

GLOBAL WARMING: INVENTING AN APOCALYPSE

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Apocalyptic visions, such as those conjured up by environmentalism, have been made throughout Man's history and invariably turn out to be false. They attract widespread interest principally for the reason that bad news is more newsworthy than good news. Thus the prediction of catastrophes due to global warming, even on very inconclusive evidence, is likely to be treated with considerably more importance than the prediction that things might not be so bad after all. By contrast, the non-doomsday scenario demands far more evidence in order to satisfy its critics.

Climatologist Patrick J. Michaels, in a major scientific inquiry into global warming,¹ has presented such evidence. This essay encapsulates and elaborates his findings.

GLOBAL WARMING: PRELIMINARY CONSIDERATIONS

Prior to a detailed scrutiny of the facts and theories regarding global warming there are a few questions that one would expect should occur to those who automatically assume the worst:

- (1) If global warming *is* taking place why is it assumed that it can only have bad consequences?
- (2) Would not *some* parts of the world benefit from higher temperatures?
- (3) Alternatively, if, on balance, global warming would be harmful why is it assumed that Man would be unable to adjust to changing conditions quickly enough? Changes, if there are any, are taking place slowly so why is it assumed that Man would be unable to cope? As George Reisman writes:

Large numbers of people have been enlisted in the campaign against energy out of fear that the average mean temperature of the world may rise a few degrees in the next century, mainly as a result of the burning of fossil fuels. If this were really to be so, the only appropriate response would be to be sure that more and better air conditioners were available ... It would not be to seek to throttle and destroy industrial civilization.²

In regard to global warming, about the only fact that is universally agreed upon is that there has been an increase in "Greenhouse Gases", particularly CO₂, in the atmosphere, due to the burning of fossil fuels. But, contrary to popular misconceptions, there is no consensus on what the consequences of this will be. Before discussing those consequences a number of further facts can be cited.

- (1) All the greenhouse gases are produced in nature, as well as by humans. To give one example, termites are responsible, annually, for 10 times the current world production of CO₂ from burning fossil fuels.³
- (2) CO₂ concentrations have varied widely in the geological past, obviously, therefore, from before Man had any significant impact, or even existed.
- (3) The oceans act as a "sink" for CO₂ and hold 60 times more of it than does the atmosphere.

What will be the consequences of the increase in greenhouse gases?

GLOBAL WARMING: THE POPULAR VISION

In his extensive study of the Greenhouse Effect,⁴ all the technical information used by Patrick Michaels is either provided in the refereed scientific literature, is based on that literature, or has been presented at scientific meetings for which presentations were prescreened by a program committee.

At the beginning of his study Michaels describes what he calls the "Popular Vision" regarding global warming. He starts with a quote from NASA scientist, James E Hansen, on June 23 1988, to the effect that global warming is sufficiently large that we can ascribe a high degree of confidence to the greenhouse effect. Michaels then adds that many environmentalists, but few climatologists, agree with that view. He describes the following as the "Popular Vision":

a rapid planetary warming [due to the greenhouse effect] of approximately 4 degrees centigrade with a major sea level rise (up to 25 feet ...) caused mainly by the melting of ... land ice, especially in Greenland and Antarctica. Also ... withering corn as daytime temperatures regularly exceed 38 degrees centigrade in ... [America's] heartland and ... massive deforestation and desertification. All of those changes will take place while population increases rapidly, so war over the earth's rapidly depleting resources seems to be highly probable.⁵

According to a CNN poll 70% of the US public (at the time of publication) subscribes to this view. Michaels, however, paints the following picture as the one which seems to emerge on the basis of the evidence:

We are creating a world in which the winters warm and the summers do not, a world in which the nights warm and the days do not. We are creating a world in which the growing season lengthens and the great ice fields of Greenland and Antarctica change little (they may even be enlarging). The CO₂ we are emitting to the atmosphere has an additional effect: when plants are supplied adequate nutrients, they grow better.⁶

One of the reasons why the Popular Vision has become popular is that it is possible to cite a number of misleading truisms. For example, Michaels cites [former] Senator Al Gore as stating: "there is no longer any significant disagreement in the scientific community that the greenhouse effect is real". Such a statement is intended to imply that "all scientists" agree that temperatures are rising disastrously as a result. But there is no such consensus regarding temperatures rising disastrously. In fact, they are *not* rising disastrously. The real picture is somewhat more complex.

The 1990 report of the Intergovernmental Panel on Climate Change (IPCC) states that "The greenhouse effect is real and greenhouse gases 'already' [why is this word necessary?] keep the earth warmer than it would otherwise be."⁷ The reason for the query is that there is a natural greenhouse effect that keeps the earth at *normal* temperatures, i.e., warm enough for life. So to say that it *already* keeps the temperature warmer than otherwise suggests that things might actually be better without it.

ABOUT GREENHOUSE GASES

Greenhouse gases warm the lowest layers of the atmosphere by redirecting to the earth the sun's radiation which would normally escape to space. The most common of these gases is water vapour and its concentration changes very little. But the concentration of CO₂, as noted above, has varied widely throughout its history. For most of the past billion years, and during the past 100 million years (during which most of our food and fibre crops evolved), CO₂ concentration has been higher than it is today. The atmosphere is currently impoverished in CO₂ and geological evidence reveals that temperatures dropped *before* CO₂ declined and not after.

There are many other greenhouse gases besides CO₂ and water vapour, and their temperature-enhancing effects, other things being equal, do not add up in a linear fashion. As concentrations increase, eventually the temperature does not change.

The effects of all the greenhouse gases can be combined to give an equivalent CO₂ concentration called the "effective" CO₂ concentration. This concentration is currently 60% greater than it was before the start of industrialisation. (Increased CO₂ concentration by itself is about half this figure.)

TEMPERATURE RECORDS: A PREVIEW

In analysing the major global temperature records that have been produced Michaels begins by examining that due to Hansen. This forms NASA's global temperature record between 1880 and 1988 and was presented to the US Senate and House of Representatives. Hansen



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claimed an observed warming over the last century of 0.6 to 0.7 degrees centigrade which was 30% greater than that in objective trend analyses of other temperature records. It was then revealed that Hansen had been sloppy in his presentation. He had simply subtracted the average of the first 10 years of the record from the average of the last 10 years, ignoring the intervening 80 years. It is those intervening years which are especially interesting as shall be seen shortly. (The correct statistical procedure to apply to data of this sort, which displays random fluctuations, is to compute a trend line through *all* the data.)

Another instance of misleading presentation by Hansen is in the actual temperature record itself. The temperature curve appears to rise dramatically at the end (i.e., in 1988). But this was because the temperatures had been averaged over the first 5 months of the year *only*, whereas all the other temperatures were annual averages. Variances in monthly temperatures are greater than variances in *annual* temperatures, so to plot a 5-month average temperature on the same graph as annual average temperatures is highly misleading. The 5-month result was noted on the record but its significance was not explained. How many Congressmen or news reporters are conversant with the science of statistics? When all the 1988 data finally came in the adjusted graph did not look very different from the temperatures in the rest of the warm 1980s. But the problem was that the damage had already been done.

PROBLEMS WITH THE TEMPERATURE RECORDS

The major problem with the temperature records is that the readings are almost always land-based, yet 70% of the earth's surface is ocean. Land is more sensitive to temperature effects than water. Michaels describes several ways in which the temperatures can be artificially biased upwards but the most important is the so-called "urban" effect. Temperature readings from towns and cities are generally warmer than those from rural areas because buildings and pavements retain more heat and prevent normal ventilation.

The implications of such biasing can be profound, especially in regard to the longest-standing temperature records. This is because most originated at 19th-century points of commerce, which means they were near sources of water-power, that is, rivers. Those sites, at which cold air converges at night, then show artificial warming years later as the cities grow up around the temperature stations. Thus, they are initially shielded from a true climatic warming, and then they exaggerate one that may not have occurred.

Tom Karl, of the US Department of Commerce, has developed the most reliable temperature record, though (in 1990) only applicable to the US, by carefully noting movements of temperature stations and population changes.

[Karl] found that statistically significant artificial warming begins to appear in towns with populations as small as 2500. After sifting through the 16,000 official temperature stations that are in the US Department of Commerce's national network Karl retained fewer than 500 in what he calls the Historical Climate Network (HCN) ... the dismissal of 97 percent of the original stations demonstrates how pervasive the urban effect can be in biasing our temperature records.⁸

The HCN record produces a warming trend of 0.3 to 0.35 degrees centigrade in the past 100 years. Jones and Wigley, of the University of East Anglia, produced a record showing a warming trend of 0.45 degrees for the same period (note: this was a comparison for the US only, not the world). The Hansen record fared worse, although it became apparent that he had shipped the wrong data to Karl for comparison.

In addition, the HCN record shows *no warming whatsoever* for the past 60 years. Yet two thirds of the post-industrial greenhouse-enhancing gas emissions date from about 45 years ago. So all of the warming shown in the HCN occurs well before this time. The implications of this will be made more explicit in the next section.

Comparisons of the three records were published in the March 1989 *Bulletin of the American Meteorological Society*, yet no newspaper reports appeared.

THE SOUTHERN HEMISPHERE TEMPERATURE RECORD

The most detailed simulations of climate are known as General Circulation Models (GCMs). Such models attempt to calculate how the climate should change if the greenhouse effect were to be enhanced. For the Southern Hemisphere such models take into account the following facts.

(1) Water requires much more energy to raise its temperature a given amount than does land.

(2) The snow and ice fields of the Antarctic reflect more than three-quarters of incoming solar radiation, whereas the earth as a whole absorbs three-quarters of it.

(3) The Southern Hemisphere is mostly water.

Therefore, warming due to greenhouse-enhancement should be less in the Southern Hemisphere than in the Northern Hemisphere.

Jones and Wigley's temperature record for the Southern Hemisphere shows a 0.6 degree centigrade warming since 1900 but just over half of it occurs prior to 1950, the point at which the major greenhouse enhancement took place. From the beginning of the Industrial Revolution up until 1950 one third of the enhancement took place and at a *far* lower rate than has occurred since 1950. Therefore, if the warming of the first half of the 20th century is attributable to the greenhouse, today's temperatures should be much *warmer* than the temperature records actually show.

Another important fact is that the Jones and Wigley temperature record for the Southern Hemisphere does not include any Antarctic data. In 1989 John Sansom published that history but only as far back as 1957.⁹ It shows no net warming for the Antarctic land mass since that time. When that data is combined with the Jones and Wigley record, and averaged out, it produces a quarter of a degree of warming since 1950.

There are further problems with the Jones and Wigley (and Hansen) temperature records. The most accurate measures of global temperatures are those due to satellites. They measure the temperature of the lower atmosphere to an accuracy of plus or minus 0.01 degrees centigrade. Their measurements are based on the vibrations of oxygen molecules which vary with temperature. Also satellite coverage is universal, but the ground-based temperature network is mainly confined to land areas, which cover only 30% of the earth's surface.

Jones and Wigley's record did try to take sea temperatures into account but in a manner which erroneously biased those temperatures upward. One instance of such bias was the arbitrary adjustment upward of sea surface temperatures to agree with nearby land temperatures.

The major problem with the satellite record is that it only starts from 1979. Nevertheless in that period, in which both the Jones and Wigley, and Hansen, records show a pronounced warming trend compared with the immediately preceding decade, the satellite record shows *no warming trend whatsoever*.

There is a statistical method, called "explained variance", which measures the degree of correspondence between two sets of data. For example, an explained variance of 100 per cent means perfect correspondence whereas an explained variance of 0 per cent means zero correspondence. A figure below 50 percent implies poor correspondence. Taking the satellite record as a standard, Tom Karl's HCN (for the US only) produces an explained variance of 86 per cent. Both the Jones and Wigley and Hansen *global* records give explained variances less than 50 percent. Despite this the IPCC Policymakers Summary states:

Confidence in the observed warming of surface temperatures has been increased by their similarity to recent satellite measurements ...¹⁰

The National Oceanic and Atmospheric Administration (NOAA) constructed a temperature record for the Southern Hemisphere, for the period 1950-1990. According to Michaels this record is not as good as Karl's US HCN. Nevertheless, like the satellite record, it shows no warming for the period after 1979, though it does show warming for 1950-1979.

THE NORTHERN HEMISPHERE TEMPERATURE RECORD

According to the GCMs the Northern Hemisphere, which contains most of the world's land, should have warmed more than the Southern Hemisphere. The Jones and Wigley record shows that it did not.

... in the standard statistical sense ... there is no net warming in the past 50 years ... the most prominent feature of the past century is a rapid warm-up [of 0.5 degrees centigrade] that took place between 1915 and 1930. Because that increase occurred so early, it could hardly have had anything to do with the enhanced greenhouse. Thus the "natural" variability ... must be on the order of at least 0.4 degrees centigrade, which suggests that the greenhouse signal will be very difficult to find in our temperature record.¹¹

Finally, once again, the satellite records since 1979 show no warming and the very warm years of the 1980s, which appear on the land-based records, do not show up at all.

So we are left with the peculiarity that the Northern Hemisphere, which contains most of the earth's land and which therefore should warm up first and fastest, shows virtually no warming in the past 50 years; while the Southern Hemisphere, which should warm up least and slowest, gives a more "greenhouse-like" signal.

SEA SURFACE TEMPERATURES

Regional climates are often controlled by the temperatures of the oceans. Yet in the US alone the number of land-based stations exceeds the number of Oceanic stations by at least 3,000 to 1.

Nevertheless there have been some carefully constructed sea surface temperatures (SSTs). These records correspond well with the land-based records, with respect to the timing of warming and cooling periods, though the absolute temperature variations are about half those of the land-based records. But the SSTs do not show the high 1980s temperatures for the Northern Hemisphere that show up on the land records. Also, both the land-based records and the SSTs show a *decline* in temperature for the Northern Hemisphere from the 1940s to the 1970s.

The major fact that needs to be explained is why the Southern Hemisphere has behaved in a more greenhouse-like fashion than the Northern Hemisphere.

ATTEMPTED EXPLANATIONS

One reaction to the poor correspondence of the GCMs with the observed data, and to the lack of warming, is to hypothesize a "natural" random cooling that just happens to cancel out the greenhouse warming. The problem with this explanation is:

No causation is implied or suggested, and the argument resorts to the complete unknown (a random perturbation) in an attempt to explain what is known (a lack of warming).¹²

One GCM, the Goddard Institute for Space Studies (GISS) model, ran a 100-year simulation in the late 1980s, without any greenhouse enhancement, or any change in overall driving variables such as solar intensity or planetary reflectivity. The idea was to see what variation in temperature would be possible due to natural random fluctuations. The answer came out as 0.4 degrees centigrade, which is of the right order of magnitude to cancel the greenhouse effect. But how good is the GISS model?

the current [1992] error in its estimation of Southern Hemisphere temperatures poleward of 70 degrees is approximately 12 degrees centigrade [!], and the sea surface temperatures are artificially set "to ensure a match of sea surface temperatures to their [known] climatological averages." Thus the temperature of 70 per cent of the earth is fed in as the "right" answer, and errors in excess of 10 degrees centigrade are still generated over the remaining 30 percent.¹³

Another response to the observed lack of warming is that "the data don't matter". Those very words were spoken by Chris Folland of the United Kingdom Meteorological Office at a meeting of climatologists in Asheville, North Carolina, on August 13, 1991. Shortly after that Folland added:

Besides, we're not basing our recommendations [for immediate reductions in CO₂ emissions] upon the data; we're basing them upon the climate models.¹⁴

Folland claimed that the GISS model showed that a random cooling was sufficient to cancel out the greenhouse warming. But Michaels argues that even if we assume that the GISS model is reliable (which, as we have seen, it isn't):

the chance that a random ghost in the climate machine is suppressing the warming of the Northern Hemisphere is only 1 in 10. This is then cited as the basis for what will be the greatest experiment in central energy planning in history.¹⁵

GCM MODELS

The mid-1980s GCMs predict an average 4 degree centigrade rise in global temperature for a doubling of CO₂. There are many faults with those models, including the following:

[The GCMs] included oceans that did not mix vertically or interact properly with the atmosphere, unrealistic cloud definitions ... an earth that did not rotate with respect to the sun (and, therefore, had no 24-hour day and night cycle; in those GCMs, it is always a sunny day) ... [They] also suffered from stepwise (instantaneous) doubling of CO₂, rather than the low-order exponential increase that occurs in the real world.¹⁶

Michaels adds that:

People who find fault with those GCMs are often accused of setting up "straw men", because the models' limitations are so well known within the scientific community. But the objections are hardly "straw", because the models form the basis, and an ostensibly scientific rationale, for the greatest experiment in the central planning of energy in human history — a few trillion dollars of expenditure, extracted mainly from a nation that routinely runs a \$250 billion annual deficit.

The projections of newer, more realistic, GCMs are changing and many are cooling. Warming is delayed when the oceans and the atmosphere interact. Nevertheless even the coolest models overpredict the actual rise in temperature that has occurred since the major enhancement of greenhouse gases (i.e., since 1950).

In the newer models, less warming is calculated when either the oceans or the clouds are simulated more realistically. Therefore, improved models that incorporated both clouds and oceans would produce even less net warming.

Stephen Schneider, of the National Center for Atmospheric Research (NCAR) which is responsible for one of these models, claimed, before the new results were published, that the models (i.e., the older ones) do pretty well at simulating the climate (when they don't). But after the new, cooler United Kingdom Meteorological Office (UKMO) model came out Schneider claimed "It is going to be another decade or two before we have answers that are credible". So, apparently, the warmer models do pretty well while the cooler ones do not provide answers that are credible.¹⁷ If it is going to be another decade or two before we have answers that are credible for what are more realistic GCMs, how is it that *less* realistic GCMs are somehow credible *today*?

Another problem with GCMs is to do, not with the scientific simulations, but with how they are presented.

In almost every publication of GCM results in the refereed scientific literature and in UN and congressional reports [that Michaels has seen] ... projected warming has been dramatically distorted by the use of map projections that assume that the area in each band of latitude is equal.

The distortion arises because, for example, the newer, more realistic, GCM models typically predict the largest temperature rises to be in polar regions. But areas of the earth which are closer to the poles, and therefore occupy a smaller proportion of the earth's surface, appear to occupy a larger proportion when projected onto a plane. The newer NCAR and Geophysical Fluid Dynamics Laboratory (GFDL) models show areas of the earth with temperature rises greater than 4 degrees centigrade, to cover more than 20% of the earth's surface when projected onto a plane. But, in reality, the predicted percentages are less than 5% for the former model and about 2% for the latter. In summary:

While the climate models are probably still too warm in general, almost all of the warming in the newer ones is confined to high-latitude winter. Because the sun is either at, or beneath the horizon, almost all of the warming of more than 4 degrees centigrade is projected for evening or night.

Thus, even though the models do not include the anthropo-generated particulates [dust and finely divided aerosols], they show that almost all of the strong warming of the next century will be in the winter, at night, or in the highest latitudes (or some combination of those three). Adding the particulate effect is likely to push warming further in those directions.¹⁸

WHY NO NORTHERN HEMISPHERE WARMING?

The most plausible explanation for the lack of Northern Hemisphere warming is that there has been increasing cloudiness. Increasing cloudiness would decrease the amount of evaporation from land surfaces that would otherwise occur with rising temperatures.

Over the world's agricultural regions, evaporation is primarily restricted to daytime, when the sun beats down. At night, the opposite, condensation, dominates. If cloudiness increases, then daytime evaporation drops even if rainfall goes up. Clouds tend to reduce the night-time cooling rate, so an increase in cloudiness would lengthen the growing season.

Do the GCMs take into account day and night cyclic climate variations?

most of the 1980s [GCM] models did not have explicit 24-hour day and night (evaporation and condensation) cycles. Hansen's GISS model was an exception, but to date it has misestimated the ratio of night-to-day warming by 9 to 1 in the Northern

Hemisphere. As a result, the models cannot successfully calculate the implications of an increase in cloudiness.¹⁹

Increasing cloudiness has the following sort of effect on temperature:

the earth reflects a bit more than one-quarter of the incoming solar radiation and clouds are one of the prime reflectors ... [A] mere 2 percent change in global reflectivity [depending on assumptions] would create enough cooling to totally offset the warming associated with an effective doubling of CO₂. [That] amounts [depending on assumptions] to roughly a four percent increase in average global cloudiness.²⁰

As it happens, cloudiness records, due to Australian climatologist Ann Henderson-Sellers, and dated back to 1900, are available for the US and Canada. Records, due to Steven Warren et al., are also available for the Northern and Southern Hemispheres for the past 50 years.²¹ All the records show clearly discernible increases in cloudiness over their respective time periods. The Southern Hemisphere cloud increase since 1950 appears to be about half that of the Northern Hemisphere, though the data for the former is more sparse.

The Northern Hemisphere record has been divided into various cloud types, latitude bands and seasons.

What appears remarkable are the large increases [in cloudiness] observed in the industrial latitudes of the Northern Hemisphere, along with the tendency for large increases to be in the low-level stratocumulus. Not only is that cloud type very effective at cooling, it is the type that might be enhanced by industrial activity.²²

The Henderson-Sellers records for the US and Canada were actually included as a supporting contribution to the IPCC report. But no mention of the implications of her data was made in the Policy-makers Summary.

Increasing cloudiness may be caused by both the greenhouse effect itself and by the family of anthropogenerated particulates. The latter are mainly caused by the combustion of coal and petroleum. Dust from agricultural activity may also be a source.

Increasing cloudiness should have the following day-and-night and seasonal effects (among others).

- (1) The warming (night-time) effect from clouds should be pronounced on (long) winter nights.
- (2) The cooling (daytime) effect from clouds should be pronounced on (long) summer days.
- (3) The warming (night-time) effect from clouds should be attenuated on (short) summer nights.
- (4) The cooling (daytime) effect from clouds should be attenuated on (short) winter days.

Tom Karl's HCN (for the US) appears to be the most reliable of the land-based temperature records when compared to satellite measurements (from 1979). Karl et al. subsequently extended the HCN to include the USSR and China. In aggregate the three records cover 42% of the land mass of the Northern Hemisphere. It turns out that each of the four points above, concerning the distribution of warming, is confirmed by the HCNs, and, on an annual basis, the observed ratio of night-to-day warming is greater than 10 to 1. How do the GCMs fare?

in the few attempts that have been made to use GCMs to explicitly examine the day-night breakdown in more temperate latitudes ... there is only a slight tendency for a bit more night warming.

Thus ... the difference between night and day appears to be off by an order of magnitude (10 to 1) in those models. That would not be so bad if the models were intended only for academic consumption, but they are the basis for policy recommendations of the United Nations. That use can be defended only if "the data don't matter."²³

Michaels summarises the broad consequences of the greenhouse effect as follows:

The greenhouse effect is real, but ... seems to be muted in the Northern Hemisphere by industrial particulates and is perhaps transformed into a benign or beneficial alteration of the atmosphere by the same industrial activity that enhanced it in the first place. In the Southern Hemisphere, even with the absence of those industrial compounds, warming appears to take place much more at night than during the day, perhaps as a result of an increase in high cirrus clouds that are a product of the greenhouse enhancement itself.²⁴

THE APOCALYPSE MACHINE

Michaels presents the following very perceptive points as forming the essentials of the "apocalypse machine".

- (1) Define the Problem as Apocalyptic.
- (2) Present the Apocalyptic Vision as a Mainstream View: Dissenters are Crackpots.
- (3) Play up the Lurid Prognostications and Imagery of Doom Because Apocalypse Sells Newspapers and Television Time.
- (4) Build Massive Financial Support.
- (5) Use That Lobbying Support to Pass Economically Profound Legislation Before the Necessary Science Has Been Completed.
- (6) Invent a New One.

Stephen Schneider can be considered a representative spokesman for the Apocalyptic Vision:

On the one hand, we are ethically bound to the scientific method, in effect promising to tell the truth, the whole truth, and nothing but ... which means that we must include all the doubts, caveats, ifs, and buts.

On the other hand, we are not just scientists, but human beings as well. And like most people we'd like to see the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climatic change. To do that we have to get some broad-based support, to capture the public's imagination. That, of course, entails getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of any doubts we might have. This "double ethical bind" that we frequently find ourselves in cannot be solved by any formula. Each of us has to decide what the right balance is between *being effective and being honest* [emphasis added]. I hope that means being both.²⁵

If we think about it, it is hardly surprising that our simulations of the global climate have been so unsatisfactory. After all, we have difficulty predicting the weather accurately for more than a few days in advance. As George Reisman remarks, there is a strange contradiction in the environmentalists' approach:

The environmental movement maintains that science and technology cannot be relied upon to build a safe atomic power plant, to produce a pesticide that is safe, or even to bake a loaf of bread that is safe, if that loaf of bread contains chemical preservatives. When it comes to global warming, however, it turns out that there is one area in which the environmental movement displays the most breathtaking confidence in the reliability of science and technology, an area in which, until recently, no one — even the staunchest supporters of science and technology — had ever thought to assert very much confidence at all. The one thing, the environmental movement holds, that science and technology can do so well that we are entitled to have unlimited confidence in them, is *forecast the weather!* — for the next one hundred years.²⁶

NOTES

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19. *Ibid.* p. 94.
20. *Ibid.* p. 95.
21. *Ibid.* pp. 98-99. The records are reproduced by Michaels.
22. *Ibid.* p. 97.
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26. George Reisman, *The Toxicity of Environmentalism*, op. cit., p. 16.