FOREWORD

Ben Santer

In the mid-1990s, I was the convening lead author of the eighth chapter of the *Second Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC), ["Detection of Climate Change and Attribution of Causes"]. After years of careful evaluation of the available scientific evidence, my scientific coauthors and I concluded in 1995 that: "the balance of evidence suggests a discernible human influence on global climate."

Subsequent IPCC Scientific Assessment Reports in 2001, 2007, and 2013 confirmed our 1995 finding. The most recent *2013 Assessment Report* concluded that: "It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century." The words "extremely likely" had a specific probabilistic meaning: greater than 95 percent probability of occurrence.

This dramatic evolution in our scientific understanding—from the cautious "balance of evidence" statement to the more definitive finding that humans have been "the dominant cause" of the observed warming since 1950—has occurred in less than two decades. In parallel with this evolution in understanding, scientists have observed global-scale increases in the temperatures of the land and ocean surfaces, in the temperature of the lowest layer of the atmosphere, and in the heat content of the ocean. Global-mean sea level has risen. Arctic sea ice extent and thickness has decreased, along with Northern Hemisphere snow coverage. Large-scale climate change is also evident in the water cycle—in zonal-mean rainfall patterns, surface humidity, the amount of water vapor in the atmosphere, and runoff from major river basins. These extraordinary transformations are occurring over the span of one human lifetime.

From the careful detective work performed by many hundreds of climate scientists, it is clear that natural factors alone cannot explain these distinctive

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changes in the atmosphere and oceans, in the snow and ice, and in the distributions and abundances of many plant and animal species around the world. While the climate can and does vary naturally in response to changes in the sun's energy output, large volcanic eruptions, or internal oscillations in the climate system (phenomena such as El Niños and La Niñas), a "natural causation" diagnosis does not fit the incredibly rich array of observational evidence. In order to best explain the unusual observed behavior, a strong human influence is required. It is immutable fact that this strong human influence is primarily due to fossil fuel burning, and the resulting changes in atmospheric levels of heat-trapping greenhouse gases.

As I write these words in March 2014, scientists have just discovered the gravity wave "fingerprints" from the Big Bang. This profoundly important discovery—a marvelous feat of technology and scientific imagination—may help us to understand the very beginnings of space and time. And yet, even as we are deciphering the origins of the universe, we are fundamentally and dramatically changing our own planet. Humanity's "fingerprints" are now identifiable in many different aspects of the climate system, and human-caused climate change appears destined to impact life on Earth for millennia to come.

But even as we look outward to understand the universe, many people still refuse to look at our own home planet, and are unable to recognize how we are changing our fragile atmosphere. Dr. John Berger's *Climate Peril* performs an extraordinary public service—it helps all of us clearly see that we are no longer just innocent bystanders in the climate system. Dr. Berger lucidly describes our likely climatic future, past and present-day climate, and the human and natural drivers of climate change. He then shows some of the projected impacts of human-caused climate change, such as changes in the properties of extreme events, progressive acidification of the world's oceans, and species extinctions. These perils are not future hypothetical events. We are experiencing them now, in our lifetimes.

To make informed decisions on how to respond to human-caused climate change, we need an informed, scientifically savvy global citizenry. Climate science needs to be accessible to the many, not just to a select few. *Climate Peril* fulfills this goal of making the science accessible. The book is a comprehensive, plain-English introduction to complex scientific issues. It should be read by anyone who has children or grandchildren and cares about the kind of world with which we leave them.

While a sobering book, *Climate Peril* also offers a hopeful perspective on humanity's future, and on our ability to provide cheap, low-carbon energy. A

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species that is clever enough to peer more than 13 billion years into the past, and identify the gravity wave signature of the Big Bang, can surely figure out ways of providing cheap, low-carbon energy for the billions of citizens of planet Earth. But as *Climate Peril* so starkly reveals, that is a global enterprise of greatest urgency—a looming test of whether our species can graduate from troubled adolescence to maturity. Passing this test will require the development and deployment of advanced energy technology, engaging the best scientific minds, and mustering the political will to solve a problem that affects every one of Earth's inhabitants.

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