Post-printing additions to the book, *The Science of Global Warming*

So many new things relevant to this book keep coming that I have initiated this as a way to at least cover some of them. I will divide them by season, i.e. Fall, Winter, Spring and Summer.

Fall

Trump's EPA Bans Greenhouse Gas Reporting Program

In several places in this book, I have pointed out that methane is 25 times more potent a greenhouse gas than CO_2 (p 35, 57). As such, it is extremely important to identify sites of methane leakage, world-wide, to reduce the accumulation of this dangerous greenhouse gas. Despite this, on September 12, 2025, Trump's EPA proposed to eliminate GHG reporting requirements.

The Greenhouse Gas Reporting Program (GHGRP), established by EPA in 2009 consistent with congressional direction, forms the bedrock of greenhouse gas reporting from industrial sources in the US.

This program is vital for fighting climate change because it provides accurate data showing who is polluting, how much they emit, and where emissions come from. Ending it would blindfold communities, scientists, and public officials — making it impossible to hold major polluters accountable or design effective climate policy.

Repealing the GHGRP would harm companies working to reduce emissions and their workers, giving an unfair advantage to fossil fuel execs wishing to pollute our communities without accountability or transparency. It would stifle innovation, setting the country back in developing pollution-reduction technologies of the future.

Repealing this program would benefit major polluters at the expense of public health and safety. The Greenhouse Gas Reporting Program must be kept intact. Without disclosure, oil, gas, and coal companies could expand pollution unchecked, leaving taxpayers to bear the costs of climate disasters, health impacts, and infrastructure damage.

COPs and Renewable Energy

A recent book by Peter Betts[1] reviews his life-long history of serving as a negotiator for the UK and the EU at many COP conferences. A common thread is **the concern by developed or developing countries, that any significant restrictions on emission from fossil fuels would have a deleteriously negative effect on their economy.**

As described in the book, page 58 – 60, **renewable energy is now cheaper than fossil fuels**. This negates the above issue. **Decreasing a country's output of CO_2 from fossil fuels, would simply require increasing the country's renewable energy sources, i.e., more solar, more wind, more hydrothermal, or more geothermal.** Once in place this would be a permanent resource.

Trump's policy is to reduce or remove all efforts at increasing renewable energy. There is absolutely no rational reason to do this. The old reason was the fossil fuels were cheaper, but that is no longer true. The only reason that makes sense is that because of their financial contributions to his campaign, he is so beholden to the fossil fuel companies that he is intent on destroying all our renewable energy resources. **That means he values his campaign money more than the welfare of the nation. By destroying renewable energy sources, he is leaving the country far less great than it was before he took office.**

It is not even clear that this is doing the fossil fuel companies a favor. These companies would benefit greatly by **investing some of their billions into renewable energy themselves. This will be profitable indefinitely while their fossil fuels resources are limited and will soon be exhausted.** In addition, as described on page 153 and 158, the fossil fuel companies could be part of the solution by using their expertise to find, process, sell and distribute ground olivine and other climate rocks.

Immigrants

The Horrors of ICE. I live in the Los Angeles area. Almost every day the evening news reports on the horrors of ICE operations in various U.S. cities. While this may seem unrelated to the subject of global warming, it is relevant to a related

issue – **the many misguided policies of the Trump administration**. Claiming climate change is a hoax and destroying all efforts to mitigate it, is a disastrous policy. Trump's approach to immigrants is also a disaster.

I do agree with his efforts deport undocumented immigrants with a criminal record. However, his approach of using Nazi Storm Trooper-like tactics, ICE, is misguided.

According to Syracuse University's Transactional Records Access Clearinghouse nearly **three-quarters of immigrants in ICE detention as of September 2025 have no criminal convictions.**

"The latest attack against the metropolis of Chicago by Trump's deportation leviathan, whose so-called Operation Midway Blitz this fall has made its earlier occupation of Los Angeles look like a play date." [2]

"Armed agents have sauntered through downtown and manned a flotilla of boats on the Chicago River. They shot and killed a fleeing immigrant and raided an apartment building with the help of a Black Hawk helicopter. In nearby Broadview, home to the region's main Immigration and Customs Enforcement detention facility, rooftop migra shot pepper balls at protesters below, including a pastor. They even tear-gassed a neighborhood that was about to host a Halloween children's parade, for chrissakes."

This is just a sample of the horrific ICE tactics, driven by Trump's chief of staff for policy, Stephen Miller's hatred of immigrants.

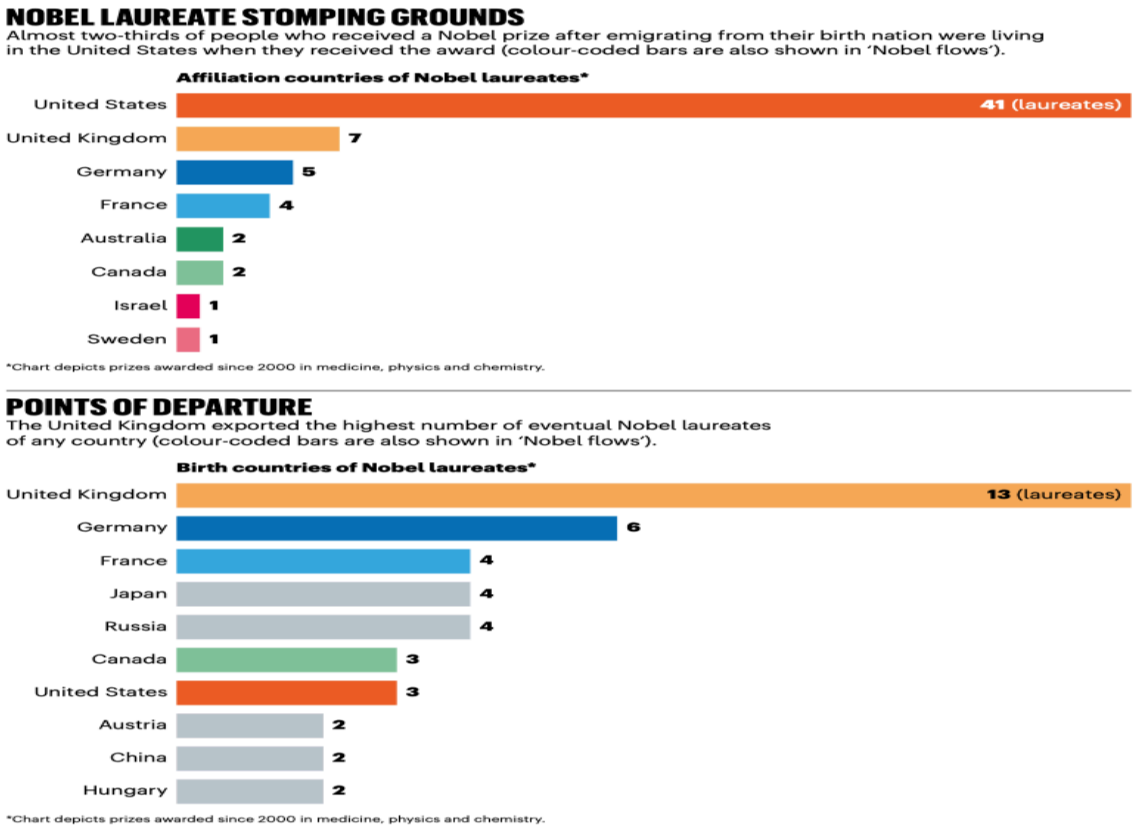
Is there a better way to do it? Of course. The local and state police, the FBI and other resources, are perfectly capable of identifying and finding the immigrants with significant criminal records. By affording them due process, something that does not happen now, we can be assured that any deportations do not violate the constitution. There is no need for an army of unidentified, masked, heavily armed, ICE bullies and huge detention centers which combined, cost an estimated 100+ billion dollars. **That is the connection to global warming. That money would be much better spent doing climate change mitigation**.

While I am at it, I would like to discuss **some of the positive thing's immigrants do for the United States.** The most obvious are the jobs they perform that most other citizens are not interested in – farm work, lawn maintenance, house

cleaning, and service jobs for our major hotels and restaurants. All of these industries have suffered following ICE raids.

Birth Rate Crises. This is a subject that is rarely discussed. Some 29 countries have a **fertility crisis because of birth rates of <1.5 children per couple, so far below replacement levels of 2.1, that it seriously threatens their economic future due to a disappearing and aging work force**. This is such a serious problem in Japan that they are considering opening the country to immigration, for the first time. The U.S. does not yet have such a birth rate crisis because of its immigrants, something the Trump administration ignores in its rush to deport millions.

Nobel Prize Winners The following diagram[3] shows the number of Nobel Prize winners by country of residence. The top diagram shows that the highest number (41) resided in the United States, far more than any other country. Before we bend over backwards congratulating ourselves, look at the bottom diagram showing Nobel Laurates by country of birth. Now the U.S. is way down the list with only 3. The UK was on the top of the list with 13. The reason for this desrepancy is that **most of the 41 Nobel Prize winners that resided in the U.S. - were immigrants that came in during the pre-Trump days when the U.S. encouraged diversity.** The authors asked the Trump administration for comment but got only silence.



Stephen Miller is Trump's Chief of Staff for Policy and U.S. Homeland security advisor. He has a lifelong history of hating immigrants, Muslims and all others that are not W*ASPS*. Rather than reviewing the details here, the interested reader can Google 'Stephen Miller and Immigrants' or 'Why does Stephen Miller hate immigrants?' The disturbing issue in not why Stephen Miller hates immigrants, **but why Trump has chosen this disgusting, hateful person as one of his closest advisers? He clearly agrees with his views.**

Wives of the President and Vice President. It is worth noting that the wives of the two highest ranking officials in the U.S. government – are recent immigrants.

Trump Officials Accused of Bullying Tactics to Kill a Climate Measure

More than 100 nations were poised to approve a historic deal to **slash CO_2 pollution from cargo ships**. That's when the United States launched a pressure campaign that officials around the world have called extraordinary, even by the

standards of the Trump administration's combativeness, according to nine diplomats on its receiving end. [3,4]

These and other threats, including tariffs, sanctions and the revocation of diplomats' U.S. visas, effectively killed the deal,

Foreign diplomats said they were stunned by what they described as "nasty" and "very personal" threats made by State Department officials, which were mostly aimed at leaders from poorer or small countries that are economically dependent on the United States. Some of the delegations were summoned to the U.S. Embassy in London for these discussions, these people said:

"The deal would have imposed a fee on heavily polluting vessels to push the industry to clean up. It was negotiated over several years by the International Maritime Organization, a United Nations agency that oversees shipping policy."

The Trump administration was able to block the vote, the nine diplomats said, after numerous countries backed away in the face of the threats from the Americans. The Trump administration said the shipping fee would have hurt the American economy, the same lame excuse as disussed above.

David Goldwyn, a former American diplomat and U.S. Energy Department official during the Obama and Clinton administrations, said the Trump administration's tactics were over the top. "This is like using a cruise missile, to redress a traffic violation."

Senator Sheldon Whitehouse, Democrat of Rhode Island said, "It was like a bunch of gangsters coming into the neighborhood and smashing windows and threatening shop owners."

To top it off, **for the first time in 30 years, the United States was not sending high level representatives to the annual U.N. climate talks, COP-30, in Brazil. However, California is sending a large contingent of climate experts to fill in.[6]**

Trump kills the CMB-S4 Telescope

I have discussed elsewhere in the book how the Trump administration is devastating our country's longstanding world prominence in science (p199-213). One more of many examples is his stopping support for the CMB-S4 telescope.[7]

CMB-S4 stands for Cosmic Microwave Background – stage 4. This telescope would have given us insight into what was happening during the very earliest time after the big bang. What seemed like a bit of background noise in radio signals turned out to be a messenger from the early cosmos. For decades, we have scrutinized these photons: their wavelength (and associated temperature), their intensity and their variation across space.

Chanda Prescod-Weinstein stated that "The CMB is almost a literal gold mine, in the sense that it provides a lot of information about where everything we can see came from, including the stars whose explosions make gold. If we scan the entire sky and look at the temperature associated with the photons, we see small variations in the temperature. Their locations are random, but the size of the variation is consistent across them all. Places where there was a little bit more were essentially the starting point of gas that gravitationally accumulated into protostars, which became stars that clustered together into what eventually became galaxies. **So, those little variations in the CMB are the beginning of us."**

These actions tell us that the Trump administration is totally lacking in any curiosity about the physical and biological world – the last thing we need in our so-called leaders.

The authors state, **"The pullback from the project is part of the US's reckless retreat from global science collaboration."**

Climate sensitivity

I bring up this subject because it is relevant to predicting the earth's temperature 50 to 70 years from now when our youth will be mature adults.

Climate sensitivity is most often defined as **the temperature increase expected from a doubling of atmospheric carbon dioxide concentrations from pre-industrial levels.**

There are two types.

Equilibrium Climate Sensitivity (ECS): This measures the long-term temperature rise that would occur after the climate system has had time to fully adjust to a sustained doubling of CO_2. This can take centuries or more, due to the slow warming of the deep ocean. The Intergovernmental Panel on Climate Change

(IPCC) Sixth Assessment Report (AR6) estimated the "likely" range for ECS to be between 2.5°C and 4°C, with a best estimate of 3°C.[8]

(It is of interest that Charney, J. (1979)[7] in his summary what skeptics about rising global temperatures say, "**A wait and see policy means waiting until it is too late**.")

Transient Climate Response (TCR): This measures the temperature increase at the *time* the atmospheric CO_2 concentration has doubled. TCR is lower than ECS because the deep oceans have not yet fully warmed and absorbed all the excess heat. The IPCC estimates the likely range for TCR to be between 1.4°C and 2.2°C.

Equation relating the Earth's temperature and CO_2 levels.

The Keeling curve data shows that both the amount of atmospheric CO_2 and rate of increase in atmospheric CO_2 levels, are increasing (p13-15). This raises the important question - at a given CO_2 level, what is the expected global temperature? The relevant equation is complex, but it can be simplified to the following direct, relationship between CO_2 concentration and temperature change.
It is log rhythmic meaning that constant concentration *increases* have a progressively smaller additional warming effect (diminishing returns).

$$\Delta T = \lambda \times 5.35 \times \ln\left(\frac{C}{C_0}\right)$$

Where λ is the climate sensitivity parameter (or "gamma factor"), which represents how much the temperature will rise per W/m^{2}of forcing (a commonly used value is approximately 0.5∘C per W/m2.

C is the new or present atmospheric CO_2 level.

C_0 is the reference or pre-industrial atmospheric CO_2

concentration (typically 280 ppm, the level in 1750).

5.35 is a constant determined from radiative transfer calculations.

The results of this equation are shown below.

Alert: Our Youth are at Risk.
What they must look forward to.

The Trump Administrant's policy of ignoring climate change and global warming will be dangerous to our children and grandchildren, to our earth and to our planet.

Here is why.

1. Scientific instruments on Mauna Loa in Hawaii, have been measuring atmospheric CO_2 levels since 1959. Initially the level was 315 ppm.

2. These levels have progressively increased to current levels of 465 ppm.

3. Studies of isotopes of carbon, C^{12} and C^{13} prove that the CO_2 comes from the burning of fossil fuels.

4. As long as emissions continue, this progressive increase in levels is to be expected.

5. What is unexpected and rarely commented on, is that **both the amount and the rate of increase of atmospheric CO_2 are increasing**.

6. The rates of increase are:
   in 1967 - 1.0 ppm/year,
   in 1987 - 1.5 ppm/year,
   in 2007 - 2.0 ppm/year,
   in 2017 - 2.5 ppm/year,
   in 2023 - 2.8 ppm/yr, and
   in 2025 –3.5 ppm/yr

7. When the rate is measured by GtC/year (gigatons of carbon/year) the results are the same:
   In 1960 it was 1.8 GtC/year,
   In 1990 it was 3.8 GtC/year,
   In 2020 it was 5.0 GtC/year.

8. It has been assumed that if we get to Net Zero, these progressive increases will stop – but as shown in this book (p 196), this may not be the case.

9. The earth's Heat Imbalance is the ratio of the amount of the sun's heat irradiation entering the earth to the amount radiated back into space.

10. The Earth's Heat Imbalance is enormous. It is equivalent to 432,000 atomic bombs going off in our oceans every day.

11. This high degree of heat imbalance is due to two things:

a. The high level of greenhouse gases (CO_2 and methane) that trap the heat, the greenhouse effect.

b. The loss of the earth's albedo.

12. Albedo refers to the ability of the earth to reflect heat irradiation back to space. The major components of albedo are glaciers and sea ice, both of which are melting.

13. The high level of the earth's heat imbalance heats the oceans, causing them to release the CO_2 they contain, further increasing the heat imbalance. This CO_2 feedback loop will cause the level of atmospheric CO_2 to increase even after Net Zero.

14. The average global temperature increases are 0.20 ºC per decade which is more than three times faster than the long-term average since 1850.

15 Our youth will be living on this planet for another 50 to 70+ years or 5 to 7 decades.

16. As of September 2025, the current global average temperature was approximately 1.51°C above pre-industrial levels over the last 12 months.

17. **The 2024 summer temperatures were higher than at any time in the past 2,000 years.**

18. The current level of CO_2 is 465 ppm. Until we reach Net Zero, the increase in atmospheric CO_2 levels is estimated to be 26 ppm/decade. This equates to 595 to **647 ppm** at a time our current youth are 60+.

19. If we ignore the problem and make no efforts at mitigation, as is the policy of the current Trump administration, global temperatures in 5 to 7 decades will be 2.5ºC to 2.9ºC, or approximately twice the current temperatures.

18. Using the equation for calculating the global temperature for a given ppm level (see above), for the lower value of 595 ppm, the estimated global temperature would be 3.26 ºC in 50 years.

19. For the higher value of 647 ppm, the estimated global temperature would be 3.63 ºC in 50 years.

20. **The effects of lobal temperature of 3.26 – 3.63ºC or more, over pre-industrial levels** would push the planet well into the range of major tipping points and severe human and ecological consequences and dangerous destabilization.

- 50-60% of the population would be exposed to deadly heat,
- sea levels would rise 0.6 to 1.1 meters (3.6 ft),
- there would be a 10 to 20% global GDP loss,
- 99% of coral reefs would be lost,
- global crop yields would be down 10 to 20%,
- with multiple breadbasket failures,
- megadroughts in some areas, floods in other places
- worldwide wildfire seasons intensify dramatically.
- in some places this would result in crop failures with mass starvation, and
- mass migration of climate refugees, with
- 200 to 400 million displaced, and
- enormous political stress on some countries,
- freshwater scarcity for up to 3 billion people,
- arctic sea ice fully lost in the summer,

• Greenland icesheets show irreversible melting,
• permafrost melting would produce large releases of methane,
• methane is 25 times more potent of a greenhouse gas than CO_2,
• large areas of the Amazon rain forest would die.
• this level of biodiversity loss would likely mark the planet's sixth mass extinction, with irreversible ecosystem collapse in coral reefs, tropical forests, and polar regions. (IPCC)

In summary: climate change and global warming are real, not a hoax, and will be a great danger to our children and grandchildren.

If the Trump administration does not care about the fate of their children and grandchildren, stick with your present policies.

If you do care – change your policies.

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