The natural history of climate change

To understand the climate, we have to first understand time, argues **Ian Plimer.**

We are *all* environmentalists.

Some of us underpin our environmentalism with political and romantic idealism, others underpin it with emotion, others have a religious view of the environment, some underpin their environmental view with economic pragmatism and many, like me, try to acquire an integrated scientific understanding of the environment. An integrated scientific view involves a holistic view of the Earth and considers life, ice sheets, oceans, atmosphere, rocks and extraterrestrial phenomena which influence our planet.

Geology is about time, changes to our environment over time and the evolution of our planet. Geology is the only way to integrate all aspects of the environment. Past climate changes, sea level changes and catastrophes are written in stone.

Time is a beautiful but misunderstood four-letter word. Most of us can't fathom the huge numbers that geologists and astronomers use, hence most of the community has little knowledge of geology. History and archaeology are rarely integrated with natural geological events. There is little or no geological, archaeological and historical input into discussions about climate change.

It is little wonder then that catastrophist views of the future of the planet fall on fertile pastures. The history of time shows us that depopulation, social disruption, extinctions, disease and catastrophic droughts take place in cold times and in warm times life blossoms and economies boom.

Climate has always changed. It always has and always will. Sea level has always changed. Ice sheets come and go. Life always changes. Extinctions of life are normal. Planet Earth is dynamic and evolving. Climate changes are cyclical and random. Through the eyes of a geologist, I would be really concerned if there were no change to Earth over time. In the light of large rapid natural climate changes, just how much do humans really change climate?

The Earth's climate is driven by the receipt and redistribution of solar energy. Without this, there would be no life on Earth. Despite well-documented linkages between climate and solar activity, the Sun tends to be brushed aside as the driver of climate on Earth in place of a trace gas (CO_2), most of which derives from natural processes. The CO_2 in the atmosphere is only 0.001 per cent of the total CO_2 held in the oceans, surface rocks, air, soils and life.

Although we are in one of the many warm periods between ice ages, there is a significant amount of ice remaining in the polar regions. Polar ice has been present for less than 20 per cent of geological time, life on Earth for more than 80 per cent of time and liquid water on Earth for 90 per cent of time. Planet Earth is a warm wet volcanic greenhouse planet, which is recovering from glacial times and is naturally warming. Cooling has also occurred in the current interglacial times. Earth has warmed and cooled on all time scales, whether they be geological, archaeological, historical or within our own lifetime. The key questions are: How much of this warming can be attributed to human activity?

If we humans are warming the planet now, how do we explain alternating cool and warm periods during the current post-glacial warming?

Before we can hope to understand present climate change, we must understand how climate has changed in the past. We know that there have been past climate changes which have been extreme and rapid yet we do not understand all the drivers of these past climate changes. Although we know that there are a large number of variables that influence climate, there are probably variables that have not yet been discovered. Some of the known variables have a huge effect

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on climate, others have a slight effect, but combinations can have an unpredictable effect.

We cannot view planet Earth as a simple scientific experiment where, by changing one variable, we can isolate another variable.

Calculations on supercomputers, as powerful as they may be, are a far cry from the complexity of the planet Earth, where the atmosphere is influenced by processes that occur deep within the Earth, in the oceans, in the atmosphere, in the Sun and in the cosmos. To reduce modern climate change to one variable (CO_2) or, more correctly, a small proportion of one variable (i.e. human-produced CO_2) is not science, especially as it requires abandoning all we know about planet Earth, the Sun and the cosmos. Such models fail.

The history of temperature change over time is related to the shape of continents, the shape of the sea floor, the pulling apart of the crust, the stitching back together of the crust, the opening and closing of sea ways, changes in the Earth's orbit, changes in solar energy, supernoval eruptions, comet dust, impacts by comets and asteroids, volcanic activity, bacteria, soil formation, sedimentation, ocean currents and the chemistry of air. If we humans, in a fit of ego, think we can change these normal planetary processes, then we need stronger medication.

If we look at the history of CO_2 over time, we see the atmospheric CO_2 content has been far higher than at present for most of time. Furthermore, atmospheric CO_2 follows temperature rise—it does not create a temperature rise. To argue that human emissions of CO_2 are forcing global warming requires all the known, and possibly chaotic, mechanisms of natural global warming to be critically analysed and dismissed. This has not even been attempted. To argue that we humans can differentiate between human-induced climate changes and natural climate changes is naïve. To argue that natural climate changes are slow and small is contrary to evidence. The slogan 'Stop climate change' is a very public advertisement of absolute total ignorance as it is not cognisant of history, archaeology, geology, astronomy, ocean sciences, atmospheric sciences and the life sciences.

Humans can change the weather. The 'urban heat island' effect shows that the concentration of roads, concrete, buildings and machinery in towns of more than 1000 inhabitants creates a warmer setting than in a rural setting. In Europe, we see a 'winter weekend effect' where cooler wetter weather probably results from human activity. These weather changes do not necessarily mean that humans change climate.

Pollution...

Pollution shortens your life. However, CO_2 is not a pollutant. Global warming and a high CO_2 content bring prosperity and lengthen your life. Carbon dioxide is plant food, is necessary for life, and without CO_2 there would be no complex life on Earth. In some parts of the world, polluting smogs are common. They currently derive from backyard brickworks, small dirty smelters and furnaces, power stations using sulphur-high ash coals, forest clearing fires, bush and grass fires and millions of small obsolete and dirty wood, charcoal and coal stoves, heaters, boilers and furnaces. Millions of coal fires caused similar smogs in England up until the 1950s.

The Kyoto Protocol is a treaty to regulate CO_2, methane, nitrous and other nitrogen oxides, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. It cannot be a treaty to regulate greenhouse gases, because water (H_2O) vapour, the main greenhouse gas, is not included. Car exhaust gases consist of harmless gases (CO_2, nitrogen, H_2O vapour), pollutants (carbon monoxide, volatile organic compounds, nitric oxide, nitrogen dioxide, sulphur dioxide and PM-10 [very small particulate matter]). A car's catalytic converter converts some 95 per cent of these pollutants into H_2O and CO_2. Smog consists of ozone (formed from the photochemical reaction of nitrogen oxides with hydrocarbons), sulphur dioxide and PM-10. Smog can kill people, plants and animals.

The open combustion of poor quality carbon fuels produces soot, smoke, ash, unburnt fuel and chemicals containing sulphur, chlorine, nitrogen, fluorine and metals. In confined unventilated places, open fires produce poisonous carbon monoxide. At present, China emits more sulphur dioxide than any other country in the world and this chokes people, causes acid rain, damages life and destroys buildings. The 'Asian Brown Cloud' covers an area as large as Australia, obscuring the Sun in some polluted Asian cities. It has a profound effect on human health. At times, it drifts right across the Pacific Ocean and covers the Northern Hemisphere. These smogs are not due to CO_2, which is invisible. Darker soot falling on snow and ice allows it to absorb more solar energy and may contribute to more rapid melting of snow and ice.

The Western world was bathed in atmospheric pollution half a century ago. The smoke pollution from 1860 to 1960 of London, Manchester and Pittsburgh was far greater than that of Beijing today. Charles Dickens called the notorious pea souper fogs of London 'particular', and Edward I passed a law in 1272 AD trying to get rid of them. London was called the 'big smoke' because that's exactly what it was. Little sunshine could penetrate the atmosphere. Children developed rickets from the lack of sunshine, plants and animals died and lung disease was widespread. The smog was commonly so dense that bus drivers could not see the kerb and a passenger had to walk along the edge of the road with a light to lead the way. Trains had difficulty running as drivers could not see the signals, and detonators had to be placed on rail tracks to warn of potential dangers. The Black Fog of 1952, triggered by a temperature inversion over London, reduced visibility to 10 centimetres and 4000 Londoners died of respiratory problems caused by sulphur dioxide. The *Clean Air Act* of 1956 prevented the use of open fires of coal and wood in big cities. It was reticulated cheap coal-fired and nuclear reactor electricity that stopped pollution in Britain. The same will probably happen in Asia.

The public have rightfully become less tolerant of pollution and much progress has been made to clean up the Western world. Governments, the media and

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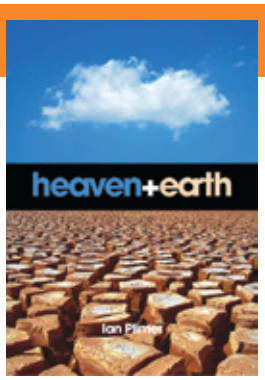

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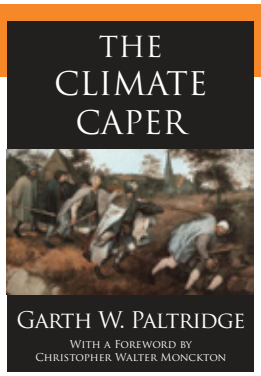

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many people are of the view that CO_2 is the cause of climate change, is of human origin and is a pollutant. It would seem to the layman that there is no longer any need for scientific debate about climate change.

...And climate change

The warm climate of Greenland 1000 years ago allowed the growing of grain, sheep and cattle. This warm climate could not have resulted from human emissions of CO_2. A few hundred years later, the bitterly cold weather of the Little Ice Age could not have derived from a decrease in human emissions of CO_2. There must be other causes of warming and cooling. How can we know that the slight warming since 1850 is due to humans adding CO_2 to the atmosphere? Furthermore, there have also been coolings since 1850. There must be other global-scale natural processes at work and the question must be asked: Does atmospheric CO_2 have anything at all to do with climate?

If CO_2 derived from modern industrialisation is the culprit for global warming, then why did the global temperature increase from 1918 to 1940, decrease from 1940 to 1976, increase from 1976 to 1998 and decrease from 1998 to the present? Throughout this period, humans were adding increasing amounts of CO_2 to the atmosphere. The IPCC does not explain the temperature variations in the 20th Century. There was alarm in the 1970s that the decreasing temperature was heralding another ice age. This was an important lesson from which nothing was learned. After 1976, temperature started to rise and again there was alarm, this time that there was going to be a period of global warming. Then temperatures started to fall after 1998. There is now silence. It is not possible to make computer model forecasts of climate change for the year 2040, 2100 or 2300 based on a few decades of data.

If we change the time scale and look at the last 6 million years, for 3 million years it was warmer than now. For the other 3 million years there was an increase in the magnitude of high-frequency warm and cold cycles. During the last three warm cycles, it was 5°C warmer than now. Past natural climate changes have been partly cyclical and partly unpredictable and have nothing to do with human additions of CO_2 to the atmosphere.

Why are slight temperature changes in our lifetime related to humans adding CO_2 to the atmosphere whereas past slight and large climate changes cannot possibly be related to industrialisation?

There is no problem with global warming. It stopped in 1998. The last two years of global cooling have erased nearly thirty years of temperature increase. The year of 2008 was an exceptionally cold year. By the end of January 2008, blizzards and cold temperatures in China had killed 60 people, millions lost electricity service, nearly a million buildings were damaged, airports were closed and Hong Kong had the second longest cold spell since 1885. In February 2008, cold weather in Vietnam destroyed 40 per cent of the rice crop and killed 33,000 head of livestock. In Mumbai the lowest temperature for 40 years was recorded. In the USA, International Falls, Minnesota set a new record (-40°C) breaking the old record (-37°C) set in 1967. In Reading, Pennsylvania, the temperature stayed below -40°C for six consecutive days for the first time since the 18th Century. Alaskan glaciers grew. On October 29 2008, the USA beat or tied 115 low-temperature records for that date. Alaska, which was unusually warm in 2007, recorded -32°C for that night, beating the previous low by 2°C.

In the first week of December 2008, blizzards closed roads and schools across northern England and Scotland. Large parts of the UK were blanketed with snow for the third time in the 2008-09 winter. At the same time the UK government's Committee on Climate Change issued its first report on how Britain is to handle the terrifying threat of runaway global warming. Nature certainly has a keen sense of humour.

With 24-hour news, we always have weather and climate disasters somewhere in the world in real time. Some place on Earth will always be breaking a local, regional or national record for temperature or precipitation.

One thing I have learned from more than 40 years in science is that surprises abound. When I look at the history of planet Earth, no surprise can surprise me any longer. The impossible happens.