I have been told by a high government official that I should not talk about “dangerous anthropogenic interference” with climate, because we do not know how much humans are changing the Earth’s climate or how much change is “dangerous”. Actually, we know quite a lot. Natural regional climate fluctuations remain larger today than human-made effects such as global warming. But data show that we are at a point where human effects are competing with nature and the balance is shifting.

Ominously, the data show that human effects have been minimized by a Faustian bargain: global warming effects have been mitigated by air pollutants that reduce the amount of sunlight reaching the Earth’s surface. This Faustian bargain has a time limit, and the payment is now coming due.

Actions that would alleviate human distortions of nature are not only feasible but make sense for other reasons, including our economic well-being and national security. However, our present plan in the United States is to wait another decade before re-examining the climate change matter. Delay of another decade, I argue, is a colossal risk.

The scientific method, exemplified to me as a student by Prof. James Van Allen’s Department of Physics and Astronomy, has the potential to aid the public and decision-makers in addressing the global warming issue in ways that have multiple benefits to our environmental and economic well being. So far, this process has been hampered, as the global warming story reveals various dangerous interferences with the scientific process.

*Presentation on October 26, 2004, in the Distinguished Public Lecture Series at the Department of Physics and Astronomy, University of Iowa*
Figure 1. (a) Parents and older sisters. (b) With four older sisters and friend.
GOLDILOCKS PLANETS

Mars

Temperature: -50°C
Greenhouse Effect: a few degrees

Earth

Temperature: +15°C
Greenhouse Effect: ~30°C

Venus

Temperature: +450°C
Greenhouse Effect: ~470°C

Figure 2. The Goldilocks Planets.
“The only way to have real success in science ... is to describe the evidence very carefully without regard to the way you feel it should be. If you have a theory, you must try to explain what’s good about it and what’s bad about it equally. In science you learn a sort of standard integrity and honesty.”

Richard Feynman

See http://www.giss.nasa.gov/edu/gwdebate re “Global Warming Debate”

Figure 3. The Feynman Quotation.
Figure 4. Temperature anomalies in 2004, relative to 1951-1980 mean (reference 1).
Figure 5. Global mean temperature change, based on meteorological stations before 1900 and stations plus sea surface temperatures after 1900 (reference 1).
A climate forcing is a mechanism that alters the global energy balance. A forcing can be natural – fluctuations in the sun’s brightness, for example – or human made, such as aerosols and greenhouse gases. Human-made climate forcings now dominate natural forcings.
Figure 7. (a) Sophie explains greenhouse warming to Conner, (b) Connor, though only 5 months old, gets it: it’s 2 Watts of forcing.
Figure 8. Vostok (Russian base in central Antarctica) temperature for past 400,000 years (reference 3).
Figure 9. Vostok carbon dioxide, methane, and temperature record for the past 400,000 years (reference 3).
Figure 10. Ice age climate forcings imply a climate forcing of $\frac{3}{4}^\circ$C per W/m$^2$ (reference 4).
Global Climate Forcings

Figure 11. Estimated climate forcings during the past 150 years (reference 5).
Figure 12. Observed and simulated global surface temperature change for forcings of Figure 11. The five model runs differ in initial ocean and atmosphere conditions, and thus follow their own chaotic paths (reference 5).
Figure 13. Global climate simulations driven by forcings of Figure 11 (reference 5).
Figure 14. Ocean heat content change between 1993 and 2003 in top 750 meters of the world ocean. Observations from reference 11. Climate model the same as in previous two figures, driven by climate forcings in Figure 11.
Figure 15. $\text{CO}_2$, $\text{CH}_4$ and temperature records inferred from Antarctic ice core and recent in situ measurements (reference 6). Time scale after 1850 is expanded to allow changes of the past century to be seen. The indicated global temperature anomaly, relative to the 1880-1899 mean, is estimated to be half of the Antarctic temperature anomaly.
What determines “dangerous anthropogenic interference”?

Figure 16. Surface melt on Greenland ice sheet descending into moulin, a vertical shaft carrying the water to base of ice sheet. (Roger Braithwaite, reference 2).
Figure 17. The area with summer snowmelt on Greenland in years 1992 and 2002 (Professor Konrad Steffen, University of Colorado).
Ice Discharge from Greenland

• Flow velocity from Jakobshavn ice stream increased ~40% in past three years (Waleed Abdalati, AGU presentation)

Figure 18. Ice discharge speed up of ice streams…(Konrad Steffen, University of Colorado)
Figure 19. Precipitation changes with increasing CO₂ and "all forcings" in 2000 (reference 7).
Figure 20. The Faustian bargain. Humans have enjoyed the fruits of the industrial revolution and avoided a large cost in climate change, as aerosol cooling has mitigated greenhouse warming. Payment comes due when humanity realizes that it cannot tolerate the further exponential growth of air pollution that would be needed for continued mitigation of global warming.
Figure 21. Global surface temperature simulations extended through 21st century (reference 5).
Figure 22. (A) Annual growth of atmospheric CO₂ based on measurements through 2003 and on scenarios of IPCC (reference 8) and Hansen and Sato (reference 9). Fossil fuel emissions are continuing to grow as shown by the top curve in (B). The average fraction of emissions that remains airborne (C) continues to be about 60%, implying that the underlying CO₂ growth rate is now 1.9 ppm/year, closer to the IPCC (2001) scenarios than to the "Alternative Scenario" (reference 10).
On the Road to Climate Stability

A-Team Report on Prospects for Halting the Growth of CO₂ Emissions

by Darnell Cain, James Hansen, Robert Schmunk, Emily Gibble, Carolyn Harris, Umit Kenis, Robert Kruckeberg, Lydie Louis, Katrina Smith-Mannschott, Tanya Martinez, Lionel Pandolfo, Colin Price, Crissaris Sarnelli, Anna Rouvinskaya, Leila Woolley, Jane Zeng

Students, teachers and researchers question the inevitability of rising CO₂ emissions and develop a tool to aide public understanding of policy options

A-Team article available at

http://www.columbia.edu/~jeh1

Figure 23. A-Team paper available on Dr. Hansen’s personal web site at Columbia. This personal page www.columbia.edu/~jeh1 is not sponsored, reviewed or monitored by Columbia University.
Figure 24. World energy consumption (top) and world CO₂ emissions (bottom) based on data from EIA (13). Pie charts are the division of energy use and CO₂ emissions among countries in 2002. Line graphs show the histories since 1980 including the annual growth rates.
Figure 25. CO₂ emissions in the United States from automobiles and light trucks. Vehicle sales are assumed to increase throughout the period by 140,000 per year, the proportion of new light trucks and automobiles is the same as in 2003, vehicle survival rates are the same as for 1990 vehicles. The “No Actions” or base case has MPG for new vehicles the same as in 2003. “Jorge’s choice” phases in by 2015 new vehicle improvements of 4.8 MPG for light trucks and 2.8 MPG for automobiles. “Moderate action” has new vehicles achieving the NRC (14) ‘Path 1.5’ emission reductions by 2015 and ‘Path 2.5’ by 2030. “Strong action”, in addition, introduces advanced hybrid-electric vehicles beginning in 2015 achieving 20% of the fleet by 2030 and 40% by 2050, and hydrogen-powered vehicles beginning in 2030 and achieving 30% of the fleet by 2050.
Jim and Larry:

As you may know, Drew Shindell has been working extensively with [redacted] of GSFC and [redacted] of HQ PAO on a press release on his newest paper. The press release had been slated to be released on September 27 but has been held up.

Here is an email from [redacted] about what the hold-up is:

"According to HQ, there's a new review process that has totally gridlocked all earth science press releases relating to climate or climate change. According to HQ Public Affairs, 2 political appointees, [redacted] and the White House are now reviewing all climate related press releases... thus, the 4+ week review time for Drew's press release that was slated for issue on Sept. 27th. We're still waiting to get the release back from the WH. We'll let you know when it happens."

Wanted to let you know about this important new change.
Thanks.

Leslie

Figure 26. New review process for Earth Science press releases.
References


