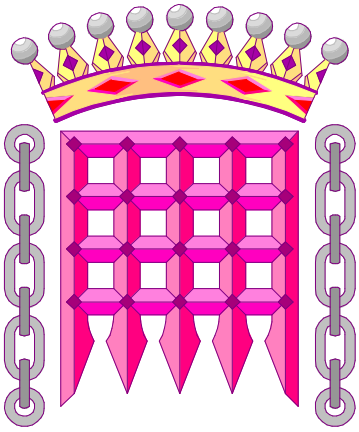
Gore Gored

A Science-based response to Al Gore's Global Warming Commentary in London's Sunday Telegraph 19 November 2006



By

Christopher Monckton, 3rd Viscount Monckton of Brenchley

CSPP Reprint series

The Center for Science and Public Policy
Washington, D.C.
Robert Ferguson, Exc. Dir.
202-454-5249
http://www.scienceandpolicy.org
bferguson@ff.org
November, 2006

Gentle reader,

In this commentary on Al Gore's *Sunday Telegraph* article of 19 November 2006 responding to my articles of 5 and 12 November on climate change, *Gore's full text is full-out in Roman face [italics]. Comments are indented in bold face.*

Readers may check the elementary calculations with a scientific calculator. The calculations use the simple formulae provided by the UN as derivations from the complex atmosphere-ocean general-circulation computer models upon which it heavily relies in the absence of hard, climatic data. References to scientific papers in support of the commentary are listed at the end.

Monckton of Brenchley
monckton@mail.com

19 November 2006

Concluding Findings

ALL TEN of the propositions listed below must be proven true if the climate-change "consensus" is to be regarded as true. We conclude as follows:

Proposition	*Conclusion*
1. That the debate is over and all credible climate scientists are agreed.	**Demonstrably false**
2. That temperature has risen above millennial variability and is exceptional.	**Very unlikely**
3. That changes in solar irradiance are an insignificant forcing mechanism.	**Demonstrably false**
4. That the last century's increases in temperature are correctly measured.	**Unlikely**
5. That greenhouse-gas increase is the main forcing agent of temperature.	**Not proven**
6. That temperature will rise far enough to do more harm than good.	**Very unlikely**
7. That continuing greenhouse-gas emissions will be very harmful to life.	**Unlikely**
8. That proposed carbon-emission limits would make a definite difference.	**Very unlikely**
9. That the environmental benefits of remediation will be cost-effective.	**Very unlikely**
10. That taking precautions, just in case, would be the responsible course.	**Demonstrably false**

A Note on References used herein

Mr. Gore says one should rely upon evidence from the scientific journals, not from Viscounts. And not, one might add, from films. Nearly all references are from the scientific journals. The references to the UN's assessment reports are among the few from sources other than the learned journals. In particular, Mr. Gore has recommended reliance upon Science, upon Nature and upon Geophysical Research Letters. Many of the references listed here are from those three journals.

Gore: (italics throughout)

A FORMER colleague of mine in the US Senate, the late Daniel Patrick Moynihan, once said, "Everyone is entitled to their own opinions, but they are not entitled to their own facts." I was reminded of this upon reading the Viscount Monckton of Brenchley's two submissions to the Sunday Telegraph.

Monckton: (bold, indented throughout)

That global warming is likely to cause harm rather than good is an opinion, to which Gore is entitled. That there is no scientific consensus as to the rightness of that opinion is a fact, to which all are entitled. I have received some 500 emails in response to my two articles, a large response given that readers who wanted to contact me had to find my email address via the *Telegraph* website. In addition, the posting of the article on the website received 127,000 hits – a near record - before the link crashed. Of the emails, about one-third were from scientists in climate physics and related fields, including tenured professors, solar physicists, forestry specialists, government environmental scientists, and even a particle-physicist from CERN reporting its upcoming research to test the theories of Svensmark *et al.* (2006) about cosmic rays and cloud formation, suggesting a considerably larger role for the Sun in warming than the UN allows. About 95% of the 500 emails I received, and very nearly all the emails from scientists, were strongly supportive of the conclusions which I had reached: namely, that global warming is probably harmless, and that, if not, even if we in the UK stopped using energy altogether the effect on future temperature would be negligible.

To begin with, there is a reason why new scientific research is peer-reviewed and then published in journals such as Science, Nature, and the Geophysical Research Letters, rather than the broadsheets. The process is designed to ensure that trained scientists review the framing of the questions that are asked, the research and methodologies used to pursue the answers offered, and even, in some cases, to monitor the funding of the laboratories – all in order to ensure that errors and biases are detected and corrected before reaching the public.

There were some 90 references to learned papers in the scientific journals in the document supporting my article on the science of climate change that was posted on the *Telegraph's* website. This commentary, too, is supported by a substantial list of some 60 references to learned papers in journals including the three mentioned by Gore. The many journal references (hundreds more could have been cited) demonstrate that there is no scientific consensus that the effect of increased greenhouse-gas concentrations on the climate will be as serious as the UN's reports suggest. But I shall also take some references from the UN's assessment reports, with apologies that they are more political and less scientific than the papers in the journals. The *Summaries for Policymakers* at the head of each of the UN's reports are written not by scientists at all but by the political representatives of governments. There is repeated evidence of substantial and significant departures from the science in these political *Summaries.* In every instance, the discrepancies move in the direction of overstating and exaggerating the supposed problem even more than the scientific sections.

That level of scrutiny is typically not applied to newspaper columns of course, but since the stakes are so high in the debate over the climate crisis I would like to review here just a few of the misleading claims in Viscount Monckton's submissions to illustrate my belief that readers of The Telegraph should rely upon more reliable and authoritative sources than the Viscount for information on the latest climate science.

That level of scrutiny is typically not applied to books or films, of course, but since the stakes are so high in the debate over the climate "crisis" I should like to review here just a few of the misleading claims in Gore's film *An Inconvenient Truth*, to illustrate my belief that cinema-goers should rely upon more reliable and authoritative sources than Gore for information on the latest climate science. Here is Senator James Inhofe's list of some of Gore's scientific errors:

- **Gore promoted the now-debunked "hockey stick" temperature chart for the past 1,000 years in an attempt to prove man's overwhelming impact on the climate, and attempted to debunk the significance of the mediaeval warm period and little ice age (for discussion and references, see below).**

- **Gore insisted on a link between increased hurricane activity and global warming that most sciences believe does not exist (for discussion and references, see below).**

- **Gore asserted that today's Arctic is experiencing unprecedented warmth while ignoring that temperatures in the 1930's were as warm or warmer (NCDC, 2006);**

- **Gore said the Antarctic was warming and losing ice but failed to note, that is only true of a small region and the vast bulk has been cooling and gaining ice (see my first article).**

- **Gore hyped unfounded fears that Greenland's ice is in danger of disappearing (for discussion and references, see below).**

- **Gore erroneously claimed that ice cap on Mt. Kilimanjaro is disappearing due to global warming, though satellite measurements show no temperature change at the summit, and the peer-reviewed scientific literature suggests that desiccation of the atmosphere in the region caused by post-colonial deforestation is the cause of the glacial recession (see my first article).**

- **Gore made assertions of massive future sea level rise that is way out side of any supposed scientific "consensus" and is not supported in even the most alarmist literature (for discussion and references, see below).**

- **Gore incorrectly implied that a Peruvian glacier's retreat is due to global warming, while ignoring the fact that the region has been cooling since the 1930s and other glaciers in South America are advancing (see Polissar *et al.*, 2005, for an interesting discussion of glaciers in the tropical Andes).**

- **Gore blamed global warming for water loss in Africa's Lake Chad, though NASA scientists had concluded that local water-use and grazing patterns are probably to blame (Foley and Coe, 2001).**

- **Gore inaccurately said polar bears are drowning in significant numbers due to melting ice when in fact 11 of the 13 main groups in Canada are thriving, and there is evidence that the only groups that are not thriving are in a region of the Arctic that has cooled (Taylor, 2006).**

- **Gore did not tell viewers that the 48 scientists whom he quoted as having accused President Bush of distorting science were part of a political advocacy group set up to support the Democrat Presidential candidate, John Kerry, in 2004.**

Gore is now an adviser to the UK Government on climate change.

First, Monckton claims that Dr. James Hansen of NASA said that the temperature would rise by 0.3C and that the sea level would rise by several feet. But Hansen did not say that at all, and the claim that he did is extremely misleading. In fact, Dr. Hansen presented three scenarios to the U.S. Senate (high, medium, and low). He explained that the middle scenario was "most plausible" and, as it turned out, the middle scenario was almost exactly right.

Hansen's three scenarios, presented to Congress during the very hot summer of 1988, projected global mean temperature increases of 0.3C, 0.25C and 0.45C respectively in the 12 years to 2000: an average of 0.33C. But 0.06C was the actual increase (NCDC, 2006). I fairly said 0.3C and 0.1C.

As to sea levels, I corrected this point in my second article. Mean sea level is difficult to measure. It probably rose by less than 1 inch between 1988 and 2000; the rate of increase – 1 inch every 15 years – has not risen for a century; and there is little reason to suppose that the rate of increase should accelerate. Morner (2004), who has spent a lifetime in the study of sea levels, provides an "official evaluation of the sea-level changes that are to be expected in the near future." He finds that "sea level records are now dominated by the irregular redistribution of water masses over the globe ... primarily driven by variations in ocean current intensity and in the atmospheric circulation system and maybe even in some deformation of the gravitational potential surface."

Morner says: "The mean eustatic rise in sea level for the period 1850-1930 was in the order of 1.0-1.1 mm/year," but that "after 1930-40, this rise seems to have stopped (Pirazzoli *et al.*, 1989; Morner, 1973, 2000)." This stasis, in his words, "lasted, at least, up to the mid-60s." Thereafter, "the record can be divided into three parts: (1) 1993-1996 with a clear trend of stability, (2) 1997-1998 with a high-amplitude rise and fall recording the ENSO event of these years and (3) 1998-2000 with an irregular record of no clear tendency." Most important of all, in his words, "There is a total absence of any recent 'acceleration in sea level rise' as often claimed by IPCC and related groups."

He concludes: "When we consider past records, recorded variability, causational processes involved and the last century's data, our best estimate of possible future sea-level changes is +10 +/- 10cm in a century, or, maybe, even +5 +/- 15cm." See also Morner (1995); INQUA (2000).

Van der Veen (2002) intended "to evaluate the applicability of accumulation and ablation models on which predicted ice-sheet contributions to global sea level are based, and to assess the level of uncertainty in these predictions arising from uncertain model parameters." He concluded that "the validity of the parameterizations used by glaciological modeling studies to estimate changes in surface accumulation and ablation under changing climate conditions has not been convincingly demonstrated."

Munk (2003) says: "Surveys of glaciers, ice sheets, and other continental water storage can place only very broad limits of -1 to +1 mm/year on sea level rise from freshwater export." It is not known how the cryosphere will respond to global warming.

> **Braithwaite and Raper (2002) analyze mountain glaciers and ice caps, *excluding* the Greenland and Antarctic ice sheets. They begin by saying: "The temperature sensitivity of sea level rise depends upon the global distribution of glacier areas, the temperature sensitivity of glacier mass balance in each region, the expected change of climate in each region, and changes in glacier geometry resulting from climate change." They end by reporting that "None of these are particularly well known at present," and they conclude that "glacier areas, altitudes, shape characteristics and mass balance sensitivity are still not known for many glacierized regions and ways must be found to fill gaps."**

Monckton goes on to level a serious accusation at all the scientists involved in the Intergovernmental Panel on Climate Change, claiming that they have "repealed a fundamental physical law" and as a result have misled the people of the world by exaggerating the sensitivity of the Earth's climate to extra carbon dioxide. If this were true, the entire global scientific community would owe Monckton a deep debt of gratitude for cleverly discovering a gross and elementary mistake that had somehow escaped the attention of all the leading experts in the field.

> **Here and elsewhere, I shall not respond to *ad hominem* remarks, but shall comment only *ad rem*. As will be shown below, the shortfall between the observed 20th-century temperature increase of 0.45 to 0.6C and the 20th-century increase of 1.6 to 3.75C that would have been expected from the projections made by the models upon which the UN relies is unwarranted either in the laws of physics or in the 20th-century global mean surface air temperature record. This shortfall between reality and the UN's projections is well established in the scientific literature (see, for instance, Hansen, 2006), though until my article was published it was not known to the public. There is certainly no scientific consensus on the reason for the very substantial discrepancy. Some, such as the Hadley Centre (IPCC 2001, quoted by Lindzen, 2006) blame pollutant aerosols for reflecting some of the Sun's radiance back to space. Others (such as Barnett, 2005, or Levitus, 2005), say the oceans are acting as a heat-sink. If there is in fact no good reason for the discrepancy between reality and projection, and if – as I am by no means alone in thinking - the UN's models are simply over-projecting the likely temperature effects of elevated greenhouse gas concentrations, then the UN's projections of future temperature increases may be around three times greater than they should be.**

But again, this charge is also completely wrong, and it appears in this case to spring from the Viscount's failure to understand that these complex, carefully constructed supercomputer climate models not only have built into them the physical law he thinks he has discovered is missing, but also many others that he doesn't mention, including the fundamentally important responses of water vapor, ice and clouds that act to increase the effects of extra carbon dioxide.

> **The laws of physics say the increase in temperature is 0.3C for every additional watt per square metre of temperature. The UN says 0.5C (IPCC 2001). Several physicists have confirmed my result, which readers may like to check for themselves using a scientific calculator. The necessary equation is –**
>
> $$T = [E / (\varepsilon.\sigma)]^{1/4} - 273.15$$ **(Stefan-Boltzmann equation).**
>
> **Earth/troposphere emissivity ε is about 0.614. The Stefan-Boltzmann constant, σ, is 5.67 x 10^{-8}. Using these values, calculate T for successive values E_0 = 236wm^{-2} (Houghton, 2002) and E = 237wm^{-2}. Since T_0 = 13.79C and T = 14.09C, for a forcing of 1wm^{-2}, the change in temperature is $T - T_0$ = 0.3C, as stated in my article, and not the 0.5C implicit in the UN's 1996 report (IPCC, 1996) and stated in the 2001 report (IPCC, 2001).**

Both in my article and in the supporting discussion document and calculations, I explicitly mentioned climate feedbacks from water vapour and ice-melt. I did not mention climate feedbacks from clouds because, as the UN itself says, even the direction of the change in radiative forcing and hence in temperature caused by clouds is not known (IPCC 2001). I explained that the UN's reason for using a figure nearly twice what the laws of physics mandate for the increase in temperature for each watt of additional forcing was to incorporate an allowance for climate feedbacks.

However, I demonstrated that, if one assumed that the UN's positive climate feedbacks were matched by negative feedbacks, the observed climate response over the 98 years 1900-1998 was identical to the climate sensitivity projected by use of the UN's greenhouse-gas forcing equation. In short, there is no direct observational evidence in the 20th-century global mean surface air temperature record that any allowance at all should be made for climate feedbacks in response to temperature increases arising from elevated greenhouse-gas concentrations in the atmosphere. As will be seen, the implications for forward projections of temperature increase are substantial.

Moreover, direct observations from the 20th century, from the last ice age and from the atmosphere's response to volcanic eruptions, all give estimates of the earth's sensitivity to extra CO_2 that are exactly in line with model results (around a 3 degrees Celsius warming for a doubling of the CO2 concentration).

The UN's projection for the radiative forcing effect of CO_2 is calculable from the following equation:

$$\delta E_{CO2} = z \ln(C / C_0) \ \mathrm{wm}^{-2}$$ **(IPCC 2001).**

For simplicity, we shall amend this equation to allow for all greenhouse gases, and for climate feedbacks. Note that all other forcings in the UN's table (IPCC, 2001), such as those from black carbon, the Sun, reflective aerosols etc., are shown as minor, little-understood and broadly self-cancelling. Thus -

$$\delta E = f g z \ln(C / C_0) \ \mathrm{wm}^{-2}$$ **where -**

- δE **is the change in radiance at the tropopause (IPCC 2001, ch.6), for all g.h.g. forcings and feedbacks;**
- f **is the UN's "climate feedback factor" of 1.7 (implicit in IPCC 2001); raised to 2.7 (Houghton, 2006);**
- g **is the UN's "all-greenhouse-forcings" factor of 1.664, falling by 2100 to 1.25 (IPCC 2001);**
- z **is the carbon-dioxide forcing coefficient of 6.3 (IPCC 1996); reduced to 5.35 (IPCC 2001).**
- C **is the atmospheric concentration of CO_2 in 1998, i.e. 365ppmv (Keeling & Whorf, 2004);**
- C_0 **is the atmospheric concentration of CO_2 in 1900; i.e. 292ppmv (IPCC 2001).**

Therefore the UN's current best estimate of the additional radiant energy in the atmosphere resulting from all radiative forcings caused by elevated concentrations of CO_2 and all other

greenhouse gases, and fully taking account of all climate feedbacks resulting from the forcings, may be calculated –

$$\mathbf{2.7 \times 1.664 \times 5.35} \ln\mathbf{(365 / 292) = 5.36} \ \mathrm{wm}^{-2}$$

The UN gives observed centennial temperature change as 0.6C, equivalent to 1.98wm^{-2}. So projected figure of 5.36wm^{-2} derived from the UN's model results using the UN's own formula and coefficients projects a sensitivity to extra CO_2 that is not *exactly* or even approximately in line with observation, but is in fact 2.7 times greater than what was actually observed.

Interestingly, without the UN's "climate feedback factor" there would be no over-projection in the 20th-century calculation. Then the climate sensitivity to a doubling of CO2 (assuming the UN's suggested fall in the all-forcings factor from 1.664 in 1998 to 1.25 by 2100) would be:

$$\mathbf{1.0 \times 1.250 \times 5.35} \ln\mathbf{(2) = 4.64} \ \mathrm{wm}^{-2},$$

equivalent to 1.4C. This less than half the 3C mentioned by Gore as the "consensus" value. However, if the UN's current "climate feedback factor" of 2.7 is included, then the climate sensitivity to a doubling of CO2 is not the 3C mentioned by Gore but 3.75C. The UN's new projected climate sensitivity approaches three times the value which is correct both in physical law and by reference to the observed increase in temperature over the 20th century.

<u>Direct observations from the last ice age</u>

Direct observations from the last ice age were not possible. We were not here. Temperatures and CO_2 concentrations have been *indirectly* deduced from samples of air from former ages locked in the ice of Greenland or Antarctica. The results do not provide a basis for reliable estimates of the earth's sensitivity to extra CO_2: they show that increases in CO_2 do not *precede* increases in temperature – they *follow* it.

Petit et al. (1999) reconstructed surface air temperature and atmospheric CO2 concentration profiles from Vostok ice core samples covering 420,000 years, concluding that during glaciation "the CO2 decrease lags the temperature decrease by several thousand years" and "the same sequence of climate forcing operated during each termination."

Using sections of ice core records from the last three inter-glacial transitions, Fischer et al. (1999) decided that "the time lag of the rise in CO2 concentrations with respect to temperature change is on the order of 400 to 1000 years during all three glacial-interglacial transitions."

On the basis of atmospheric carbon dioxide data obtained from Antarctic Taylor Dome ice core samples, and temperature data obtained from the Vostok ice core, Indermuhle et al. (2000) looked at the relationship between these two variables over the period 60,000-20,000 years ago. A statistical test on the data showed that movement in the air's CO2 content lagged behind shifts in air temperature by approximately 900 years, while a second statistical test yielded a mean lag-time of 1200 years.

Similarly, in a study of air temperature and CO2 data obtained from high time resolution samples at the Antarctic Concordia Dome site, for the period 22,000-9,000 ago, covering the last glacial-to-interglacial transition, Monnin et al. (2001) found that the start of the CO2 increase lagged the start of the temperature increase by 800 years.

In yet another study of the 420,000-year Vostok ice-cores, Mudelsee (2001) concluded that variations in atmospheric CO2 concentration lagged behind variations in air temperature by 1,300 to 5,000 years.

In a study using different methodology, Yokoyama et al. (2000) analyzed sediments in the tectonically stable Bonaparte Gulf of Australia to determine the timing of the initial melting phase of the last great ice age.

Commenting on the results of that study, Clark and Mix (2000) note that the rapid rise in sea level caused by the melting of land-based ice that began approximately 19,000 years ago preceded the post-glacial rise in atmospheric CO2 concentration by about 3,000 years.

Caillon et al. (2003) focused on an isotope of argon (^{40}Ar) that can be taken as a climate proxy, thus providing constraints about the relative timing of CO_2 shifts and climate change. Air bubbles in the Vostok ice core over the period that comprises Glacial Termination III - which occurred 240,000 years ago - were studied. They found that "the CO_2 increase lagged behind Antarctic deglacial warming by 800 ± 200 years."

We conclude that there is plentiful evidence in the scientific literature that increases in atmospheric CO_2 have followed increases in temperature in former ages and cannot have been the cause of those increases. In this respect, ice-core studies can tell us no more than that there may be a small climate feedback from increased atmospheric CO_2 in response to temperature.

<u>Direct observations of the atmosphere's response to volcanic eruptions</u>

The most recent major volcanic eruption to have been observed directly was that of Mount Pinatubo, in the Philippines, in June 1991. Sassen (1992) reported that cirrus clouds were produced during the eruption, Lindzen *et al.* (2001) proposed that cirrus clouds might provide a possible negative feedback that might partially counteract the positive feedbacks assumed in the UN's climate feedback factor.

Douglass and Knox (2005) considered this negative climate feedback in some detail: "We determined the volcano climate sensitivity and response time for the Mount Pinatubo eruption, using observational measurements of the temperature anomalies of the lower troposphere, measurements of the long wave outgoing radiation, and the aerosol optical density." They reported "a short atmospheric response time, of the order of several months, leaving no volcano effect in the pipeline, and a negative feedback to its forcing."

They also note that the short intrinsic climate response time they derived (6.8 ± 1.5 months) "confirms suggestions of Lindzen and Giannitsis (1998, 2002) that a low sensitivity and small lifetime are more appropriate" than the "long response times and positive feedback" assumed in the UN's models. They conclude that "Hansen *et al.*'s hope that the dramatic Pinatubo climate event would provide an 'acid test' of climate models has been fulfilled, although with an unexpected result."

<u>Conclusion</u>

We conclude, on the basis of a study of the UN's own reports and of the academic literature in the peer-reviewed scientific journals, that the UN may have failed to take negative climate feedbacks sufficiently into account, there is no consensus among climate scientists on any of the three classes of evidence for the UN's estimate of climate sensitivity cited by Gore, and that in all three classes – 20th-century observation, palaeoclimatological reconstruction and studies of volcanic eruption – there is recent, frequent and compelling evidence in the

scientific literature that raises serious questions about the validity of the "consensus" position.

And, despite Viscount Monckton's recycled claims about the so-called "hockey stick" graph (an old and worn-out hobby horse of the pollution lobby in the U.S.), this faux controversy has long since been thoroughly debunked. The global warming deniers in the U.S. were so enthusiastic about this particular canard that our National Academy of Sciences eventually put together a formal panel, comprised of a broad range of scientists including some of the most skeptical, which vindicated the main findings embodied in the "hockey stick" and definitely rejected the claims Monckton is now recycling for British readers.

No. In fact the committee of the National Research Council, (North *et al.*, 2006), which answers to the National Academies of Sciences and of Engineering, while confident that today's temperatures are warmer than at any time in the past 400 years, was "less confident" about the UN "hockey-stick" graph's abolition of the mediaeval warm period, because of a lack of data before 1600 AD. The committee's report criticized the methodology of the authors of the "hockey-stick", The committee notes explicitly, on pages 91 and 111, that the method used in compiling the UN's "hockey-stick" temperature graph has no validation skill significantly different from zero. Methods without a validation skill are usually considered useless.

Similar grounds for concern were listed in a report by three independent statisticians for the US House of Representatives (Wegman *et al.*, 2005), who found that the calculations behind the "hockey-stick" graph were "obscure and incomplete". Criticisms of the hockey-stick summarized in my article came from papers in the learned journals: e.g. McIntyre and McKitrick (2005). Wegman *et al.* (2005) found these criticisms "valid and compelling". It found that the scientists who had compiled the graph had not used statistical techniques properly, and found no evidence that they had "had significant interactions with mainstream statisticians". It found that the scientists' "sharing of research material, data and results was haphazardly and grudgingly done." It found that the peer review process, by which other scientists are supposed to verify learned papers before publication, "was not necessarily independent". Finally, it found that the "hockey-stick" scientists' "assessments that the decade of the 1990s was the hottest decade of the millennium and that 1998 was the hottest year of the millennium cannot be supported by their analysis". It recommended that State-funded scientific research should be more carefully and independently peer-reviewed in future, not only by the learned journals but also by the UN's climate change panel. It recommended that authors of the UN's scientific assessments should not be the same as the authors of the learned papers on which the UN relies; that State-funded scientists should make their data and calculations openly and promptly available; and that statistical results by scientists who were not statisticians should be peer-reviewed by statisticians.

The NAS stated that the late 20th century warming in the Northern Hemisphere was unprecedented during at least the last 1,000 years and probably for much longer than that. They also noted that the finding has "subsequently been supported by an array of evidence."

No. In fact, North *et al.* (2006) said this: "Less confidence can be placed in proxy-based reconstructions of surface temperatures for A.D. 900 to 1600, although the available proxy evidence does indicate that many locations were warmer during the past 25 years than during any other 25-year period since 900. Very little confidence can be placed in statements about average global surface temperatures prior to A.D. 900 because the proxy data for that time frame are sparse." These quotations, taken from an executive summary

signed by all members of the committee that prepared the report, bear no relation to what Gore says they said.

As to the "array of evidence" supporting the "hockey-stick" graph's conclusion that there was no mediaeval warm period – a conclusion which could not be properly drawn from the methodology used to produce the graph itself – Wegman *et al.* (2005) said: "In our further exploration of the social network of authorships in temperature reconstruction, we found that at least 43 authors have direct ties to [the graph's lead author] by virtue of coauthored papers with him. Our findings from this analysis suggest that authors in the area of paleoclimate studies are closely connected and thus 'independent studies' may not be as independent as they might appear on the surface."

So, no matter how many charts or graphs the Viscount might want to create, the basic facts remain the same. What the models have shown, unequivocally, is that carbon dioxide and other greenhouse gases mainly released from industrial activities are warming the planet.

My first article said: "There are more greenhouse gases in the air than there were, so the world should warm a bit, but that's as far as the 'consensus' goes." There is no consensus at all on how much warming there will be, or about whether or when it will be dangerous. Models are of theoretical interest, but they are not definitive. Until recently they contained "flux adjustments" – or fudge-factors – many times larger than the very small changes in tropospheric radiant energy that are at issue.

Computer models are not capable of showing anything "unequivocally": they are suitable only for making projections, which may or may not prove reliable. The models upon which the UN so heavily relied failed to predict either the timing or the magnitude of the El Nino Southern Oscillation event in 1998. More recently they have failed to predict the sharp cooling of the climate-relevant surface layer of the ocean that has occurred in the past two years (Lyman, 2006).

Sixty Canadian scientists expert in climate and related fields, writing to the Canadian Prime Minister earlier this year (Canada, 2006) said: "Observational evidence does not support today's computer climate models, so there is little reason to trust model predictions of the future."

Dr. Vincent Gray, a research scientist and a reviewer working on the UN's 2001 report (IPCC, 2001) has noted, "The effects of aerosols, and their uncertainties, are such as to nullify completely the reliability of any of the climate models."

Freeman Dyson, an eminent physicist, said this in a talk to the American Physical Society (Dyson, 1999): "The bad news is that the climate models on which so much effort is expended is unreliable. The models are unreliable because they still use fudge-factors rather than physics to represent processes occurring on scales smaller than the grid-size. … The models fail to predict the marine stratus clouds that often cover large areas of ocean. The climate models do not take into account the anomalous absorption of radiation revealed by the Atmospheric Radiation Measurements. This is not a small error. If the ARM are correct, the error in the atmospheric absorption of sunlight calculated by the climate models is about 28 watts per square metre, averaged over the whole Earth, day and night, summer and winter. The entire effect of doubling the present abundance of carbon dioxide is calculated to be about four watts per square metre. So the error in the models is much larger than the global warming effect that the models are supposed to predict. Until the ARM were done, the error was not detected, because it was compensated by fudge-factors that forced the models to agree with the existing climate. Other equally large errors may still be hiding in the models, concealed by other fudge-factors. Until the fudge-factors are eliminated and the

> **computer programs are solidly based on local observations and on the laws of physics, we have no good reason to believe the predictions of the models. … They are not yet adequate tools for predicting climate. … We must continue to warn the politicians and the public, 'Don't believe the numbers just because they come out of a supercomputer.'"**
>
> **Eugene Parker, a leading solar physicist, has said: "The inescapable conclusion is that we will have to know a lot more about the Sun and the terrestrial atmosphere before we can understand the nature of the contemporary changes in climate. … In our present state of ignorance it is not possible to assess the importance of individual factors. The biggest mistake that we could make would be to think that we know the answers when we do not" (Parker, 1999).**

Scientists have also carefully examined the real world evidence (temperature change as measured by air balloons, ground and satellite measurements, proxies like ice cores and tree rings, for example) and have found that the models do indeed match the observations.

> **Until last year, the observations did not even match each other. NASA (2005) said the trend in satellite measurements of the lower troposphere (from the surface to about 5 miles up) was just 0.08C per decade since 1979, but the trend in surface temperature measured on the ground (NCDC, 2006) is twice that, 0.16C per decade in the same period. NASA (2005) commented: "These differences are the basis for discussions over whether our knowledge of how the atmosphere works might be in error, since the warming aloft in the troposphere should be at least as strong as that observed at the surface." More recently, however, NASA has found that its satellite sensors had been pointing in the wrong direction. Satellite tropospheric temperature trends now accord with those at the surface. Balloon temperatures were also out of alignment with both surface and satellite temperatures for many years. Recently, however, a correction has been made to the handling of the data and they now conform.**
>
> **Furthermore, the *fact* of warming does not tell us its *cause*. Though carbon dioxide and other greenhouse gases are likely to be a contributing factor, they are not likely to be the only factor, and may not even be the main one. Even if greenhouse gases are the sole factor, there is no consensus about the UN's projected warming trend for the future. Besides, as we have shown, the models do not match the observed change in temperature, the discrepancy is large, and there is no consensus either about the reason for the discrepancy or about whether the discrepancy is real.**

It is important to understand that there is not just one single strand of evidence leading us to believe that global warming is occurring, but rather that all of the peer-reviewed evidence, from scientists around the world, points in the same direction.

> **Mr. Gore says that *all* of the peer-reviewed evidence points in the same direction. A very large proportion of it points in the opposite direction, as the papers listed here make plain. For instance, Soon and Baliunas (2003) listed some 240 scientific papers in which a period of at least 50 years of anomalous drought, rainfall or temperature were indicated at some time during the mediaeval warm period. The authors of the "hockey-stick" graph angrily dismissed Soon and Baliunas (2003) as irrelevant, but – whatever the paper's faults – it demonstrates that the "consensus" repeatedly claimed by the UN and its supporters is far from real.**

To be sure, not all of the finest workings of the climate system are yet fully understood to the finest grain. However, all of the basics are absolutely clear. Global warming is real,

human activities are causing the problem, many of the solutions are available to us now, it is not too late to avoid the worst, and all we need to get started solving the crisis is the political will to act.

> **"Global Warming Is Real", says Gore. Sixty leading climatologists and scientists in related fields wrote to the Canadian Prime Minister (Canada, 2006): "Climate Change Is Real" is a meaningless phrase used repeatedly by activists to convince the public that a climate change catastrophe is looming and humanity is the cause. Neither of these fears is justified. Global climate changes occur all the time due to natural causes, and the human impact still remains impossible to distinguish from the natural 'noise'."**
>
> **For the third time Gore recites the already-agreed fact of warming. However, there is no consensus on whether or to what degree human activities are causing "the problem", or even whether there is a problem. Global cooling, widely predicted in the 1970s, would have been much more dangerous than warming. The unusual hot weather in mainland Europe killed 3,000 elderly Frenchmen a couple of years ago. Like so many other events, it was blamed on global warming but was not caused by manmade climate change. It arose from natural climate variability. The most recent cold snap in the UK killed 25,000 people.**

This is what prompted the national academies of science in the 11 most influential nations on the planet to come together to jointly call on every nation to "acknowledge that the threat of climate change is clear and increasing." They added that the "scientific understanding of climate changes is now sufficiently clear to justify nations taking prompt action."

> **The "scientific understanding" is so crude that the central question – by how much can the temperature be expected to rise as a result of a given additional amount of greenhouse gas in the atmosphere – has not been definitively established either empirically or theoretically. It has been established by laboratory experiment that increased CO_2 concentrations can cause additional scattering of outgoing longwave radiation at the tropopause, but not at or near the surface, and only at the fringes of one of the three principal absorption bands of CO_2. It has been established that the stratosphere is cooling, suggesting that less outgoing radiation is emerging from the tropopause. But it is insufficiently clear whether or to what extent the temperature increase since 1900 is attributable to anthropogenic as opposed to natural factors, and it is not even clear by how much the temperature rose between 1900 and 1998 (NCDC US global mean temperature anomaly 0.3C, AccuWeather from land-based stations 0.45C, NCDC global mean 0.53C; UN 0.6C).**

Scientists will continue to pose questions and answer them in the peer-reviewed literature -- and I urge the public and policymakers in the U.K. to rely upon the best advice from your premiere institutions ranging from the outstanding British Antarctic Survey, to the Royal Society, the Met Office and the Hadley and Tyndall Centres for the decisions that must be made.

> **The Royal Society no longer has an independent mind on climate change. With other national scientific bodies, it has declared its deference to the UN, which continues to use the defective and discredited "hockey-stick" graph in its current publications, and has not yet apologized for it. My first article referred to the Hadley centre's division of its temperature projections by three to make them conform to 20th-century observation (IPCC, 2001, cited in Lindzen, 2006). We shall quote the Tyndall Centre later.**

In a second line of argument, Viscount Monckton also is concerned about the findings of the Stern report. But let's explore its conclusions: The report suggests that it will cost more to allow global warming to continue unabated than it will to begin to take thoughtful actions now. In other words, the impact on living standards could be quite small, if rational, thoughtful policies were put into place and if government were to work with industry to exploit the economic opportunities than if we allow global warming to run amok.

> **The 2.1% discount rate used by Stern (2006), though not explicitly stated in his report, is less than half the absolute minimum which a commercial organization would use when deciding to invest. Also, Stern's calculations have not followed the rule of economics that, when deciding not only *whether* but also *when* to invest, there should be no investment until the net present value is shown to be double the outlay (ref). Stern also assumes far more rapid climate change even than the UN. By all these means, he exaggerates the economic rewards of acting now and the costs of waiting. Correcting for these and other factors, the case for substantial, immediate investment vanishes. In any event, since the fast-developing economies such as China, India, Indonesia and Brazil excluded themselves from the scope of the Nairobi post-Kyoto agreement, just as they excluded themselves from Kyoto itself, no action which we take in the UK would make any noticeable difference to global temperature.**
>
> **Even if the UK were to close down completely, and were to cease altogether to use energy, operate industries or drive cars, the reduction in global temperature by 2035 would amount to 0.006C. This negligible temperature saving would be more than outweighed by just a few years' further economic growth in the Kyoto-exempted, Nairobi-excused China, which already has 30,000 coal mines, opens a new coal-mine every week and will continue to open a new coal-fired power station every five days until 2012. If global warming is a problem, the West, even acting collectively, can do nothing without the co-operation of China, India, Indonesia, Brazil and other fast-emerging, fast-polluting economies.**
>
> **That is why it is important for the UN and its followers, such as Gore, not to try to maintain that bad science like the "hockey-stick" has been "vindicated" when the very document he quotes as having "vindicated" it had in effect condemned it as useless. China and the other awakening tigers will not be convinced of the need for action to curb carbon emissions unless and until the UN produces science that is not only properly peer-reviewed (unlike the "hockey-stick") but also both transparent and honest.**

Some of the policies detailed in the report include: increasing global public energy research and development funding, dramatically reducing waste through energy efficiency measures, expanding and linking emissions trading systems and carbon markets, multiplying programs to reduce deforestation of natural areas such as Amazonia, and continuing to set aggressive domestic and global targets to reduce the pollution that causes global warming. None of these policy measures should cause alarm.

> **Reversal of 20th-century deforestation, which I recommended in my second article, would get us a quarter of the way towards CO_2 stabilization. All the other measures mentioned by Gore would make practically no difference.**
>
> **The EU emissions trading system trades more emissions rights than are currently emitted, contributes nothing to reducing CO_2 emissions, and actually encourages the increases which are happening across Europe.**

The UK climate change levy taxes all forms of energy production equally, regardless of whether or how much they emit CO_2, and hence has everything to do with increasing revenue and nothing to do with preventing climate change.

Global targets cannot be set without China and other mega-polluters. Aside from deforestation, therefore, all Stern's proposed policy measures – none of which is properly or clearly costed - are mere extravagant gestures that, like the existing measures in place in the UK and Europe, would cost much and achieve nothing.

In fact, not only are they rational, but also they have substantial co-benefits which include increased air quality, improved access to energy among the rural poor in developed countries, further independence from foreign sources of energy in volatile and unstable regions of the world, and, of course, the obvious opportunities in the new markets developing for low carbon technologies.

Air quality is a good aim, but in the UK we already have some of the cleanest air among industrialized countries. The quickest improvement we could make in air quality would be to go nuclear, like the French (who have little more than half the UK's carbon footprint as a result), and to close down coal-fired power stations, which the EPA in the US has estimated cause some 37,000 premature deaths a year.

More energy for the rural poor is a good aim, but energy in the UK is supplied by a national grid to all parts, urban or rural. Independence from foreign energy sources is good, but, for almost all countries (including the UK), impossible.

"Low-carbon technologies" are a good aim (if CO_2 is really a problem), but unless they involve nuclear power they won't produce enough energy to replace fossil-fuelled power stations. Gore lists several attractive-sounding wishes, few of which – even if realizable affordably or at all – would make a significant contribution to cutting CO_2 emissions.

And with regards to some of the financial implications suggested by the Stern report, one need only look to the insurance industry for validation of the potential costs of global warming. On Wednesday, the reinsurance giant Munich Re reported, "driven by climate change, weather related disasters could cost as much as a trillion dollars in a single year by 2040."

Whenever a corporation makes a public pronouncement on policy, it speaks in the hope of gaining a commercial advantage. Insurance companies are aware that if enough panic about climate change can be engendered they can hike their premiums, tell their customers that this is a responsible and prudent precaution, and get rich on the proceeds in the near-certain knowledge that they won't have to pay out. As we shall show later, the spread of human populations and settlements into the path of pre-existing climatic patterns has caused – and will continue to cause – many times more expense to the insurance industry than climate change.

The Stern report will not be the last economic analysis of the issue, but it certainly provides an important contribution to the literature and sheds light on some of the major concerns that policymakers must address.

For the reasons enumerated above, many serious economists regard Stern (2006) as valueless. To take one example, Stern contains a lengthy chapter on how to arrive at the appropriate discount rate for carrying out the central investment appraisal: yet the rate he

chose (but somehow failed to state) is fully described in a single page in the UK Treasury's "Green Book". The chosen rate is no more than half the 4% real risk-free interest rate, which would normally be the absolute minimum discount rate for a commercial project. The Labour Government has been using the 2% rate for some years so as artificially to justify the recent rapid expansion of the UK State sector.

The Nobel Prize-winning economist Milton Friedman, who sadly died last week at the age of 94, calculated that the State consumes at least twice as many resources in doing any given thing as the private sector. Stern (2006) does not advocate transferring most of the State's activities – hospitals, schools and council houses, say – to the private sector, notwithstanding the substantial environmental benefits that would follow from the consequent and large reduction in inefficiency and waste.

Sir Winston Churchill said, "One ought never to turn one's back on a threatened danger and try to run away from it. If you do that, you will double the danger. But if you meet it promptly and without flinching, you will reduce the danger by half."

First one must assess whether there is a danger. At present there is merely a scare, which is not the same thing. Sir Winston Churchill also said: "It is a mistake to try to look too far ahead. The chain of destiny can only be grasped one link at a time." Climate, in the formal, mathematical sense, is a chaotic object. It is the proven characteristic of mathematically-chaotic objects that neither the magnitude nor the timing of their phase-transitions (in environmentalese, "tipping points") can be predicted (IPCC, 2001; Lorenz, 1963). There is simply too little information to allow us to look as far ahead as 100 years and say with any degree of confidence how little or how much the world will warm.

As Lorenz (1963) put it in his landmark paper: "When our results concerning the instability of non-periodic flow are applied to the atmosphere, which is ostensibly non-periodic, they indicate that prediction of the sufficiently distant future is impossible by any method, unless the present conditions are known exactly. In view of the inevitable inaccuracy and incompleteness of weather observations, precise, very-long-range weather forecasting would seem to be non-existent."

We learned this lesson again the hard way in the U.S. when we were warned that the levees were about to break in New Orleans because of Hurricane Katrina and those warnings were ignored. Later, a bipartisan group of members of Congress, chaired by Representative Tom Davis, a Republican from Virginia, said in an official report: "The White House failed to act on the massive amounts of information at its disposal." This bipartisan group added that a "blinding lack of situational awareness and disjointed decision-making needlessly compounded and prolonged Katrina's horror."

For many years the Democrat Mayors of New Orleans and the Democrat-controlled city administration and state legislature had failed and failed again to make the necessary investment in strengthening the levees, based on the massive amount of information which had been put before them time and time again by the city engineers. New Orleans, administered by the Democrats, was a disaster waiting to happen.

There is extensive scientific literature on the lack of connection between hurricanes and climate change. A review article on hurricanes and climate change (Pielke *et al.*, 2005), found that "globally there has been no increase in tropical cyclone frequency over at least the past several decades." Papers by Lander and Guard (1998), Elsner and Kocher (2000) and Webster *et al.* (2005) are cited.

Furthermore, Pielke *et al.* point out, research on possible future changes in hurricane frequency due to global warming has produced studies that "give such contradictory results as to suggest that the state of understanding of tropical cyclogenesis provides too poor a foundation to base any projections about the future."

With respect to hurricane *intensity*, Emanual (2005) had found "a very substantial upward trend in power dissipation [i.e., the sum over the life-time of the storm of the maximum wind speed cubed] in the North Atlantic and western North Pacific." However, Pielke *et al.* (2005) found that "other studies that have addressed tropical cyclone intensity variations (Landsea *et al*., 1999; Chan and Liu, 2004) show no significant secular trends during the decades of reliable records."

Also, although early theoretical work by Emanuel (1987) "suggested an increase of about 10% in wind speed for a 2C increase in tropical sea surface temperature," more recent work by Knutson and Tuleya (2004) points to only a 5% increase in hurricane windspeeds by 2080. Michaels *et al*. (2005) conclude that even this projection may be twice as great as it should be.

People are now living in more exposed coastal locations and tornado alleys than hitherto. By 2050, for example, Pielke *et al.* (2000) report that "for every additional dollar in damage that the IPCC expects to result from the effects of global warming on tropical cyclones, we should expect between $22 and $60 of increase in damage due to population growth and wealth." Pielke *et al.* (2005) conclude that "The primary factors that govern the magnitude and patterns of future damages and causalities are how society develops and prepares for storms rather than any presently conceivable future changes in the frequency and intensity of the storms."

By contrast, the U.K. has, for years, stood as a world leader on global warming. When I served as Vice President, I had the good fortune to work with both Tory and Labour leaders in negotiating the Kyoto Protocol. In the 1980's, when I was a Senator, I had the privilege of working with Prime Minister Thatcher as she led the world in helping to solve the threat to the stratospheric ozone layer.

Senator James Inhofe (Republican, Oklahoma) has told the Senate that even if all signatories were to comply with Kyoto in full (most won't) world temperature in 2100 would be one-twenty-fifth of a degree Celsius lower than it would be if Kyoto had never happened. We should not fool ourselves that feel-good, gesture politics such as the irrelevant Kyoto Protocol will make any difference to the reality of the problem – if there is a problem. The US Senate – during the administration of Bill Clinton and Al Gore – rightly voted unanimously, 97-0, to reject Kyoto or any suchlike treaty that did not bear down upon carbon emissions from all the nations of the world, including fast-developing countries like China.

We shall certainly not be able to demand that the awakening tigers of the Third World should deny themselves the economic growth whose benefits we already enjoy unless and until the UN admits and apologizes for mistakes like the "hockey-stick" temperature graph, ceases to use them in its current publications, and desists from peddling the flagrant and baseless exaggerations which my articles have quantified and exposed.

Sixty Canadian scientists (Canada, 2006) wrote to tell their Prime Minister: "If, back in the mid-1990s, we knew what we know today about climate, Kyoto would almost certainly not exist, because we would have concluded it was not necessary."

And today, although there are differences between the platforms, both of the U.K.'s largest parties have issued strong statements about the need for action -- and your nation has largely avoided the partisan bickering and downright denial that has stymied action in the United States. This bipartisan comity is essential to rise to the challenges presented by such a complex problem as the climate crisis.

> **Almost all recent decisions supported by both major parties – such as the decision in 1990 that the UK should join the European exchange-rate mechanism – have proven expensively disastrous. However, the profound economic collapse which followed the decision to join the ERM caused a fall in UK emissions of CO_2 for four years, unexpectedly helping the UK to come closer to meeting its Kyoto emissions target than most EU countries. Of the pre-expansion 15 EU members bound by Kyoto, 13 are expected not to meet their targets.**
>
> **On the evidence to date, the decision of the Conservative party to abandon its constitutional duty of opposition to the costly but futile gestures proposed by the Government in mitigation of supposed anthropogenic climate change may well prove as expensive as its catastrophic decision in Government to attempt to repeal the laws of arithmetic by bringing the UK into the ERM, but less likely to reduce CO_2 emissions.**

As your Parliament moves forward to debate legislation this session, it is essential that you imagine this not solely as a scientific discussion or even a political dialogue, but as a moral moment where we decide who we are as human beings, and what obligation to the future we feel is appropriate for us to accept as part of our responsibility in this generation. At stake is nothing less than the survival of human civilization and the habitability of the earth for our species.

We have the opportunity here to avoid needlessly bickering with one another on the editorial pages, and instead join together to experience what very few generations in history have had the privilege of knowing---a generational mission, a compelling moral purpose, a shared and unifying cause, and an opportunity to work together to choose a future for which our children will thank us instead of cursing our failure to protect them against a clear and present danger with equally clear and devastating future consequences. By rising to meet this historic planetary emergency, we have the opportunity to become not the selfish and self-destructive generation, but the next Greatest Generation.

> **Numberwatch (2006) gives a long and well-referenced list of the wars, plagues, diseases, deaths and extinctions which have been blamed on "global warming" in a similarly apocalyptic fashion to Gore.**
>
> **Sir John Houghton, who produced the IPCC's first three reports in 1990, 1995 and 2001, has written (Houghton, 1994) : "Unless we announce disasters, no one will listen."**
>
> **One of the UK's leading "consensus" scientists (Hulme, 2006) has this to say about exaggerated rhetoric of the sort which Gore uses here:**
>
> **"Over the last few years a new environmental phenomenon has been constructed … - the phenomenon of 'catastrophic' climate change. It seems that mere 'climate change' was not going to be bad enough, and so now it must be 'catastrophic' to be worthy of attention. The increasing use of this pejorative term - and its bedfellow qualifiers 'chaotic', 'irreversible', 'rapid' - has altered the public discourse around climate change.**

"This discourse is now characterised by phrases such as 'climate change is worse than we thought', that we are approaching 'irreversible tipping in the Earth's climate', and that we are 'at the point of no return'. I have found myself increasingly chastised by climate change campaigners when my public statements and lectures on climate change have not satisfied their thirst for environmental drama and exaggerated rhetoric. It seems that it is we, the professional climate scientists, who are now the (catastrophe) sceptics. How the wheel turns!"

References

BARNETT, T.P., D.W. Pierce, K.M. AchutaRao et al. **2005.** *Penetration of human-induced warming into the world's oceans.* Science **309:** 284-287.

BRAITHWAITE, R.J. and Raper, S.C.B. **2002.** *Glaciers and their contribution to sea level change.* Physics and Chemistry of the Earth **27:** 1445-1454.

CAILLON, N., Severinghaus, J.P., Jouzel, J., Barnola, J.-M., Kang, J. and Lipenkov, V.Y. **2003.** *Timing of atmospheric CO_2 and Antarctic temperature changes across Termination III.* Science **299:** 1728-1731.

CANADA. **2006.** *Letter from 60 scientists to the Canadian Prime Minister.* 6 April. Text and signatories below, or at http://www.canada.com/nationalpost/financialpost/story.html?id=3711460e-bd5a-475d-a6be-4db87559d605

CHAN, J.C.L. and Liu, S.L. **2004.** *Global warming and western North Pacific typhoon activity from an observational perspective.* Journal of Climate **17:** 4590-4602.

CLARK, P.U. and Mix, A.C. **2000.** *Ice sheets by volume.* Nature **406**: 689-690.

DOUGLASS, D.H. and Knox, R.S. **2005.** *Climate forcing by the volcanic eruption of Mount Pinatubo.* Geophysical Research Letters **32:** 10.1029/2004GL022119.

DYSON, Freeman J. **1999.** *The Science and Politics of Climate Change.* Address to the Centennial Meeting of the American Physical Society, Atlanta, Georgia, 25 March.

ELSNER, J.B. and Kocher, B. **2000.** *Global tropical cyclone activity: A link to the North Atlantic Oscillation.* Geophysical Research Letters **27:** 129-132.

EMANUEL, K. **1987.** *The dependence of hurricane intensity on climate.* Nature **326:** 483-485.

EMANUEL, K. **2005.** *Increasing destructiveness of tropical cyclones over the past 30 years.* Nature **436:** 686-688.

FISCHER, H., Wahlen, M., Smith, J., Mastroianni, D. and Deck, B. **1999.** *Ice core records of atmospheric CO_2 around the last three glacial terminations.* Science **283:** 1712-1714.

FOLEY, Jonathan A., and Coe, Michael T. **2001.** *Decline of Lake Chad.* Journal of Physical Research (Biogeosciences): http://news.nationalgeographic.com/news/2001/04/0426_lakechadshrinks.html (reported in National Geographic News).

HANSEN, J., Lacis, A., Ruedy, R. and Sato, M. **1992.** *Potential climate impact of Mount Pinatubo eruption.* Geophysical Research Letters **19:** 215-218.

HANSEN, J., Nazarenko, L., Ruedy, R., Sato, M., Willis, J, Del Genio, A., Koch, D., Lacis, A., Lo, K., Menon, S., Novakov, T., Perlwitz, J., Russell, G., Schmidt, G., and Tausnev, N. **2006.** *Earth's energy imbalance: confirmation and implications.* Science **308:** 1431-1434.

HOUGHTON, Sir John. **1994.** *Global Warming: The Complete Briefing.* Cambridge University Press, London.

HOUGHTON, Sir John. **2002.** *Overview of the climate change issue.* Presentation to "Forum 2002" at St. Anne's College, Oxford. www.jri.org.uk/resource/climatechangeoverview.htm.

HOUGHTON, Sir John. **2006.** *Replies to questions from Lord Monckton,* Royal Society, London, 27 October.

HULME, M. **2006.** *Chaotic world of climate truth.* BBC News Viewpoint, 4 November 2006. Available from the Internet at http://news.bbc.co.uk/1/hi/sci/tech/6115644.stm.

INDERMUHLE, A., Monnin, E., Stauffer, B. and Stocker, T.F. **2000.** *Atmospheric CO2 concentration from 60 to 20 kyr BP from the Taylor Dome ice core, Antarctica.* Geophysical Research Letters **27:** 735-738.

INQUA. **2000.** *Sea Level Changes, News and Views, The Maldives Project.* Homepage of the commission on sea level changes and coastal evolution, http://www.pog.su.se/sea.

IPCC. **1996.** *The Science of Climate Change: Contribution of Working Group I to the Second Assessment Report of the IPCC* (eds. J. T. Houghton et al.), Cambridge University Press, London, 1996.

IPCC. **2001.** *Climate Change, The Scientific Basis,* Cambridge University Press, London, 2001.

KEELING, C.D., and Whorf, T.P. **2004.** *Trends in atmospheric carbon dioxide at Mauna Loa, Hawaii.* Carbon Dioxide Research Group, Scripps Institution of Oceanography, University of California, La Jolla, California 92093-0444, U.S.A.

KNUTSON, T.R. and Tuleya, R.E. 2004. *Impact of CO2-induced warming on simulated hurricane intensity and precipitation: Sensitivity to the choice of climate model and convective parameterization.* Journal of Climate **17:** 3477-3495.

LANDER, M.A. and Guard, C.P. **1998.** *A look at global tropical cyclone activity during 1995: Contrasting high Atlantic activity with low activity in other basins.* Monthly Weather Review **126:** 1163-1173.

LANDSEA, C.W., Pielke Jr., R.A., Mestas-Nunez, A.M. and Knaff, J.A. **1999.** Atlantic basin hurricanes: Indices of climatic changes. *Climatic Change* **42**: 89-129.

LEVITUS, S.J., Antonov, J, and Boyer, T. **2005.** *Warming of the world ocean 1955 – 2003.* Geophysical Research Letters **32:** L02604, doi:10.1029/2004GL021592

LINDZEN, R.S. and Giannitsis, C. **1998.** *On the climatic implications of volcanic cooling.* Journal of Geophysical Research **103:** 5929-5941.

LINDZEN, R.S., Chou, M.-D. and Hou, A.Y. **2001.** *Does the earth have an adaptive infrared iris?* Bulletin of the American Meteorological Society **82:** 417-432.

LINDZEN, R.S. and Giannitsis, C. **2002.** *Reconciling observations of global temperature change.* Geophysical Research Letters **29:** 10.1029/2001GL014074.

LINDZEN, R. **2006.** *Article on climate change.* Sunday Telegraph, London, 30 October.

LORENZ, Edward N. **1963.** *Deterministic nonperiodic flow.* Journal of the Atmospheric Sciences, **20:** 130-141.

LYMAN, John M., Willis, J.K., and Johnson, G.C. **2006.** *Recent cooling of the upper ocean.* Geophysical Research Letters, **33:** L18604, doi:10.1029/2006GL027033.

MANN, M.E., Bradley, R.S. and Hughes, M.K. **1998.** *Global-Scale Temperature Patterns and Climate Forcing Over the Past Six Centuries.* Nature **392:** 779-787.

MANN, M.E., Bradley, R.S. and Hughes, M.K. **1999.** *Northern Hemisphere Temperatures During the Past Millennium: Inferences, Uncertainties, and Limitations.* Geophysical Research Letters **26:** 759-762.

MANN, M.E., Bradley, R.S. and Hughes, M.K. **2004.** *Corrigendum.* Nature, 1 July 2004, p. 105.

McINTYRE, Stephen and McKitrick, Ross. **2005.** *Hockey sticks, principal components, and spurious significance. Geophysical Research Letters*, **32:** L03710, doi: 10.1029/2004GL021750.

MICHAELS, P.J., Knappenberger, P.C. and Landsea, C.W. **2005.** *Comments on "Impacts of CO2-induced warming on simulated hurricane intensity and precipitation": Sensitivity to the choice of climate model and convective scheme.* Journal of Climate.

MOBERG, A., Sonechkin, D.M., Holmgren, K., Datsenko, N.M., Karlen, W., Lauritzen, S.E. **2005.** *Highly variable Northern Hemisphere temperatures reconstructed from low and high-resolution proxy data.* Nature **433:** 613-617.

MONNIN, E., Indermühle, A., Dällenbach, A., Flückiger, J, Stauffer, B., Stocker, T.F., Raynaud, D. and Barnola, J.-M. **2001.** *Atmospheric CO2 concentrations over the last glacial termination.* Science **291:** 112-114.

MORNER, N.-A. **1973.** *Eustatic changes during the last 300 years.* Palaeogeography, Palaeoclimatology, Palaeoecology **9:** 153-181.

MORNER, N.-A. **1995.** *Recorded sea level variability in the Holocene and expected future changes.* In: Eisma, D. (Ed.), Climate Change: Impact on Coastal Habitation, CRC Press, Boca Raton, Florida, 17-28.

MORNER, N.-A. **2000.** *Sea level changes along Western Europe.* In: Integrated Coastal Zone Management, 2nd ed., IPC Publishing, London and Hong Kong, 33-37.

MORNER, N.-A. **2004.** *Estimating future sea level changes from past records.* Global and Planetary Change **40:** 49-54.

MUDELSEE, M. **2001.** *The phase relations among atmospheric CO2 content, temperature and global ice volume over the past 420 ka.* Quaternary Science Reviews **20:** 583-589.

MUNK, W. **2003.** *Ocean freshening, sea level rising.* Science **300:** 2041-2043.

NASA. **2006.** *Satellite-measured global mean stratospheric and lower-tropospheric air temperatures.* Updated monthly at http://www.ghcc.msfc.nasa.gov/MSU/msusci.html.

NCDC. **2006.** *Global annual land and ocean mean temperature anomalies*. Data available for download from the Internet at ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual.land_and_ocean.90S.90N.df_1901-2000mean.dat.

NORTH, Gerald R., Biondi, F., Bloomfield, P., Christy, J.R., Cuffey, K, Dickinson, R.E., Druffel, E.R.M., Nychka, D., Otto-Bliesner, B., Roberts, N., Turekian, K.K., and Wallace, J.M. **2006.** *Surface temperature reconstructions for the last 2,000 years.* National Research Council of the National Academies of Science and Engineering, Division on Earth and Life Studies, Board on Atmospheric Sciences and Climate, Committee on Surface Temperature Reconstructions for the Last 2,000 Years. National Academies Press, Washington.

NUMBERWATCH. **2006.** *Referenced list of events blamed on global warming.* Available for download from the Internet at http://www.numberwatch.co.uk/warmlist.htm

PARKER, E.N. **1999.** *Climate change.* Nature **399:** 416.

PETIT, J.R., Jouzel, J., Raynaud, D., Barkov, N.I., Barnola, J.-M., Basile, I., Bender, M., Chappellaz, J., Davis, M., Delaygue, G., Delmotte, M., Kotlyakov, V.M., Legrand, M., Lipenkov, V.Y., Lorius, C., Pepin, L., Ritz, C., Saltzman, E., and Stievenard, M. 1999. *Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica.* Nature **399:** 429-436.

PIELKE Jr., R.A., Landsea, C., Mayfield, M., Laver, J. and Pasch, R. 2005. *Hurricanes and global warming*. Bulletin of the American Meteorological Society **86:** 1571-1575.

PIELKE Jr., R.A. and Pielke Sr., R.A. **1997.** *Hurricanes: Their Nature and Impacts on Society*. John Wiley and Sons.

PIELKE Jr., R.A., Pielke, Sr., R.A., Klein, R. and Sarewitz, D. **2000.** *Turning the big knob: Energy policy as a means to reduce weather impacts.* Energy and Environment **11:** 255-276.

PIRAZZOLI, P.A., Grant, D.R. and Woodworth, P. **1989.** *Trends of relative sea-level changes: past, present, future.* Quaternary International **2:** 63-71.

POLISSAR, P.J., Abbott, M.B., Wolfe, A.P., Bezada, M., Rull, V., and Bradley, R.S. **2006.** *Solar modulation of Little Ice Age climate in the tropical Andes.* Proceedings of the National Academy of Sciences 10.1073/pnas.0603118103.

SASSEN, K. **1992.** *Evidence for liquid-phase cirrus cloud formation from volcanic aerosols: Climate indications.* Science **257:** 516-519.

SOON, W. and Baliunas, S. **2003.** *Proxy climatic and environmental changes of the past 1000 years.* Climate Research **23:** 80-110.

STERN, Sir Nicholas. **2006.** *Report of the Review on the Economics of Climate Change.* HM Treasury, London.

SVENSMARK, H., Pedersen, J, *et al*. **2006.** *Experimental evidence for the role of ions in particle nucleation under atmospheric conditions,* Proceedings of the Royal Society **A**. London, October 2006: www.spacecenter.dk

TAYLOR, Dr. Mitchell. **2006.** *Last stand of our wild polar bears*. Government of Nunavut, Igloolik, Nunavat, Canada, May 1. http://meteo.lcd.lu/globalwarming/Taylor/last_stand_of_our_wild_polar_bears.html.

van der VEEN, C.J. **2002.** *Polar ice sheets and global sea level: how well can we predict the future?* Global and Planetary Change **32:** 165-194.

WEBSTER, P.J., Holland, G.J., Curry, J.A. and Chang, H.-R. **2005.** *Changes in tropical cyclone number, duration and intensity in a warming environment.* Science **309:** 1844-1846.

WEGMAN, Edward J., Scott, D.W., and Said, Yasmin H. **2005.** *Ad Hoc Committee Report to the Chairman of the House Committee on Energy and Commerce and to the Chairman of the House Subcommittee on Oversight and Investigations on the "Hockey-Stick" global climate reconstruction*. US House of Representatives. Available for download from the Internet at http://energycommerce.house.gov/108/home/07142006_Wegman_Report.pdf

YOKOYAMA, Y., Lambeck, K., Deckker, P.D., Johnston, P. and Fifield, L.K. **2000.** *Timing of the Last Glacial Maximum from observed sea-level minima.* Nature **406:** 713-716.

60 CLIMATE SCIENTISTS' LETTER TO THE CANADIAN PRIME MINISTER
6 APRIL 2006

** Sixty eminent scientists in climate and related fields disagree strongly with the "consensus" which Gore and other supporters of the UN say is unanimous. This is the text of the strongly-worded letter which they wrote to the Canadian Prime Minister on 6 April 2006.*

AN OPEN LETTER TO PRIME MINISTER STEPHEN HARPER

cc. Hon. Rona Ambrose, Minister of the Environment; Hon. Gary Lunn, Minister of Natural Resources

"Dear Prime Minister, - As accredited experts in climate and related scientific disciplines, we are writing to propose that balanced, comprehensive public-consultation sessions be held so as to examine the scientific foundation of the federal government's climate-change plans. This would be entirely consistent with your recent commitment to conduct a review of the Kyoto Protocol. Although many of us made the same suggestion to then-prime ministers Martin and Chretien, neither responded, and, to date, no formal, independent climate-science review has been conducted in Canada. Much of the billions of dollars earmarked for implementation of the protocol in Canada will be squandered without a proper assessment of recent developments in climate science.

“Observational evidence does not support today's computer climate models, so there is little reason to trust model predictions of the future. Yet this is precisely what the United Nations did in creating and promoting Kyoto and still does in the alarmist forecasts on which Canada's climate policies are based. Even if the climate models were realistic, the environmental impact of Canada delaying implementation of Kyoto or other greenhouse-gas reduction schemes, pending completion of consultations, would be insignificant. Directing your government to convene balanced, open hearings as soon as possible would be a most prudent and responsible course of action.

“While the confident pronouncements of scientifically unqualified environmental groups may provide for sensational headlines, they are no basis for mature policy formulation. The study of global climate change is, as you have said, an "emerging science," one that is perhaps the most complex ever tackled. It may be many years yet before we properly understand the Earth's climate system. Nevertheless, significant advances have been made since the protocol was created, many of which are taking us away from a concern about increasing greenhouse gases. If, back in the mid-1990s, we knew what we know today about climate, Kyoto would almost certainly not exist, because we would have concluded it was not necessary.

“We appreciate the difficulty any government has formulating sensible science-based policy when the loudest voices always seem to be pushing in the opposite direction. However, by convening open, unbiased consultations, Canadians will be permitted to hear from experts on both sides of the debate in the climate-science community. When the public comes to understand that there is no "consensus" among climate scientists about the relative importance of the various causes of global climate change, the government will be in a far better position to develop plans that reflect reality and so benefit both the environment and the economy.

“‘Climate change is real’ is a meaningless phrase used repeatedly by activists to convince the public that a climate catastrophe is looming and humanity is the cause. Neither of these fears is justified. Global climate changes all the time due to natural causes and the human impact still remains impossible to distinguish from this natural ‘noise.’ The new Canadian government's commitment to reducing air, land and water pollution is commendable, but allocating funds to ‘stopping climate change’ would be irrational. We need to continue intensive research into the real causes of climate change and help our most vulnerable citizens adapt to whatever nature throws at us next.

“We believe the Canadian public and government decision-makers need and deserve to hear the whole story concerning this very complex issue. It was only 30 years ago that many of today's global-warming alarmists were telling us that the world was in the midst of a global-cooling catastrophe. But the science continued to evolve, and still does, even though so many choose to ignore it when it does not fit with predetermined political agendas. We hope that you will examine our proposal carefully and we stand willing and able to furnish you with more information on this crucially important topic.”

Dr. Ian D. Clark, professor, isotope hydrogeology and paleoclimatology, Dept. of Earth Sciences, University of Ottawa

Dr. Tad Murty, former senior research scientist, Dept. of Fisheries and Oceans, former director of Australia's National Tidal Facility and professor of earth sciences, Flinders University, Adelaide; currently adjunct professor, Departments of Civil Engineering and Earth Sciences, University of Ottawa

Dr. R. Timothy Patterson, professor, Dept. of Earth Sciences (paleoclimatology), Carleton University, Ottawa

Dr. Fred Michel, director, Institute of Environmental Science and associate professor, Dept. of Earth Sciences, Carleton University, Ottawa

Dr. Madhav Khandekar, former research scientist, Environment Canada. Member of editorial board of Climate Research and Natural Hazards

Dr. Paul Copper, FRSC, professor emeritus, Dept. of Earth Sciences, Laurentian University, Sudbury, Ont.

Dr. Ross McKitrick, associate professor, Dept. of Economics, University of Guelph, Ont.

Dr. Tim Ball, former professor of climatology, University of Winnipeg; environmental consultant

Dr. Andreas Prokoph, adjunct professor of earth sciences, University of Ottawa; consultant in statistics and geology

Mr. David Nowell, M.Sc. (Meteorology), FRMS, Canadian member and past chairman of the NATO Meteorological Group, Ottawa

Dr. Christopher Essex, professor of applied mathematics and associate director of the Program in Theoretical Physics, University of Western Ontario, London, Ont.

Dr. Gordon E. Swaters, professor of applied mathematics, Dept. of Mathematical Sciences, and member, Geophysical Fluid Dynamics Research Group, University of Alberta

Dr. L. Graham Smith, associate professor, Dept. of Geography, University of Western Ontario, London, Ont.

Dr. G. Cornelis van Kooten, professor and Canada Research Chair in environmental studies and climate change, Dept. of Economics, University of Victoria

Dr. Petr Chylek, adjunct professor, Dept. of Physics and Atmospheric Science, Dalhousie University, Halifax

Dr./Cdr. M. R. Morgan, FRMS, climate consultant, former meteorology advisor to the World Meteorological Organization. Previously research scientist in climatology at University of Exeter, U.K.

Dr. Keith D. Hage, climate consultant and professor emeritus of Meteorology, University of Alberta

Dr. David E. Wojick, P.Eng., energy consultant, Star Tannery, Va., and Sioux Lookout, Ontario.

Rob Scagel, M.Sc., forest microclimate specialist, principal consultant, Pacific Phytometric Consultants, Surrey, B.C.

Dr. Douglas Leahey, meteorologist and air-quality consultant, Calgary.

Paavo Siitam, M.Sc., agronomist, chemist, Cobourg, Ontario.

Dr. Chris de Freitas, climate scientist, associate professor, The University of Auckland, N.Z.

Dr. Richard S. Lindzen, Alfred P. Sloan professor of meteorology, Dept. of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology

Dr. Freeman J. Dyson, emeritus professor of physics, Institute for Advanced Studies, Princeton, N.J.

Mr. George Taylor, Dept. of Meteorology, Oregon State University; Oregon State climatologist; past president, American Association of State Climatologists

Dr. Ian Plimer, professor of geology, School of Earth and Environmental Sciences, University of Adelaide; emeritus professor of earth sciences, University of Melbourne, Australia

Dr. R.M. Carter, professor, Marine Geophysical Laboratory, James Cook University, Townsville, Australia

Mr. William Kininmonth, Australasian Climate Research, former Head National Climate Centre, Australian Bureau of Meteorology; former Australian delegate to World Meteorological Organization Commission for Climatology, Scientific and Technical Review

Dr. Hendrik Tennekes, former director of research, Royal Netherlands Meteorological Institute

Dr. Gerrit J. van der Lingen, geologist/paleoclimatologist, Climate Change Consultant, Geoscience Research and Investigations, New Zealand

Dr. Patrick J. Michaels, professor of environmental sciences, University of Virginia

Dr. Nils-Axel Morner, emeritus professor of paleogeophysics & geodynamics, Stockholm University, Stockholm, Sweden

Dr. Gary D. Sharp, Center for Climate/Ocean Resources Study, Salinas, Calif.

Dr. Roy W. Spencer, principal research scientist, Earth System Science Center, The University of Alabama, Huntsville

Dr. Al Pekarek, associate professor of geology, Earth and Atmospheric Sciences Dept., St. Cloud State University, St. Cloud, Minn.

Dr. Marcel Leroux, professor emeritus of climatology, University of Lyon, France; former director of Laboratory of Climatology, Risks and Environment, CNRS

Dr. Paul Reiter, professor, Institut Pasteur, Unit of Insects and Infectious Diseases, Paris, France. Expert reviewer, IPCC Working group II, chapter 8 (human health)

Dr. Zbigniew Jaworowski, physicist and chairman, Scientific Council of Central Laboratory for Radiological Protection, Warsaw, Poland

Dr. Sonja Boehmer-Christiansen, reader, Dept. of Geography, University of Hull, U.K.; editor, Energy & Environment

Dr. Hans H.J. Labohm, former advisor to the executive board, Clingendael Institute (The Netherlands Institute of International Relations) and an economist who has focused on climate change

Dr. Lee C. Gerhard, senior scientist emeritus, University of Kansas, past director and state geologist, Kansas Geological Survey

Dr. Asmunn Moene, past head of the Forecasting Centre, Meteorological Institute, Norway

Dr. August H. Auer, past professor of atmospheric science, University of Wyoming; previously chief meteorologist, Meteorological Service (MetService) of New Zealand

Dr. Vincent Gray, expert reviewer for the IPCC and author of The Greenhouse Delusion: A Critique of 'Climate Change 2001,' Wellington, N.Z.

Dr. Howard Hayden, emeritus professor of physics, University of Connecticut

Dr. Benny Peiser, professor of social anthropology, Faculty of Science, Liverpool John Moores University, U.K.

Dr. Jack Barrett, chemist and spectroscopist, formerly with Imperial College London, U.K.

Dr. William J.R. Alexander, professor emeritus, Dept. of Civil and Biosystems Engineering, University of Pretoria, South Africa. Member, United Nations Scientific and Technical Committee on Natural Disasters, 1994-2000

Dr. S. Fred Singer, professor emeritus of environmental sciences, University of Virginia; former director, U.S. Weather Satellite Service

Dr. Harry N.A. Priem, emeritus professor of planetary geology and isotope geophysics, Utrecht University; former director of the Netherlands Institute for Isotope Geosciences; past president of the Royal Netherlands Geological & Mining Society

Dr. Robert H. Essenhigh, E.G. Bailey professor of energy conversion, Dept. of Mechanical Engineering, The Ohio State University

Dr. Sallie Baliunas, astrophysicist and climate researcher, Boston, Mass.

Douglas Hoyt, senior scientist at Raytheon (retired) and co-author of the book The Role of the Sun in Climate Change; previously with NCAR, NOAA, and the World Radiation Center, Davos, Switzerland

Dipl.-Ing. Peter Dietze, independent energy advisor and scientific climate and carbon modeller, official IPCC reviewer, Bavaria, Germany

Dr. Boris Winterhalter, senior marine researcher (retired), Geological Survey of Finland, former professor in marine geology, University of Helsinki, Finland

Dr. Wibjorn Karlen, emeritus professor, Dept. of Physical Geography and Quaternary Geology, Stockholm University, Sweden

Dr. Hugh W. Ellsaesser, physicist/meteorologist, previously with the Lawrence Livermore National Laboratory, Calif.; atmospheric consultant.

Dr. Art Robinson, founder, Oregon Institute of Science and Medicine, Cave Junction, Ore.

Dr. Arthur Rorsch, emeritus professor of molecular genetics, Leiden University, The Netherlands; past board member, Netherlands organization for applied research (TNO) in environmental, food and public health

Dr. Alister McFarquhar, Downing College, Cambridge, U.K.; international economist

Dr. Richard S. Courtney, climate and atmospheric science consultant, IPCC expert reviewer, U.K.

Christopher Walter Monckton, 3rd Viscount Monckton of Brenchley (born 14 February 1952) is a former British journalist.

The eldest son of the 2nd Viscount Monckton of Brenchley, Monckton was educated at Harrow School, Churchill College, Cambridge and University College, Cardiff. He joined the *Yorkshire Post* in 1974 and then worked as a press officer at the Conservative Central Office from 1977–79. In 1979, he became the editor of the Catholic newspaper *The Universe*, and the managing editor of *The Sunday Telegraph's Magazine* in 1981.

In 1983 he returned to the Conservative offices again, this time as Margaret Thatcher's policy adviser. Three years later, he became assistant editor of the newly-formed newspaper, *Today*. His final job in journalism was as a consulting editor of the *Evening Standard* from 1987–92.

Monckton was a director of his own, namesake consultancy company, Christopher Monckton Ltd., between 1987 and 2006, when he retired through ill health. He is also a member of the Worshipful Company of Broderers, an Officer of the Order of St. John of Jerusalem and a Knight of Honour and Devotion of the Sovereign Military Order of Malta. Upon the death of his father in 2006, Monckton inherited his title.