

**I**N RECENT YEARS, a “consensus” of scientists has emerged claiming that greenhouse warming is the cause of climate change. Many have argued that this consensus means that the science of global warming is settled. Yet, science never is settled. Science advances every day by insights developed from new data and analysis.

Furthermore, “the work of science has nothing whatever to do with consensus,” as author, screenwriter, and film director Michael Crichton explained in a 2003 lecture at the California Institute of Technology: “Consensus is the business of politics. In science, consensus is irrelevant. What is relevant is reproducible results. The greatest scientists in history are great precisely because they broke with the consensus.”

Today’s global-warming “consensus” has been crafted very carefully since 1988 by the Intergovernmental Panel on Climate Change, founded by the World Meteorological Organization and the United Nations Environment Programme. IPCC set out “to prepare a comprehensive review and recommendations with respect to the state of knowledge of the science of climate change.”

In 1988, many scientists were convinced that observed global warming must be caused by observed increases in concentrations of greenhouse gases, which are known to absorb narrow bands of infrared energy radiated by Earth. Therefore, these gases must get warmer. This warmer air, then, has to, in some way, cause Earth to get warmer. The logic seems pretty clear.

These scientists felt the primary purpose of the IPCC, therefore, was to demonstrate a scientific consensus behind greenhouse-warming theory that was broad enough to convince politicians to make the difficult and expensive decisions to cut back greenhouse-gas emissions. They did not set out to find the true cause of global warming; they set out to prove consensus behind their favored theory. This strategy paid off in Paris on Dec. 12, 2015, when representatives of 195 countries agreed to reduce greenhouse-gas emissions in an attempt to hold “the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5° above pre-industrial levels.”

This political effort by scientists would be a praiseworthy tactic if their favored theory turns out to be correct, but there is increasing evidence that causes many other scientists to wonder about greenhouse-warming theory. For example, the changes in the rates of global warming since 1988 cannot be explained directly by greenhouse-warming theory. They are, however, illustrated very clearly by an alternative theory.

The world has been warming. All four major analyses of average global surface temperatures by NASA, National Oceanic and Atmospheric Administration, British Hadley Center, and Berkeley Earth agree that the world warmed very little from 1950-70, warmed at least 1°F from 1970-98, warmed very lit-

# THE HEAT IS ON

BY PETER L. WARD

*“Climate models . . . overestimate the role of greenhouse gases and underestimate the role of ozone depletion.”*

tle from 1998-2013, and then warmed another half-degree since 2013 at a rate nearly five times faster than the period from 1970-98.

Meanwhile, greenhouse-gas concentrations in the atmosphere burgeoned at ever-increasing rates. Greenhouse-warming theory, therefore, cannot explain why there was little warming from 1950-70 and from 1998-2013. Greenhouse-gas concentrations have been rising at rates that are quite different from the rates of global temperature increase. This is why climate models have been overpredicting temperatures since 1998.

To warm the world, you must add heat to the Earth-atmosphere system, which is warmed primarily by radiation from the sun. Most of this heat is stored in the oceans. Ocean heat content has been rising since 1970. Where is this heat coming from? What changed around 1970? There was no significant alteration in greenhouse-gas concentrations around this time. Furthermore, greenhouse gases do not appear to absorb enough heat to play a major role in the global warming observed. There is another well-documented source.

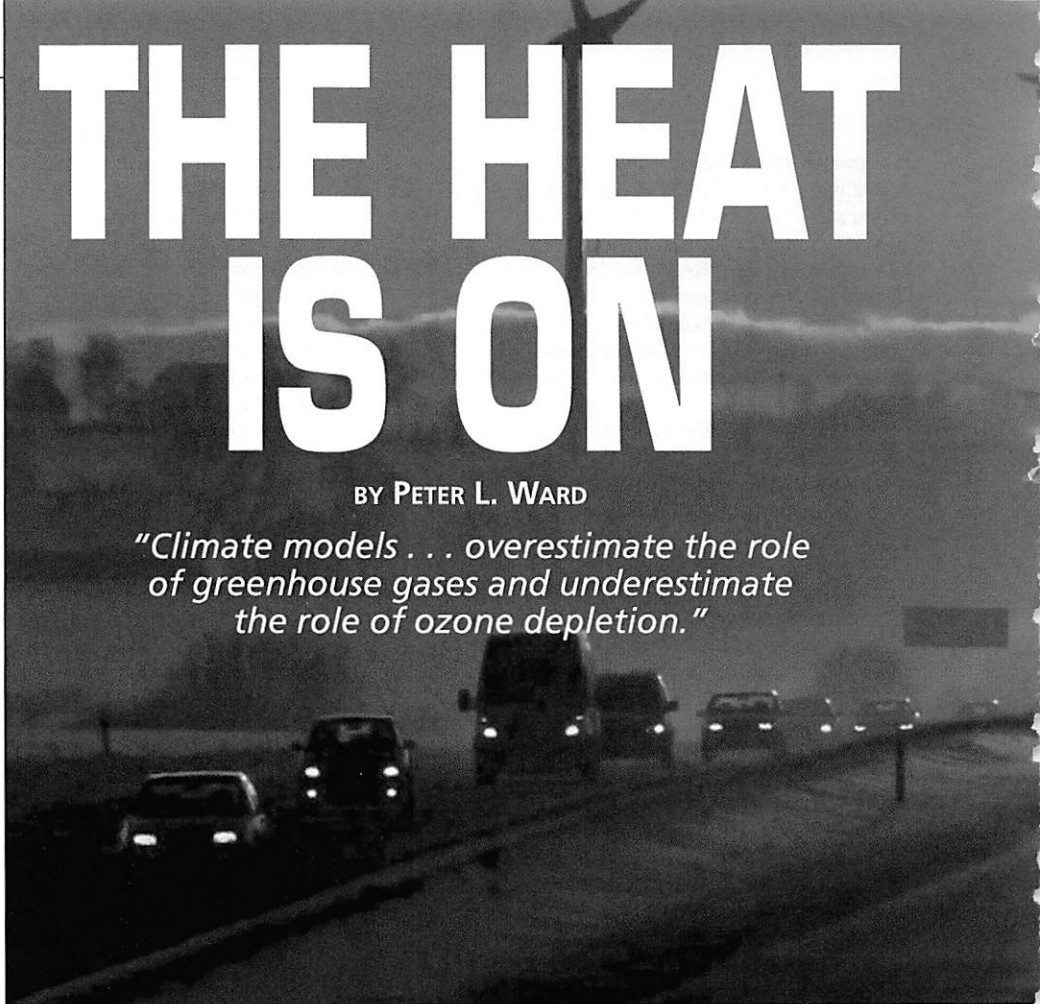
The ozone layer, 12 to 19 miles above Earth, absorbs ultraviolet-B radiation, the highest-energy solar radiation reaching the lower stratosphere. When the ozone layer is depleted, more of this high-energy radiation reaches Earth’s surface, increasing our risk of sunburn and skin cancer. Thus, the optical thickness of the ozone layer determines how much energy reaches Earth’s surface. Think of the ozone layer as acting like a venetian win-

dow blind determining how much light (radiant energy) enters your room.

Since 1970, the greatest increases in ozone depletion formed the Antarctic Ozone Hole extending from 55 or 60 degrees south to the South Pole. The greatest warming of Earth in the past 1,800 years similarly was on the Antarctic Peninsula, well within the Antarctic Ozone Hole, where low temperatures rose 12°F from 1951 to 2003, primarily since 1970. The second greatest depletion of ozone was in the Arctic, something climate scientists call Arctic amplification of global warming. There was lesser depletion throughout mid latitudes and very little depletion in the tropics. Similarly, temperatures warmed most in polar regions, significantly throughout mid latitudes, and changed very little in the tropics.

Ultraviolet-B radiation reaching Earth when ozone is depleted is 48 times more energetic than infrared radiation absorbed most strongly by carbon dioxide. Higher energy means higher amounts of heat contained in the radiation. Increasing amounts of ultraviolet radiation warm Earth. Ultraviolet-B radiation penetrates oceans tens of meters and, therefore, raises ocean heat content very efficiently. The greatest warming of oceans observed since 1970 has been in those surrounding Antarctica that lie within the Antarctic Ozone Hole.

In the 1960s, chlorofluorocarbon gases (CFCs) became quite popular for use as spray-can propellants, solvents, and refrigerants because these manufactured gases are very inert—they do not interact chemically with most





things. By 1970, store shelves were full of spray cans containing all types of paints, lubricants, solvents, perfume, hair-spray, and such—and ozone in the stratosphere began to be depleted.

In 1974, scientists figured out that, when CFCs reach the stratosphere, they can be broken down by solar ultraviolet radiation, releasing atoms of chlorine, and that, under certain conditions, best developed in late winter and early spring, one atom of chlorine can destroy more than 100,000 molecules of ozone.

In 1985, scientists discovered the Antarctic Ozone Hole, which showed that ozone depletion was a very serious problem. They worked closely with political leaders at the United Nations to develop the Montreal Protocol on Substances that Deplete the Ozone Layer, mandating reduced production of CFCs beginning in 1989. Increases in CFCs stopped in 1993; in ozone depletion, 1995; and in temperature, 1998.

Humans appear to have caused global warming beginning around 1970 by manufacturing CFCs and to have stopped this warming by 1998 after phasing out production of CFCs. Without the Montreal Protocol, global temperatures might have risen another half-degree since 1998. However, CFCs last in the atmosphere for decades.

Warming beginning in 2014 appears caused by the eruption of Bárðarbunga volcano in central Iceland. Starting in late August, Bárðarbunga extruded 33 square miles of basaltic lava in merely six months, the highest

rate of basalt production since 1783. The eruption appears to have caused 2016 to be the hottest year ever recorded by thermometers.

Voluminous basaltic lava flows covering tens to millions of square miles have been contemporaneous throughout the Earth's history, with periods of major warming and major mass extinction. Chlorine and bromine gases emitted from basaltic lavas deplete the ozone layer. Around 252,000,000 years ago, basaltic lava covered an area in Siberia as large as 87% of the contiguous U.S. Just imagine lava extending from New York City to San Francisco and from Seattle to Miami. This was the greatest warming we know of in the past 600,000,000 years. Some 96% of all marine species and 70% of all terrestrial vertebrate species went extinct.

Similarly, massive basaltic volcanism in Iceland from 11,750 to 9,375 years ago appears to have warmed the world out of the last Ice Age. The eruption of Eldgjá in Iceland, spreading basaltic lava over an area of 500 square miles, looks to have started the Medieval Warm Period. Eruption of basaltic lava near Craters of the Moon National Monument in the Snake River Plain of Idaho around 200 B.C. likely started the Roman Warm Period. Massive basaltic lava flows punctuate the geologic time scale. They occur at times when geologists note the greatest sudden changes in climate and in fossil types.

Climate models overestimate the heat contained in infrared radiation and underestimate the heat contained in ultraviolet radiation. In

other words, they overestimate the role of greenhouse gases and underestimate the role of ozone depletion. The mathematics, developed by the Arrhenius equation 120 years ago, is based on a fundamental misunderstanding in physics concerning radiant energy. We now know that radiant energy simply is a function of frequency of oscillation of the bonds holding the radiating matter together, not a function of wave amplitude and bandwidth as currently calculated in climate models.

What is most surprising is that scientists never have demonstrated in an experiment how much air is warmed when concentrations of carbon dioxide gas are increased. Experiments are fundamental to the scientific method. As Steven Chu, Nobel physicist and former Secretary of Energy, wrote: "The final arbitrator of any point of view are experiments that seek the unbiased truth." Richard Feynman, another Nobel physicist, put it this way: "It doesn't matter how beautiful your theory is; it doesn't matter how smart you are. If it doesn't agree with experiment, it's wrong."

The only experiment reported in the scientific literature concerning greenhouse gases was done in 1900 by physicist Knut Ångström, who showed, in two different ways, that warming caused by increasing concentrations of carbon dioxide is minimal. In 2017, scientists need to carry out such experiments if they wish to defend greenhouse-warming theory. Such experiments are quite unlikely to be successful.

Ozone depletion remains at much higher levels now than in 1970. Therefore, ocean heat content will continue to rise and glaciers will continue to melt, but the major global warming predicted by climate models is highly unlikely. We need to be concerned about ozone depletion, not increasing concentrations of greenhouse gases.

We should be able to move forward together burning fossil fuels safely, minimizing pollution, and meeting the never-ending increasing energy needs of a rapidly developing world. It also makes sense to work together developing renewable sources of energy, as fossil fuels are unlikely to last more than a few generations and renewable energy is beginning to make economic sense, especially in regions lacking major energy distribution infrastructure.

The challenge is to meet increasing energy needs while making the world safer for our grandchildren. It is time to bring peace to the climate wars and all work together for a better world. ★

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