30. CLIMATE (TEMPERATURE) AND THE CONSTITUTION #3

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Former Senator Schmitt Summarizes History of Global Temperature

Ten thousand years of natural, post-Ice Age climate variability should give pause to those who maintain that current slow global warming and carbon dioxide increases result largely from human use of fossil fuels. Public confidence in that position also suffers from the exposure of fraudulent academic and bureaucratic behavior aimed at overriding normal processes of skeptical scientific review and debate. Supposedly "scientific" advocates of human-caused global warming used a mathematical trick to hide a real decline in global temperature prior to 2000 because it did not fit their hypothesis that human activities have caused global warming **[1].**

In the face of diligent and realistic climate observations by others, believers in human-caused global warming and their tightly bound socialist supporters have circled the wagons. The National Academy of Science, Nature and Science magazines, and the mainstream climate establishment have increased the volume, but not the reasonableness, of both their denunciations of disagreeing scientists and their rationalizations for the missteps of other scientists with whom they agree **[2]**. The "human-caused global warming" community continues to talk only to themselves instead of engaging in a reasonable dialog with reputable disagreeing scientists. These latter scientists want objective enquiry to take place before forcing unconstitutional legislative and regulatory decisions on an increasingly skeptical electorate– decisions that will cost both liberty and the American economy dearly.

Observational data and interpretations related to global temperature and atmospheric carbon dioxide deserve close examination before taking irrevocable and dangerous regulatory actions. If there were no other factors affecting temperature at the Earth's surface, the balance between heat from the sun and heat re-radiated from the Earth to space would give an average surface temperature of about 0 °F (-18 °C) **[3]**. Not good. Fortunately, the trapping of heat in the atmosphere by water, carbon dioxide, and other gases, generally referred to as the "greenhouse effect," makes the planet habitable rather than being a ball of ice covered rock and water with occasional volcanic eruptions. Weather and ocean processes moderate this atmospheric heating. n Natural greenhouse heat trapping effects of atmospheric water and to a lesser extent carbon dioxide and methane, add about 146 thermal watts per square meter (versus the Sun's irradiance at the Earth of 1366 watts per square meter). With just the greenhouse effect of water and carbon dioxide, the average temperature at the Earth's surface would be about 140°F (60°C). Fortunately, weather phenomena have a significant overall cooling effect so that the average surface temperature of the Earth becomes about 59°F (15 °C) **[4]**.

Geological investigations indicate that over the last 600 million years average global surface temperature appears to have been buffered roughly at a maximum of about 72 °F (22 °C) **[5]**. During this 600 million years, major cold perturbations to about 54 °F (12 °C**)** occurred about every 150 million years **[6]**. Over that period, carbon dioxide decreased from an estimated maximum of about 7000ppm 550 million years ago to minimum of about 300ppm around 300 million years ago **[7]** (current level at 385ppm) without changing the long-term average temperature at the Earth's surface. The last 53 million years were significantly colder than the previous average **[8]**, as indicated by oxygen isotopes of shells in sea floor cores **[9]**, but comparable to earlier cold periods.

Around 56 million years ago, marine and continental isotopic records indicate that significant new light carbon appeared in the atmosphere (the Paleocene-Eocene Thermal Maximum or PETM), but evidence also exists that a period of climate warming preceded that release of light carbon **[10]**. Unusual warming of the deep oceans may have released both dissolved carbon dioxide and seabed methane. Both before and after the PETM, six less extreme and shorter duration warming events have been documented **[11]**. In contrast to the PETM warming, a significant decrease in sea surface temperatures **[12]** appears to have lasted about 3 million years within a >20 million long Ice Age around 44.5 million years ago. This fall in temperature is associated with a reduction in atmospheric light carbon (^{12}C) relative to heavy (^{13}C) **[13]**. The timing of the initiation of the change in carbon composition, however, has not yet been resolved relative to the ~20 million year long cold anomaly in sea surface temperatures during a period of already cold temperatures and continental glaciations.

43 million years ago, declining carbon dioxide concentration reached about 1400ppm, followed by three oscillations during the next 10 million years with amplitudes of about 1000ppm **[14]**. With one known exception **[15]**, temperature apparently remained relatively constant during these ancient carbon dioxide oscillations. The exception occurred during the most recent oscillation when oxygen isotope ratios indicate a sharp drop in temperature **[16]** 33.5 million years ago. This correlates with about the time ice sheets began to accumulate on Antarctica **[17]** and a drop in sea level of about 40m over two million years **[18]**. Relative to today's values, declining atmospheric carbon dioxide levels remained relatively high (740-1400ppm) even as Antarctica cooled.

About 22 million years ago, with its continued slow migration away from Africa, Australia, and South America, the ocean distribution and currents around Antarctica began to resemble modern configurations **[19]**, with partial deglaciation of that continent beginning about 14-15 million years ago **[20]**. A particularly warm two million years for the tropical Earth latitudes developed about 4 million years ago even as sea surface temperatures slowly declined toward present levels **[21]**. This seemingly contradictory situation apparently related to a long-term north-south expansion of the warm tropical ocean waters resulting in a factor of four reduction in the sea surface temperature gradient from the equator to at least 34 °N (~2 °C gradient versus ~8 °C, today) that lasted until about 1.5 million years ago. Along with disruptions of the El

Niño Southern Oscillation, convective tropical Hadley circulation in the atmosphere apparently slowed during this long period with both effects probably leading to significant global climate impacts.

About 2.75 million years ago [22], major ice ages began to oscillate with periods of warmth (interglacials). This occurred in spite of the concurrent anomaly in the tropical sea surface temperature gradient. Ten specific high latitude ice ages took place in the last million years, apparently correlated with a change from the Earth's 41,000-year orbital obliquity cycle to its 100,000-year eccentricity cycle as the dominant solar influence on cooling [23]. A significant decrease in the overall concentration of atmospheric carbon dioxide occurred at about the same time as this change in orbital influence with even greater, temporary reductions associated with each ice age as cooler oceans would have dissolved more of this gas; however, the reported data do not support a causal association of this decrease in carbon dioxide with the overall cooling during this million-year period [24].

Compilations of temperature changes in the oceans and seas, as preserved by oxygen isotope variations in shells from cores of bottom sediments, provide a record of natural cycles of major climate change back for 1.8 million years [25]. For example, geological analysis of features related to sea level changes over the last 500,000 years shows a remarkable correlation of these changes with major natural climate change [26]. These data further indicate the approach of the peak of the warming portion of a normal climate cycle that began with the end of the last Ice Age [27].

Terminations of past ice ages appear to be associated with increased solar heating (insolation), as orbital influences changed, and not with triggering increases in carbon dioxide levels; although such increases certainly accompanied the terminations. Suggestions have been made recently that increase in atmospheric carbon dioxide forced temperature increases and ice age terminations over the last 20 million years or so [28]. Such speculations suffer from science's inability to adequately time-correlate most these very ancient changes in carbon dioxide levels with changes in global temperature. Carbon dioxide release from more slowly warming oceans would be expected to lags surface warming by hundreds to thousands of years [see below]. No observational support exists for a conclusion that a specific natural carbon dioxide change forced a specific temperature change.

The lesson in these variations in values for atmospheric carbon dioxide and global temperature through geologic time, at least at a million-year or so time-resolution, appears to be that no evidence exists that increases and decreases in carbon dioxide have triggered global temperature changes as derived from fossil oxygen isotope ratios. Other long-term geological and solar-related phenomena affecting atmospheric water concentrations may have overwhelmed any broad greenhouse effects related to carbon dioxide; or, alternatively, the proxies used for estimating ancient atmospheric carbon dioxide concentrations may be invalid [29]. All we really know at present is that natural variations in climate have been very complex, often extreme, and all before human industrial activity existed.

Studies of Antarctic ice cores indicate that during the last 420,000 years Earth-surface temperatures several degrees warmer than present existed during the four interglacials that preceded our own [30]. At a low time-resolution of 1000s of years, carbon dioxide in the atmosphere during these interglacials apparently did not rise above 290ppm (compared to 385ppm today), and its changes would appear to be correlated directly with temperature changes [31]. On the other hand, high time-resolution ice core data indicates that both increases and decreases in atmospheric carbon dioxide lag associated increases and decreases in global temperature by hundreds to a thousand years for major long-term temperature variations [32]. The broad rise or fall in average ocean temperature would be expected to precede any effect on stored carbon dioxide due to the oceans' relatively high mass and slow circulation.

As the Earth moved out of the last major Ice Age beginning about 19,000 years ago [33], dramatic climate and temperature oscillations occurred based on analyses of oxygen isotopes [34]. These oscillations reached steady state periods of relative warmth or cold that lasted 500 to 1000 years before another major change occurred. Northern Hemisphere warming after the Younger Dryas, the last major cold period, began about 11,600 years ago and proceeded rapidly over about 100 years before a more gradual, 1500-year warming trend took over. Geological analysis of New Zealand mountain glaciers indicate that the post-Younger Dryas warming also occurred in the Southern Hemisphere [35]. From about 10,000 years ago to the present, a period of relative warm conditions, the Holocene Climate Optimum, has prevailed, although multi-decade long variations have occurred, including the Medieval Warm Period and Little Ice Age discussed below.

Recent study of sediment cores from the Antarctic margin on the Pacific side of the Western Antarctic Peninsula suggests a somewhat different temperature history for that region versus the Northern Hemisphere [36]. Although this analysis of proxies for sea surface temperature shows a comparable warming between 12,000 and 9000 years ago after the Younger Dryas, a 7000-year erratic but overall cooling trend followed. This is in contrast to the Northern Hemisphere warm period over this time, documented in studies of tree rings. Another Antarctic warm interval, however, appears to have existed between about 1800 and 500 years ago, possibly correlated with the Northern Hemisphere's Medieval Warm Period. Cooling set in again between 500 and 200 years ago, possibly associated with the north's Little Ice Age.

As discussed above, a particularly prolonged warm period in the current interglacial between 9000 and 6000 years ago has been documented, most recently in oxygen isotopic analyses of Greenland ice sheet cores [37] and in Great Lakes Region tree ring analyses [38]. That warm period resulted in significant thinning of Greenland's ice sheet to thicknesses within a 100m of those of today. Several other warm periods have occurred since, the most pronounced of which has been termed the Medieval Warm Period (500-1300) [39]. Warm periods of this nature, sometimes referred to as "climate optimums" or "climate anomalies," were largely highly beneficial to fledgling human cultures. During the latter centuries of the Medieval Warm Period, however, overpopulation relative to available technology, severe weather and drought, and other factors forced migrations from many centers of civilization [40], primarily to places with more reliable water resources. These adverse effects of warming, however, stand in contrast to the advantageous migrations of modern humans about 22,000 years ago from Asia into the Americas during the last Ice Age. At that time, low sea levels created a land bridge between Asia and North America [41]. Adaptability is the key.

After a century-long transition from the Medieval Warm Period, the Little Ice Age of 1400-1900 recorded the most recent interval of significant global cooling. Global cooling characterized the Little Ice Age in most regions of the Earth, accompanied in some areas by droughts [42]. By 1400, however, Arctic ice pack had enclosed Iceland and Greenland and driven Viking settlers away from their farms on those islands [43]. By the end of the 1600s, in response to the continued climate cooling, glaciers had advanced over valley farmlands cultivated as those same glaciers receded during the Medieval Warm Period [44]. Indeed, essentially all of the consequences of warming prior to 1300 reversed during the next several hundred years of the Little Ice Age.

Since about 1660, gradual global warming of about 0.9 °F (0.5 °C) each 100 years has occurred [45], although decades-long cooling events have interrupted this trend. Antarctic sea ice, however, now has been expanding northward for about two decades [46] after indications in the Law Dome ice core of an additional gradual retreat between about 1960 and 1990 [47].

As geological proxy records for temperature approach the present, analyses show that measurement of modern, short-term trends in Earth surface temperature are suspect [48], if only because thousands of rural measuring stations have disappeared in favor of reliance on relatively warm airport and other urban stations [49]. Difficulties also arise from many land sensors being located within the expanding effect of urban heat islands [50] and many sea surface temperature measurements being inconsistently determined [51]. Rigorous investigation and analysis of the sources of data that appear to show Earth surface warming accelerating during the last century indicates many non-climatic factors may influence the quality and magnitude of measurements [52] if not the overall trend in slow warming. Government agency reports that the first decade of the 21st Century set records for warmth, based largely on Earth surface-based instruments [53], appear inconsistent with satellite and other observations and may be biased by the measurement problems cited here.

After 1979, earth-orbiting satellites have provided data on temperature variations through globally averaged, microwave determination of temperatures of the lower atmosphere [54]. These measurements are independent of local biases affecting temperatures measured at weather stations [55]. Global circulation models, on which the human-caused climate change hypothesis depends for much of its support, appear to have failed to make correct predictions of the temperature of the lower atmosphere (troposphere) looking back over the last 50 years of direct satellite-based observations. Reports that instrument re-calibrations now confirm the model predictions [56] remain in sharp dispute [57]. Additionally, the long-term trends of 20th Century atmospheric circulation indices representing several major oceanic oscillations do not support climate model simulations for the same period [58].

Near-surface atmospheric temperature variations since 1979, as well as over the last 120 years, correlate much more closely with solar variations than with the steady rise in carbon dioxide levels [59]. Analyses of much less variable sea surface temperatures (SST) indicate that such temperatures rose from about 1900 to the 1940s, fell until the mid-1970s, and subsequently have been rising [60]. Other reports, however, have SST leveling off or decreasing [61] with no net heat increase for the last 58 years [62], particularly since 2003 [63] and possibly since 1990 [64]. The long-term climatic implications of this apparent broad scale ocean cooling are not known. An abrupt drop in SST in the Northern Hemisphere at a minimum in the 11-year sunspot cycle between about 1968 and 1972 has not yet been fully explained, but it illustrates nature's variability over relatively short time spans.

Another temperature anomaly relative to the long-term slow warming trend exists in satellite data that shows a decline in Antarctic snowmelt between 1979 and 2009 **[65]**. Research on this anomaly suggests that levels of Antarctic snowmelt correlate with oceanic and atmospheric interactions in the mid to high latitudes of the South Pacific (the El Niño-Southern Oscillation in ocean and atmosphere temperature and the Southern Hemisphere Annular Mode of pressure gradient variation). These interactions, on the other hand, show no correlation with the slow trend in modern global warming **[66]**. In contrast to Antarctica, snowmelt in Greenland appears to be on the increase and may be contributing to more rapid movement of its ice sheet **[67]**. Additionally, reports of accelerating ice sheet mass loss in Greenland and Antarctica **[68]** need to be reconciled with reports that conflict with these assessments **[69]**.

Throughout geologic history, biological systems' responses to global cooling and warming show the effects of natural climate change. Extinctions, regional die-offs, redistribution in altitude and latitude, and basic evolutionary change of plant and animal species in response to climate change have been the rule, not the exception. Increased research and media scrutiny makes us more aware of what plant and animal species do continuously, if often episodically, in response to change. Polar bear fossil evidence **[70]** and their modern distribution **[71]** indicate that the species clearly has adapted repeatedly to over 100,000 years of climates warmer than at present, such as the Medieval Warm Period. Corals have survived hundreds of million years of extraordinarily geological and climate change.

Glacial and interglacial temperature changes of at least 5 °C between 324,000 and 193,000 years ago in the Pleistocene caused the redistribution of Andean mountainous plant species by as much as 1000m **[72]**. Elsewhere, tree mortality may be on the upswing as species adjust to gradual, warming induced changes in the location of optimum habitats **[73]**, but this surely also happened during other warm periods when we were not around to notice. Net terrestrial primary biological production, however, has remained roughly constant over the last decade although down slightly from the previous decade **[74]**. Warming induced die-offs in some plant species will be compensated to some degree by increased growth in other species due to increases in available atmospheric carbon dioxide **[75]**. Local variations in biological production in response to Artic Sea ice retreats and redistributions have been documented; however, it is not clear that there has been a regional reduction in primary production as measured by chlorophyll concentrations **[76]**.

Although the observational, historical, and geological evidence indicates strongly that global scale changes in the climate, ocean chemistry, and biological activity have roots in natural processes, the concentration of human pollution in local areas of the Earth have documented adverse impacts **[77]**. It remains increasingly in the economic and societal interests of the private sector and State governments to stop and reverse adverse, unnatural local changes for which they bear constitutional responsibility.

Private sector, State, and Federal control of their contributions to regional local pollution effects, and consumer, shareholder, and voter insistence on prevention and cleanup, form an integral part of the nation's future. Appropriate and restrained Federal regulation within the Founders' logically constrained intent of Article I, Section 8, Clause 3, of the Constitution, that is, the Commerce Clause, can contribute greatly to the instigation of this new environmental ethic. On the other hand, unconstitutional coercion will make matters worse while at the same time eroding essential liberties. The long road back to constitutional protection of the environment began with the elections of 2010, and must continue with the elections of 2012 and beyond.

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