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## The Long Consensus On Climate Change

By Naomi Oreskes  
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With the release of the new report by the Intergovernmental Panel on Climate Change tomorrow, the fourth since the organization's founding in 1988, many will be looking for what's new. How have estimates of sea-level rise changed? How soon will we achieve a doubling of carbon dioxide levels?

Scientists and journalists focus on novelty, because both are largely about discovery. But from a policy perspective, what matters is not what's new but what's old. What matters are not the details that may have shifted since the last report, or that may shift again in the next one, but that the broad framework is established beyond a reasonable doubt. Although few people realize it, this framework has been in place for nearly half a century, and scientists have been trying to alert us to its importance for almost that long.

Scientific research on carbon dioxide and climate dates to the 19th century, when Irish scientist John Tyndall established that CO<sub>2</sub> is a greenhouse gas -- meaning that it traps heat and keeps it from escaping to outer space. In the 19th century, this was understood as a fact about our planet, one that made it hospitable to life, but did not have any political implications.

That began to change in the early 20th century, when Swedish geochemist Svante Arrhenius deduced from Tyndall's work that CO<sub>2</sub> released to the atmosphere by burning fossil fuels could alter Earth's climate. By the 1930s British engineer Guy Callendar had compiled empirical evidence that this effect was already discernible.

Callendar's concern was pursued in the 1950s by numerous American scientists, including oceanographer Roger Revelle, a one-time commander in the U.S. Navy Hydrographic Office, who helped his colleague Charles David Keeling find funds to implement a systematic monitoring program. By the 1960s, Keeling's assiduous measurements at Mauna Loa Observatory in Hawaii demonstrated conclusively that atmospheric carbon dioxide was, indeed, steadily rising. (For this work, President Bush [awarded](#) Keeling the National Medal of Science in 2002.) Although these scientists may not be household names, they are well known in the scientific community. However, even most scientists don't know that they -- and others -- have been communicating concerns about global warming to presidents of both parties since the 1960s.

One early warning that we "will modify the heat balance of the atmosphere to such an extent that marked changes in climate . . . could occur" came in 1965 from the Environmental Pollution Board of the President's Science Advisory Committee. While the Bush administration has been loath to accept this reality, an earlier administration accepted it as a statement of scientific fact. In a special message to Congress in February 1965, President Lyndon B. Johnson noted: "This generation has altered the composition of the atmosphere on a global scale through . . . a steady increase in carbon dioxide from the

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burning of fossil fuels."

A second warning came in 1966 from the U.S. National Academy of Sciences Panel on Weather and Climate Modification, headed by geophysicist Gordon MacDonald, who later served on President Richard Nixon's Council on Environmental Quality. While examining the question of deliberate weather modification, MacDonald's committee concluded that increased carbon dioxide might also lead to "inadvertent weather modification."

In 1974, in the wake of the Arab oil embargo, Alvin Weinberg, director of the Oak Ridge National Laboratory, realized that climatological impacts might limit oil production before geology did. In 1978, Robert M. White, the first administrator of the National Oceanic and Atmospheric Administration and later president of the National Academy of Engineering, put it this way:

"We now understand that industrial wastes, such as carbon dioxide released during the burning of fossil fuels, can have consequences for climate that pose a considerable threat to future society."

In 1979 the subject was addressed by the JASON Committee, the reclusive group of scientists with high-level security clearances who gather annually to advise the U.S. government; its members have included some of the most brilliant scientists of our era.

The JASON scientists predicted that atmospheric carbon dioxide might double by 2035, resulting in mean global temperature increases of 2 to 3 degrees Celsius and polar warming of as much as 10 to 12 degrees. This report reached the Carter White House, where science adviser Frank Press asked the National Academy of Sciences for a second opinion. An academy committee, headed by MIT meteorologist Jule Charney, affirmed the JASON conclusion: "If carbon dioxide continues to increase, [we] find no reason to doubt that climate changes will result, and no reason to believe that these changes will be negligible."

It was these concerns that led to the establishment of the Intergovernmental Panel on Climate Change and, in 1992, to the United Nations Framework Convention on Climate Change, which called for immediate action to reverse the trend of mounting greenhouse gas emissions. One early signatory was President George H.W. Bush, who called on world leaders to translate the written document into "concrete action to protect the planet." Three months later, the treaty was unanimously ratified by the Senate.

Since then, scientists around the world have worked assiduously to flesh out the details of this broadly affirmed picture. Many details have been adjusted, but the basic parameters have not changed. Well, one thing has. In 1965, the concern that greenhouse gases would lead to global warming was a prediction. Today, it is an established scientific fact.

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