A BRIEF HISTORY OF CLIMATE

> *"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 the geologist, I would really be concerned if there were no changes to earth over time*." Professor Ian Plimer [1].

Even after a cursory examination of the history of the Earth's climate, several points stand out. First, if you were ever forced to define a 'normal' climate for Earth in the past 30 million years, it would have to be the climate during a glacial period within an Ice Age.

Second, Earth's climate is in a continual state of change. Even within a single Ice Age, there are alternating warmer and colder periods. So, within periods lasting hundreds of thousands of years, there are also alternating periods of cold and warm lasting thousands of years, and within those years there are more alternating periods lasting hundreds of years in which there are even more alternating periods lasting decades.

Finally, for all life on Earth, warm periods are good, while cold periods are bad and, sometimes, can be devastating. As Plimer states;

> *"The history of time shows us that depopulation, social disruption, extinctions, disease and catastrophic droughts take place in cold times, and life blossoms and economies boom in warm times."* [2]

We are currently in an Ice Age that started 34 million years ago [3]. To date five major Ice Ages have been identified [4], the first starting more than two billion years ago. Figure 1 provides more details about these five Ice Ages.

Fig. 1 – Five Ice Ages [4]

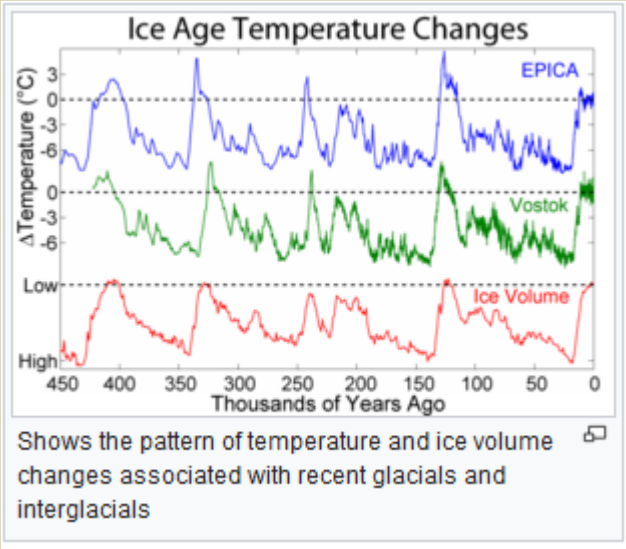
Starting Age mya =**m**illion **y**ears **a**go	**Ice Age Name & Geological Period**
2,300 - 1,700 to mya	**"Hurion"** in the Huronian Era in Precambrian time
720 - 630 mya	**"Cryogenian"** at the end of the Proterozoic Era, in Precambrian time
460 - 420 mya	"**Andrean-Saharan**" in the middle of the Paleozoic Era, between the Ordovician and Silurian Periods
360 - 260 mya	"**Late Palezoic**" in the late Carboniferous and early Permian Periods, late in the Paleozoic Era
37 mya - today	The "**Quaternary**" Ice Age:

Glacial and Interglacial Periods

Within the present Ice Age there are multiple alternating periods of cold (*glacial periods*) and warm (*interglacial periods*) changes in the climate. There is evidence that similar cycles occurred in previous Ice Ages, including the Andean-Saharan and the Late Paleozoic ice ages.

Generally, the glacial periods (cold) can last up to 100,000 - 120,000 years, whereas interglacials (warm) normally last 10,000 - 12,000 years. We are presently in a warm interglacial period called the "Holocene" that has, so far, lasted 11,700 years.

The following graph shows the temperature and ice volume movements caused by these cycles between some of the most recent glacial and interglacial periods.



Shows the pattern of temperature and ice volume changes associated with recent glacials and interglacials

The Past 120 Thousand Years

In took four hundred years to enter the most recent glacial period which began 116,000 years ago. It took six thousand years, with the climate fluctuating wildly, to end this glacial period 14,000 years ago.

Fig. 2 – Glaciation Period -116,000 to -14,000 years ago

PERIOD & NAME	COLD or WARM	COMMENTS
-116,000 years	COLD	**Start of Glaciation:** Cold, dry and windier. Amazon Forest turned to grassland. Snowline down 900 metres. Sea temperatures -3C cooler. Three hominid species at the start, but only Homo Sapiens survived this period.
-107,000	COLD	Forests in Europe abruptly disappeared.
-74,000	COLD	Intensely cold after Indonesian volcano Toba erupted.

-60,000 to -55,000	**WARM**	Slightly warmer, glaciers start to retreat.
-55,000 to -32,000	**COLD**	
-32,000 to -28,000	**WARM**	Great migration of Cro-Magnon man in Europe. -30,000 years; Human population, a few hundred thousand
-28,000 to 14,000	**COLD**	**Zenith of this glacial period -21,000 to -17,000**. Temperatures -5C lower than today. Sea Levels-130 metres lower. Arid, cold, and windier, lake levels low. 5,000 feet thick ice over Scandinavia, Scotland and the Canadian/US border.
-14,000 years		**End of Glaciation**

The Present Interglacial Period

Before we look at the **present** interglacial period here a few facts [5] about the ***previous*** 14,000 year long interglacial period which occurred more than 120,000 years ago:

- Sea level was six metres higher than today. Coral reefs thrived.
- Air temperature was warmer, 6ºC at the poles, and 2ºC at the equator.
- The ice sheets retreated but did not completely melt. Polar bears survived.
- Alpine valley glaciers retreated.
- Vegetation and animal habitats changed.
- Trees advanced up slopes, and to higher latitudes.
- Life on Earth thrived and there were fewer cold snaps.
- There was no industry emitting CO_2 at that time, so this warming could only be natural.

Within the present interglacial period, there have been both warm and cool periods. Not surprisingly, the warmest period occurred in the middle of this interglacial period – a 4,000 year warm period called the "*Climate Optimum*".

In Figure 3 on the following page, there is a description of the present climate period from 20,000 years ago to 2,000 years ago.

Fig. 3 – Present Interglacial Period -20,000 to 2,000 years ago

PERIOD & NAME	COLD or WARM	COMMENTS
-20,000 years	COLD	**Coming out of the Glacial Period:** Temperature -5C lower. Sea Levels -130 metre lower. Cold, dry and windier. Amazon Forest turned to grassland. Snowline down 900 metres. Climate fluctuates wildly. Greenland temperatures will rise 20C.
-14,000 years	WARM	**End of Glaciation.** Sea levels will now rise 130 metres in the next 14,000 years.
-14,500 to 12,900	WARM	Sea Levels rise 20 metres (1.25cm per year rate). Bering Strait, English Channel and Irish sea formed. Corsica and Sardinia split, Haikou, Taiwan, and Japan split from mainland. Paua New Guinea and Tasmania split from Australia. Sharp cooling from -13,900 to -13,600
-12,900 to -11,500 **Younger Dryas**	COLD	Intense cold period. Greenland temperatures drop 15C, UK temperatures drop 5C. Stressed life on Earth. Changed plant and animal distribution. Expansion of ice sheets and alpine valley glaciers. Wind strength increased ocean currents changed. This change was rapid; it occurred in 10-100 years. Scandinavian forests replaced with tundra. Extinction of American mega fauna. End of this period saw temperature rises of 7C over a few years.
-11,500 to -8,900 **Holocene warming period**	WARM	End of Younger Dryas sees temperatures similar to today's temperatures. Human, plant and animals adapted to rapid rise in temperature and sea levels. Ice sheets retreated, forests expanded, sea levels rose, trees replaced grass, grass replaced deserts. Human population grows to 5 million.
-8,900 to --8,500	COLD	Intense cold, windier glacial like period.
-8,500 to --4030	WARM	Temperature +2C higher. Sea Level +2metre higher. Unusually warm in Greenland and the greatest summer melt of ice in this interglacial period was seen.
-8,000 years	WARM	**Holocene maximum**. Arctic 3C warmer, Iceland 1.5C (2-3C higher than 1961-1990 average), New Zealand temperatures 2.3C warmer, than today. Human population 100-150 million.
-4,030 to –2,500	COLD	300 year drought, leading to collapses of empires and depopulation

As we approach the end of this interglacial period there have been alternating multi-century warm and cold periods – and within each of them, there have been alternating multi-decadal warm and cold periods.

The Past 2,000 Thousand Years

During this period depicted in Figure 4, there have been two multi-century warm periods both of which were warmer than our current warming period, and all

three of them are cooler than the Climate Optimum warm period. In the same timeframe there are two multi-century cooling periods.

The first cooling period, the Dark Ages Cooling Period was devastating for life on Earth, yet it was not as cold as The Little Ice Age that occurred five hundred years later.

Fig. 4 – Past 2,000 years

PERIOD & NAME	COLD or WARM	COMMENTS
200BC to 400AD: **Roman Warming Period**	**WARM**	Temperature +2-6C higher. Sea levels slightly lower. Olive Trees grow in the Rhine Valley. Grapes Grown near Hadrian's Wall UK. Most of Europe enjoyed a Mediterranean climate. Wetter climate, with rainfall, lake levels and river flows higher. North Africa was the bread basket for both the Romans and Carthaginians – now mostly desert. Antarctica warmer. Excess food, all UK's 5.5 million people could be fed.
400AD to 800AD: **Dark Ages Cooling Period**	**COLD**	Sudden cooling over a few years made the Dark Ages a terrible time to live. There was famine, war, change of empires and disease. Millions died (25 million from the bubonic plague alone). Trees nearly stopped growing. The UK's population would not pass 5.5 million for another seven hundred years. The Black Sea froze, and ice formed on the Nile. All this led to large scale population migration. In central America, the Mayan civilisation collapsed. The Dark Ages ended as quickly as it had begun.
800AD to 1300AD: **Medieval Warming Period**	**WARM**	Temperature +1.5-2C higher. Sea levels slightly lower. Far warmer than present and warming was widespread. Europe was warm, rainfall higher, growing seasons longer over larger areas, climate was stable and agricultural productivity was high. Excess food led to a doubling of Europe's population. UK's population rose from 1.4 to 5.5 million. France's population tripled to 18 million. Within 100years, China's population doubled with temperatures 2-3C warmer than now. Vikings established settlements in Greenland, Iceland and North America.
1300AD to 1850AD: **Little Ice Age**	**COLD**	The change into The Little Ice Age only took 23 years. It led to famine, depopulation, war and disease. Wet weather and the resultant bad harvests in 1697 brought disasters to farming communities. In Finland famine killed one third of the population. Pacific Island populations declined markedly. The period was not uniformly cold with four intense cold periods and some significant warm periods leading some to call it the Twin Ice Age. The Vikings deserted Greenland, Inuits paddled canoes between a vastly increased Arctic ice to Scotland. River Thames and the Seine froze enough for fairs to be held on the ice.
1850 to Present Day: **Current Warming Period**	**WARM**	Temperatures have increased 0.7C since this warming began. The last time the river Thames froze was 1896. Arctic ice is retreating slowly. The good, in fact very good, times have returned. This period is covered in more detail in the next table.

The Little Ice Age was a very cold period that lasted for 550 years with the lowest temperatures around 1700. During this time glaciers were more widespread on Earth than any time in the past 11,700 years.

The Past 170 Years

In the Current Warming Period, which started in 1850 as we come out of The Little Ice Age, we see the same alternating temperatures that Earth has experienced for millions of years.

1. Cooling period continuing through 1850 to 1860,
2. Warming period 1860 - 1888,
3. Cooling period 1888 - 1915,
4. Warming period 1915 - 1945,
5. Cooling period 1945 - 1970,
6. Warming period 1970 - 1998, and
7. Cooling period from 1998, that continues today (2021).

However, the Green scientists want to convince us that a temperature rise of less than one degree over 160 years is very different and is dangerous, claiming that it is a large rise and it is happening faster than ever seen before. This is untrue.

In the past, larger changes in temperatures have occurred in much shorter periods of time. The Green movement should study the previous interglacial period described above and note that today's climate is not extraordinary. Before calling anything "*abnormal*" we all should understand what "*normal*" is.

Even the alarming projections the Greens climate models have made - that have so far been 400% or more in error - are still within the normal range of climate variations seen in the past.

In emphasising the current warming trend, the Green scientists minimise, or ignore, the cooling periods in the past 160 years. In the early 1990s, when they were forced to recognise them, they fervently and foolishly declared that there would be no more cooling periods. Their falsified greenhouse theory and the models based on that theory predicted this.

In 1998, global warming stopped and has not resumed to date, 23 years later (2021). None of the Green scientists, nor any of the 22 major climate models predicted this hiatus in global warming. However, as day follows night, another multi-decadal warming period will follow, which is expected to start at approximately 2023-2029.

It is not surprising that temperatures are gradually rising, because we are still coming out of The Little Ice Age. It was the severest cooling period in the past 11,700 years, so we would not only expect it to warm, but we would wish it to warm. Times were not good during The Little Ice Age.

Conclusion

The Greens' campaign about global warming has convinced the public that, before 1850, everything was in a benevolent state of stability, and this was upset by Man and his industrial revolution. This has had two effects.

First, any change that people detect in the climate is immediately blamed on Man. Second, the naive Green acolytes regularly regurgitate a well taught phrase "Climate change is real" to any sceptic who dares 'not to toe the party line'. As if this is the first time the climate has changed, and Man has caused this.

This is rubbing salt in the wound, as the sceptics have continually reminded the Greens that climate has been changing for billions of years, and what the Greens are seeing is a continuation of those natural changes.

The Greens' task is to convince the public that they can differentiate Man's small effect, if any, within this natural change. If humans are the sole cause of warming the planet now, how do we explain the alternating cool and warm periods during the current interglacial warming period? To date, they have failed on both counts.

Notes:

1. Plimer, Ian, "Heaven+Earth, Global Warming: The Missing Science", Connor Court Publishing, Ballan Victoria Australia, 2009, p.10.
2. Ibid, p.9.
3. https://en.wikipedia.org/wiki/Ice_age#Major_ice_ages, 1121hrs 25th July 2021. Some say the present ice age started 2.58 million years ago based on when the Arctic ice cap started forming, while others base it on when the Antarctic ice sheet started forming 34 million years ago.
4. Ibid. Some say there have been six Ice Ages which depends on the definition of "Major".
5. Plimer, Ian, "Heaven+Earth, Global Warming: The Missing Science", Connor Court Publishing, Ballan Victoria Australia, 2009, p. 30.