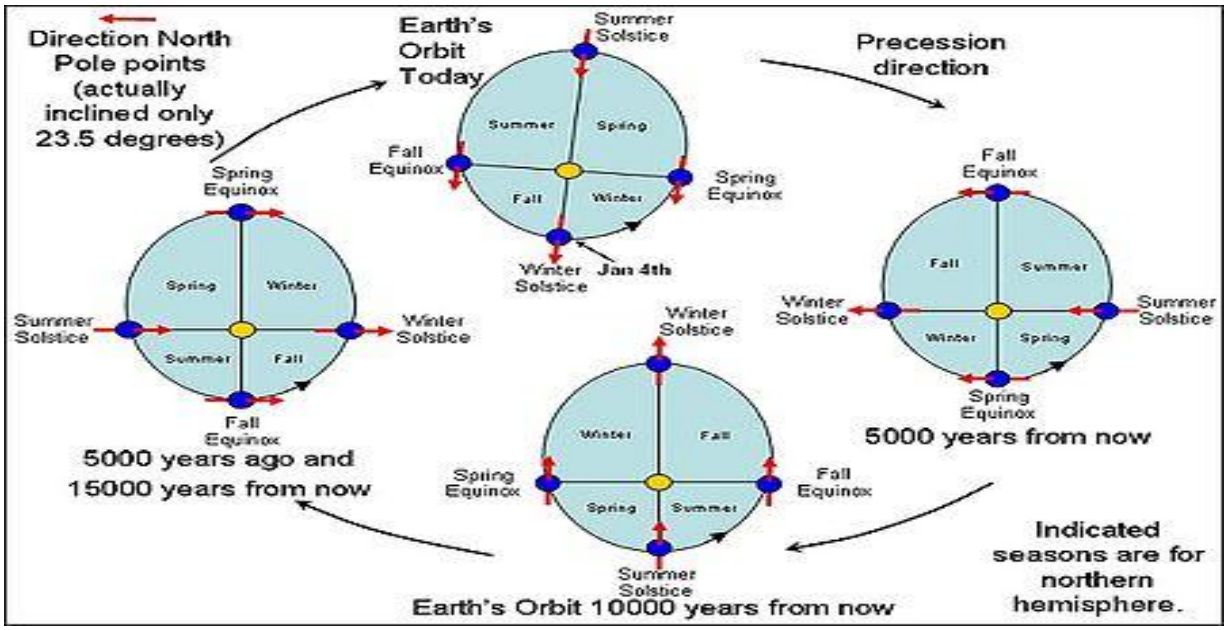
The recent intense interest in the ancient Mayan Calendar demonstrates that even in ancient times Mayan astronomers were aware of these eccentric orbital cycles. These are not meant to be interpreted as specific dates but Eras of astronomical change and alignment. The Earth is presently orbiting within the culmination of one of these astronomical cycles of planetary alignment. The planetary alignment phase alone takes many years (decades) to complete.

During an elliptical orbital phase which has been occurring for many thousands of years, especially when the Earth's axis is at its greatest tilt, the Planet heats unevenly. At its farthest distance from the Sun, this elliptical orbit allows for significantly greater cooling. Ice flows and glaciation begin to build at the poles and are not entirely melted. This soon leads to climate change cooling events as refrigerated air passes aloft over the permanent ice flows. Ultimately this results in glaciations and an Ice Age.

The Earth is presently moving toward a nearly circular orbit around the Sun. This happens when the planetary gravitational pull and that of the Galactic Centre become balanced usually through planetary alignment. Then the Earth returns to near circular orbit, as it is moving toward at present, and the Planet begins to gradually heat up throughout both Hemispheres. Global temperatures rise, especially at the poles. This raises sea levels as well. Seasonal climate becomes warmer,

wetter near the poles and seasonal variability increases, especially at first. Then this levels out and seasonal variances decline once the entire Planet becomes fully warmed. Many such Interglacial Warming Intervals (IWI) have happened countless times before without the interference of Humankind.

But the Earth's orbit is still slightly elliptical at present. Because Perihelion (Earth's closest point in its orbit around the Sun) occurs in the Southern Hemisphere's Summer and Aphelion (point farthest away from the Sun) in its Winter, it is expected that Southern Hemisphere climate will continue to become somewhat more extreme with slightly longer Summers than Winters. This also explains the very noticeable extra 'sting' in the Southern Hemisphere's Summer sunshine as there is a full 6.8% more solar radiation streaming into the Southern Hemisphere atmosphere especially during the Summertime.



The same tilt and orbital pattern will mean that the Northern Hemisphere will gradually begin to experience slightly shorter Summers and longer Winters.

And as the season precession continues over the next 10,000-50,000 years temperatures around the entire Planet will continue to slowly warm. This will be more noticeable at the poles where conditions will become noticeably warmer and wetter. This will inevitably result in glacial and polar ice pack melting and rising sea levels which in many past ages have been much higher than they are today! The contrast in temperatures, while gradually warming occurs will increase evaporation and convection within the atmosphere leading to more significant precipitation and increased storm events.

Any major and sudden environmental and climate changes that might alter this rhythmic orbital climate cycle will have more to do with massive natural forces such

as a sudden Asteroid/Comet/Meteor impact; tectonic/volcanic eruptions and natural sustained wildfires. Anthropogenic (Human), marine and terrestrial life activity also can contribute to atmospheric pollution and some 'greenhouse gas' warming. But their impact remains much less than the massive natural cycles and forces that rule the known Universe.

Short of complete nuclear annihilation, there is little we can possibly do as a species to alter in the least the inevitable rhythmic orbital cycles of the Earth that ultimately result in the major climate change events.

The Earth and all its inhabitants are definitely within such a Global Warming Climate Change or Interglacial Warming Interval (IWI) and Mass Extinction Event now. As in the past, it is those who remain adaptable and flexible to change that survive and those that resist it that perish. For more information about mass extinctions and present rates please see: http://dodosgone.blogspot.com/2007/06/extinction-rate-estimates.html

Paleocene-Eocene Thermal Maximum. Today's Earth is entering a similar eccentric orbital pattern to one which occurred about 65 million years ago known as the Paleocene-Eocene Thermal Maximum, another Interglacial Warming Interval (IWI). Temperature rose to 6C/11F warmer than now with the highest average warming occurring nearer the Polar Regions and associated cooler Temperate Zones. C02 Carbon Dioxide levels were much higher than today. Sea levels rose considerably more than what they are today.

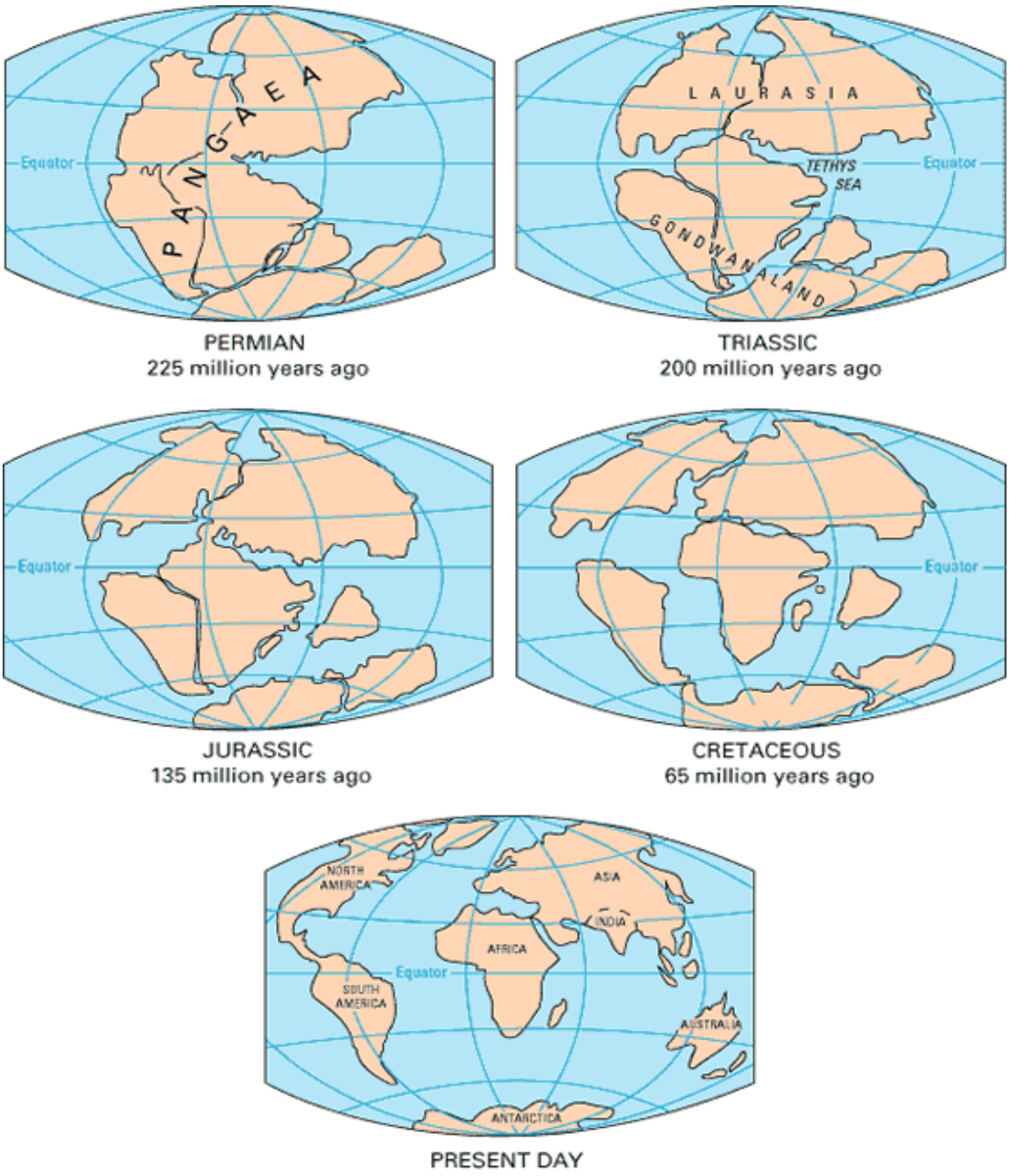
Temperate and tropical conditions prevailed around the Planet and all ice sheets eventually melted. Lush vegetation and forests prevailed through the Arctic Circle as well as Antarctic continent. Tropical species even flourished near the Poles! While some mass extinction occurred, it was a time when Mammalian life began to flourish.

Applying the theory of Orbital Eccentricity and Earth's Orbital Cycles to the present Global Warming trend, that is so similar to that of the Paleocene-Eocene Thermal Maximum, this would suggest that the Earth will continue to gradually warm naturally for thousands of years. Estimates vary between 3,000 - 10,000 years or possibly as high as 50,000 years. If this theory proves true, nothing the tiny Human race could do today would in the least alter that orbital symmetry. It is a natural consequence of the Earth's rotation and orbital position as it relates to the gravitational influence of the other Planets (especially Jupiter and Saturn), Moon and Sun.

For a full discussion about the P-E Thermal Maximum (IWI) which is very likely what will happen again soon on the Earth please review: http://en.wikipedia.org/wiki/Paleocene%E2%80%93Eocene_Thermal_Maximum

Paleomap of Tectonic Plate Continental Drift through Geologic Time:

Pangaea:

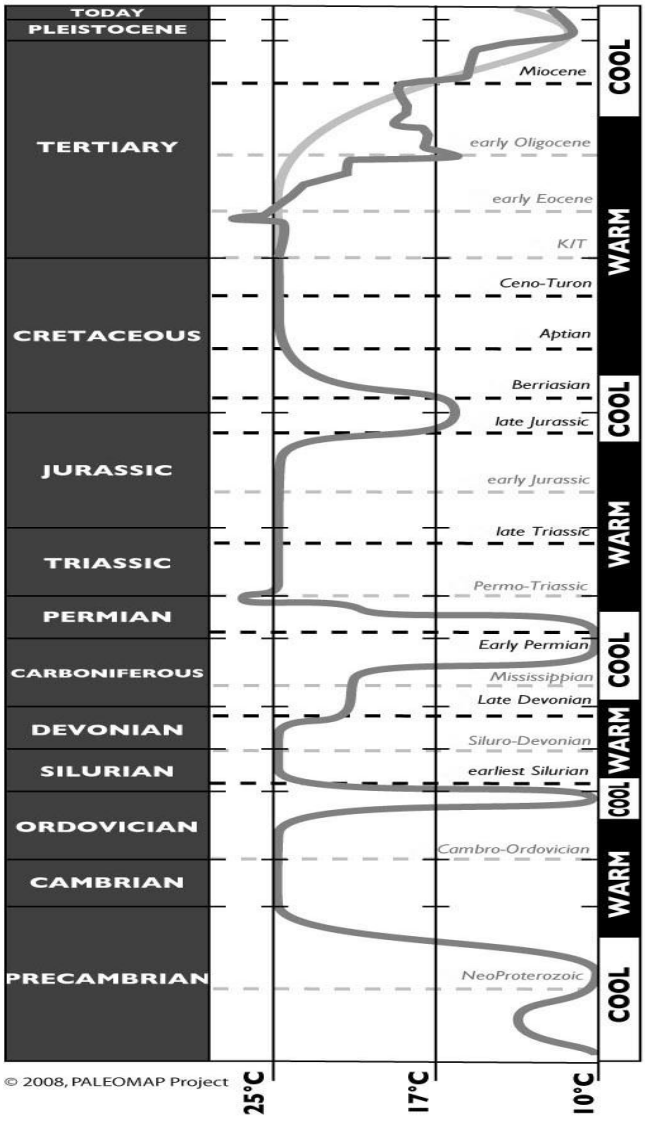


The Paleomap Project by Christopher R. Scotese is a brilliant compilation study tracing the geological, meteorological and paleontological changes and development of the Earth's natural history through geological time. Each period of geological time is itemized as to its climate and the changes that occurred during that interval. There is also a skilful animated table picturing the Earth's continents and their changing placement through tectonic continental drift plus their climate changes throughout geological history. The Paleomaps even include speculative maps of future continental placements.

Please see Paleomap Animation: http://www.scotese.com/futanima.htm

Also included is this graph charting the average global temperatures as traced through geological time. Note the rhythmic and often fairly sudden fall and rise in global temperatures that occur as natural cycles through time.

This once again lends further support to the Milankovitch Theory of orbital eccentricity as being a primary factor in climate change. Which when combined with random, uncontrollable and unforeseen astronomical events (bolide impacts and supernova events) and geological activity (tectonic plate shifting, volcanic events) accounts for the vast amount of climate change that has regularly occurred throughout geological history. All these documented Climate Changes have been profound and often sudden without any Anthropogenic (Human) influence whatsoever!



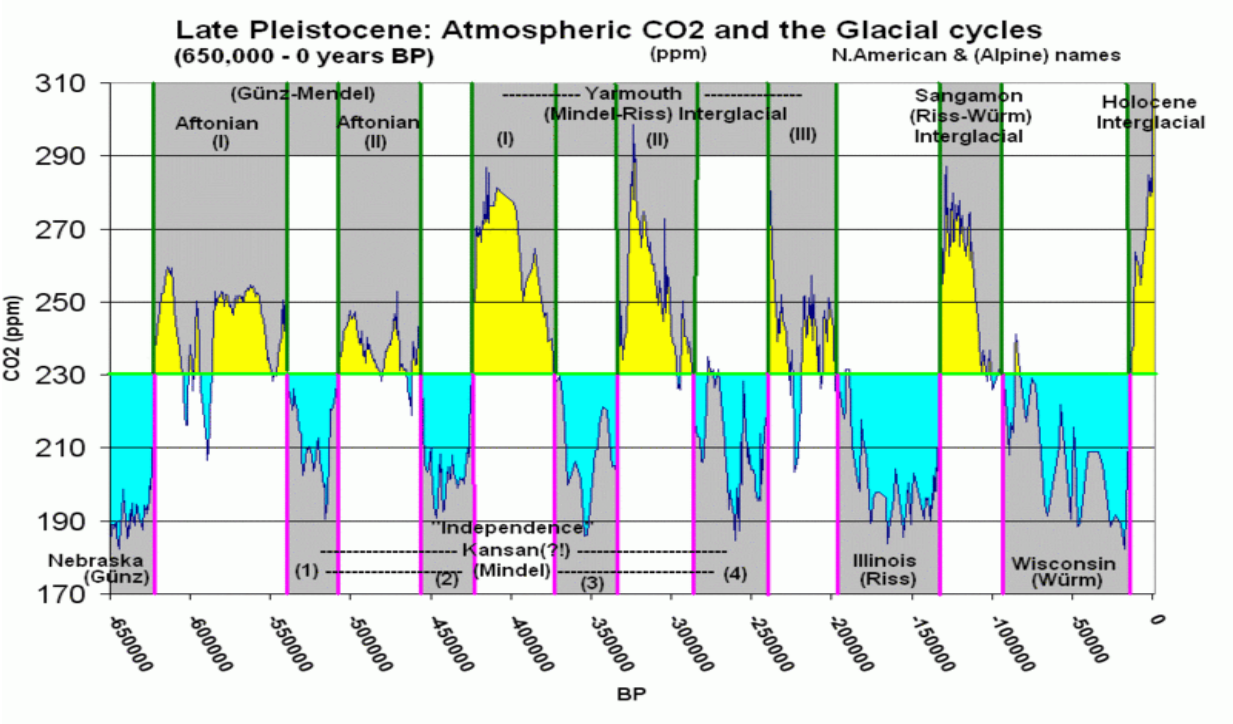
The Paleo Map charting Geographical, Meteorological and Paleontological Changes throughout the geological ages of Earth Time.

Please see: http://www.scotese.com/climate.htm

Pleistocene Epoch Rhythmic Glaciation and Inter-glaciation Warming Interval (IWI) Chart: This dramatic chart documents the Geological and scientific research data collected over the 'recent' period of glaciations starting 650,000 years ago which are still occurring to the present day.

The CO2 and Glaciation Cycle Chart clearly demonstrates a repeated rhythmic cycle of glaciation followed by an interval of Inter-glacial warming (IWI). The present Holocene Epoch is the latest interval of warming. If this rhythmic cycle continues, both temperatures and CO2 levels could continue to rise for several thousand years yet before reversing into the next Ice Age. This rhythmic

cycle of glaciation and warming strongly supports the Milankovitch Cycle of Orbital Eccentricity Theory.



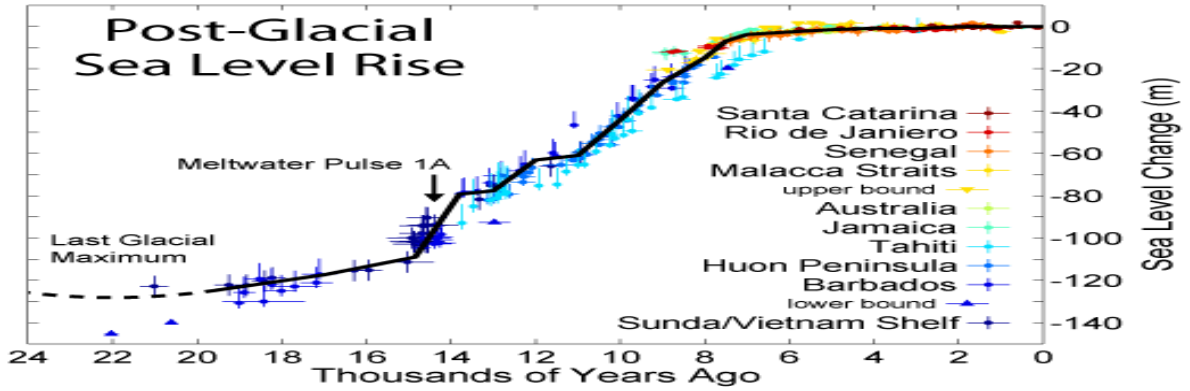
This Glaciation Cycle is shown here on the Late Pleistocene CO2 and Glaciation chart, which clearly shows that rapid falls and rises in CO2 Carbon Dioxide levels and average world temperatures resulting in glaciation (in blue) and Interglacial Warming Intervals (IWI) in yellow, have happened repeated and rhythmically without Anthropogenic (Human) influence.

For more information please research:
http://en.wikipedia.org/wiki/File:Atmospheric_CO2_with_glaciers_cycles.gif

Post Glacial Sea Level Rise:
This graph and associated scientific paper detail the sea level averages starting 24,000 years ago at the end of the last Glacial Maximum until the present day.

Sea levels have risen approximately 130m/434.2 ft. since the glaciation ended. Most of this occurred quite dramatically during the early Holocene 15,000-8,000 years ago and have since levelled off.

Sea levels over the past several thousand years have remained stable and have shown only a minor and slow increase.



For a more detailed discussion please research: http://en.wikipedia.org/wiki/File:Post-Glacial_Sea_Level.png

Quaternary Extinction Events:

This discussion paper produced by Wikipedia itemises the profound number of species throughout the world that have become extinct during the recent Quaternary Period, which includes nearly the entire history of Human development.

Most of these extinctions happened to larger species during the Late Pleistocene to Early Holocene Epoch but extinctions have continued until the present day. Various theories are discussed as to the causes and contributing factors associated with these extinctions.

The general consensus is that they have come about due to Climate Change stress confounded by persistent Human predation. For a detailed discussion please research: http://en.wikipedia.org/wiki/Quaternary_extinction_event

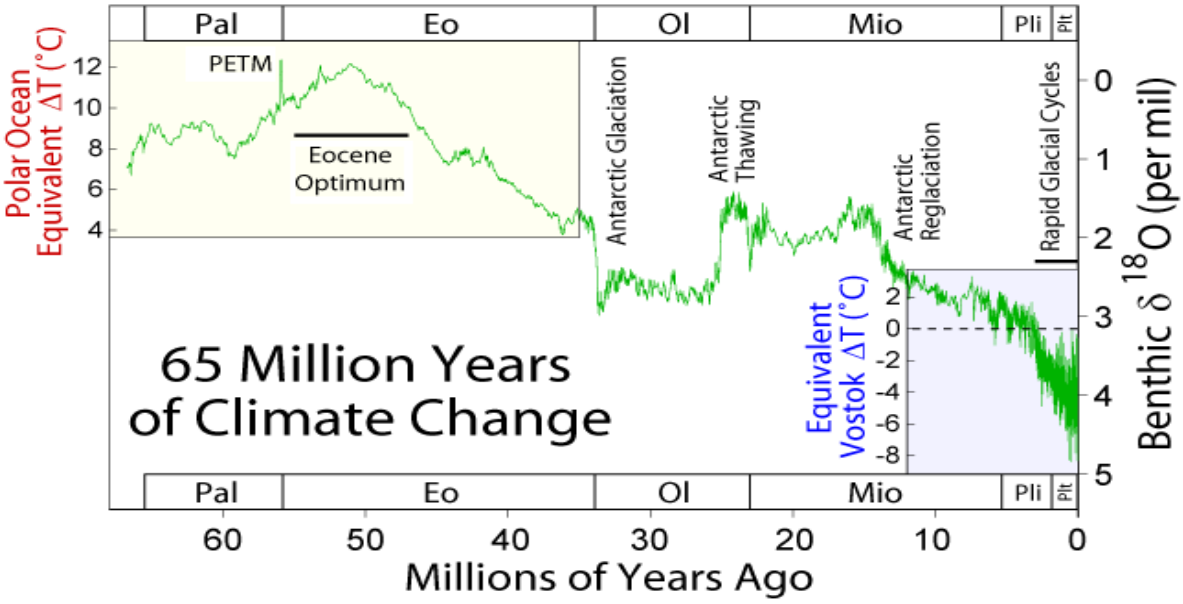
Quaternary Glaciation to the Present Day:

This document provides discussion, facts and Geological/Scientific research on the Quaternary Glaciation which began during the Pleistocene Epoch starting 2.58 million years ago and has continued up until the present day.

This includes the most recent Neoglaciation, better known as the 'Little Ice Age' which occurred from the 14-19th Centuries. There have been numerous and rhythmic glaciations followed by warming Inter-glaciation events. The present Interglacial Warming Interval (IWI) cycle can be seen here on the following Climate Change Temperature Graph.

This Climate Change Graph clearly shows that while temperatures are indeed warming, they are still at very low temperature levels when viewed over geological time in the past 65 million years.

For more detailed information about this last period of glaciation please research:
http://en.wikipedia.org/wiki/Quaternary_glaciation and
http://en.wikipedia.org/wiki/File:65_Myr_Climate_Change.png



Sceptic Views of Climate Changes:

Climate change theory has many sceptics with very valid scientific data and observations to support them. The fact is that almost anything can be proved through convenient presentation of statistical data. There is equally as much convincing evidence that much of today's Climate Change hysteria has been generated by data so flawed that the current hysteria has been labelled as a hoax!

Please see:
http://blogs.telegraph.co.uk/news/jamesdelingpole/100017393/climategate-the-final-nail-in-the-coffin-of-anthropogenic-global-warming

and a much more detailed and scientific document

http://www.middlebury.net/op-ed/global-warming-01.html

Scientific Facts Refuting Climate Change Theory:

The data refuting Climate Change as being of entirely Anthropogenic (Human) cause and its negative impacts upon Humanity are convincing and often profound." More People Die from the Cold than from Heat and no Place on Earth is too Hot for Humans."

This document presents very sensible sceptical views and puts current data and observations into a much broader scientific perspective.

The assertion put forward here is that global data is a mess and often conflicting also that present rates of sea level rise and warming temperatures are nearly indistinguishable.

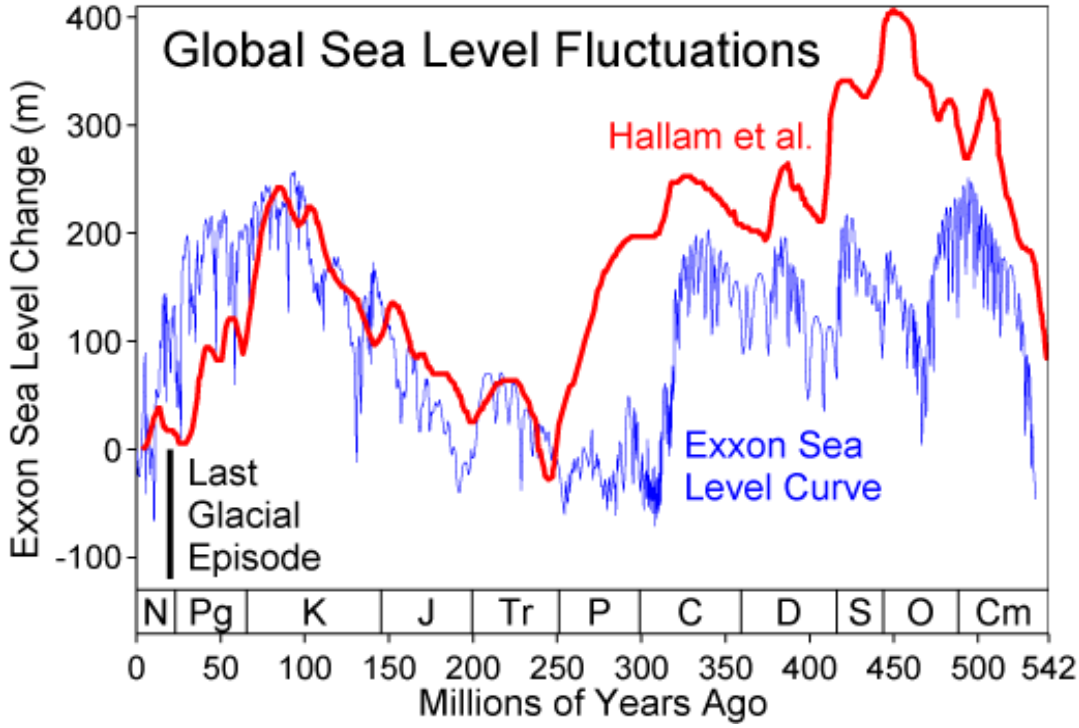
They propose that present global warming trends and associated weather changes are not caused by Anthropogenic influences but are a consequence of natural cycles.

Please review: http://www.climatecooling.org

Sea Level Averages through Geological Time:

This graph clearly shows that present sea levels are considerably lower than they have often been during much of Earth's geological history. Therefore it would not be at all unusual to expect sea levels to rise in the near future.

Many Scientists and Theorists anticipate a rise of 15ft (5m) before the next Interglacial Warming Phase ends. Should the ever-increasing influence of Anthropogenic (Human) activity continue to influence rising temperatures, a corresponding rise in seas level would result.



For a summary of this sea level data please research:
http://en.wikipedia.org/wiki/File:Phanerozoic_Sea_Level.png

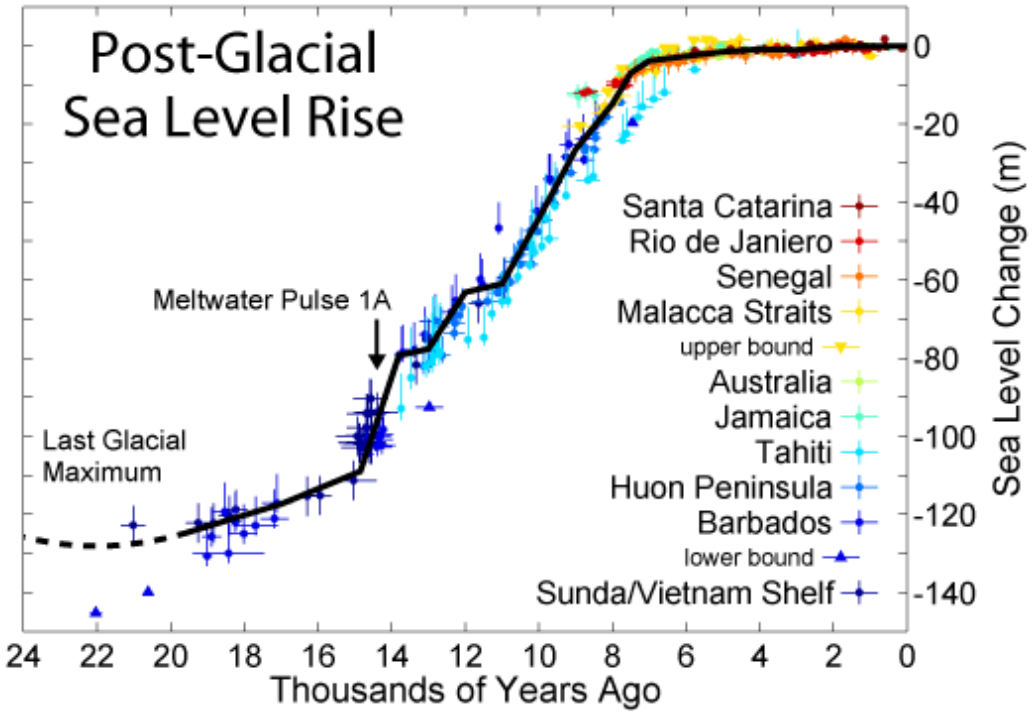
Sea Levels Rising around the World an Interactive Map scaled to a flood/sea level rise of 0-60m. This fascinating interactive global map allows the researcher to select any location on the Planet and alter sea levels by as much as 60m (200.4 ft). That is the maximum sea level potential ever experienced during the strongest Interglacial Warming Phase in geological time.

Most predictions expect a 5m (16.7ft) sea level rise before the present Interglacial Warming Phase subsides. But should Anthropogenic influences result in all ice sheets and glaciation melting, the upper limit of sea level flooding would occur, which would be at least 200m (668ft) higher than today!

To see this Flood Map visit: http://flood.firetree.net/?ll=35.9200,136.6600&z=16

Sea Level Rises during the Present Holocene Period: Scientific evidence shows that during the present Holocene Period sea levels began to rise along with temperatures as the last glaciation period faded 22,000 years ago. Then 15-14,000 years ago there was a major Melt Water Pulse event which lasted until 8-6,000 years ago. Sea levels rose dramatically during that time and have only slightly risen since.

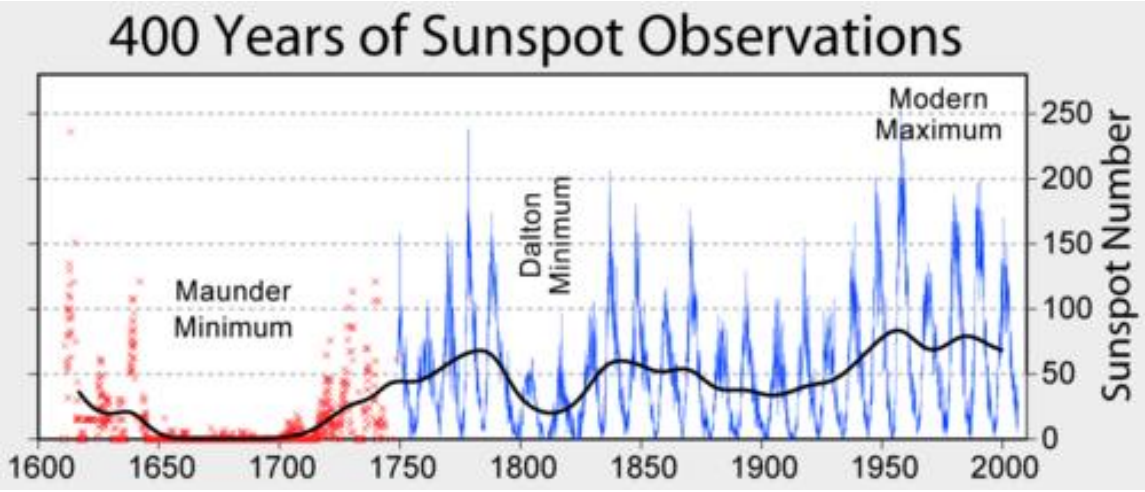
Since Humanoid activity was not significantly polluting the atmosphere at that time and no other extraneous environmental events occurred that might explain this abrupt and very sudden warming, this suggests that a natural planetary orbital cycle event increased temperatures resulting in dramatic rises in sea levels.



For a detailed summary of the sea level rise over the past 24,000 years and most recently observed Holocene (previous 10/9,000 years) sea levels please see:
http://en.wikipedia.org/wiki/File:Post-Glacial_Sea_Level.png

Solar Activity: Effects of Solar Activity on Climate Change:

Solar Maximum and Minimum Cycles:



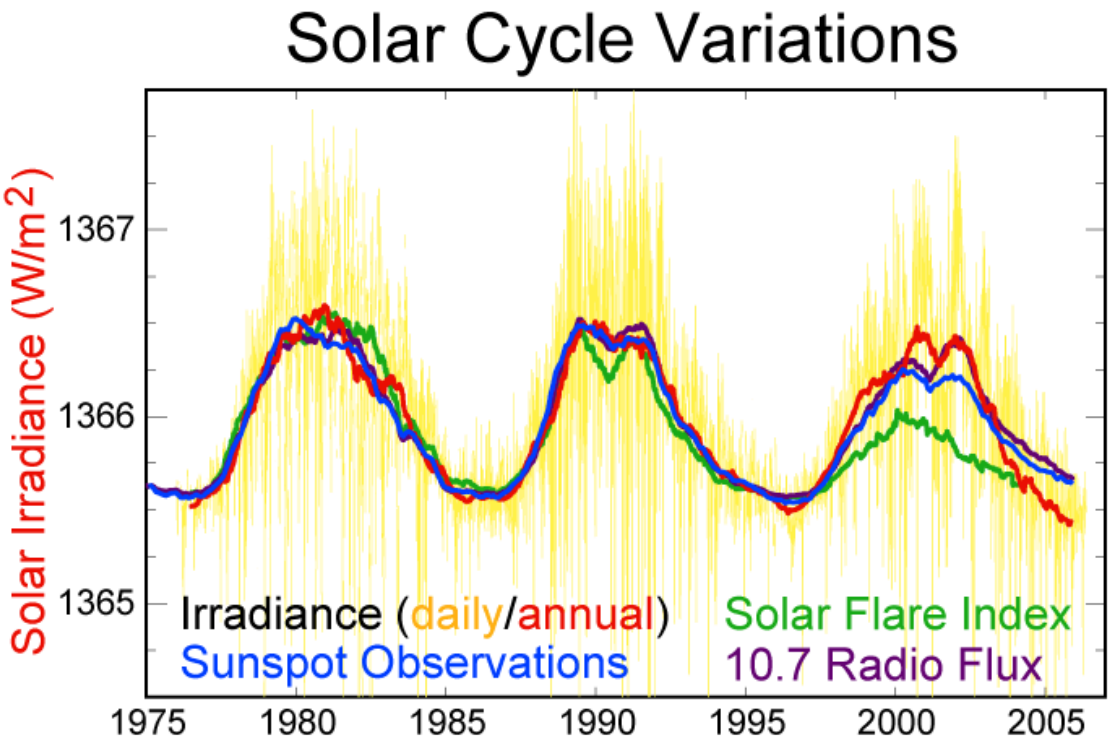
There appears to be little questioning that Solar activity plays a vital role in atmospheric events, temperature and weather patterns on the Earth. The above graph charts recent Sunspot activity which closely relates to these atmospheric changes and events. There appears to be a rhythmic sunspot cycle averaging approximately 12 years in length with a variation of 9-14 years between one peak cycle and the next.

This appears to occur because of the dramatic gravitational pull and magnetic influence of the other Planets on the Sun, especially Jupiter which contains the largest mass and gravitational/magnet field of any of the other Planets.

This is strongest when Jupiter's magnet field interacts strongly with Mars, Saturn, Uranus and Neptune plus the inner Planet Venus. Whenever Jupiter's elliptical orbit and magnet field combine with that of other Planets and/or the Sun, this creates regular rhythmic Synodic Cycles that then 'attract' and interact with Solar Wind and magnet energy from the Sun creating a period of greater activity on the Sun.

For a full discussion of Synodic cycles of Jupiter and other Planets in the Solar System, please research: http://www.jupitersdance.com/thefinalwaltz

The graph below shows more recent observations of this rhythmic Solar Cycle.



The present dramatic increase in solar flares and major sunspot activity in 2011further supports this model. Solar activity is forecast to reach its maximum 2012-2013.

Lack of sunspot and intense solar flare activity does appear to have a correlation between average global temperatures: sustained periods of minimal sunspot and lower solar activity do correlate to lower average global temperatures. The "Little Ice Ages' which occurred periodically between the 16th to 19th Centuries link with the reduced solar activity shown on the 400 Years of Sunspot Observations graph.

Longer-term data about solar and sunspot activity is unavailable. However almost all other celestial bodies demonstrate elliptical orbits with distinct Synodic Cycles of conjunction, Apogee and Perigee that result in short, medium and long-term cycles.

Available data demonstrates a significant period of low solar activity lasting at least 100-150 years or perhaps longer followed by a much more active cycle. This supports the theory of long-term Synodic Cycles that contribute to rhythmic Solar Cycles which would also greatly impact atmospheric conditions and Climate Change events.

Recent data would suggest that any period of heightened solar activity will result in increased solar radiation producing on Earth additional atmospheric heating and turbulence which would result in near immediate and often significant weather events. Therefore, a period of sustained Solar activity could potentially contribute to substantial Climate Change that could alter climate patterns over a prolonged period.

If such activity occurred at a time when the Earth's orbit and rotation were circular and its axis more upright, this heating could be immediate, profound and substantial over both Hemispheres. This could result in substantial global warming as is happening today in 2011.

Were Solar activity to increase during an elliptical orbital Earth cycle, which naturally results in cooler temperatures, especially on the 'shaded' hemisphere its effects might be to reduce subtly the average global temperature cooling effect of the elliptical orbit.

But might result in more dramatic contrasts in temperatures over the exposed Hemisphere; resulting in more pronounced atmospheric turbulence and storms. If such turbulence blew over existing ice sheets, this might actually further cool the atmosphere on the 'shaded' side of the Planet as well as create a period or stormy and windy weather.

For more information please refer to:
http://en.wikipedia.org/wiki/Solar_maximum

Super Interglacial Alternative Theory:
Rising sea levels occur with Global Warming or Interglacial Warming Intervals. This fascinating interactive model shows the inundation of coastlines around the world that is expected to happen if present trends of CO2 and Global Warming continue as would appear likely. The model is based on what has already occurred repeatedly through previous ages of Geological time. This model allows for a sea level rise of up to 200m/668ft higher from what it is today. During the Cretaceous Period sea levels rose even higher than this when global temperatures were at their highest and all

glaciations and ice sheets had completely melted. Click on the Globe Picture at the bottom of the page to adjust sea levels to any location on the Planet.

For more information please see:
http://jesse.usra.edu/articles/iceagemodule/iceagemodule-25.html

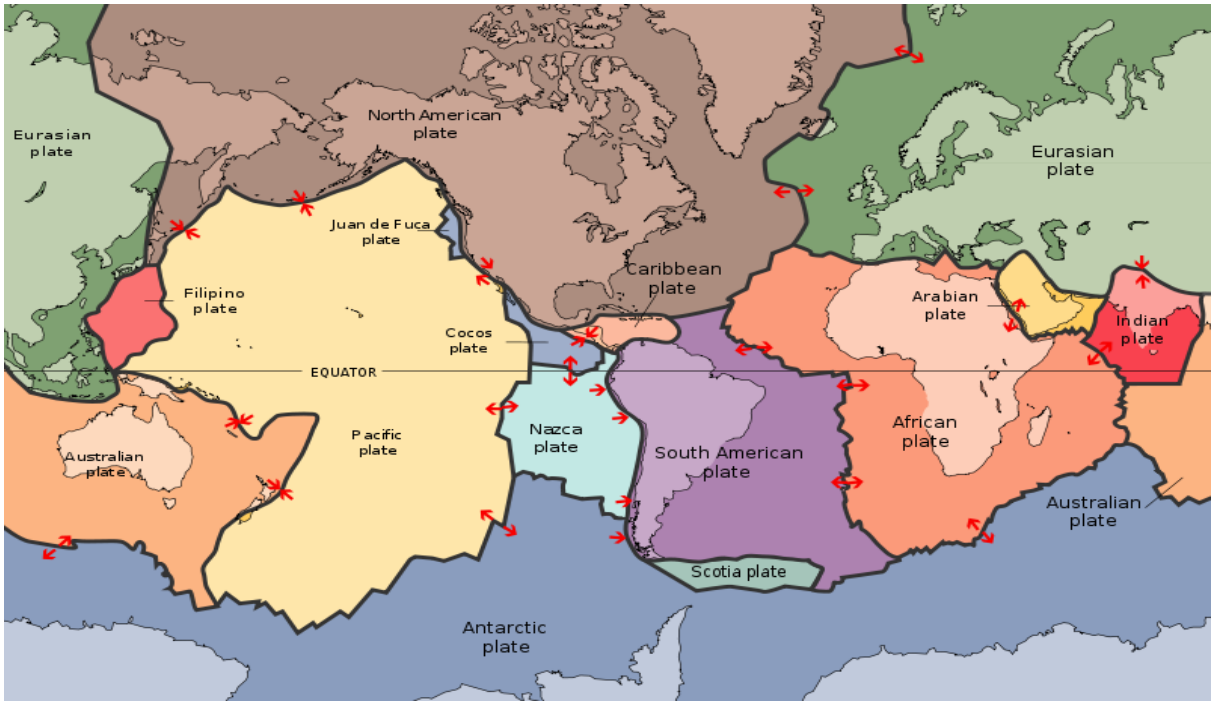
For global interactive picture and instructions please see:
http://jesse.usra.edu/articles/iceagemodule/resources/html/supervislarge.html (this make take a while to load but is worth it!)

Tectonic Plates:

The Earth's continents and oceans all rest and actually 'float' as broken pieces of the Earth's crust that slowly shift above the molten magma layer of the Earth. Each broken piece of floating crust is known as a Tectonic Plate.

In recent times, these plates have remained rather slow moving. But their speed has a lot to do with pressures placed upon them by the astronomical gravitational pull of Moon, Planets and the Sun; intense volcanism within the Earth, and especially the massive pressure and weight of the World's oceans pressing against them.

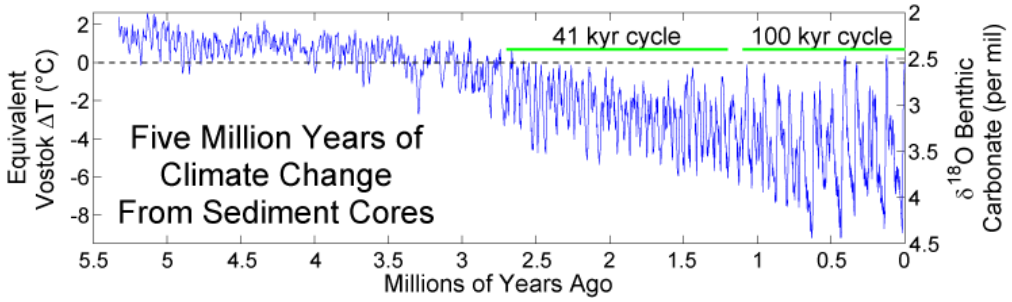
As sea levels fluctuate, the Tectonic Plates are pushed by the changing pressure and weight, causing sometimes rapidly continental shifts.



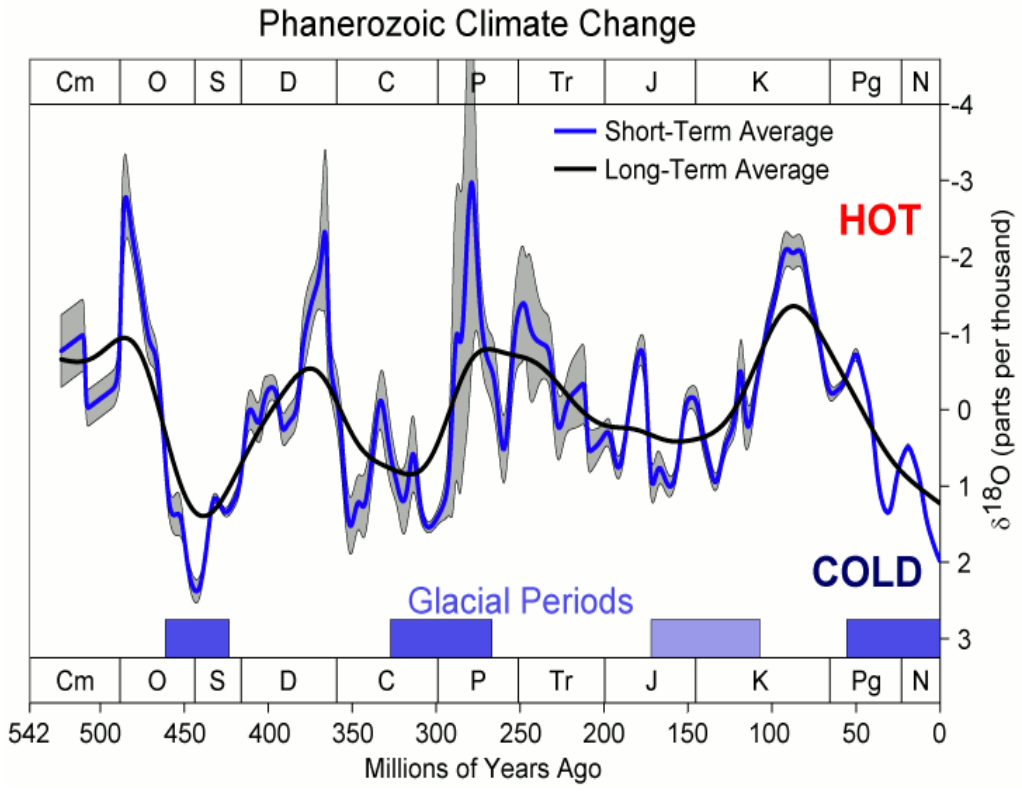
Tectonic plates of the world as mapped in the late 20th Century courtesy Wikipedia. For more detail please visit: http://en.wikipedia.org/wiki/Plate_tectonics

[Temperature Averages through the Geological History of Earth]:

The Earth's temperature through the Ages of Geological history have continually fluctuated in rather rhythmic patterns that quite strongly correlate and support the [Milankovitch] Cycles of an [Eccentric Earth orbit and rotation] as being the cause.



At present the Earth's climate is still considered to be in an Ice Age cycle which has been characterised for over 3 million years by cycles of glaciation followed by Interglacial Warming Phases like the one at the present time. Notice from the graph, that in the recent past the Earth's temperatures have been falling. While the Earth's average temperature has just recently increased rapidly, this is highly typical before yet another profound fall in temperatures. When viewed over 5.5 million years, geological data would still suggest that even though average temperatures are climbing at present, the Earth is still gradually and progressively moving into a deeper Ice Age!



For more information and images visit [www.daleharvey.com]

Geological data viewed over the entire Phanerozoic Eon of 542 million years (nearly the entire time of multi-cellular life), shows repeated fluctuations between ‘climate optimum’ (IWI) very warm periods and Ice Ages like the present age.

These long-term Climate Change patterns have continuously occurred in rather rhythmic cycles, some more pronounced than others, but none-the-less rhythmic.

The observation that the Earth is presently still technically in a gradually deepening Ice Age of considerable duration, suggests by the shear law of averages combined with Earth’s geological past that the Planet is overdue for a considerable warming event. And if one were to judge from the geological past, this should be abrupt, dramatic and rapid warming, like what is happening now.

There have been several periods of significant warming of the Earth through geological time. Each warming phase has been of profound importance to the advancement of life on Earth.

The most recent significant warming phase, 65-100 Million years ago, witnessed the remarkable Cretaceous Period ‘Age of the Dinosaurs’ when life on Earth flourished.

230 Million years ago saw another smaller spike in global temperatures. During the Middle-Late Triassic Period, the weather was generally dry and hot. Some Pangaean continental regions had hot summers and cold winters.

But there were no glaciers or polar ice caps. Indeed Polar Regions were moist and temperate enough to sustain reptiles and forests! This was the great time of life’s rebound following the massive Permian-Triassic Extinction Event.

Life flourished in new forms everywhere. This was the time that witnessed the rise of the Archosaurs whose future relations would rule the world as the Dinosaurs.

Then 300 million years ago the Permian Period was very dry with extensive deserts and one of the hottest times ever on the Planet.

This saw a very rich sea life plus the diversification of land vertebrates including the earliest ancestral relations to Mammals, and the dramatic rise of the Reptiles. There were dense forests featuring the first Cycads and Gingkoes plus great Southern Seed Fern forests.

365 Million years ago during the Late Devonian Period conditions again became very warm and there were no glaciers of ice caps. This warming period saw the great diversification of plants. Also it was a time of dramatic adaptation and change when Amphibians, Reptiles and many unique animals for the first time came up out of the

sea and began life on the land. 490 Million years ago the Earth became increasingly warm and wet.

This is when plants came first upon the land and spread to cover the Earth. Ocean life was prolific and the first soft-bodied fossils of advanced organisms began to appear. This remarkable period of change and diversification is known today as the 'Great Ordovician Bio-diversification Event'.

Each and every Climate Change Warming Phase has resulted in astounding change and extraordinary diversification, development and growth amongst adaptable life forms.

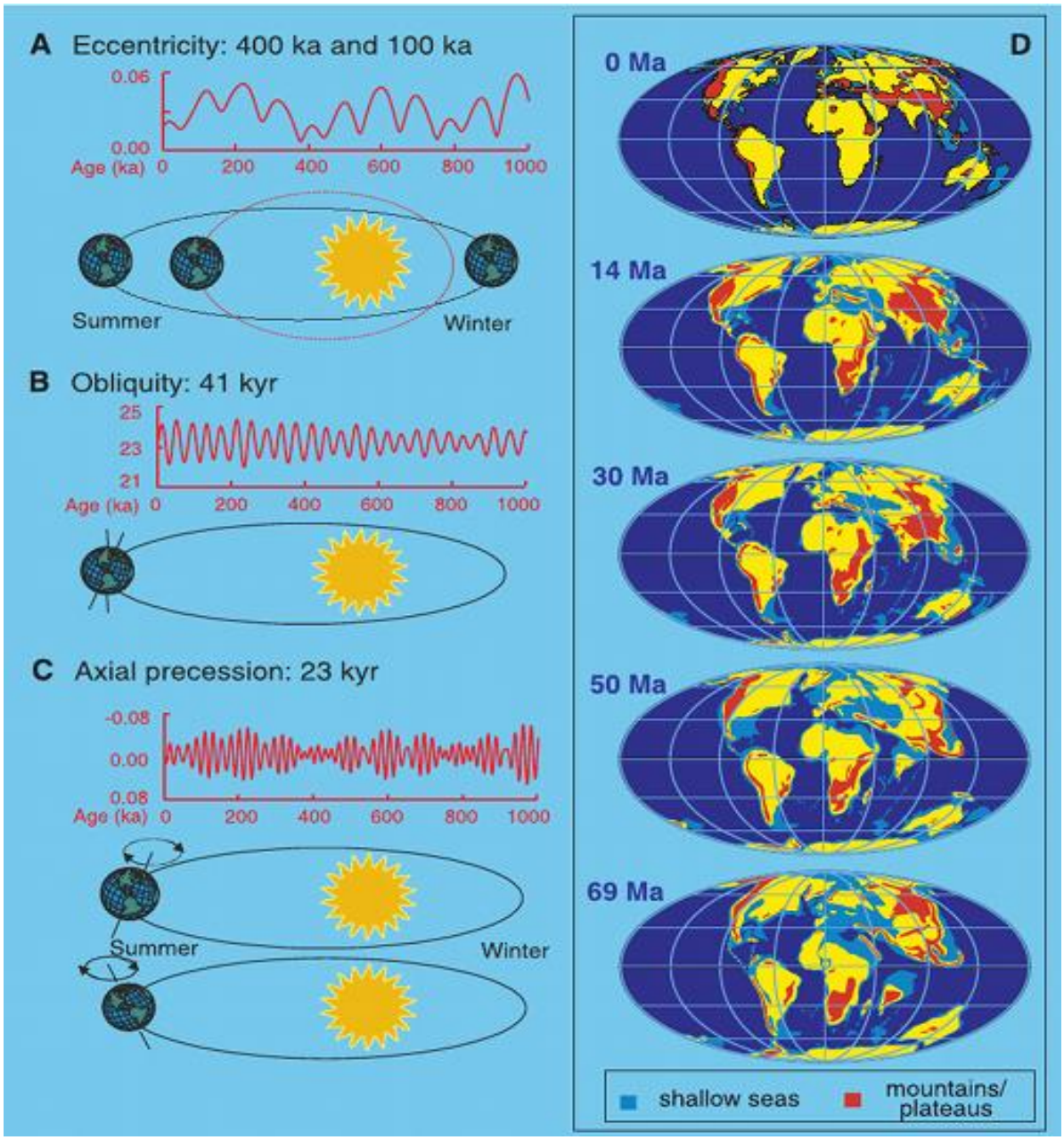
In marked contrast to what 'doomsday' predictions are made about the current models of Global Warming, each and every warming event has been remarkably beneficial to the advancement of evolution and life.

*No Anthropological (Human) activity influenced any of the many past Climate Change (IWI) warming events! Notice also the similarity of on-set between each of these dramatic, rapid and sudden Climate Change (IWI) Warming Events.

An almost identical pattern is happening today. It is also happening exactly when one would expect when viewing the history of geological time. And also notice that each and every warming event abruptly ended, without so much as a Human Being present on the Earth at that time!

For further research please read:
http://en.wikipedia.org/wiki/Geologic_temperature_record#An_Overall_View

The Resilient Earth by Doug L. Hoffman
This brilliant and comprehensive scientific blog, book and paper expands and outlines the science behind climate change combining global geography, tectonic continental drift and orbital eccentricity into a blend of sensible theories about actual Climate Change.



The conclusions arrived by Mr. Doug Hoffman in his blog, book and scientific paper and research entitled [The Resilient Earth] were only discovered by the author after completion of this paper on climate change.

Yet Hoffman's findings are remarkable similar and supportive to my own conclusions as to the causes and effects of Climate Change.

For further insights, please read Hoffman's Resilient Earth blog: http://www.theresilientearth.com/?q=blogs/doug-l-hoffman
and also
http://www.theresilientearth.com/?q=content/trends-rhythms-aberrations-mechanisms-climate-change

Timeline of Evolution:
Basic Time lines that define the evolution and development of most Earth and its living species through geological time.

Axis scale: millions of years ago.
Dates prior to 1 billion years ago are speculative.
The basic timeline is a 4.5 billion year old Earth, with (very approximate) dates:
3.8 billion years of simple cells (prokaryotes),
3 billion years of photosynthesis,
2 billion years of complex cells (eukaryotes),
1 billion years of multicellular life,
600 million years of simple animals,
570 million years of arthropods (ancestors of insects, arachnids and crustaceans),
550 million years of complex animals,
500 million years of fish and proto-amphibians,
475 million years of land plants,
400 million years of insects and seeds,
360 million years of amphibians,
300 million years of reptiles,
200 million years of mammals,
150 million years of birds,
130 million years of flowers,
65 million years since the non-avian dinosaurs died out,
2.5 million years since the appearance of the genus Homo,
200,000 years since humans started looking like they do today,
25,000 years since the disappearance of Neanderthal traits from the fossil record.
13,000 years since the disappearance of Homo floresiensis from the fossil record.

Timeline of Evolution also includes dates back 4,600 million years with an abbreviated listing of events for each date throughout the evolutionary history of Earth.

For further inspection please research: http://en.wikipedia.org/wiki/Timeline_of_Evolution

Tsunamis and Mega Tsunamis and Bolide/Meteor Impacts: Giant tidal waves, known as ‘mega-tsunami’, caused by Tectonic Plate and continental shelf or volcanic wall collapse and bolide/meteor impacts are much more common than once thought.

Such events are near ‘random’ and as yet totally unpredictable. Yet each such event has the potential to almost instantaneously level the surrounding landscape and produce Climate Change of a catastrophic environmental nature and either enhance or reverse climate cycles and life on associated areas of the Earth. The largest tsunami in recorded history was a localized event in Lituya Bay Alaska, 9 July, 1958

when a landslide at the Bay headlands caused from an earthquake produced a seismic wave that removed trees at 1,720ft/524m.

In 1792 Mt. Unzen volcano in Japan collapsed into the sea creating a 100m (334ft) wave that decimated the Japanese coastline killing at least 15,000.
For profound information please read: http://en.wikipedia.org/wiki/Megatsunami

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A Consultation with Dale Harvey

Dale Harvey is an International Environmental Consultant. Many people arrange consultations with Dale Harvey regarding a wide variety of garden questions and botanical learning situations. This is done by contacting him at: www.daleharvey.com or www.daleharvey.co.nz to arrange a personal consultation or by emailing a question to: info@daleharvey.co.nz

The Following are excerpts from a series of botanical correspondence education Internet sessions between Dale Harvey and a very talented student in Wayne, New Jersey who prefers to be identified by the Pen Name: sk8brdkd. With his parent's consent and encouragement he is presently interested in learning more about the amazing world of Nature, botanical arts and sciences and also how to become a photographer. The photos are all the students original work upon which Mr. Harvey is commenting:

In this fine picture you took in Laurelwood Gardens, New Jersey, are featured a variety of coniferous and deciduous trees and shrubs.

A Coniferous tree appears on both the right side and lower left side of this picture.

Coniferous (con-if'-ur-us) trees are evergreen trees that first originated in a really ancient age. There are fossils of these from nearly 300 million years ago when the world was very warm. This was called the Carboniferous- Permian Boundary Period: a time of climate change around the world without Humankind being there at all!

The prehistoric subtropical horsetail and fern trees of that time were so smart that they learned how to overcome both heat and cold, dry and wet by creating needle-like leaves with tiny holes along their sides that could open and close at will. This

way they could breath and eliminate excess water or draw in fresh air. Then they could close up to save this water when it was dry or cold. The needles could reflect excessive heat.

They learned to create a special piny sap that protected them from freezing, too. They kept their leaves all winter so they could draw in sunlight and heat which they learned to turn into food.

They did this by creating very special green chlorophyll (klor'-o-fill) molecules. Green Chlorophyll molecules in plants are very much like haemoglobin (hee-mo-globe'-in) molecules in blood that make it appear red. The difference is that chlorophyll can turn air, sunlight and water into food. See how smart they are!

The other trees in the middle of this picture are Deciduous (Dee-sid'-you-us) tree species. That means they lose their leaves in winter and start new growth when the weather warms up in spring.

Deciduous trees are also pictured here in what are called Deciduous Hardwood forests or woodlands. These smart trees and shrubs learned how to survive ages ago in a different way.

After the ancient times when the Earth was really warm, suddenly something happen and the Earth became very cold and only got warm for part of the year.

Maybe an asteroid hit the Earth and shifted the axis upon which it spins. More likely, the Earth's orbit became greatly elliptical causing the skies to turn cloudy, cold and dark which allowed glacial ice to build up.

No one knows exactly what happened. But soon Ice Ages came upon the land. Some of the coniferous plants were so hardy that it did not hurt them and many of their ancestors still survive to this day. But some were so tender to freezing that they had to adapt to the changing climate or die.

So they learned how to change and flatten their leaves to draw in more sunshine and warmth when it came back each year in Spring. They even learned how to transform their piny sap into a sugar sap that gave them more energy for warmth. Today Maple syrup is made from the same sugar sap of the Maple tree (pictured here) which gives us energy and warmth just the same as it does the Maple Tree!

As the cold returned, the trees drew the sap with its green chlorophyll molecules plus all the food they had made from sunlight back into the hard and strong branches and trunks. Sometimes the sap even went all the way down into the roots where it was safe from freezing. As the green chlorophyll drained from the leaves, only the brightly coloured pigments remained within the translucent cellulose (sell'-you-lows) that gives the leaf its shape.

It is these bright pigments within that cellulose which produce the brightly coloured autumn leaves of 'fall'. Soon after the green sap disappears from each leaf, they disconnect from the branches and the leaves fall away to create a warm blanket of leaves around the tree on the ground. This warm leafy blanket combined with the warming sap energy inside the roots helps to protect and feed the trees during the long winter.

These smart deciduous trees are now sending their green sap out of the leaves back down into the branches and roots where it will remain safe for winter. What remains are the true colours that the leaves are made of. While the tree is growing these true leaf colours are covered by the green sap which is made largely of chlorophyll pigments. The green chlorophyll molecules sort of 'paint' the entire leaf in green. Thus the entire leaf appears green on the outside just like when we paint the inside

walls of a room. The walls might be any bright shade of colour on the inside but once we paint them with green paint, they appear green until we strip that colour away.

In the leaf the green ‘paint is made of large molecules called chlorophyll molecules. They are so large and complex that they usually cover over all other pigments. Chlorophyll molecules are sometimes called "Nature's Green Magic'.

That is because these chlorophyll pigment molecules are so smart that they can transform sunlight and mix this with air and water to create food that keeps the tree alive. A little like how Bees can turn pollen and nectar into Honey which is their food.

Very smart! Have you learned how to turn sunlight into food yet through your skin?

P.S. A secret here: Yes you do know how, almost. A clue is Vitamin D that your body can make from the sunlight. But that is another story!

See how these smart deciduous trees are allowing the beautiful morning sunlight to pass right through the branches where it can warm the ground around the trees' roots? By losing their leaves the bare branches allowed sunlight to penetrate right to the ground where it warms the leafy blanket keeping the tree roots cozy and safe over the colder winter months until warmth returns again to start regrowth in the Spring.

In summer when the trees are green you would not be able to see the sunrise or sunset so well through the leafy canopy. Then the smart trees are making food from their leaves by mixing air, moisture and sunlight together. And the leafy, shady canopy covers over the ground keeping the soil around its roots cool and moist. That way the trees conserve more moisture which they use to make extra food.

These trees have become so smart that they can live outside all year creating their own natural protection. Some day perhaps people will become smart enough to be able to do the same.

So cherish and protect your trees. They are peaceful and smart. And even produce the very air we all breathe, for free. Then when we breathe out, our air is full of carbon dioxide, the trees and plants breathe this in through those tiny holes in their leaves.

They use our Carbon Dioxide combine with sunlight and water to make their sugar sap food and what they 'breath' out makes more air for you to breath.

They are our helpful, peaceful and very smart friends who silently help and watch over all of us every day.

About Pine trees:

This is a fine example of a coniferous Pine Tree. Conifers like this Pine tree are a very ancient and sacred species. In ancient times long ago in old Europe, people felt that the Pine tree was very sacred and wise. They celebrated its strength and strong character. It sheltered them and wildlife from winters' freezing weather. In the horrible and cold winters many centuries ago following the Ice Ages, when people had little to eat and sometimes even froze to death, they would bring Pine branches and even entire Pine trees inside and sometimes decorate them with berries and cones.

This reminded them to be strong and wise like the Pine tree and care for each other as the Pine tree gave them evergreen shelter, and pine cones and wood to make things and to burn to keep them warm. Sometimes the Pine trees even provided them with food by catching the other animals that found shelter there beneath the Pines.

Every winter people used to do this as a reminder to give them strength and hope. Soon it became a tradition. Even today we still carry on this tradition, even though many people have now forgotten why or where this started. For these are the ancient origins of our Christmas trees!

For these very ancient people the time we celebrate as our Christmas celebration was once known as Yule: the time of the Winter Solstice the darkest and shortest days that starts the coldest time of the year. Even today it is a time each year when many people once again remind ourselves to care for one another and live with hope and love in our hearts, knowing that if we remain determined, strong and united that we will survive until a brighter spring day gives us new life once again.

<u>Tall and skinny Pines and Conifers:</u>

These smart conifers were 'born this way'! A long time ago they learned to grow this way because during the ancient times there was a lot of snow and ice around. Many big, broad and leafy trees were so over-burdened with ice and snow that they came crashing down to the ground like they do when there is an ice storm. This kind of conifer was smart enough to work out that if it remained very tall and skinny, the ice

and snow would only bend its branches down without breaking them all off and killing the tree. Very smart! These conifers are special kinds that lose their leaves in winter. They are called Larch trees. Their botanical name is: Larix. This one is botanically named: Larix kaempferi pendula.

Whenever there is a big ice storm it is almost always the big trees with spreading and wide branches that come crashing down. Most conifers are only weighed down with branches drooping until the weight is so great as to pull them over. Even then, their piny sap makes them more flexible and many times that way they survive the Winter storms.

But a single and solitary pole, like a tall post or flag pole, that looks a lot like this tall and skinny conifer Larch, is almost never damaged by ice and snow. These conifers have learned to out-smart winter!

This is another type of conifer tree that has learned to out-smart Winter. This is Taxodium, the Swamp Cypress, one of the few true Coniferous trees that lose its leaves in the Autumn.

These very ancient trees along with the more northern Larch were the first trees during ancient times of the Carboniferous Period more than 300 million years ago

that adapted to Climate Change by learning to drop their foliage as the season cooled.

During the Early Carboniferous Period the world's climate changed from very much warmer than today with Carbon Dioxide levels much higher than now.

Then the climate began to change to seasonal variations that brought much colder temperatures. Many of the ancient tropical plant species and life forms died out. But the smart ones adapted and changed along with the climate.

Through the warm months this Swamp Cypress tree is covered in ferny and soft needle-fronds that reflect its subtropical ancient origins. Then in Autumn these fronds turn vivid colours before dropping off to create a warm blanket of needles beneath the tree.

Very soon this Swamp Cypress will show bare branches like the more 'modern' deciduous trees showing just behind it.

These 'smart' Cypress trees are living relics from that very ancient time that remind us that Climate Changes don't always have to be bad. Look at these beautiful Survivors!

And also note that when the climate changed and turned colder and seasonal, the Carbon Dioxide levels were much higher than they are now. It was not the Carbon Dioxide that changed the climate but something else...that is another story!!!

I think this Laurelwood Gardens Park in New Jersey where you took this picture is really special! The rounded brick-red/pinkish shrub in the center of frame is Acer

palmatum purpureum dissectum (A'-sir-palm-a'-toom purr--purr'-ee-um dye-seck'-tum). A long Latin word that translates: Maple, with leaves shaped like the palm of your hand, in a purple color, and split into many sections i.e.

The Purple Split-Leafed Japanese Maple.

A very showy and impressive shrubby small ‘tree’ that is a favourite for Japanese and landscape gardens.

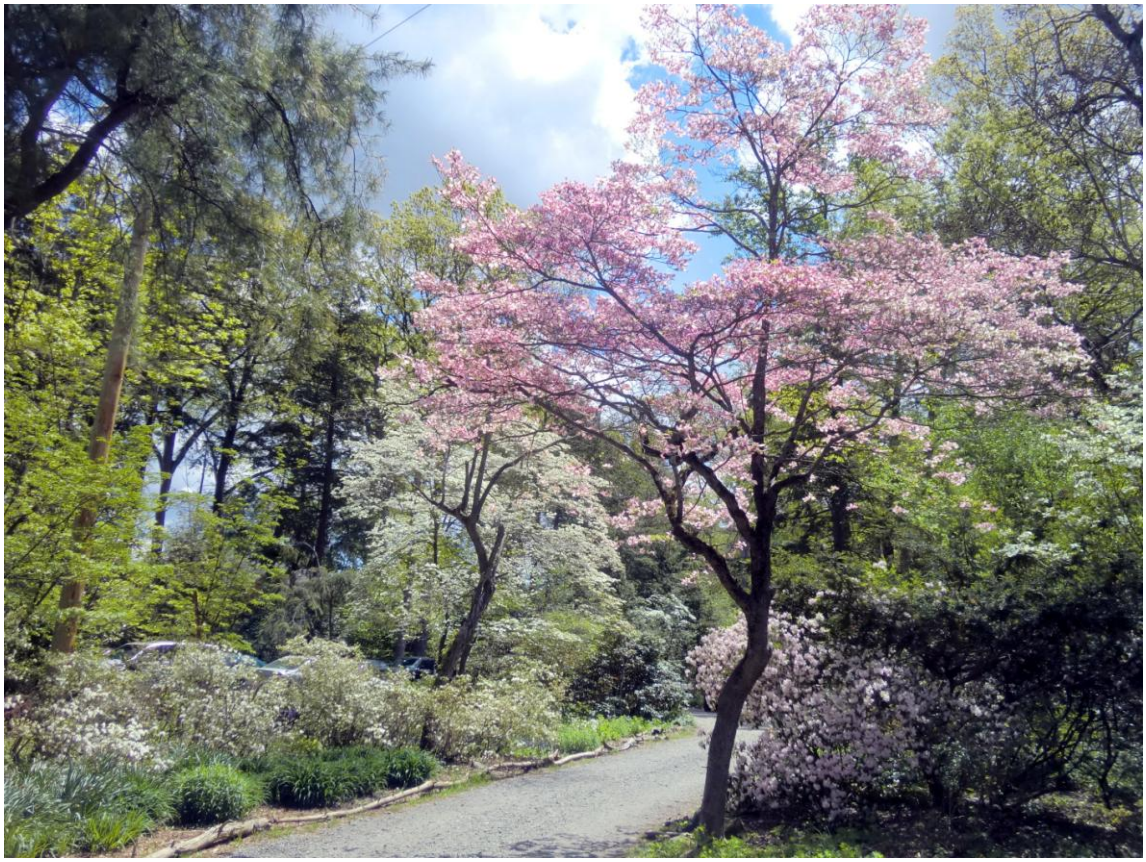
Picture of Laurelwood Gardens in New Jersey:

The spectacular white flowering tree is Cornus florida alba: the American White Flowering Dogwood.

The bright pink-flowering shrubs are deciduous Azaleas.

The taller shrub with arching branches (near the middle and right side of this picture) if you look closely is covered in small pinkish/white open trumpet flowers with a creamy yellow throat sometimes with golden speckles inside.

They are very beautifully colored like miniature Orchid flower. This shrub is called Kolkwitzia (colk-wit’-see-uh) the Beauty Bush.



Picture in Laurelwood Gardens:

This beautiful scene features the graceful taller trees known as Cornus florida, the American Dogwood. Dogwoods are amongst the most favourite of all small trees, especially in the North American landscape.

They are ‘native’ plants from there. In the botanical sense, ‘native’ refers to a plant, shrub or tree that is (or once was) naturally found growing wild in that region. These wild species have been cultivated for many years. The finest have been carefully selected and cross bred to create the beautiful trees we see around us today.

The shorter shrubs with white trumpet flower (center and left of frame) or fluffy pink flowers (center right of frame) are Azaleas. Some of them are also native to North America and many are native to Asia.

The taller bushy shrubs center background look like Viburnum burkwoodi, with impressive roundish clusters of small pinkish white flowers with the most Heavenly perfume of Carnation-Clove.

This is another deciduous flowering bush. Laurelwood Gardens appears to be a very well cared-for park. Next time you and your Family visit there, watch for the Gardeners or see if you can find out who cares for the plants there. Introduce yourself; perhaps show them your beautiful pictures taken there. Then ask if they

can help you learn all the plant names and show you how to grow them. Most likely they will be very willing to show and teach you more.

Pictures taken at Longwood Gardens, Kennett Square, Pennsylvania:

These are all lovely pictures you have taken of one of the world's finest botanical gardens. You are so fortunate to be able to visit such a wonderful place!

The top left picture features pink leafed Caladiums; a tropical tuberous rooted 'bulb' botanically called a 'rhizome (rise'-ohm) which is a fancy name for a fleshy and thick root a little like Ginger root. Caladiums are native to tropical climates so they only grow outdoors where you live in the Summer months.

Because their rhizomes are killed by cold weather, they are called 'tender' bulbs. The pretty pink Impatiens growing in flower beds behind them and surrounding the fountain pool are also tender warm weather flowers native to the tropical regions.

Longwood Gardens starts all their tender tropical plants in small containers grown in their glasshouses. Then once the weather warms and all danger of frost has passed, they plant them outdoors in their beautiful gardens. You could start some tender plants yourself indoors on a sunny windowsill. The top right picture features the giant pads of the Victorian water lily from the steamy jungles of the Amazon River basin.

The leaves can become so big that small children can ride on them like flat boats! The large soft pink water lily in the middle of this picture is its flower. The much small lily pads (foreground and back) with bright pink flowers are the hardy temperate zone water lilies.

These smaller water lilies are native to North America and grow from underwater rhizomous roots. But unlike the tender Caladium rhizome the North American water lily rhizome is 'hardy'. That means it is strong enough to withstand freezing. So is sometimes called a 'frost-hardy rhizomous rooted' plant.

The bottom left picture of the Longwood Gardens Conservatory looks like my backyard! We grow almost all of these beautiful plants outdoors here in our New Zealand gardens. We also have two conservatories, but not as impressive or large as this wonderful structure at Longwood Gardens. Tender plants that would be killed by freezing weather can be protected and successfully grown in a conservatory or glasshouse.

Some day in the distant future once your New Jersey climate warms up a little more and your winters become more moderate, you will be able to grow all these things outside in your gardens, too! Once upon a time many millions of years ago when the world's climate was much warmer than it is today, tropical plants much like these in your picture grew outdoors where you live now!

But even now if you could build a simple framed building such as a basic garage structure and then cover it in clear plastic sheeting and put a heater inside, you could create your very own conservatory where frost-tender warm season plants would thrive. Within a conservatory you could grow your own flowers and food all year round. You and your Family could be surrounded by green and healthy world all the time.

This picture (lower right) of the Longwood Gardens Fountains is impressive. Aren't these the most magnificent fountains!?! These were built by the DuPont Family to entertain their guest with magnificent displays of water often accompanied by fireworks and music when they threw lavish parties. During those times it was only the very wealthy who could afford to build conservatories and large water features like these. Today many of these beautiful places are maintained by private and public organizations. Every community should have someplace like this to visit as these places inspire us to create a more beautiful world around us.

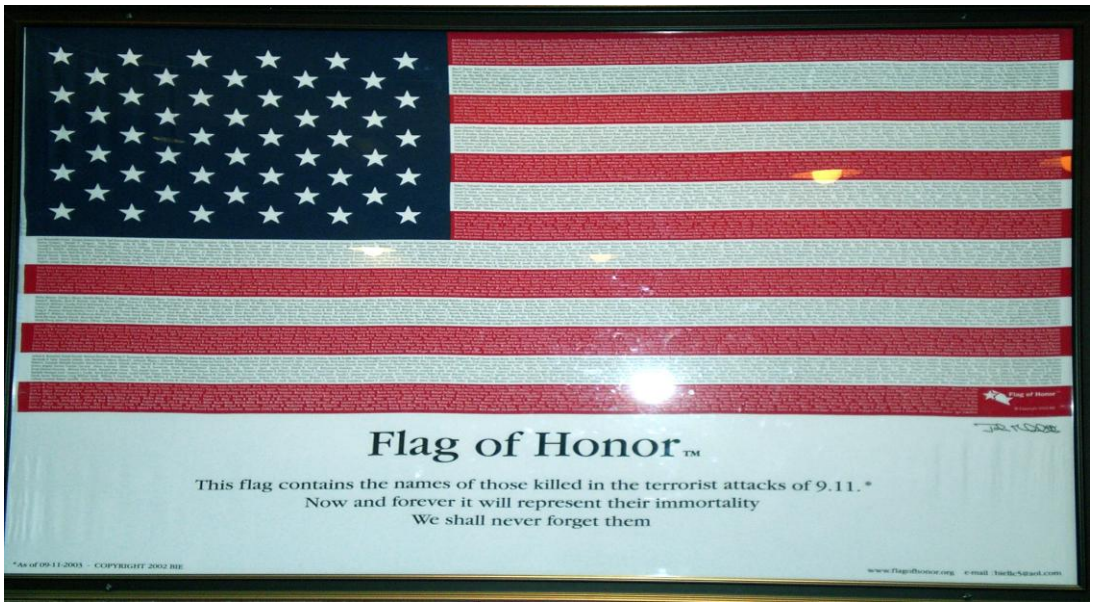
Every garden should have some sort of water feature if at all possible. After all, Earth is a 'water planet' and almost all animals, including humankind and plants plus most all life on Earth are mostly composed of water molecules combined with atoms of Carbon and other elements.

City drinking water from your tap is becoming rather expensive. Also it is often chemically treated to kill algae and/or bacteria or remove unwanted minerals in the water. Sometimes the residual (what remains) from these chemicals stays in the water. While this might be acceptable for Humans, this type of water sometimes isn't the best for plants.

The very best way to bring water to your garden is to save your own by collecting it in large tanks, or perhaps even a small pond. Natural rainwater is usually best because it comes fresh and sometimes very pure as rain falling from the sky.
Rainwater is sometimes very mineral-rich when it picks up fine dust or smoke particles in the air. This can transform your rainwater into weak fertilizer water. But if you live in a bigger city with lots of pollution, it is best to test your water to make sure it is not too acid from the city smoke. If it is, the water can be treated by adding a small amount of lime.

Experienced Gardeners often know that treated municipal (city) drinking water may refresh a dry garden, but it is rainwater that will make your garden grow. Often a Gardener who uses rainwater has little need to fertilize their plants as the rainwater does this for them. Some Gardeners whose garden plants become used to growing with natural rainwater can sometimes use treated drinking water from the hose as a mild fungicide/insecticide to help eliminate disease and insect pests.

You can collect rainwater from your roof by connecting the downspout from your roof gutter to a barrel, water tank or even run a pipe off the roof into your pond. In past times, many of our ancestors relied on water tanks for their drinking water. And today many people still prefer to drink rainwater rather than chemically treated water. Rain is like little drops of gold falling from the sky.



This is a picture taken at the 9/11 Memorial in New York City.

For more information and images visit www.daleharvey.com

This is a very moving and sad picture that reflects the crisis and difficult times in which we all live today. To all of you people searching for answers, praying for proper guidance and accurate knowledge to save you; begging for mercy and relief; trying to find your way in these changing times; and especially to all you cherished younger Generation:

May your Generation bring us all a brighter, greener, more-caring and peaceful future. Where our enemies are never again each other, rather they are: learning to overcome and adapt to climate change, cure disease, eliminate famine, illiteracy and poverty, where we learn to respect and regard each other, all of us, all over this World, as treasured and valuable resources and true friends.

We all have arrived here from a common shared heritage so it is only logical that we should all live as a World in Union.

Learn how to green your world and transform an urban jungle into a bountiful and prosperous Garden Paradise where we live for caring, kindness, knowledge and understanding and truly discover our place in the Heavens.

Let us learn to create in reality the Kingdom of Heaven here on Earth. While this may sound idealistic, just imagine if all 7 billion people on Earth each planted a garden which they cared-for and nurtured. In that one small act alone, our entire world would be propelled toward a real-life paradise and a better way of living for all.

Make it your badge of courage and your motto to end this age of anger, hatred and suffering and replace it with a caring and wonderful New World. Change the focus from 'fighting for peace' to 'Working for Wisdom' in all that you do. This is your challenge. And you and all like you are brave and strong enough to win the victory.

Fossil and stone relics are earthly pictures that tell the truth about our distant past and those that lived here before us that may help to guide our future path.

Now it is your turn.

You, too, were Born This Way! This is your special moment in time to be here and shine. And you have a reason and right to be here and make a difference.

I believe that it is people like You and your Generation that can change this World for the better forever.

May your journey, your path and all of your lives be Eternally Blessed!

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**Footnote:

And, that's what happened to the Dinosaurs.
Don't let this happen to You!
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Post Script: Since the completion of this document two important scientific reports have appeared that strongly support the findings of this publication. They are the United Nations Framework Convention on Climate Change Report released December 2011 which updates two decades of data and research.

Also following an in-depth analysis of core sample drilling from ice sheets and deep ocean sediments a new Paleoclimate Report Eco-Alert has been issued through NASA Goddard Institute for Spaces Studies Eco-Alert Paleoclimate Report by Director Jensen E Hansen and Makiko Sato. Their findings also strongly concur with what has been concluded within this document.

Also see the most recent December 2011Climate Change Report from NASA about suspected climate changes ahead to 2100.

Dale Harvey is an International Environmental Consultant, Journalist, Television & Radio Presenter, Public Speaker, Photographer, Garden and Landscape Expert, Social Scientist & Community Development Officer.

He is the product of a New Zealand Mother and United States Father who met in Auckland, New Zealand during World War II. His experience with Nature started at a very early age and Dale was gardening at the age of four with his Parents and Grandparents guidance on their orchard property in Mangere East, South Auckland, New Zealand. His Family then returned to the U.S.A. where he continued his education through a double Master of Arts Degree in Education and Social Sciences from the University of Kentucky.

He became a Mental Health Professional with the U.S. Government funded Comprehensive Care Centers, Lexington, Kentucky where he advanced his Community Development skills. Later he was awarded citizenship and environmental awards for his famous 'Flower Power' environmental and gardening programs; targeting the community development and education of urban families and youth in Cincinnati, Ohio.

This was funded by the Cincinnati Institute of Arts, City of Cincinnati Parks and Citizen's Committee on Youth. He received further accolades as an Administrator and Grant Writer for the USA Federally-funded Arts Resource Corp (ARC) in St. Petersburg, Florida. In the USA he also won awards for: Citizenship, Contributions to Community Development, Creative Arts, Music, Scientific Research; Spiritual Development, Youth Programs and Writing. He was awarded a Full Fellowship from the National Endowment for the Arts, Washington, D.C. as an Environmental

Craftsman representing botanical Arts and Sciences to research, study and work with the Bunka-Cho (Japanese National Government Agency for Cultural Affairs) based at the International House of Japan, Roppongi, Minato, Tokyo, Japan. There he developed a new international style of gardening that integrated the best of Eastern and Western styles and traditions.

He also unearthed a significant ancient buried garden on the grounds of the Australian Embassy that became a candidate as a National Treasured Site for the Japanese nation. He soon became the International Botanical Consultant to both the Australian Embassy and New Zealand Consulate in Tokyo. He was also offered the opportunity to live and work in Melbourne, Australia contributing to the Greening of Australia program.

Following this he continued Botanical Consultation work in Singapore and Australia where he developed the exclusive Toorak Jungles Nursery in the Melbourne, suburbs of Malvern and Toorak. Together with partner John Newton they received a top business award there; developed botanical and community environmental education programs for Australian Schools and also escorted exclusive tours to Japan sponsored by ANZ Bank and Qantas Airlines.

Dale returned to oversee the development of his Grandparents South Auckland homestead in 1984. This soon became known as the Quarter Acre Paradise gardens. These gardens became the inspiration and set location for his top-rated TV 3 television series Living Earth sponsored by Yates New Zealand. Plus his Radio I-98 'Joy of Gardening' plus 'Alice and Dale in the Garden' series; Radio I 'Art of Gardening' sponsored by Duncan & Davies and later Radio Pacific's 'National Garden Show' which ran weekly for many years.

Meanwhile at his Quarter Acre Paradise Gardens, Dale grew beautiful flowers, plants and vegetables, many from cuttings and seed that he then photographed and wrote about for his highly successful weekly double-page spreads in Woman's Day Magazine and other ACP publications for many years. The gardens became legendary for their yearly 'Great Christmas Light Show' featuring 100,000 flowers and many more thousands of lights sparkling through elaborate artistic and botanical displays created by Designer John Newton.

The Gardens also became the base for his many Community and School Projects which won two Environmental Initiative Awards from Auckland City Council and featured as the "new 'green' technology" in special botanical features on NHK television in Japan. Later a combined group of Auckland and Manukau City Counsellors, Business and Community Leaders and the Elders of the Polynesian Island Churches and Communities united in the heart of the Quarter Acre Paradise gardens to dedicate a new tourism brochure and bless the gardens as the 'Kingdom

of Heaven Returned'. The gardens are still visited today by busloads of Garden and Nature lovers.

Mr. Harvey and Mr. Newton then travelled to the USA where they combined their talents with Pioneer Floral and Garden Nursery and the Pine Ridge Lodge Staff and their community of Friends to create the remarkable Pine Ridge Lodge gardens in Wautoma, Wisconsin.

Today Dale Harvey with the assistance of Webmaster John Newton publish a colourful and large monthly botanical educational newsletter and run two botanical websites www.daleharvey.co.nz and www.daleharvey.com plus the Face book page 'Quarter Acre Paradise Gardens' which is distributed to a wide international audience.

The purpose of these websites is to educate and inspire a worldwide audience to become more active and knowledgeable about botanical arts and gardening as a means of uplifting their lives and improving the Planet. These sites include detailed costs, descriptions, justifications and objectives necessary to receive local funding for a community and/or school garden project. Also included are detailed articles about a variety of flowers , fruits and vegetables that can be successfully grown.

It is also possible to contact Mr. Harvey for an in-depth consultation and/or to request special information and research about most commonly grown plants as well as answers to many botanical questions.

Dale Harvey maintains his International Environmental Consultation practice to the present day. He now has nearly 37 years of practical professional experience and 59 years of personal gardening experience through 17 countries in both Hemispheres. He includes amongst his interests: Archaeology; Artistry and Fine Arts (especially drawing and painting); Astrology and Celestial Arts and Sciences; Astronomy; a wide range of Botanical Arts and Sciences; Broadcasting (Radio and Television); Community Development; Education and Teaching; Journalism; Meteorology; Music (Clarinet and Guitar); Palaeontology; Pets and Animal Husbandry; Photography; Psychology and Mental Health; Public Speaking; Research; Social Sciences and Sociology; Writing; plus enjoying thoroughly every moment of 'real' life.

Dale Harvey continues to spread his environmental messages and practical, common sense solutions for the benefit of people around the world. Dale's life goal has always revolved around doing whatever was necessary to guide the world towards an age of environmental paradise and peace for all.

"Imagine how uplifted our world would become if all 7 billion people on the Planet each planted a garden."