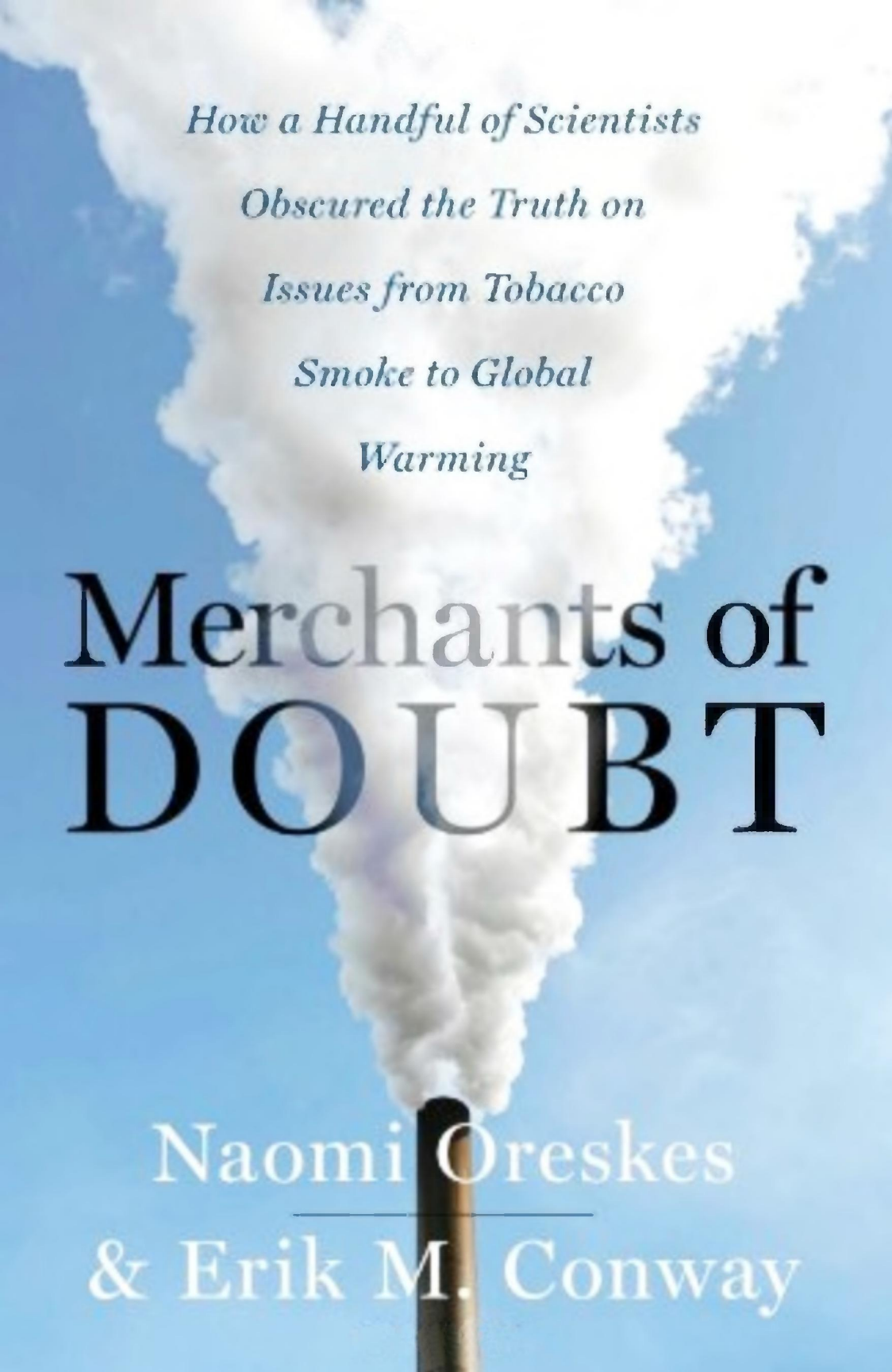
How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming
Merchants of DOUBT
Naomi Oreskes
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MERCHANTS OF DOUBT

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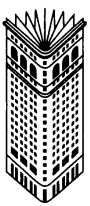

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To Hannah and Clara
It's in your hands now.

This generation has altered the composition of the atmosphere on a global scale through . . . a steady increase in carbon dioxide from the burning of fossil fuels.

—Lyndon Johnson
Special Message to Congress, 1965

The trouble with Americans is that they haven't read the minutes of the previous meeting.

—Adlai Stevenson

Contents

Introduction

Ben Santer is the kind of guy you could never imagine anyone attacking. He's thoroughly moderate—of moderate height and build, of moderate temperament, of moderate political persuasions. He is also very modest—soft-spoken, almost self-effacing—and from the small size and nonexistent décor of his office at the Lawrence Livermore National Laboratory, you might think he was an accountant. If you met him in a room with a lot of other people, you might not even notice him.

But Santer is no accountant, and the world has noticed him.

He's one of the world's most distinguished scientists—the recipient of a 1998 MacArthur "genius" award and numerous prizes and distinctions from his employer—the U.S. Department of Energy—because he has done more than just about anyone to prove the human causes of global warming. Ever since his graduate work in the mid-1980s, he has been trying to understand how the Earth's climate works, and whether we can say for sure that human activities are changing it. He has shown that the answer to that question is yes.

Santer is an atmospheric scientist at the Lawrence Livermore National Laboratory's Model Diagnosis and Intercomparison Project, an enormous international project to store the results of climate models from around the globe, distribute them to other researchers, and compare the models, both with real-world data and with each other. Over the past twenty years, he and his colleagues have shown that our planet *is* warming—and in just the way you would expect if greenhouse gases were the cause.

Santer's work is called "fingerprinting"—because natural climate variation leaves different patterns and traces than warming caused by greenhouse gases. Santer looks for these fingerprints. The most important one involves two parts of our atmosphere: the troposphere, the warm blanket closest to the Earth's surface, and the stratosphere, the thinner,

colder part above it. Physics tells us that if the Sun were causing global warming—as some skeptics continue to insist—we'd expect both the troposphere and the stratosphere to warm, as heat comes into the atmosphere from outer space. But if the warming is caused by greenhouse gases emitted at the surface and largely trapped in the lower atmosphere, then we expect the troposphere to warm, but the stratosphere to cool.

Santer and his colleagues have shown that the troposphere is warming and the stratosphere is cooling. In fact, because the boundary between these two atmospheric layers is in part *defined* by temperature, that boundary is now moving upward. In other words, the whole structure of our atmosphere is changing. These results are impossible to explain if the Sun were the culprit. It shows that the changes we are seeing in our climate are not natural.

The distinction between the troposphere and the stratosphere became part of the Supreme Court hearing in the case of *Massachusetts et al. v. the EPA*, in which twelve states sued the federal government for failing to regulate carbon dioxide as a pollutant under the Clean Air Act. Justice Antonin Scalia dissented, arguing that there was nothing in the law to require the EPA to act—but the honorable justice also got lost in the science, at one point referring to the stratosphere when he meant the troposphere. A lawyer for Massachusetts replied, "Respectfully, Your Honor. It is not the stratosphere. It's the troposphere." The justice answered, "Troposphere, whatever. I told you before I'm not a scientist. That's why I don't want to deal with global warming."[1]

But we all have to deal with global warming, whether we like it or not, and some people have been resisting this conclusion for a long time. In fact, some people have been attacking not just the message, but the messenger. Ever since scientists first began to explain the evidence that our climate was warming—and that human activities were probably to blame—people have been questioning the data, doubting the evidence, and attacking the scientists who collect and explain it. And no one has been more brutally—or more unfairly—attacked than Ben Santer.

THE INTERGOVERNMENTAL PANEL on Climate Change (IPCC) is the world's leading authority on climate issues. Established in 1988 by the World Meteorological Organization and the United Nations Environment Program, it was created in response to early warnings about global warming. Scientists had known for a long time that increased greenhouse gases

from burning fossil fuels could cause climate change—they had explained this to Lyndon Johnson in 1965—but most thought that changes were far off in the future. It wasn't until the 1980s that scientists started to worry—to think that the future was perhaps almost here—and a few mavericks began to argue that anthropogenic climate change was actually already under way. So the IPCC was created to evaluate the evidence and consider what the impacts would be if the mavericks were right.

In 1995, the IPCC declared that the human impact on climate was now "discernible." This wasn't just a few individuals; by 1995 the IPCC had grown to include several hundred climate scientists from around the world. But *how* did they know that changes were under way, and how did they know they were caused by *us*? Those crucial questions were answered in *Climate Change 1995: The Science of Climate Change*, the Second Assessment Report issued by the IPCC. Chapter 8 of this report, "Detection of Climate Change and Attribution of Causes," summarized the evidence that global warming really was caused by greenhouse gases. Its author was Ben Santer.

Santer had impeccable scientific credentials, and he had never before been involved in even the suggestion of impropriety of any kind, but now a group of physicists tied to a think tank in Washington, D.C., accused him of doctoring the report to make the science seem firmer than it really was. They wrote reports accusing him of "scientific cleansing"—expunging the views of those who did not agree.[2] They wrote reports with titles like "Greenhouse Debate Continued" and "Doctoring the Documents," published in places like *Energy Daily* and *Investor's Business Daily*. They wrote letters to congressmen, to officials in the Department of Energy, and to the editors of scientific journals, spreading the accusations high and wide. They pressured contacts in the Energy Department to get Santer fired from his job. Most public—and most publicized—was an op-ed piece published in the *Wall Street Journal*, accusing Santer of making the alleged changes to "deceive policy makers and the public."[3] Santer *had* made changes to the report, but not to deceive anyone. The changes were made in response to review comments from fellow scientists.

Every scientific paper and report has to go through the critical scrutiny of other experts: peer review. Scientific authors are required to take reviewers' comments and criticisms seriously, and to fix any mistakes that may have been found. It's a foundational ethic of scientific work: no claim can be considered valid—not even *potentially* valid—until it has passed peer review.

Peer review is also used to help authors make their arguments clearer,

and the IPCC has an exceptionally extensive and inclusive peer review process. It involves both scientific experts and representatives of the governments of the participating nations to ensure not only that factual errors are caught and corrected, but as well that all judgments and interpretations are adequately documented and supported, and that all interested parties have a chance to be heard. Authors are required either to make changes in response to the review comments, or to explain why those comments are irrelevant, invalid, or just plain wrong. Santer had done just that. He had made changes in response to peer review. He had done what the IPCC rules required him to do. He had done what *science* requires him to do. Santer was being attacked for being a good scientist.

Santer tried to defend himself in a letter to the editor of the *Wall Street Journal*—a letter that was signed by twenty-nine co-authors, distinguished scientists all, including the director of the U.S. Global Change Research Program.[4] The American Meteorological Society penned an open letter to Santer affirming that the attacks were entirely without merit.[5] Bert Bolin, the founder and chairman of the IPCC, corroborated Santer's account in a letter of his own to the *Journal*, pointing out that accusations were flying without a shred of evidence, and that the accusers had not contacted him, nor any IPCC officers, nor any of the scientists involved to check their facts. Had they "simply taken the time to familiarize [themselves] with IPCC rules of procedure," he noted, they would have readily found out that no rules were violated, no procedures were transgressed, and nothing wrong had happened.[6] As later commentators have pointed out, no IPCC member nation ever seconded the complaint.[7]

But the *Journal* only published a portion of both Santer and Bolin's letters, and two weeks later, they gave the accusers yet another opportunity to sling mud, publishing a letter declaring that the IPCC report had been "tampered with for political purposes."[8] The mud stuck, and the charges were widely echoed by industry groups, business-oriented newspapers and magazines, and think tanks. They remain on the Internet today. If you Google "Santer IPCC," you get not the chapter in question—much less the whole IPCC report—but instead a variety of sites that repeat the 1995 accusations.[9] One site even asserts (falsely) that Santer admitted that he had "adjusted the data to make it fit with political policy," as if the U.S. government even *had* a climate policy to adjust the data to fit. (We didn't in 1995, and we still don't.)[10]

The experience was bitter for Santer, who spent enormous amounts of time and energy defending his scientific reputation and integrity, as well

as trying to hold his marriage together through it all. (He didn't.) Today, this normally mild-mannered man turns white with rage when he recalls these events. Because no scientist starts his or her career expecting things like this to happen.

Why didn't Santer's accusers bother to find out the facts? Why did they continue to repeat charges long after they had been shown to be unfounded? The answer, of course, is that they were not interested in finding facts. They were interested in fighting them.

A FEW YEARS later, Santer was reading the morning paper and came across an article describing how some scientists had participated in a program, organized by the tobacco industry, to discredit scientific evidence linking tobacco to cancer. The idea, the article explained, was to "keep the controversy alive."[11] So long as there was doubt about the causal link, the tobacco industry would be safe from litigation and regulation. Santer thought the story seemed eerily familiar.

He was right. But there was more. Not only were the tactics the same, the people were the same, too. The leaders of the attack on him were two retired physicists, both named Fred: Frederick Seitz and S. (Siegfried) Fred Singer. Seitz was a solid-state physicist who had risen to prominence during World War II, when he helped to build the atomic bomb; later he became president of the U.S. National Academy of Sciences. Singer was a physicist—in fact, the proverbial rocket scientist—who became a leading figure in the development of Earth observation satellites, serving as the first director of the National Weather Satellite Service and later as chief scientist at the Department of Transportation in the Reagan administration.[12]

Both were extremely hawkish, having believed passionately in the gravity of the Soviet threat and the need to defend the United States from it with high-tech weaponry. Both were associated with a conservative think tank in Washington, D.C., the George C. Marshall Institute, founded to defend Ronald Reagan's Strategic Defense Initiative (SDI or "Star Wars"). And both had previously worked for the tobacco industry, helping to cast doubt on the scientific evidence linking smoking to death.

From 1979 to 1985, Fred Seitz directed a program for R. J. Reynolds Tobacco Company that distributed $45 million to scientists around the country for biomedical research that could generate evidence and cultivate experts to be used in court to defend the "product." In the mid-1990s, Fred Singer coauthored a major report attacking the U.S. Environmental Protection

Agency over the health risks of secondhand smoke. Several years earlier, the U.S. surgeon general had declared that secondhand smoke was hazardous not only to smokers' health, but to anyone exposed to it. Singer attacked this finding, claiming the work was rigged, and that the EPA review of the science—done by leading experts from around the country—was distorted by a political agenda to expand government control over all aspects of our lives. Singer's anti-EPA report was funded by a grant from the Tobacco Institute, channeled through a think tank, the Alexis de Tocqueville Institution.[13]

Millions of pages of documents released during tobacco litigation demonstrate these links. They show the crucial role that *scientists* played in sowing doubt about the links between smoking and health risks. These documents—which have scarcely been studied except by lawyers and a handful of academics—also show that the same strategy was applied not only to global warming, but to a laundry list of environmental and health concerns, including asbestos, secondhand smoke, acid rain, and the ozone hole.

Call it the "Tobacco Strategy." Its target was science, and so it relied heavily on scientists—with guidance from industry lawyers and public relations experts—willing to hold the rifle and pull the trigger. Among the multitude of documents we found in writing this book were *Bad Science: A Resource Book*—a how-to handbook for fact fighters, providing example after example of successful strategies for undermining science, and a list of experts with scientific credentials available to comment on any issue about which a think tank or corporation needed a negative sound bite.[14]

IN CASE AFTER CASE, Fred Singer, Fred Seitz, and a handful of other scientists joined forces with think tanks and private corporations to challenge scientific evidence on a host of contemporary issues. In the early years, much of the money for this effort came from the tobacco industry; in later years, it came from foundations, think tanks, and the fossil fuel industry. They claimed the link between smoking and cancer remained unproven. They insisted that scientists were mistaken about the risks and limitations of SDI. They argued that acid rain was caused by volcanoes, and so was the ozone hole. They charged that the Environmental Protection Agency had rigged the science surrounding secondhand smoke. Most recently—over the course of nearly two decades and against the face of mounting evidence—they dismissed the reality of global warming. First they claimed

there was none, then they claimed it was just natural variation, and then they claimed that even if it was happening and it was our fault, it didn't matter because we could just adapt to it. In case after case, they steadfastly denied the existence of scientific agreement, even though they, themselves, were pretty much the only ones who disagreed.

A handful of men would have had no impact if no one paid any attention, but people did pay attention. By virtue of their earlier work in the Cold War weapons programs, these men were well-known and highly respected in Washington, D.C., and had access to power all the way to the White House. In 1989, to give just one example, Seitz and two other players in our story, physicists Robert Jastrow and William Nierenberg, wrote a report questioning the evidence of global warming.[15] They were soon invited to the White House to brief the Bush administration. One member of the Cabinet Affairs Office said of the report: "Everyone has read it. Everyone takes it seriously."[16]

It wasn't just the Bush administration that took these claims seriously; the mass media did, too. Respected media outlets such as the *New York Times*, the *Washington Post*, *Newsweek*, and many others repeated these claims as if they were a "side" in a scientific debate. Then the claims were repeated again and again and again—as in an echo chamber—by a wide range of people involved in public debate, from bloggers to members of the U.S. Senate, and even by the president and the vice president of the United States. In all of this, journalists and the public never understood that these were *not* scientific debates—taking place in the halls of science among active scientific researchers—but misinformation, part of a larger pattern that began with tobacco.

This book tells the story of the Tobacco Strategy, and how it was used to attack science and scientists, and to confuse us about major, important issues affecting our lives—and the planet we live on. Sadly, Ben Santer's story is not unique. When scientific evidence mounted on the depletion of stratospheric ozone, Fred Singer challenged Sherwood Rowland—the Nobel laureate and president of the American Association for the Advancement of Science who first realized that certain chemicals (CFCs) could destroy stratospheric ozone. When a graduate student named Justin Lancaster tried to set the record straight on Roger Revelle's views in the face of the claim that Revelle had changed his mind about global warming, he became the defendant in a libel lawsuit. (Lacking funds to defend himself, Lancaster was forced to settle out of court, leaving both his personal and professional life in tatters.)[17]

Fred Seitz and Fred Singer, both physicists, were the most prominent and persistent scientists involved in these campaigns. William Nierenberg and Robert Jastrow were physicists, too. Nierenberg was a one-time director of the distinguished Scripps Institution of Oceanography and member of Ronald Reagan's transition team, helping to suggest scientists to serve in important positions in the administration. Like Seitz, he had helped to build the atomic bomb, and later was associated with several Cold War weapons programs and laboratories. Jastrow was a prominent astrophysicist, successful popular author, and director of the Goddard Institute for Space Studies, who had long been involved with the U.S. space program. These men had no particular expertise in environmental or health questions, but they did have power and influence.

Seitz, Singer, Nierenberg, and Jastrow had all served in high levels of science administration, where they had come to know admirals and generals, congressmen and senators, even presidents. They had also dealt extensively with the media, so they knew how to get press coverage for their views, and how to pressure the media when they didn't. They used their scientific credentials to present themselves as authorities, and they used their authority to try to discredit any science they didn't like.

OVER THE COURSE of more than twenty years, these men did almost no original scientific research on any of the issues on which they weighed in. Once they had been prominent researchers, but by the time they turned to the topics of our story, they were mostly attacking the work and the reputations of others. In fact, on every issue, they were on the wrong side of the scientific consensus. Smoking does kill—both directly and indirectly. Pollution does cause acid rain. Volcanoes are not the cause of the ozone hole. Our seas are rising and our glaciers are melting because of the mounting effects of greenhouse gases in the atmosphere, produced by burning fossil fuels. Yet, for years the press quoted these men as experts, and politicians listened to them, using their claims as justification for inaction. President George H. W. Bush once even referred to them as "my scientists."[18] Although the situation is now a bit better, their views and arguments continue to be cited on the Internet, on talk radio, and even by members of the U.S. Congress.[19]

Why would scientists dedicated to uncovering the truth about the natural world deliberately misrepresent the work of their own colleagues? Why would they spread accusations with no basis? Why would they refuse to

correct their arguments once they had been shown to be incorrect? And why did the press continue to quote them, year after year, even as their claims were shown, one after another, to be false? This is the story we are about to tell. It is a story about a group of scientists who fought the scientific evidence and spread confusion on many of the most important issues of our time. It is a story about a pattern that continues today. A story about fighting facts, and merchandising doubt.