

## Hot Enough for You? The Heated Debate over a Warming Planet

Reality must take precedence over public relations, for Nature cannot be fooled.

*Richard Feynman*

### POLITICAL HOT AIR

On April 8, 2010, former vice-presidential candidate and half-term Alaska governor Sarah Palin spoke to the Southern Republican Leadership Conference. She mocked the scientific community, calling global warming research “this snake-oil science stuff that is based on the global warming, Gore-gate stuff.”<sup>1</sup> As blogger Stephen Webster wrote on Raw Story the next day,

Up yours, scientists. That’s essentially the message sent by former politician Sarah Palin during a recent speech to the Southern Republican Leadership Conference, where she disparaged the work of thousands of the world’s top minds to the delight of a large crowd that laughed, clapped and cheered her on the whole way. . . .

To her credit, Palin has at least been remarkably consistent on this point, actually calling on President Obama to insult the international community and boycott the 2009 Copenhagen climate summit over emails stolen from the University of East Anglia. Even then, in December 2009, she was whipping up her fans with the term “snake oil” and claiming that because a small group of people had a dispute over data methodologies, the entire body of knowledge generated by tens of thousands from around the world was suddenly void.<sup>2</sup>

The evidence for global climate change has been accumulating since the 1950s, and was a minor political topic in the 1970s and 1980s—but there was no concerted effort to deny its reality. Even when James Hansen, the head of NASA Goddard Institute for Space Studies, and other prominent scientists brought it to the attention of Congress and the public starting in 1988, and continuing into the 1990s, very little denial or criticism occurred. There was no chance that Congress would act upon it, or that George H. W. Bush would sign a global warming bill if Congress did act. But ever since the late 1990s, the political debate has heated up. In 1997, the Clinton administration tried to take a leadership role in the Kyoto Protocol about climate change. During the early 2000s, the George W. Bush administration actively censored government scientists and allowed oil company lobbyists to tamper with and rewrite government scientific reports describing the evidence of global climate change, or the role of oil and coal companies in contributing to it. Al Gore's 2006 documentary *An Inconvenient Truth* brought the issue to the forefront, and convinced many more people than any scientific report could. The world community took notice and awarded Gore and the film's producers the 2007 Oscar for Best Documentary, and the 2007 Nobel Peace Prize for Gore and the IPCC (Intergovernmental Panel on Climate Change) scientists who discovered, compiled, and reported the evidence. Since 2009, when the Obama administration and the Democratic majority in Congress tried to act on some sort of bill, the debate has reached white-hot intensity, and the public is more confused than ever about what to believe. The political battle is largely polarized along party and cultural lines, with the right-wing media and their followers uniformly opposed and critical, and the rest of the developed world largely accepting the scientific evidence. The 2009 Copenhagen climate change conference may not have accomplished many of its lofty goals, but at least all the world's nations agreed that global climate change is real, and that something should be done about it (even if they fell short on acting upon it during the meeting).

In the midst of all this noise and confusion, how does the average person decide whom to believe? Is there really no consensus among climate scientists, so that any opinion is as good as the next? Let us look at the scientific side of the question first.

## GLOBAL CLIMATE CHANGE: THE SCIENTIFIC EVIDENCE

[Carl] Sagan called [the earth] a pale blue dot and noted that everything that has ever happened in all of human history has happened on that tiny pixel. All the triumphs and tragedies. All the wars. All the famines. It is our only home. And that is what is at stake—to have a future as a civilization. I believe this is a moral issue. It is our time to rise again to secure our future.

*Al Gore, An Inconvenient Truth*

The story goes back over a century to John Tyndall's 1850 discovery that greenhouse gases such as water vapor and carbon dioxide absorbed solar radiation and could warm the planet. Swedish scientist Svante Arrhenius, who received the Nobel Prize in Chemistry for his work, made the next major breakthrough in 1896. Arrhenius discovered that carbon dioxide was an important greenhouse gas. When the earth gets energy from the sun, the solar radiation arrives in shorter wavelengths (mostly visible and ultraviolet light) that penetrate our atmosphere. After the earth absorbs this energy, it radiates it back out as longer-wavelength infrared radiation (which we call heat), which greenhouse gases prevent from escaping. Since more heat comes in to the planet than can leave it, the earth's atmosphere warms up. Gases like carbon dioxide, nitrous oxide, and methane are similar to the glass ceilings of a greenhouse or the glass windows in your car when it is shut; they hold in heat but let the light through. Originally Arrhenius calculated that doubling the level of atmospheric carbon dioxide would cause global temperatures to rise by 5–6°C. This is remarkably close to the current estimates of scientists in the IPCC report in 2007.

The next major step occurred when Charles Keeling invented one of the first devices for measuring atmospheric carbon dioxide. In 1958 he began to take measurements in places isolated from major cities (thus minimizing local effects), and ran experiments in Antarctica and Mauna Loa on Hawaii. The Antarctic project ran out of grant funds after a few years when the NSF decided that he had proved his point, but the Mauna Loa Observatory has been running continuously for the over fifty-five years, and has collected one of the longest sets of atmospheric data ever. By the 1960s, Keeling and his colleague, the legendary Scripps oceanog-

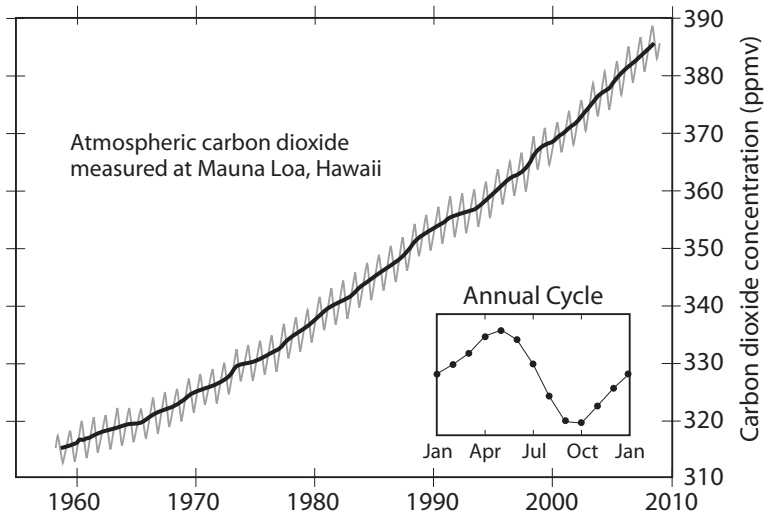


FIGURE 5.1. The “Keeling Curve” of the increase in atmospheric carbon dioxide since 1958. Superimposed on the steady upward increase each year is the annual fluctuation of the seasons. During fall and winter in the Northern Hemisphere, plants die back, decay, and release carbon dioxide; during the spring and summer, plants grow and pull carbon dioxide out of the atmosphere. *Modified from image at Globalwarmingart.com; redrawn by Pat Linse.*

rapher Roger Revelle, could see the dramatic increase in carbon dioxide (fig. 5.1). There are also the annual cycles of decreasing carbon dioxide, when the Northern Hemisphere spring plant growth takes in  $\text{CO}_2$ , and increasing carbon dioxide in the fall, when the trees lose their leaves in the north.

From Keeling’s initial data to every data set that has been collected since then, the trend is clear (fig. 5.2). Carbon dioxide in our atmosphere has increased at a dramatic rate in the past two hundred years. Not one data set collected over a long enough span of time shows otherwise. Mann and Kump (2008) compiled the past nine hundred years’ worth of temperature data from tree rings, ice cores, corals, and direct measurements of the past few centuries, and the sudden increase of temperature of the past century stands out like a sore thumb. This famous graph is now known as the “hockey stick” because it is long and straight through most of its length, then bends sharply upward at the end. Other graphs

show that climate was very stable within a narrow range of variation through the past one, two, or even ten thousand years since the end of the last Ice Age. There were minor warming events during the Climatic Optimum about seven thousand years ago, the Medieval Warm Period, and the slight cooling of the Little Ice Age from the eighteenth and nineteenth centuries. But the magnitude and rapidity of the warming represented by the last two hundred years is simply unmatched in all of human history. More revealing, the timing of this warming coincides with the Industrial Revolution, when humans first began massive deforestation and released carbon dioxide by burning coal, gas, and oil.

If the data from atmospheric gases were not enough, we are now seeing unprecedented changes in our planet. The polar icecaps are thinning and breaking up at an alarming rate. In 2000, my former graduate advisor Malcolm McKenna was one of the first humans to fly over the

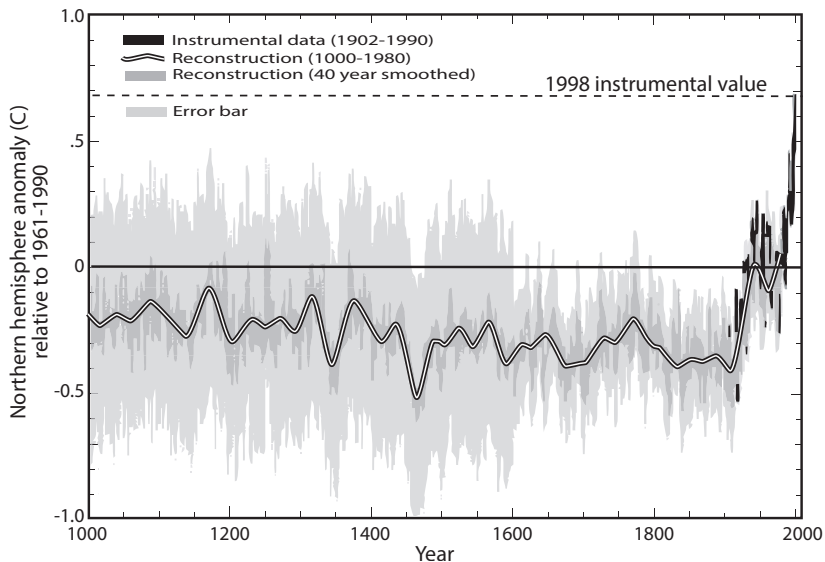


FIGURE 5.2. The record of the last thousand years of temperature change (after M. E. Mann and L. R. Kump, *Dire Predictions: Understanding Global Warming* [New York: DK, 1999]). Temperature was fairly stable until the late nineteenth century, when it suddenly shot upward in response to greenhouse gases released by the Industrial Revolution. Because of its long straight line with the sudden kick upward it is nicknamed the “hockey stick curve.” Modified from image at [Globalwarmingart.com](http://Globalwarmingart.com); redrawn by Pat Linse.

North Pole in summertime and see no ice, just open water. So much for Santa's Workshop! The Arctic ice cap has been frozen solid for at least the past three million years and maybe longer,<sup>3</sup> but now the entire ice sheet is breaking up so fast that by 2030 (and possibly sooner) less than half of the Arctic will be ice covered in the summer.<sup>4</sup> In the fall of 2012, satellite data showed a record amount of melting in Greenland, with nearly all the surface ice melting for at least part of the summer (and much of it never freezing again, but pouring into the oceans).<sup>5</sup> As you can see from watching the news, this is an ecological disaster for everything that lives up there, from the polar bears to the seals and walrus to the animals they feed upon. The Antarctic is thawing even faster. In February–March 2002, the Larsen B ice shelf, over 3,000 square km (the size of Rhode Island) and 220 m (700 feet) thick, broke up in just a few months, a story typical of nearly all the ice in Antarctica. The Larsen B shelf had survived all the previous ice ages and interglacial warming episodes of the past three million years, and even the warmest periods of the ten thousand years—yet it and nearly all the other thick ice sheets in the Arctic, Greenland, and Antarctic are vanishing at a rate never before seen in geologic history.

Many people do not care about the polar ice caps, but there is a serious side effect worth considering: all that melted ice eventually ends up as more water in the ocean, causing the sea level to rise, as it has many times in the geologic past. At present sea level is rising about 3–4 mm per year, more than ten times the rate of 0.1–0.2 mm per year that has occurred over the past three thousand years (fig. 5.3). Our geological data show that the sea level was virtually unchanged over the past ten thousand years since the present interglacial began. A few millimeters here or there does not impress people, until you consider that the rate is accelerating and that most scientists predict it will rise 80–130 cm in just the next century.

A sea-level rise of 1.3 m (almost 4 feet) would drown many of the world's low-elevation cities, such as Venice and New Orleans, and low-lying countries such as the Netherlands or Bangladesh. A number of tiny island nations such as Vanuatu and the Maldives, which barely poke out above the ocean now, are already vanishing beneath the waves. Their entire population will have to move someplace else.<sup>6</sup> If the sea level rose

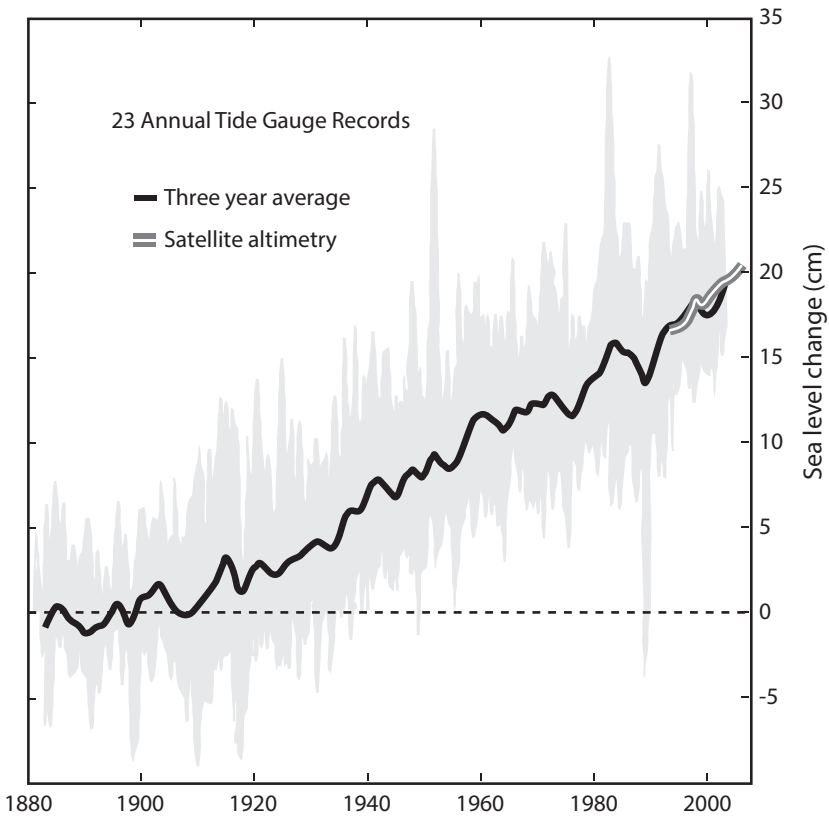


FIGURE 5.3. The recent rise in sea level.

*Courtesy Globalwarmingart.com; redrawn by Pat Linse.*

by just 6 m (20 feet), nearly all the world's coastal plains and low-lying areas (such as the Louisiana bayous, Florida, and most of the world's river deltas) would be drowned. Most of the world's population lives in coastal cities such as New York, Boston, Philadelphia, Baltimore, Washington, D.C., Miami, Shanghai, and London. All of those cities would be partially or completely underwater with such a sea-level rise. If all the glacial ice caps melted completely (as they have several times before during past greenhouse worlds in the geologic past), sea level would rise by 65 m (215 feet)! The entire Mississippi River valley would flood, so you could dock your boat in Cairo, Illinois (fig. 5.4). Such a sea-level rise

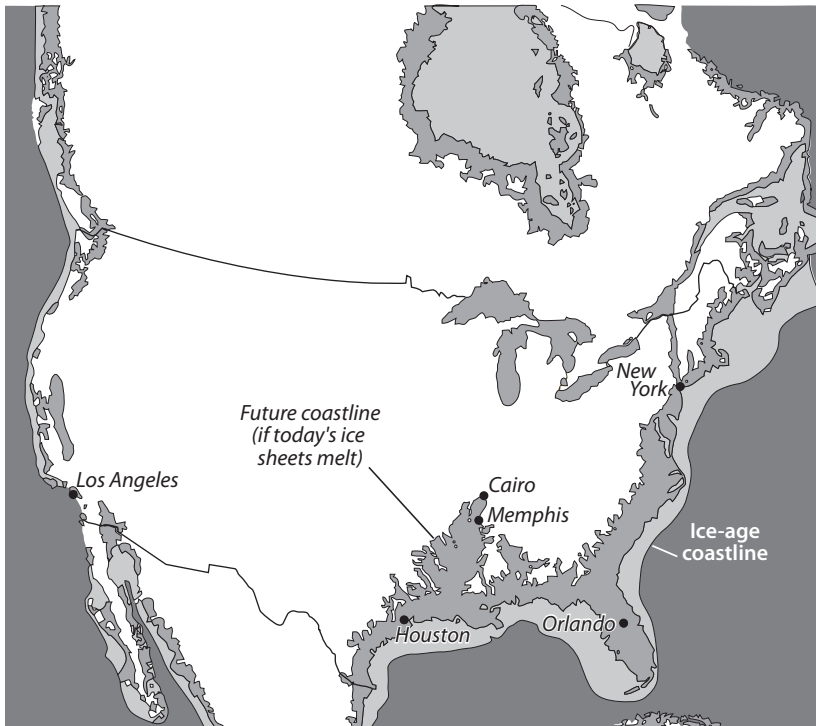


FIGURE 5.4. If all the glaciers melted, nearly all land below 215 feet in elevation would be drowned—and coastal plains, cities, and harbors would vanish. From D. R. Prothero and R. H. Dott, Jr., *Evolution of the Earth*, 8th ed. (New York: McGraw-Hill, 2009); redrawn by Pat Linse.

would drown nearly every coastal region under hundreds of feet of water, and inundate New York City, London, and Paris. All that would remain would be the tall landmarks, such as the Empire State Building, Big Ben, and the Eiffel Tower. You could tie your boats to these pinnacles, but the rest of these drowned cities would be deep under water.

One of the chief congressional critics of global warming research is Senator James Inhofe of Oklahoma. Ironically, nearly every rock in Oklahoma is a product of seas which drowned that state during past greenhouse worlds. If his activities against global warming legislation lead to the eventual drowning of his property, I hope he can swim! I wonder whether future residents of the drowned Oklahoma (much like Kevin



Costner in the science fiction film *Waterworld*) will curse their political representative who denied the evidence all around him, and did his best to bring on the disaster they were facing.

The changes occur not only in polar ice and in rising sea level. It has effects on all the climates around the world. Glaciers are all retreating at the highest rates ever documented. Many of those glaciers, especially in the Himalayas and Andes and Alps and Sierras, provide most of the fresh water that the populations below the mountains depend upon—yet this fresh water supply is vanishing. The permafrost that once remained solidly frozen even in the summer has now thawed, damaging the Inuit villages on the Arctic coast and threatening all our pipelines to the North Slope of Alaska. Not only is the ice vanishing, but we have seen record heat waves over and over again, killing thousands of people, as each year joins the list of the hottest years on record. 2010 topped that list as the hottest year, surpassing the previous record year of 2009. 2011 was the twelfth warmest year on record, even though it was supposed to be a cooler La Niña year, and 2012 looks to break the record based on the incredible summer heat waves in North America that broke all local records. Natural animal and plant populations are being decimated all over the globe as their environment changes.<sup>7</sup> Many animals respond by moving their ranges to formerly cold climates, so now places that once did not have to worry about disease-bearing mosquitoes are infested as the climate warms and allows them to breed further north.

Climate deniers try to distort or obfuscate the evidence about the changing atmosphere, and it is not always easy to give overwhelmingly conclusive data that would convince them. In some cases the data are tricky to analyze, or do not have the well-documented long-term histories necessary to answer every concern about whether recent weather events are truly unprecedented. The atmospheric system is very complicated, with many different processes operating on short-term, medium-term, and long-term time scales, and not all of it is as well understood as we would like. Thus, the arguments over changes in earth's atmosphere often reach an impasse.

Not so for the oceans. Although oceans are an even larger system than the atmosphere, we understand them much better. More importantly, we have an excellent long-term record of how the oceans have changed

over millions of years based on thousands of deep-sea cores and the paleontological record of marine fossils that goes back over 700 million years. And unlike the atmospheres, oceans change very slowly over time, since the thermal inertia of water makes the seas very resistant to change, except on long-term time scales. In addition, most ocean currents move slowly compared to atmospheric currents. So no matter what you want to make of the data showing atmospheric change, the changes in the oceans are more alarming, since oceans require immense stimuli to cause such change.

A few years ago, marine biologist and filmmaker Randy Olson (famous for his film *Flock of Dodos*, which lampoons not only creationists but also arrogant scientists who refuse to communicate with the public) founded a web-based effort to publicize the destruction of the oceans. Named “Shifting Baselines,” it refers to the fact that many ecological systems have shifted to a “new norm” or “new baseline,” and conditions no longer return to those they exhibited only thirty years ago.<sup>8</sup> For example, longtime divers and marine biologists have all documented dramatic changes in the oceans, especially coral reefs. When Olson and most senior marine biologists began diving, coral reefs were thriving around the world, and these same people are now documenting the rapid deterioration of reefs around the world in a single lifetime. Thus, the “baseline” of what is considered normal marine diversity has changed in just a few decades, and biologists being trained today have a very different concept of “normal” marine diversity than those just thirty years ago. As my friend and colleague Jeremy Jackson of the Smithsonian put it, “Every ecosystem I studied is unrecognizably different from when I started. I have a son who is 30, and I used to take him snorkeling on the reefs in Jamaica to show him all the beautiful corals there. I have a daughter who is 17—I can’t show her anything but heaps of seaweed.”<sup>9</sup> Or as marine biologist Steve Miller of the University of North Carolina, Wilmington, wrote,

Caribbean coral reefs of the 1970s changed my life. But the reefs I first knew and loved are gone, casualties of disease, coral bleaching, and overfishing. The reefs I study now in Florida are only a shadow of their former glory. My tourist friends go snorkeling and marvel at the colors and structure, but little do they know they’re looking at the ghost of a coral reef. While I can tell my friends about all that we

have lost, I am saddened that my children can't have the same personal experience I had, just 25 years ago.<sup>10</sup>

Although overfishing and disease are certainly important problems in the oceans, the biggest problem seems to be that the oceans are becoming warmer and more acidic as they absorb the excess heat and carbon dioxide from the atmosphere and turn it into carbonic acid. For a long time, some people argued that we did not need to worry about carbon dioxide, because the oceans would serve as a big buffer and absorb it all. Well, if that were ever true, it is no longer. The evidence is overwhelming that the acidity of the ocean is changing faster than it has in 300 million years.<sup>11</sup> This, more than any other factor, is responsible for the worldwide dying of the tropical coral reefs. Known as "bleaching," it occurs when the individual coral polyps (which look like tiny sea anemones) cannot tolerate the environmental conditions, such as excess heat or acid ocean waters, any longer. They shed their symbiotic algae (zooxanthellae), which in normal times help them metabolize carbon dioxide and build their skeletons, and thus lose their color. Eventually, the coral polyps die off and leave behind their huge stony skeletons, which gradually turn white. Although some reefs, like the Great Barrier Reef of Australia, are also suffering from problems like out-of-control predation by the crown-of-thorns sea star, the worldwide bleaching and dying of coral reefs can only be attributed to a global oceanographic change—and only ocean warming and acidification fits that description. Certainly, there are marine organisms that thrive in warmer, more acidic oceans (such as the algae that cause the deadly red tide, or encrusting algae growing on rocks uncropped, plus sand fleas, some less calcified crustaceans, and sea urchins),<sup>12</sup> but the vast majority of marine species are negatively affected. Once the reef corals themselves die, nearly all the hugely diverse community of animals and plants vanishes soon thereafter, leaving a mass of dead stony coral rock covered by algae, where once a gloriously beautiful and diverse reef community lived.

If the loss of the coral reefs and their huge effect on diversity were not worrisome enough, there is even more direct evidence of what ocean acidification is doing to the marine realm.<sup>13</sup> Several studies have just reported new data that shows the shells of sea creatures are now dissolving faster than they can be grown. First spotted in the thin-shelled

planktonic mollusks known as pteropods (or “sea butterflies”) in the Antarctic waters (where colder water allows higher carbon dioxide concentrations), this is an alarming sign. Once the rest of the world’s oceans become acidic enough, most calcareous shelled invertebrates (especially the world’s population of clams and snails, plus echinoderms, some sponges, and corals) will literally dissolve away as larvae before their shells can grow. In addition, the loss of the planktonic pteropods (and most other calcareous plankton, such as foraminifera and coccolithophorid algae) will wipe out the marine plankton that are the base of the food chain throughout the world’s oceans. Once the plankton vanish, so do their predators higher up, leading eventually to most of the world’s fish and whales, all of which feed on smaller animals from lower in the food chain. This would cause a dramatic extinction in the world’s oceans. It would have adverse effects not only on our need for seafood to help provide protein for some of the seven billion people on the planet, but dead oceans have a huge effect on the atmosphere as well. Once the calcareous planktonic algae vanish, they remove our largest absorber of carbon dioxide from the atmosphere, since the world’s planktonic algae have a much bigger effect on atmospheric carbon dioxide than do the land plants in rainforests and elsewhere (which are also diminishing due to deforestation).

Even more alarming is how quickly this is all happening. In one lifetime, marine biologists have witnessed widespread mass extinction in the coral reef community, and the first signs of oceans so acidic that the marine shelled organisms are dissolving before our eyes. As many studies have shown, this is faster than at any time in geologic history—even the famous “methane burp” event 55 million years ago that caused a sudden spike in carbon dioxide and worldwide mass extinction in the ocean.<sup>14</sup>

As I mentioned above, we have 700 million years of ocean history recorded in the fossil record, especially in the deep-sea cores that record the past 100 million years in great detail. We can analyze the carbon isotopic composition of shells of planktonic microfossils and show how the ocean chemistry has changed. We can look at the patterns of diversity and extinction of acid-sensitive marine fossils, and find out when the ocean has experienced this kind of “acid bath” before. As a recent article

by Hönisch and others pointed out, the current episode of mass extinction and rapid acidification of the ocean has no precedent.<sup>15</sup> The closest we can come to is the worst mass extinction in earth history, the “Great Dying” at the end of the Permian Period, about 250 million years ago. The extinction was so severe that about 95% of marine species vanished, and a similar number of land species as well. Although the complete causes are complex and still under discussion, there is a clear signal from the chemical isotopes that there was a global warming event, as well as too much carbon dioxide in the seawater (hypercapnia). It is thought to have been driven by the largest volcanic eruption in earth history, which occurred in northern Siberia. As these eruptions released greenhouse gases, they drove the delicate chemical balance in the oceans to supersaturation in carbon dioxide and highly acidic conditions. Between the toxicity of hypercapnia and the effects of dissolving shells, nearly every group of animals in the oceans vanished 250 million years ago. These included many groups, such as rugose and tabulate corals, trilobites, and blastoid echinoderms, that had survived many previous oceanic mass extinctions. Other groups, such as the brachiopods, the bryozoans, the crinoids, the bivalves and gastropods, and the ammonoid cephalopods nearly vanished, with only a few subgroups surviving to repopulate the world later.

The fossil record provides us with a sobering lesson: what we are doing to our atmosphere is bad enough, but what we do to the oceans is even deadlier, even if it is less visible to us landlubbers. Previously, all the focus has been on the mass extinction in land animals caused by humans and their associated animals, but the devastation of the oceans is far worse. The last time it was this bad, life nearly vanished from this planet.

If you have seen the documentary *An Inconvenient Truth*, or any of the other documentaries on the topic, the long litany of “things we have never seen before” and “things that have never occurred in the past 3 million years of glacial-interglacial cycles” is staggering. Still, there are many people who are not moved by the dramatic images of vanishing glaciers, or by the forlorn polar bears starving to death. Many of these people have been fed lies, distortions, and misstatements by the global warming deniers who want to cloud or confuse the issue. Let us examine some of these claims in detail:

*"It's Just Natural Climatic Variability"*

*No, it is not.* As I detailed in my 2009 *Greenhouse of the Dinosaurs*, geologists and paleoclimatologists know a lot about past greenhouse worlds, and the icehouse planet that has existed for the past 33 million years. We have a good understanding of how and why the Antarctic ice sheet first appeared at that time, and how the Arctic froze over about 3.5 million years ago, beginning the twenty-four glacial and interglacial episodes of the so-called Ice Ages that have occurred since then. We know how variations in the earth's orbit (the Milankovitch cycles) control the amount of solar radiation the earth receives, triggering the shifts between glacial and interglacial periods. Our current warm interglacial has already lasted ten thousand years, the duration of most previous interglacials, so if it were not for global warming, we would be headed into the next glacial any time now. Instead, our pumping greenhouse gases into our atmosphere after they were long trapped in the earth's crust has pushed the planet into a super-interglacial (fig. 5.5), already warmer than any previous warming period. (This is why some deniers try to discredit the evidence by saying scientists predicted global cooling in the 1970s. In

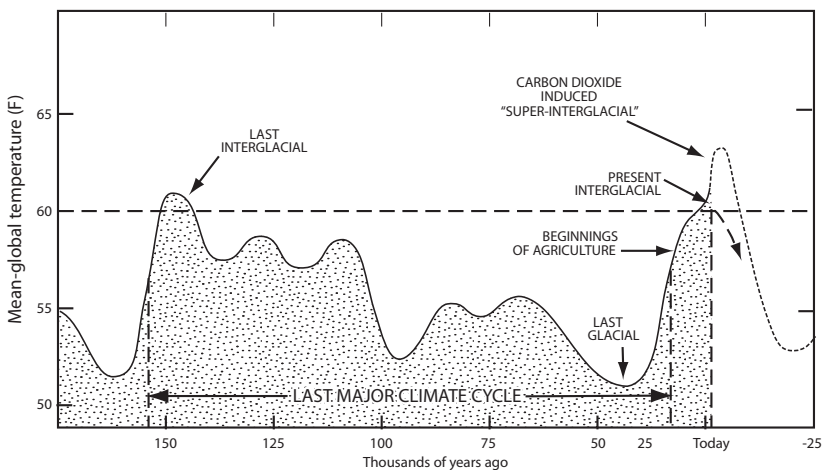


FIGURE 5.5. The last 130,000 years of glacial-interglacial cycles, showing the typical 10,000-year duration of the previous interglacial 125,000 years ago and the predicted end of our current interglacial after 10,000 years. *After Prothero and Dott 2009; redrawn by Pat Linse.*

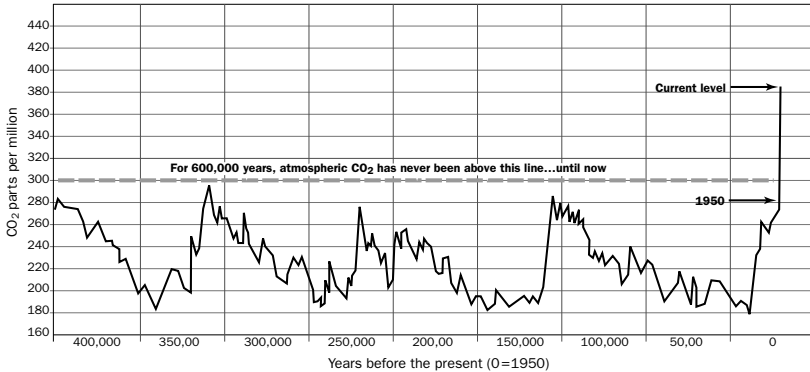


FIGURE 5.6. The climate record from EPICA core from Antarctica. It shows the normal range of climate variability over the past 650,000 years and the last six glacial-interglacial cycles. At no point in any previous interglacial was the carbon dioxide level higher than 300 ppm, or the temperatures so high, yet we are almost to 400 ppm today. This is ironclad evidence that our present episode of warming is not “normal fluctuations.” (Shown here are the last three glacial cycles.)

fact, it was mostly the media making this prediction. The peer-reviewed scientific literature consistently pointed to evidence of warming.)

We can see the “big picture” of climate variability most clearly in the EPICA cores from Antarctica (fig. 5.6), which show the details of the last 650,000 years of glacial-interglacial cycles. *At no time during any previous interglacial did the carbon dioxide levels exceed 300 ppm, even at their very warmest.* Our atmospheric carbon dioxide levels are already close to 400 ppm today. The atmosphere is headed to 600 ppm within a few decades, even if we stopped releasing greenhouse gases immediately. This is decidedly *not* within the normal range of climatic variability, but clearly unprecedented in human history. Anyone who says this is normal variability has never seen the huge amount of paleoclimatic data that show otherwise.

*“It’s Just Another Warming Episode, Like the ‘Medieval Warm Period,’ or the ‘Holocene Climatic Optimum’ or the End of the ‘Little Ice Age’”*

*Untrue.* There were numerous small fluctuations of warming and cooling over the last ten thousand years of the Holocene. But in the case of the Medieval Warm Period (about 950–1250 BCE), the temperatures were

only  $1^{\circ}\text{C}$  warmer than today, much less than the temperature changes since the beginning of our current global warming (fig. 5.7). This episode was also only a local warming in the North Atlantic and Northern Europe. Global temperatures over this interval did not warm at all, and actually cooled by more than  $1^{\circ}\text{C}$ . Likewise, the warmest period of the last ten thousand years was the Holocene Climatic Optimum (5000–9000 BCE), when warmer and wetter conditions in Eurasia caused the rise of the first great civilizations in Egypt, Mesopotamia, the Indus Valley, and China. Once again, this was largely a Northern Hemisphere Eurasian phenomenon, with  $2\text{--}3^{\circ}\text{C}$  warming in the Arctic and Northern Europe. But there was almost no warming in the tropics, and cooling or no change in the Southern Hemisphere.<sup>16</sup>

To the Eurocentric world, these warming events seemed important, but on a global scale the effect is negligible. In addition, neither of these warming episodes is related to increasing greenhouse gases. The Holo-

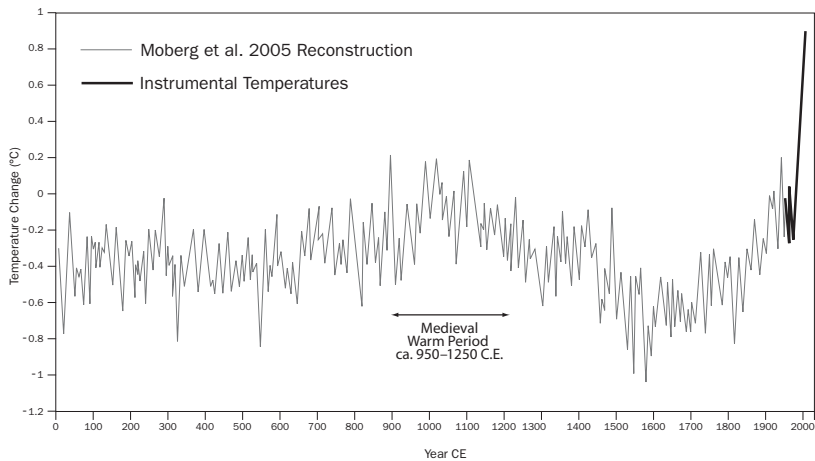


FIGURE 5.7. Plot of the details of the last thousand years of earth's average surface temperature, which shows over eight hundred years of relative stability followed by the rapid warming of the past two centuries, giving it the shape of a "hockey stick" (compare with fig. 5.3). The slight warming of the "Medieval Warm Period" is much smaller compared to the warming of the last hundred years, and this is a Northern Hemisphere graph; there is no Medieval Warm Period in the global data set. A. Moberg, D. M. Sonechkin, K. Holmgren, N. M. Datsenko, and W. Karlén, "Highly Variable Northern Hemisphere Temperatures Reconstructed from Low- and High-Resolution Proxy Data," *Nature* 433, no. 7026 (February 10, 2005): 613–617; updated from the graph in Mann and Kump 1999.



cene Climatic Optimum, in fact, is predicted by the Milankovitch cycles, since at that time the axial tilt of the earth was  $24^\circ$ , its steepest value, meaning the poles got more solar radiation than normal—leading to the warmest period of the interglacial. By contrast, not only is the warming observed in the last two hundred years much greater than during these previous episodes, but it is also *global and bipolar*, so it is not a purely local effect. The warming that ended the Little Ice Age (from the mid-eighteenth century to the late nineteenth century) was due to increased solar radiation prior to 1940. Since 1940, however, the amount of solar radiation has been dropping, so the only candidate for the post-1940 warming has to be carbon dioxide.<sup>17</sup>

*“It’s Just the Sun, or Cosmic Rays, or Volcanic Activity or Methane”*

*Nope. Sorry.* The amount of heat that the sun provides has been decreasing since 1940,<sup>18</sup> just the opposite of the deniers’ claims (fig. 5.8). Cosmic radiation causes an increase in cloud cover on the earth, so increased

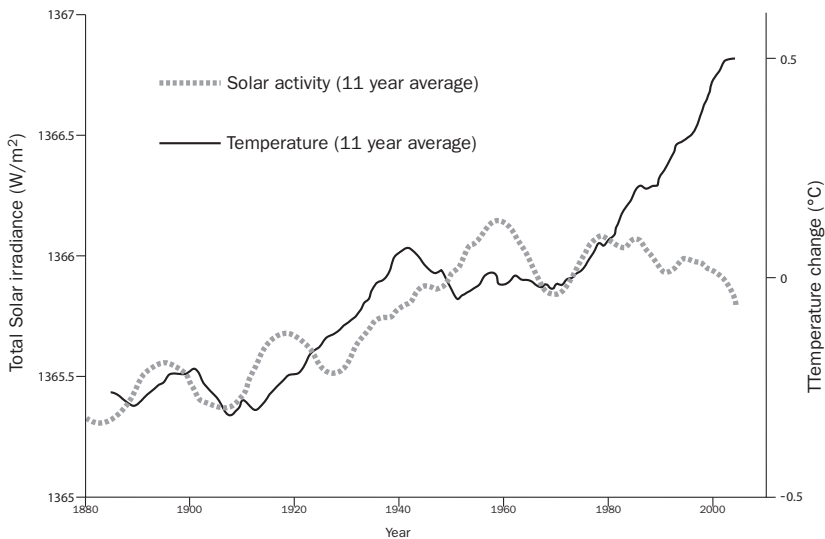


FIGURE 5.8. Plot of solar energy input to the earth versus temperature over the last century. The two tend to track each other until the last thirty years, at which time the earth warmed dramatically even as solar input went down.

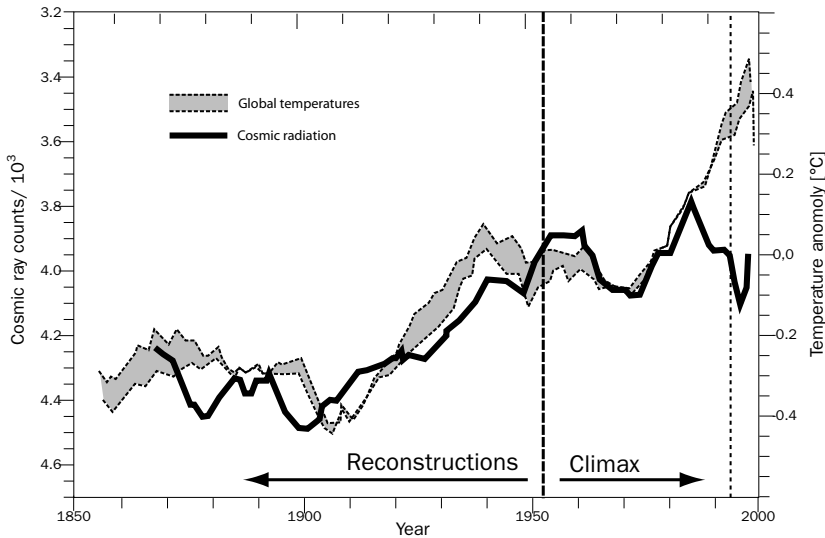


FIGURE 5.9. Reconstructed cosmic radiation (solid line before 1952) and directly observed cosmic radiation (solid line after 1952) compared to global temperature (dotted line). All curves have been smoothed by an eleven-year running mean. Redrawn from N. A. Krivova and S. K. Solanki, "Solar Total and Spectral Irradiance: Modelling and a Possible Impact on Climate," Max-Planck-Institut für Sonnensystemforschung website, September 2003, [www.mps.mpg.de/dokumente/publikationen/solanki/r47.pdf](http://www.mps.mpg.de/dokumente/publikationen/solanki/r47.pdf).

cosmic rays would cool the planet, and decreased cosmic radiation would warm it.<sup>19</sup> There are numerous measurements of cosmic radiation, and the result is clear: in the last forty years, cosmic radiation has been increasing (which should cool the planet) while the temperature has been rising (fig. 5.9), the exact opposite of the effect expected if cosmic radiation contributed to recent warming.<sup>20</sup>

Nor is there any clear evidence that large-scale volcanic events (such as the 1815 eruption of Tambora in Indonesia, which changed global climate for about a year) have any long-term effect that would explain two hundred years of warming and carbon dioxide increase. Volcanoes erupt only 0.3 billion metric tons of carbon dioxide each year, but humans emit over 29 billion metric tons a year;<sup>21</sup> clearly, we have a bigger effect. Methane is a more powerful greenhouse gas, but there is two hundred times more carbon dioxide than methane, so carbon dioxide is still the most important agent.<sup>22</sup> Every other alternative has been looked at, but the only

clear-cut relationship is between human-caused carbon dioxide increase and global warm. We just cannot squirm out of the blame on this one.

*"The Climate Records since 1995 (or 1998) Show Cooling"*

*That's a deliberate deception.* People who throw this argument out are cherry-picking the data.<sup>23</sup> Over the short term, there was a slight cooling trend from 1998–2000 (fig. 5.10A), because 1998 was a record-breaking El Niño year, so the next few years look cooler by comparison. But since 2002, the overall long-term trend of warming (fig. 5.10B) is unequivocal. This quotation is a clear-cut case of using data out of context in an attempt to deny reality. Likewise, you might hear people say that 1934 was the hottest year ever in the United States. That may be true for a local region, but globally it was nowhere near the warmest year on record.<sup>24</sup> All of the seventeen hottest years ever recorded on a global scale have occurred in the last twenty-one years. They are (in order of hottest first): 2010, 2009, 1998, 2005, 2003, 2002, 2004, 2006, 2007, 2011, 2001, 1997, 2008, 1995, 1999, 1990, and 2000.<sup>25</sup> In other words, every year since 2000 has been in the Top Ten hottest years list, and the rest of the list includes 1995, 1997, 1998, 1999, and 2000. Only 1996 failed to make the list (because of the short-term cooling mentioned already).

*"We Had Record Snow in the Winter of 2009–2010"*

*So what?* This is a classic case of how the scientifically illiterate public cannot tell the difference between *weather* (short-term seasonal changes) and *climate* (the long-term average of weather over decades and centuries and longer). Our local weather tells us nothing about the next continent, or the global average; it is only a local effect, determined by short-term atmospheric and oceanographic conditions.<sup>26</sup> In fact, warmer global temperatures mean *more moisture* in the atmosphere, which increases the intensity of normal winter snowstorms. In this particular case, the climate deniers forget that the early winter of November–December 2009 was actually very mild and warm, and then only later in January and February did it get cold and snow heavily. That warm spell in early winter helped bring more moisture into the system, so that when cold

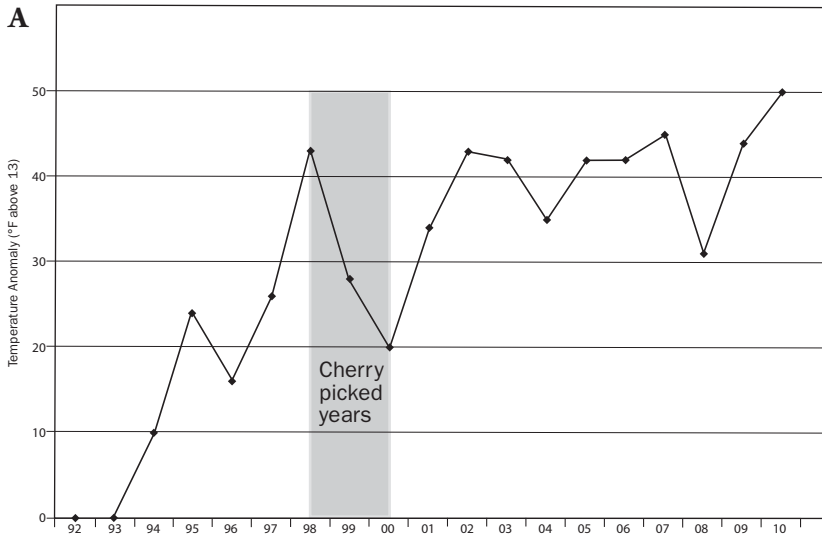
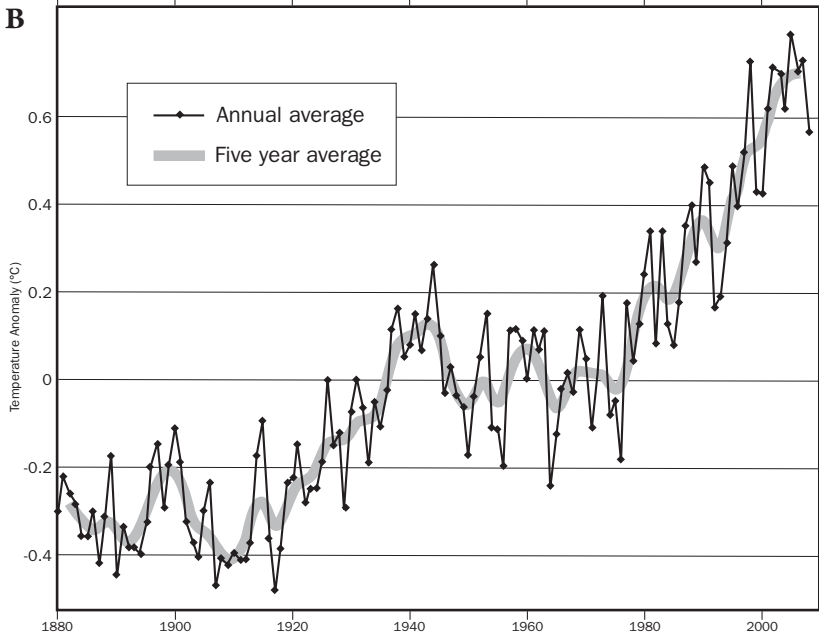


FIGURE 5.10. (A) Detailed plot of the past twenty years of global mean temperatures, showing how anomalous 1998 was. If you cherry-pick 1998 and the two years that followed, it appears that climate is cooling. However, if you pick any two points other than 1998–2000, or any rolling average, it is clear that climate is warming. Indeed, most of the years from 2002 onward are as warm or warmer than 1998, so any claim that “it has been cooling since 1998” is false. (B) The plot of global mean temperature over the past century, showing the yearly data (wiggly lines) and the smoothed curve using a five-year rolling average (gently curved line). Clearly the trend has been dramatically increasing, and individual data points from one year do not tell the whole story. The anomalous El Niño warm year of 1998 is one of those outliers. *Redrawn from GISS data by Pat Linse.*

weather occurred, the snows were worse. In addition, the snows were unusually heavy only in North America; the rest of the world had different weather, and the global climate was warmer than average. And the summer of 2010 was the hottest on record, breaking the previous record set in 2009. Anyone who mentions this silly argument is clearly ignorant of basic science.

*“Carbon Dioxide Is Good for Plants, So the World Will Be Better Off”*

*Who do they think they are kidding?* The people who promote this idea clearly do not know much global geochemistry, or are trying to play on



the fact that most people are ignorant of science. The Competitive Enterprise Institute (paid for mostly by money from oil and coal companies and conservative foundations)<sup>27</sup> has run a series of shockingly ignorant and misleading ads that insult the intelligence of any educated person, concluding with the tag line “Carbon dioxide: they call it pollution, we call it life.” Anyone who knows the basic science of earth’s atmosphere can spot the deceptions in this ad.<sup>28</sup> Sure, plants take in carbon dioxide that animals exhale, as they have for millions of years. But the whole point of the global warming evidence (as shown from ice cores) is that the delicate natural balance of carbon dioxide has been thrown out of whack by our production of too much of it, way in excess of what plants or the oceans can handle. As a consequence, the oceans are warming and absorbing excess carbon dioxide, making them more acidic.<sup>29</sup> Already we are seeing a shocking decline in coral reefs (due to bleaching) and extinctions in many marine ecosystems that cannot handle too much of a good thing. There is strong scientific evidence that the so-called Mother of all Mass Extinctions (which wiped out 95% of marine species about

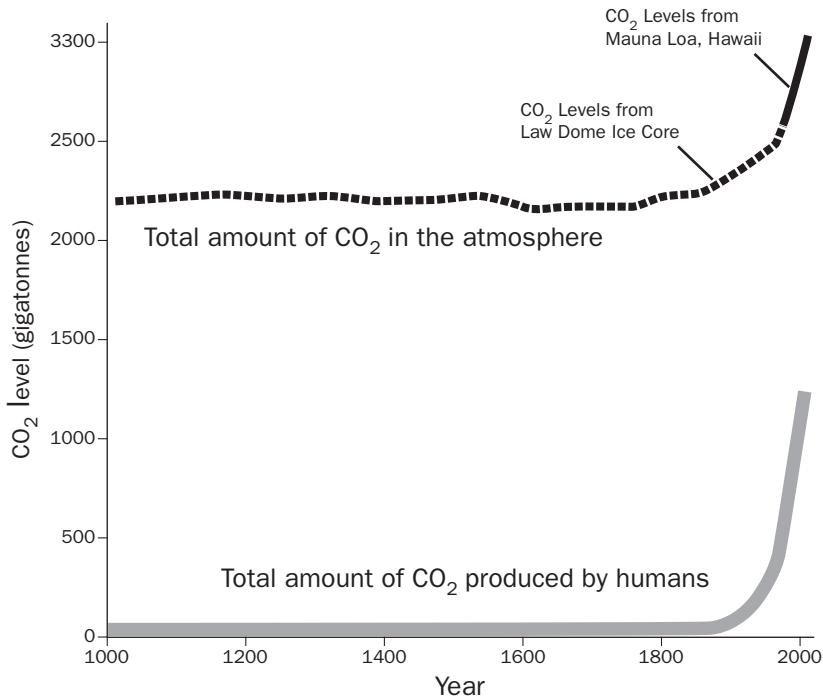


FIGURE 5.11. Comparison of measured temperature increases over the past few centuries and the amount of carbon released by humans into the atmosphere. As the plot shows, carbon dioxide tracks human emissions. From “*The Human Fingerprint in Global Warming [Intermediate]*,” *Skeptical Science website*, [www.skepticalscience.com/its-not-us-intermediate.htm](http://www.skepticalscience.com/its-not-us-intermediate.htm).

250 million years ago) was due to excess carbon dioxide (*hypercapnia*) in the oceans, which not only dissolves shells and corals but also suffocates marine life.<sup>30</sup>

Meanwhile, humans are busy cutting down huge areas of rainforest every day, which not only means there are fewer plants to absorb the gas, but the slash-and-burn practices are releasing more carbon dioxide than plants can keep up with. There is much debate as to whether increased carbon dioxide might help agriculture in some parts of the world, but that has to be measured against the fact that other traditional breadbasket regions (like the North American Great Plains) are expected to get too hot to be as productive as they are today. The latest research actually

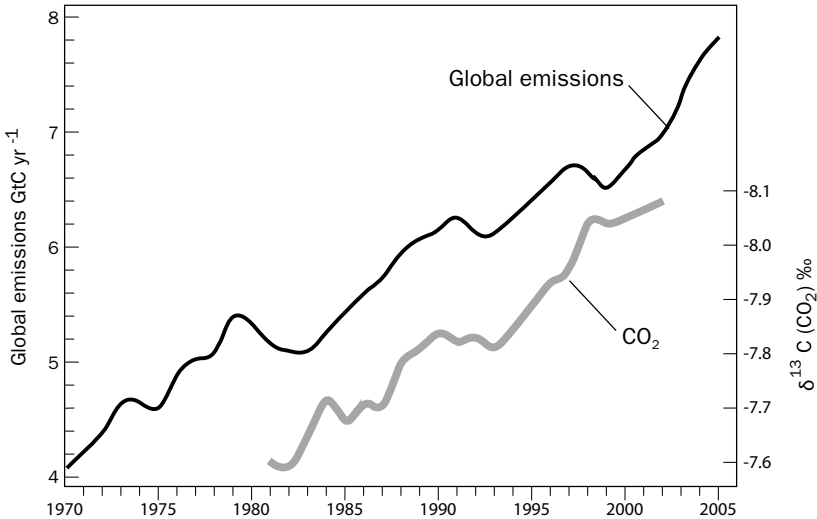


FIGURE 5.12. Annual global CO<sub>2</sub> emissions from fossil fuel burning and cement manufacture in GtC yr<sup>-1</sup> (longer line to left), annual averages of the <sup>13</sup>C/<sup>12</sup>C ratio measured in atmospheric CO<sub>2</sub> at Mauna Loa from 1981 to 2002 (shorter line to right). Redrawn from *"The Human Fingerprint in Global Warming [Intermediate]."*

shows that increased carbon dioxide inhibits the absorption of nitrogen into plants, so plants (at least those that we depend upon today) are NOT going to flourish in a greenhouse world.<sup>31</sup> Anyone who tells you otherwise is either ignorant of basic atmospheric science, or is trying to con a public that does not know science from bunk.

*"I Agree that Climate Is Changing, but I'm Skeptical that Humans Are the Main Cause, So We Should Not Do Anything"*

*This is just fence sitting.* A lot of reasonable skeptics deplore the climate denialism of the right wing, but still want to be skeptical about the cause. If they want proof, they can examine the huge array of data directly point to humans causing global warming.<sup>32</sup> We can directly measure the amount of carbon dioxide humans are producing, and it tracks exactly with the amount of increase in atmospheric carbon dioxide (fig. 5.11). Through carbon isotope analysis, we can show that this carbon dioxide

in the atmosphere is coming directly from our burning of fossil fuels, not from natural sources (fig. 5.12).

We can also measure oxygen levels that drop as we produce more carbon that then combines with oxygen to produce carbon dioxide. We can also examine the spectrum of the gases in the atmosphere, and they exactly match the spectrum expected if human-caused gases were increasing.<sup>33</sup> We have satellites out in space that are measuring the heat released from the planet and can actually *see and measure* the atmosphere get warmer. The most crucial proof emerged only in the past few years: climate models of the greenhouse effect predict that there should be cooling in the stratosphere (the upper layer of the atmosphere above 10 km (6 miles) in elevation, but warming in the troposphere (the bottom

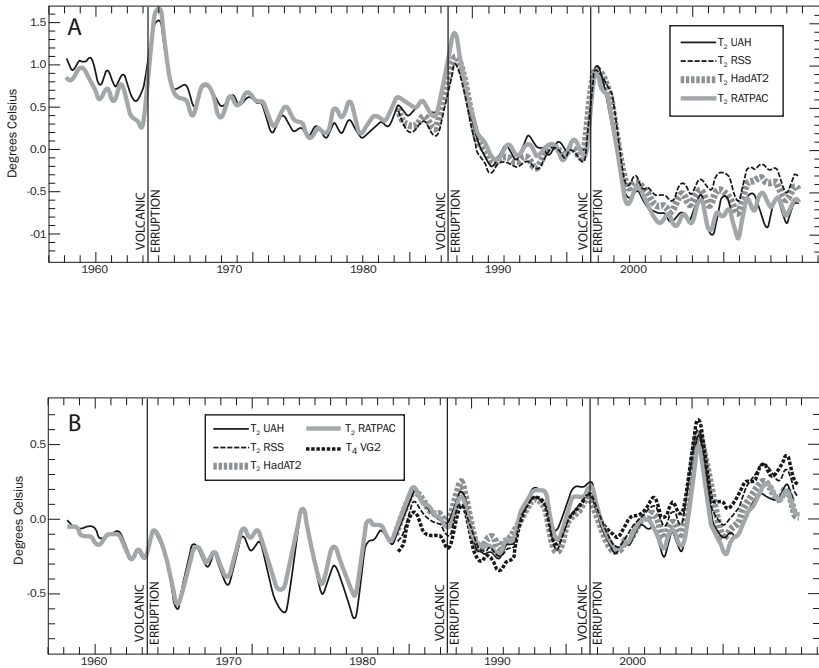


FIGURE 5.13. Change in lower stratospheric temperature, observed by satellites and weather balloons relative to period 1979 to 1997, smoothed with seven-month running mean. Major volcanic eruptions indicated by dashed lines. Redrawn by Pat Linse from T. R. Karl et al., "Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences," *Climate Science Watch* website, April 2006, [www.climate.science.gov/Library/sap/sap1-1/finalreport/sap1-1-final-all.pdf](http://www.climate.science.gov/Library/sap/sap1-1/finalreport/sap1-1-final-all.pdf).



layer of the atmosphere below 10 km [6 miles]). In contrast, an increase in solar radiation would warm the stratosphere and cool the troposphere. In fact, our space probes have measured stratospheric cooling and upper troposphere warming (fig. 5.13), just as climate scientists had predicted, and proving it is due to greenhouse gases, not the sun.<sup>34</sup> Finally, we can rule out any other culprits (see above): solar heat is decreasing since 1940, not increasing, and there are no measurable increases in cosmic radiation, methane, volcanic gases, or any other potential cause.

Face it—it is our problem.

#### THE GLOBAL DENIER CONSPIRACY

As I said on the Senate floor on July 28, 2003, “much of the debate over global warming is predicated on fear, rather than science.” I called the threat of catastrophic global warming the “greatest hoax ever perpetrated on the American people.”

*James Inhofe, January 2005*

Thanks to all the noise and confusion over the debate, the general public has only a vague idea of what the debate is really about, and only about half of Americans think global warming is real or that we are to blame.<sup>35</sup> As in the debates on evolution and creationism, the scientific community is virtually unanimous on what the data demonstrate about anthropogenic global warming. This has been true for over a decade. When historian of science Naomi Oreskes surveyed all peer-reviewed papers on climate change published between 1993 and 2003 in the world’s leading scientific journal, *Science*, she found that there were 980 supporting the idea of human-induced global warming and *none* opposing it.<sup>36</sup> In 2009, Doran and Kendall Zimmerman surveyed all the climate scientists who were familiar with the data.<sup>37</sup> They found that 95–99% agreed that global warming is real and that humans are the reason. In 2010, the prestigious *Proceedings of the National Academy of Sciences* published a study that showed that 98% of the scientists who actually do research in climate change are in agreement about anthropogenic global warming.<sup>38</sup> Geologist James Lawrence Powell searched the Web of Science for peer-reviewed articles mentioning global climate change between

1991 and 2012; only 24 out of 13,950 (less than 0.17%) reject global warming.<sup>39</sup> Every major scientific organization in the world has endorsed the idea of anthropogenic climate change as well. This is a rare degree of agreement within such an independent and cantankerous group as the world's top scientists. This is the same degree of scientific consensus that scientists have achieved over most major ideas, including gravity, evolution, and relativity. These and only a few other topics in science can claim this degree of agreement among nearly all the world's leading scientists, especially among everyone who is close to the scientific data and knows the problem intimately. If it were not such a controversial topic politically, there would be almost no interest in debating it, since the evidence is so clear-cut.

If the climate science community speaks with one voice (as in the 2007 IPCC report, and every report since then), why is there still any debate at all? The answer has been revealed by a number of investigations by diligent reporters who got past the PR machinery denying global warming, and uncovered the money trail. Originally, there were no real dissenters to the idea of global warming by scientists who are actually involved with climate research. Instead, the forces with vested interests in denying global climate change (the oil and coal companies, and the conservative free market advocates) followed the strategy of tobacco companies: create a smokescreen of confusion and prevent the American public from recognizing scientific consensus. As the famous memo from the tobacco lobbyists said, "Doubt is our product."<sup>40</sup>

The deniers generated an antiscience movement entirely out of thin air and PR. The evidence for this PR conspiracy has been well documented in numerous sources. For example, Oreskes and Conway (2010) revealed from memos leaked to the press that in April 1998 the right-wing Marshall Institute, SEPP (Fred Seitz's lobby that aids tobacco companies and polluters), and ExxonMobil met in secret at the American Petroleum Institute's headquarters in Washington, D.C. There they planned a \$20 million campaign to get respected scientists to cast doubt on climate change, get major PR effort going, and lobby Congress that global warming was not real and was not a threat. In 2012, leaked documents showed that the Heartland Institute, a libertarian think tank and the major sponsor of denialist propaganda and phony "scientific meetings,"

planned to try to get schools to teach its propaganda instead of the science of climate change.<sup>41</sup>

They beat the bushes to find scientists—*any* scientists—who might disagree with the scientific consensus. As investigative journalists and scientists have documented over and over again, the denier conspiracy essentially offered bribes to anyone who could be useful to them.<sup>42</sup> The day that the 2007 IPCC report was released (February 2, 2007), the British *Guardian* reported that the conservative American Enterprise Institute (funded largely by oil companies and conservative think tanks) had offered \$10,000 plus travel expenses to scientists who would write negatively about the IPCC report.<sup>43</sup> We are accustomed to the hired gun experts hired by lawyers to muddy up the evidence in the case they are fighting, but this is extraordinary—buying scientists with outright bribes to act as shills for organizations trying to deny scientific reality. With this kind of money, however, you can always find a fringe scientist or crank or someone with no relevant credentials who will do what they are paid to do.

Oklahoma senator James Inhofe (who gets nearly all his campaign money from oil and gas and other energy companies)<sup>44</sup> and other others bragged about having their own group of scientists who dispute global warming and publishing a list of their names. By doing a little digging, the Center for Inquiry discovered that fewer than 10% of the names on the list had any appropriate credentials or direct research experience in climate research. The rest were a mix of scientists with no relevant training or experience. Over 80% had no refereed publications in climate science at all. About 4% of the deniers on the list protested their inclusion because they *supported* the IPCC 2007 consensus that global warming is real and man-made. Dr. Stuart Jordan, formerly a climate scientist for NASA and now with the CFI, wrote, “As a result of our assessment, Inhofe and other lawmakers using this report to block proposed legislation to address the harmful effects of climate change must face an inconvenient truth: while there are indeed some well respected scientists on the list, the vast majority are neither climate scientists, nor have they published in fields that bear directly on climate science.” Dr. Ronald Lindsay of CFI wrote, “Sen. Inhofe and others have had some success in conveying to the media the impression that the number of scientists skeptical about

man-made global warming is swelling, yet this is demonstrably not true.” Inhofe had falsely claimed that the number of dissenting scientists was thirteen times more than the number of UN scientists (52) who authored the 2007 IPCC. “But those 52 U.N. scientists were in fact summarizing for policymakers the work of over 2,000 active research scientists, all with substantially similar views on global warming and its causes. This is the kind of broadside against sound science and scientific integrity that we at CFI deplore.”<sup>45</sup>

There are polls and petitions circulated by groups like Arthur Robinson’s tiny home office in Cave Junction, Oregon, known by the grandiose name the “Oregon Institute of Science and Medicine,” claiming he has a list of thousands of dissenting scientists. If you look closely at the list, however, you will find that there are virtually no climate scientists or people with direct research experience in climate science on it.<sup>46</sup> The list consists mostly of people without relevant scientific background, nonscientists, and lots of TV weathermen who do not have any research experience in climate science. (The Oregon Institute’s list of names includes many duplications, cartoon characters, fake names, people with no qualifications, and people who did not consent to have their names used because they believe global warming is real.)

Fishing around to find anyone with some science background who will agree with you and dispute a scientific consensus is a tactic employed by the creationists (as we shall see in chapter 6). It may generate lots of PR and a smokescreen to confuse the public, but it does not change the fact that *scientists who actually do research in climate change are unanimous in their insistence that anthropogenic global warming is a real threat*. Most scientists (including my many friends in the climate science community) I know and respect work very hard for little pay, yet they still cannot be bribed to endorse some scientific idea they know to be false.

If this is not convincing enough, let us use the rules about evaluating expert opinions that we discussed in chapter 2: *relevant credentials*, and *conflict of interest*. If they do not have their Ph.D. *in climate science*, and are not actively doing research *in climate science*, and publishing in *respected journals of science*, they are just rank amateurs in that topic and do not deserve to be taken seriously. This applies to many books and other writings that claim to show that there is no problem with global warming.

For example, Bjorn Lømborg has made a big splash with two books<sup>47</sup> that argue that global warming is no big deal, and we should not take measures to stop it. First of all, Lømborg is an economist, not a scientist of any kind, and the reviews of his book have ripped his arguments to shreds, because he is abysmally ignorant about the climate data he attempts to interpret.<sup>48</sup> More recently, people have carefully fact checked his footnotes and sources, and found that he has been quoting out of context (like a creationist), and most of his sources do not in fact support the claims he makes in his book.<sup>49</sup> Either Lømborg cannot understand what he is reading, or he is dishonestly trying to distort the meaning of his sources for his own purposes. Now Lømborg has come out in favor of the seriousness of global warming, and says the world's governments need to spend \$100 billion to stop it.<sup>50</sup>

Ian Plimer's *Heaven and Earth: Global Warming, the Missing Science* received more plaudits from deniers because it came from a geologist.<sup>51</sup> But Plimer is a *mining* geologist, *not* a climate scientist, and he (along with oil and coal geologists) would be expected to have a conflict of interest that would bias him toward *not* understanding climate data that threatens his livelihood. Numerous scathing reviews of the book by both climate scientists and other kinds of earth scientists revealed his complete incompetence in climate science,<sup>52</sup> yet it is hailed by the denier community as some sort of exposé from the geological community.

The climate deniers have many other things in common with creationists and other antiscience movements. They, too, like to quote people out of context (quote mining), finding short phrases in the works of legitimate scientists that seem to support their position. But when you read the full quotations in context, it is obvious that they have been used inappropriately. The original authors meant things that do not support the deniers' goals. The Climategate scandal is a classic case of this. It started with a few stolen e-mails from the Climate Research Unit of the University of East Anglia. If you read the complete text of the actual e-mails and comprehend the scientific shorthand of climate scientists who are talking casually to each other, it is clear that there was no great conspiracy or that they were faking data.<sup>53</sup> The phrase "neat trick," for example, talks about an inventive method to process and display the data, not a deliberate deception. The phrase "hide the decline" refers to the

well-known problem with recent tree-ring data that are not showing the directly measured global increase in temperature, so the scientists have replaced a flawed tree-ring data set with the actual observed temperature records. Read in context, these and other quotations make perfect sense and show no evidence of deliberate attempts to deceive the public. Yet climate deniers and politicians never read these letters in context, but grab just the quotations and use them as political weapons. All six subsequent investigations have cleared Philip Jones and the other scientists of the University of East Anglia of any wrongdoing or conspiracy.<sup>54</sup>

Even *if* there had been some conspiracy on the part of these few scientists, there is no evidence that the entire climate science community is secretly working together to generate false information and mislead the public. If there is one thing that is clear about science, it is about competition and criticism, not conspiracy and collusion. Most labs are competing with each other, not conspiring together. If one lab publishes a result that is not clearly defensible, other labs will quickly correct it. Only when every scientist in a community comes to the same conclusion independently would you arrive at the type of consensus shown by the IPCC 2007 report, or every subsequent report. In other cases, the climate deniers have claimed that the conspiracy is motivated by money. This is so bizarre and contrary to reality that it is laughable. Most scientists are just hardworking people who are willing to survive on a measly researcher's or professor's salary because they love the thrill of discovery of the truth about the world, not because they have some economic or political agenda. If they had really wanted to become rich, they would have gone into law or business or oil jobs, where the big bucks are (as many of the climate deniers have done). Yes, scientists try to win grants to support their research, but that money is minuscule compared to the huge amounts made in the oil industry, for example. You could not find a better example of the pot calling the kettle black.

This attempt to smear the hardworking scientists is one of the slimiest and most dishonest tactics of all, because the quote-mining climate deniers are either deliberately trying to mislead their audience by distorting the evidence, or they are not intelligent enough to understand the quotations and their context in the first place.

Even more bizarre is that the alarms over global climate change is some sort of left-wing conspiracy to foist Big Government on us. In fact, scientists come in every political color and stripe, but most try to rigorously exclude politics from their science. For example, Kerry Emanuel of MIT, who showed the connection between climate change and more intense hurricanes, is a Republican, as are many less famous climate scientists. Yet he does not let his political views contaminate his science. As James Lawrence Powell wrote,

Scientists . . . show no evidence of being more interested in politics or ideology than the average American. Does it make sense to believe that tens of thousands of scientists would be so deeply and secretly committed to bringing down capitalism and the American way of life that they would spend years beyond their undergraduate degrees working to receive master's and PhD degrees, then go to work in a government laboratory or university, plying the deep oceans, forbidding deserts, icy poles, and torrid jungles, all for far less money than they could have made in industry, all the while biding their time like a Russian sleeper agent in an old spy novel? Scientists tend to be independent and resist authority. That is why you are apt to find them in the laboratory or in the field, as far as possible from the prying eyes of a supervisor. Anyone who believes he could organize thousands of scientists into a conspiracy has never attended a single faculty meeting.<sup>55</sup>

The climate deniers have many other traits in common with the creationists, Holocaust deniers, and others who distort the truth. They pick on small disagreements between different labs as if scientists cannot get their story straight, when in reality there is always a fair amount of give and take between competing labs as they try to get the answer right before the other lab can do so. The key point here is that when *all* these competing labs around the world have reached a consensus and get the same answer, there is no longer any reason to doubt their common conclusion. The antiscientists of climate denialism will also point to small errors by individuals in an effort to argue that the entire enterprise cannot be trusted. It is true that scientists are human, and do make mistakes, but the great power of the scientific method is that *peer review weeds these out*, so that when scientists speak with consensus, there is no doubt that their data are carefully checked.

Finally, the most convincing evidence of the fact that this is a purely political controversy, rather than a scientific debate, is that the member-

ship lists of the creationists and the climate deniers are highly similar. Both antiscientific dogmas are fed to their overlapping audiences through right-wing media like Fox News, Glenn Beck, and Rush Limbaugh. Just take a look at the intelligent design creationism website for the Discovery Institute. Most of the daily news items lately have nothing to do with creationism at all, but are focused on climate denialism and other right-wing causes.<sup>56</sup>

“IT’S ALL POLITICS”—AND OUR  
PLANET IS THE HOSTAGE

We’re in a giant car headed toward a brick wall, and  
everyone’s arguing over where they are going to sit.

*David Suzuki*

The conclusion is clear: there is science, and then there is the anti-science of the global warming deniers. As we have seen, there is a nearly unanimous consensus among climate scientists that anthropogenic global warming is real and that we must do something about it. Yet the smokescreen, bluster, and lies of the right-wing media have created enough doubt that less than half of the American public is convinced the problem requires action. Ironically, the United States is almost alone in their denial of this scientific reality. International polls of thirty-three thousand people in thirty-three nations in 2006 and 2007 show that 90% of their citizens regard climate change as a serious problem,<sup>57</sup> and 80% think that humans are the cause of it.<sup>58</sup> Just as in the case of creationism, the United States is out of step with much of the rest of the world in accepting scientific reality. In this case, however, the main driving force is not religion, but the fear of the consequences of cutting back on our wasteful use of oil and coal and other sources of carbon dioxide, plus the conservative and libertarian political attitudes that the government should not interfere with a corporation’s right to foul our planet and destroy it for future generations. Some of these people sound like foaming-at-the-mouth loonies when you read what they say. For example, BBC News reported on a May 21, 2010, gathering of libertarian global



warming deniers organized by the Heartland Institute (a right-wing think tank funded largely by oil companies to question the evidence for global climate change).<sup>59</sup> Their speakers repeated the message that global warming is a hoax to allow governments to control businesses and people. Most of the scientific speakers had no relevant credentials in climate science—or even worse for the deniers, told them that the data do indeed support climate change.<sup>60</sup>

In some cases, the right-wing fringe has gone to extreme lengths in their hostile attitude toward legitimate science. The FBI has reported a sharp increase in threats and hate mail and intimidation against prominent climate scientists Michael Mann, James Hansen, and others. The transition from conservative climate denier to a dangerous antisemitic hate group is not difficult; one white supremacist website posted Michael Mann's picture and those of other climate scientists and labeled it "Jew." (In fact, most climate scientists are not Jewish, but the facts do not matter to racists and antisemites.) Another climate scientist told ABC News that he found a dead animal placed on his doorstep, and now he must travel with a bodyguard. As Mann said, "Human-caused climate change is a reality. There are clearly some who find that message inconvenient, and unfortunately they appear willing to turn to just about any tactics to try to suppress that message."<sup>61</sup>

Even more despicable are the right-wing politicians and pundits who target prominent scientists. These demagogues use persecution of scientists to further their own political careers, all but inviting some of their crazy followers to gun them down. We have already heard the story of the crosshairs over the names of certain Democratic members of Congress on Sarah Palin's website and Palin's telling her followers to "Reload."<sup>62</sup> These targeted members received numerous death threats, and many now require bodyguards. James Inhofe of Oklahoma is equally brazen. He listed the names of seventeen prominent climate scientists and claimed that they engaged in "potentially criminal behavior" for violating the Federal False Statements Act.<sup>63</sup> This is the classic tactic of McCarthy-style witch-hunting, or analogous to how conservative authorities (the Inquisition) threatened Galileo with torture when he dared to speak scientific truth to power. It has a tremendously chilling ef-

fect on science, not to mention what it does to the personal lives of hard-working scientists and their families. Of course, it is an entirely baseless charge, since the truth lies with the scientists, and it is Inhofe who is distorting scientific reality. Nevertheless, an antiscientific denier such as Inhofe is capable of wasting a lot of scientists' time and money fighting and defending charges in court or in Congress, not to mention the fact that all these scientists are now targets of gun-toting crazy right-wingers.

But the most extreme of all is Virginia Attorney General Ken Cuccinelli. Even before his election in 2008, he was known to be an extreme right-winger, and now he is abusing the powers of his office to push his extremist agenda. He is suing to release all the raw data and e-mails collected by Michael Mann when he worked at the University of Virginia.<sup>64</sup> (Mann is now at Penn State, so Cuccinelli cannot touch him there.) Cuccinelli hopes to find some sort of smoking gun along the lines of the East Anglia Climategate scandal. This is despite the fact, as we showed above, there was nothing amiss in the e-mails, and no conspiracy was discovered—just careless language quoted out of context. Given the right wing's scientific incompetence and misinterpretation of the East Anglia data, there is no reason to think that they will have any better ability to interpret Mann's data, should they release it. Instead, we can expect that they will find stuff that fits their preconceptions and lack of scientific expertise to judge the data in the first place. Cuccinelli is trying to claim that Mann had committed fraud, and should return all the research money, along with legal fees and triple damages. This is really just a right-wing witch hunt by an extremist politician who is using his relatively obscure position as state attorney general to further his political career. It is consistent with all the other ways he is using his office for political gain and street cred in the right-wing fringe. His crusades have ranged from the silly (he tried to cover the naked breast of the crude sketch of the goddess of virtue on the Virginia state seal) to the serious. The latter include directing public universities to remove sexual orientation from their antidiscrimination policies, attacking the Environmental Protection Agency, filing a lawsuit challenging federal health care reform, and trying to reverse George Mason University's policy on concealed weapons on campus. Polls show that the voters of

Virginia are tired of his antics and want him to work on the job that most state attorney generals are paid to do: prosecuting criminals and corporations on the behalf of the state and enforcing state laws, not tilting at right-wing windmills.<sup>65</sup>

Even though the right-wing media and politicians and oil companies have managed to bamboozle almost half of the American public, a very strong climate bill was once approved by the House, and similar bills were in discussion in the Senate.<sup>66</sup> Such bills may not pass for a while due to the current political stalemate in Congress, but eventually they will. After years of doubt in the American public thanks to the deniers' PR campaigns, recent polls are beginning to show that the American public is coming to accept the reality of climate change as well. The day before the November 6, 2012, election, a poll revealed that 68% of Americans now regard climate change as a "serious problem," up from only 48% in 2011, and 46% in 2009.<sup>67</sup> A few weeks later, another poll found that 80% of Americans accept that climate is changing (compared to 73% in 2009), and 57% say the U.S. government should do something about it.<sup>68</sup> Even Republican politicians like New Jersey governor Chris Christie and New York City mayor Michael Bloomberg were warning about the dangers of climate change. What accounts for this change in attitude? Apparently, the extreme climate events of 2012 (from the summer's record-breaking heat waves to Hurricane Sandy) are much more persuasive than anything said by scientists or politicians.

As paleontologist (and now climate activist) Tim Flannery pointed out in a talk at the Natural History Museum of Los Angeles County in October 2009, the good news is that the entire debate over global warming in the United States is largely a rearguard action and irrelevant to where the political winds are blowing now. As we showed above, most of the rest of the world's population accepts the reality, and the fact that even Kyoto holdouts such as China, India, and the United States agreed to the basic science of global warming in the 2009 Copenhagen climate summit is a big step forward (quite a bit was actually accomplished, even though they could not get binding agreements on everything).<sup>69</sup> And it is not just the liberals and environmentalists who are taking climate change seriously. Historically conservative institutions (big corpora-

tions such as General Electric, the insurance companies, and the military) are already planning on how to deal with global warming. Many of my friends high up in the oil companies tell me of the efforts by those companies to get into other forms of energy, because they know that oil will be running out soon and that the effects of burning oil will make their business less popular. BP officially stands for British Petroleum, but one of its ad campaigns states that it stands for “Beyond Petroleum.” (After its 2011 spill in the Gulf of Mexico, people were saying that BP stood for “Biggest Polluter.”)<sup>70</sup> Although oil companies still spend relatively little of their total budgets on alternative forms of energy, they still can see the writing on the wall about the eventual exhaustion of oil (see chapter 11)—and they are acting like any company that wants to survive, by getting into a new business when the old one is dying.

The Pentagon (normally not a left-wing institution) is also making contingency plans for how to fight wars in an era of global climate change, and what kinds of strategic threats might occur when climate change alters the kinds of enemies we might be fighting, and water becomes a scarce commodity. The *New York Times* reported that in December 2008, the National Defense University outlined plans for military strategy in a greenhouse world.<sup>71</sup> The entire May 2004 issue of *Monthly Review* is full of articles about how the Pentagon is planning for climate change. This issue was a summary and analysis of an October 2003 Pentagon report commissioned by Peter Marshall, director of the Pentagon’s Office of Net Assessment. The report laid out the grim scenarios that the military must consider in a greenhouse planet, and discusses the likelihood of agricultural decline and extreme weather conditions that would overtax energy demand throughout the globe. Rich countries with resources, like the United States and Australia, might build defensive fortresses around themselves to keep hordes of immigrants out, while the rest of the world fights over resources: “Violence and disruption stemming from the stresses created by abrupt changes in the climate pose a different type of threat to national security than we are accustomed to today. Military confrontation may be triggered by a desperate need for natural resources such as energy, food and water rather than by conflicts over ideology, religion, or national honor. The shifting motivation for confrontation would alter which countries are most vulnerable and the existing warn-

ing signs for security threats.”<sup>72</sup> To the Pentagon, the big issue is global chaos and the potential of even nuclear conflict. The world must “prepare for the inevitable effects of abrupt climate change—which will likely come [the only question is when] regardless of human activity.”<sup>73</sup>

Insurance companies have no political axe to grind. If anything, they tend to be on the conservative side. They are simply in the business of assessing risk in a realistic fashion so they can accurately gauge their future insurance policies and what to charge for them. Yet they are all investing heavily in research on the disasters and risks posed by climatic change. In 2005, a study commissioned by the reinsurer Swiss Re said, “Climate change will significantly affect the health of humans and ecosystems and these impacts will have economic consequences.”<sup>74</sup>

Right-wingers may still try to deny scientific reality, but big businesses such as oil and insurance, and conservative institutions such as the military, cannot afford to be blinded or deluded by phony science. They must plan for the real world that we will be seeing in the next few decades. They do not want to be caught unprepared and harmed by global climatic change when it threatens their survival. Neither can we as a society.

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