Beware of Cooling: Earth Scientist Tom Gallagher begins his presentation of changing climate showing what Ireland and the Northern Hemisphere were like 19,000 years ago. Most of Canada was covered with ice. So was Ireland, and much of northern Europe. [No wonder Ireland has no native snakes.] Gallagher emphasizes his focus is on Climate Change (not weather!), climate change is driven by variations in incoming solar energy described by Milankovitch as well as other cycles.

To understand changing climate, we need to understand energy storage and accumulation including the mechanisms and lag times. Often these are missing from climate studies. Gallagher goes into energy transport including ocean currents and how continental drift influences ocean currents. Many papers by climate scientists looking at the history of climate ignore the importance of changes in ocean currents.

Rather than limiting his research to the past 150 years or so, Gallagher goes back to about the time dinosaurs became extinct, about 67 million years ago. He relies on data, (physical evidence, from proxies, fossils, including differences in isotopes of particular atoms) not theory. His data are the earth's climate history encased in rock and ice as well as sediments in the oceans. He believes that by learning the past we can know more about the present, and are better equipped to forecast the future, but cannot do so with great certainty.

He goes through a graph of temperature and atmospheric CO2 over the Earth's history to show that there is no correlation over time. Al Gore was wrong in his movie. He shows that sea levels tend to be influenced by glacial periods; more ice means lower sea level.

Over the past 50-60 million years there has been a temperature variation of about 18 ºC (32 ºF). We are now in a brief, quite steady warm period during an Era of pulsating glaciation. Southern glaciation (Eastern Antarctica) began about 34 million years ago. About 15 million years ago the western Antarctic ice sheet began. The northern ice cap (Greenland) began around 3 million years ago.

Gallagher states that the Sun is the primary energy source for climate; the oceans are the primary energy "storage" mechanism; ocean currents are the primary energy "transport" and "collection" vehicle; and the atmosphere has a negligible capacity to store long term climate energy. [Apparently these natural features of the Earth are too complex for the IPCC and its modelers; so their focus is on the atmosphere, which has a negligible storage capacity – and still get that wrong.]

After explaining why oceans are the best storage of heat (CO_2 is a poor one), Gallagher gets to an important issue generally ignored by climate studies looking back in history: what causes changes to ocean currents? He finds that: 1) as continents have drifted, ocean passages have opened and closed over time; 2) as a result, there have been major changes in ocean currents; 3) these changes have affected energy collection and transport and climate.

Gallagher then gets into the issue of Continental Drift. For tens of millions of years starting about 66 million years ago, there was an open seaway near the equator, circulating the energy stored in the oceans. Temperatures were high, water levels were high, there were no ice caps. In the Eocene, about 56 million years ago, the Antarctic was still closed, there was no Drake passage. The Arctic Ocean was closed, temperatures 16-18 C above today. This warmth led a biological boom.

Starting in the Oligocene, about 34 million years ago dramatic climate change, cooling, began. The Drake passage opened, and the Antarctic circumpolar current began, allowing for the beginning of the east Antarctic ice sheet. India was colliding with Asia narrowing the equatorial seaway in that region. In the Mid-Miocene about 14 million years ago, the seaway in between North and South America narrowed as well as the seaway between Asia and Australia. The isolation of Antarctica increased with a widening of the southern polar current. The Antarctic ice cap extended to west Antarctica.

By 3.3 million years ago, the seaway through Panama closed and the seaway in Indonesia narrowed, terminating the Equatorial Current. These events gave us the Quaternary Period beginning with the Pleistocene Epoch which immediately proceeded the current Holocene Epoch. The Earth's oceans were forced into a North-South pattern, the North and South ice caps and ice sheets expanded. The equatorial heat transport of the oceans no longer moderated the Milankovitch Cycles, and they began to cause large 100,000 and 41,000-year glacial cycles with drastic 10-degree C swings in temperatures.

The default climate condition during the Pleistocene is: Glacial, Cold and Dusty. During periods of glaciation in what are now the great bread baskets of civilization, the Great Plains, the plains of Europe, and Asia, became barren and subject to great dust storms. These storms created huge loess-covered areas. According to the *Britannica*:

"The world's largest loess-covered areas lie between latitudes 55° and 24° N: in China on the banks of the Huang Ho; on the margins of the continental deserts of Inner Asia; in Central Asia in Kazakhstan, Uzbekistan, the foreland of the Tien Shan, and east of the Caspian Sea; and in Siberia along Lake Baikal and the Lena River and in vast regions in the southern parts of the catchment areas of the Ob and Yenisey rivers. In Europe there is an extensive, uninterrupted loess cover in the South Russian Plain, large spots and belts in the Danube Basin, along the Rhine, along the margin of the former inland ice cap in the German-Polish plain, and in the Paris Basin. In North America loess covers the plains of the Platte, Missouri,

Mississippi, and Ohio rivers and the Columbia Plateau. In the Southern Hemisphere, between latitudes 30° and 40° S, the most significant loess regions include the "pampas loesses" of Uruguay and Argentina and parts of New Zealand."

According to Gallagher, it is the accumulation of dust on icesheets that brought the Earth out of periods of glaciation, not some imaginary increase in carbon dioxide that has been speculated by since the time of Svante Arrhenius and it was used by the EPA to justify its Endangerment Finding.

Gallagher explains that his data sources include a new source of proxy data that became available in September 2020. [These data sources are ignored by the IPCC, especially by those who created the 2,000-year hockey-stick used in the Summary for Policymakers in the Sixth Assessment report (AR6, 2021)]. According to Gallagher, his data sources have high sample density and accuracy and exceptionally long time series analysis of 18O and 13C in microscopic plankton. He cites a 67-million-year record of temperature and CO2 concentration using isotopic analysis of Benthic Forams from sea sediment cores (Westerhold – Science, Sep 11, 2020). The multiple data sources used in AR6 are pieced together with no demonstration of continuity of measurement.

Gallagher goes on to explain we are living in a neoglacial, not the peak of the Holocene which ended about 8000 years ago. Humanity thrives in warm times, suffers in cold times. The Holocene had a number of abrupt warming periods of 1.5 to 3 degrees C and based on ice core graphics, the rates of temperature rise are similar to one another. Older Holocene warming rates were much faster than now. [The current "feared" 2 C warming is a political trick played by the IPCC and its followers.]

The primary influencers of climate are still here: Solar Cycle; Oceanic Currents; Oceanic Oscillations; and Regional Oceanic Energy. Further the beryllium isotope, Be10, correlates well with sunspot activity, and since 1830s the solar signal is stronger, bringing the Earth out of the Little Ice Age. [At best, carbon dioxide is a bit player in the complex play of the Earth's climate.] In his video Gallagher covers far more. See links under Challenging the Orthodoxy and https://www.britannica.com/science/loess.

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