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CHAPTER 5

What's Bad Science? Who Decides? The Fight over Secondhand Smoke

By the mid-1980s, nearly every American knew that smoking caused cancer, but still tobacco industry executives successfully promoted and sustained doubt. Scientists continued to play a crucial role in that effort, as men like Dr. Martin Cline provided powerful "expert" testimony when cases went to court.[1] In 1986, a new panic ripped through the industry, much like the one that tobacco salesmen must have felt in 1953 when those first painted mice developed cancer from cigarette tar, and again in 1963 when the industry read the first Surgeon General's report. The cause was a new Surgeon General's report that concluded that secondhand smoke could cause cancer even in otherwise healthy nonsmokers. When the EPA took steps to limit indoor smoking, Fred Singer joined forces with the Tobacco Institute to challenge the scientific basis of secondhand smoke's health risks. But they didn't just claim that the data were insufficient; they claimed that the EPA was doing "bad science." To make this claim seem credible, they didn't just fight EPA on secondhand smoke; they began a smear campaign to discredit the EPA in general and tarnish any scientific results that any industry didn't like as "junk."

A Brief History of Secondhand Smoke

Today, we know that secondhand smoke can kill. The U.S. Department of Health and Human Services tells us that "there is no risk-free level of exposure to second-hand smoke: even small amounts . . . can be harmful to

people's health."[2] But just as the tobacco industry knew that smoking could cause cancer long before the rest of us did, they knew that secondhand smoke could cause cancer, too. In fact, they knew it well before most independent scientists did.[3] In the 1970s, industry researchers had found that sidestream smoke contained *more* toxic chemicals than mainstream smoke—in part because smoldering cigarettes burn at lower temperatures at which more toxic compounds are created. So they got to work trying to produce less harmful sidestream smoke by improving filters, changing cigarette papers, or adding components to make the cigarettes burn at higher temperatures. They also tried to make cigarettes whose sidestream smoke was not less dangerous, but simply less *visible*.[4]

Those charged with protecting public health were less sanguine. The states were moving actively against tobacco. By 1979, every state except Kentucky and Nevada had some kind of antismoking legislation passed or pending. Many bills were aimed at active smoking—to discourage it by increasing taxes or restricting advertising—but some targeted what was becoming known as the "indoor air quality" issue: the impact of secondhand smoke on bystanders.[5]

New Jersey, for example, had been debating restrictions on public smoking since 1974.[6] This is curious, because in 1974 there was very little published scientific evidence to show that secondhand smoke was dangerous. Perhaps it just seemed like common sense: if smoke was harmful to the person who inhaled it on purpose, wouldn't it also be harmful to the person who inhaled it by accident?

Evidence to support that common sense began to emerge in 1980, when researchers published a paper in the weighty *New England Journal of Medicine* showing that nonsmokers working in smoky offices had decreased lung function—as much as if they were actually light smokers.[7] It was a large study—twenty-one hundred subjects—and it was statistically significant, but the science was heavily criticized. It later turned out that nearly all the critics had links to the tobacco industry, but they still had a point: it was hard to demonstrate just how much passive smoke a person was exposed to. You could make general claims about "smoky" environments, but to make a scientifically robust causal claim, you should, ideally, measure exposure levels and show that the more exposure, the more risk. This is known as a "dose-response" curve. A second study provided it.[8]

Takeshi Hirayama was chief epidemiologist at the National Cancer Center Research Institute in Tokyo, Japan. In 1981, he showed that Japanese women whose husbands smoked had much higher death rates from lung

cancer than those whose husbands did not. The study was long-term and big—540 women in twenty-nine different health care districts studied over fourteen years—and showed a clear dose-response curve: the more the husbands smoked, the more the wives died from lung cancer. Spousal drinking had no effect, and the husbands' smoking had no impact on diseases like cervical cancer that you wouldn't expect to be affected by cigarette smoke. The study did exactly what good epidemiology should do: it demonstrated an effect and ruled out other causes. The Japan study also explained a long-standing conundrum: why many women got lung cancer even when they didn't smoke.[9] Hirayama's study was a first-rate piece of science; today it is considered a landmark.

The tobacco industry lambasted its findings. They hired consultants to mount a counterstudy and undermine Hirayama's reputation.[10] One of these consultants was Nathan Mantel, a well-known biostatistician, who claimed that Hirayama had committed a serious statistical error. The Tobacco Institute promoted Mantel's work, convincing the media to present "both sides" of the story. Leading newspapers played into their hands, running articles with headlines such as SCIENTIST DISPUTES FINDINGS OF CANCER RISK TO NONSMOKERS and NEW STUDY CONTRADICTS NON-SMOKERS' RISK. Then the industry ran full-page ads in major newspapers highlighting these headlines.[11]

The "new study" was of course funded by the industry. In private, a different story was unfolding, as industry advisors acknowledged that the Hirayama study was correct. "Hirayama [and his defenders] are correct and Mantel and TI [Tobacco Institute] are wrong," one internal memo acknowledged. Industry scientific advisors "believe Hirayama is a good scientist and that his nonsmoking wives publication was correct," concluded another. Another memo put it even more strongly, saying, "Hirayama was correct, that the TI knew it, and that TI [attacked] Hirayama knowing that the work was correct."[12]

The scientific community knew it, too, and the Hirayama study had a galvanizing effect. Doctors, public health officials, and antitobacco activists began to push for controls on public smoking. By 1984, thirty-seven states and the District of Columbia had passed restrictions on smoking in public places; two years later, the number was up to forty.[13] Congress held hearings on controlling cigarette advertising and restricting sales to minors, and the Civil Aviation Board considered a smoking ban on airplane flights.[14] This would make sense, of course, only if secondhand smoke affected bystanders. In 1986, the Surgeon General declared that it did.

"The question of whether or not tobacco smoke is carcinogenic . . . was conclusively resolved more than 20 years ago," the secretary of Health and Human Services wrote to President George H. W. Bush in a cover letter to the 1986 report. For secondhand smoke the question had now been answered, too: "Involuntary smoking is a cause of disease, including lung cancer, in healthy nonsmokers."[15] Ambient tobacco smoke also caused respiratory illness and decreased lung function in infants and young children and increased the risk of asthma. "As a physician," the secretary concluded, "I believe that parents should refrain from smoking."

The report's Executive Summary was written by Robert Windom, a physician nominated by President Ronald Reagan, who took the results to their logical policy endpoint: "Actions to protect nonsmokers from ETS [environmental tobacco smoke] exposure not only are warranted, but are essential to protect public health."[16] An independent report by the National Research Council that year came to the same conclusion.[17] Smoking was not just a matter of personal preference; it was a serious risk to bystanders, like driving drunk or shouting fire in a crowded theater.

The tobacco industry was worried, very worried. It was one thing to say that smokers accepted uncertain risks in exchange for certain pleasures, but quite another to say that they were killing their friends, neighbors, and even their own children. Philip Morris vice president Ellen Merlo put it this way: "All of us whose livelihoods depend upon tobacco sales—directly or indirectly—must band together into a unified force . . . it's not a question of 'are we going to do well or badly . . . this year?' It's a question of: 'Are we going to be able to survive and continue to make a living in this industry in the years to come?' " The bottom line, she explained, was this: "If smokers can't smoke on the way to work, at work, in stores, banks, restaurants, malls and other public places, they are going to smoke less," and the industry was going to shrink.[18]

Industry disinformation campaigns now took new and creative forms. Sylvester Stallone was paid $500,000 to use Brown and Williamson products in no fewer than five feature films to link smoking with power and strength, rather than sickness and death.[19] The Center for Tobacco Research set up a "special projects" office to deal with secondhand smoke, including the development of countervailing scientific evidence, expert witnesses, and industry-sponsored conferences to challenge the emerging scientific consensus.

Several of these special projects were run though a law firm to shield these efforts from scrutiny using attorney-client privilege.[20] (We already

saw how UCLA scientist Martin Cline hid behind attorney-client privilege when testifying as an expert witness, claiming not to work for the tobacco industry, but for a law firm.) Other projects developed legal strategies to suggest that restricting smoking in the workplace would be a form of employment discrimination.[21] The industry promoted the idea of "sick building syndrome" to suggest that headaches and other problems suffered by workers in smoky atmospheres were caused by the buildings, not smoke.[22] They attempted to join forces with antitax groups to resist cigarette excise taxes.[23] And they redoubled their efforts to recruit scientists. Project Whitecoat—as its name suggests—enlisted European scientists to "reverse scientific and popular misconception that ETS [environmental tobacco smoke] is harmful."[24] Once again, the industry was fighting science with science—or at least, scientists.

In 1991, Philip Morris executives outlined four objectives specifically related to secondhand smoke. One was to fight bans on smoking in workplaces and restaurants. A second was to maintain smoking areas in transportation facilities like airports. A third was to promote the idea of "accommodation"—that smokers (like the disabled?) had the right to be accommodated. Atlanta, Georgia, would be targeted to become a "model accommodation city," because of its tradition of Southern hospitality, but there was a (literally fatal) flaw in this argument.[25] Everyone appreciates hospitality, but few would argue that it includes the right to kill your guests. So "Objective #1"—on which all else hinged—was "to maintain the controversy . . . about tobacco smoke in public and scientific forums."[26] The budget for maintaining the controversy was $16 million.

The year that followed was crucial for maintaining the controversy, because the battle had now been joined by the U.S. Environmental Protection Agency.[27] The tobacco industry had promoted the use of the phrase "environmental tobacco smoke" in preference to passive smoking or secondhand smoke—perhaps because it seemed less threatening—but this proved a tactical mistake, because it virtually invited EPA scrutiny. If secondhand smoke was "environmental," then there was no question that it fell under the purview of the *Environmental* Protection Agency. And this meant the prospect of federal regulation—what the industry most dreaded.

In December 1992, the EPA released *Respiratory Health Effects of Passive Smoking*. The report attributed 3,000 lung cancer deaths per year to secondhand smoke, as well as 150,000 to 300,000 cases of bronchitis and pneumonia in infants and young children. Another 200,000 to 1,000,000 children had their asthma aggravated, and ETS also increased the risk of

asthma in children who did not already have it. These data were statistically significant and could not be explained away by other causes, risk factors, or chance. Environmental tobacco smoke was a class A—a known human—carcinogen.[28]

Despite this strong central conclusion, the report was in many ways cautious. One potential bombshell was left out of the Executive Summary and press releases. This was the statistically significant correlation between ETS and sudden infant death syndrome (SIDS). The evidence clearly showed that ETS increased the risk of SIDS, but the panel couldn't decide whether that risk was caused by prenatal smoking, postnatal ETS, or both. Several other possible connections and correlations—increased cardiovascular disease in adults, respiratory infections in older children, and more—were also left unresolved, pending further research. But it seemed likely that at least some would be resolved on the side of harm, so the scientists concluded: "The total public health impact from ETS will be greater than that discussed here."[29]

The authors also confronted one important methodological difficulty. To assess risk, you have to compare exposed people with unexposed ones, but since ETS was everywhere, it was difficult, perhaps impossible, to find a truly "unexposed" population. So they decided to focus on studies with high spousal exposure, where effects were most likely to show up clearly. Seventeen (of thirty) studies fit this bill, and every single one showed increased risk, nine at the 95 percent confidence level, and the rest at the 90 percent level.[30] Moreover, among women who smoked, the lung cancer rate was even higher if their husbands also smoked. This showed that ETS added extra risk on top of that carried by smoking itself.

It was a judgment call to focus on high spousal exposure and to accept results at the 90 percent confidence level, but it was a reasoned one, and supported by the "weight of evidence approach" advocated by EPA risk assessment guidelines. In 1983, Congress had commissioned the National Academy of Sciences to review risk assessment in the federal government. The Redbook, as the resulting report came to be known for the color of its cover, asked each federal agency to establish clear and consistent guidelines for risk assessment.[31] The EPA had done this, and concluded that there was no magic bullet of risk assessment—different kinds of studies were useful in different ways—so the best approach was to scrutinize all the available evidence and determine where the weight of the evidence lay.[32]

There was no scientific trump card, either. Animal studies face the obvious difficulty that animals aren't people. Human studies face the difficulty

that it is generally unethical to deliberately expose people to known or suspected risks. Statistically based epidemiology grapples with the well-known problem that correlation is not causation: some associations occur by chance. Nowadays most human toxic exposures are fairly low, because most of the time most reasonable people (and reasonable employers) try to minimize exposures to substances that we know (or seriously suspect) are harmful. And when the dose is low, the response is typically small, and therefore hard to detect.

However, all of these limitations could be addressed through the weight-of-evidence approach: no one study is perfect, but each can contribute useful information. For example, to test if a correlation in humans is causal or coincidental, you can deliberately expose animals in a controlled environment. If the animals show the same effect, and if that effect follows a dose-response curve, then the effect is probably not a coincidence. This is what the EPA now argued for secondhand smoke. Environmental tobacco smoke contains the same chemicals found in direct smoke and these chemicals were known to cause cancer in lab rats. So when the epidemiology revealed increased rates of cancer in the wives of smokers, with a clear dose-response curve, it was reasonable to infer a causal connection.

Consistency and quantity of information were also important considerations. On secondhand smoke, the good news (sort of) was that there was plenty of evidence on human exposure and the results were consistent. Lots of smoke produced lots of cancer.[33] Less smoke produced less cancer. The effects were seen in the United States, Germany, and Japan, despite other differences in lifestyle, diet, and the like. The weight of evidence was heavy, indeed.[34] The EPA called it "conclusive."[35]

Who could deny all that? The answer: Both Fred Seitz and Fred Singer.

As we saw in our first chapter, Fred Seitz began working for the tobacco industry in 1979. In 1989, he took up the defense of secondhand smoke. He coordinated a report, "Links between passive smoking and disease," which frankly acknowledged the abundant scientific evidence linking ETS to lung cancer in adults, and to respiratory illness, asthma, and ear infection in children, and even to perinatal death.[36]

Seitz did not suggest, however, that the industry give up the fight. Rather, he suggested that the best way to fight such a heavy weight of evidence was to challenge the weight-of-evidence approach. The idea was to reject "exhaustive inclusion"—examining all the evidence—and to focus on the "best evidence" instead.[37]

Seitz had a point. Not all scientific studies are created equal, and lumping

the good with the bad can cause confusion and error. An epidemiological study with ten thousand people is clearly better than one with ten. But it doesn't take much imagination to see how easily a "best evidence" approach could be biased, excluding studies you don't like and including the ones you do. Seitz's report stressed that inclusion criteria should always be stated up front—such as a preference for studies with "ideal research designs." But medical studies are never conducted under ideal conditions: you cannot put people in cages and control what they eat, drink, and breathe, 24/7. Animals are by definition models for what a researcher is really interested in—people. At best, animal studies are reliable representations or good first approximations, but they can never be considered ideal; Seitz's argument was transparently self-serving. The industry was not charmed, and they took up a different banner instead. It was the banner of "sound science." For this they turned to Fred Singer.

In 1990, Singer had created his Science and Environment Policy Project to "promote 'sound science' in environmental policy."[38] What did it mean to promote "sound science"? The answer is, at least in part, to defend the tobacco industry. By 1993, he was helping the industry to promote the concept of sound science to support science they liked and to discredit as "junk" any science they didn't. He did this in collaboration with APCO Associates, the public relations firm that Philip Morris had hired to help with the secondhand smoke campaign.

Tom Hockaday was an APCO employee, and March 1993 found him working closely with Philip Morris vice president Ellen Merlo to develop scientific articles to defend secondhand smoke and promote the idea that the EPA work was "junk science." "We have been working with Dr. Fred Singer and Dr. Dwight Lee [an economist, holding the Ramsey Chair of Private Enterprise at the University of Georgia], who have authored articles on junk science and indoor air quality," Hockaday explained in a memo to Merlo. "Attached you will find copies of the . . . articles which have been approved by Drs. Singer and Lee." Merlo approved the overall approach but wished that Singer's junk science article had a "more personal introduction." Tom Hockaday reported back that Singer was "adamant that this would not be his style."[39]

What was his style? A full-frontal assault, claiming that the science done at the EPA was "junk." The headline of the article he prepared for APCO read: JUNK SCIENCE AT THE EPA. The EPA was taking "extreme positions not supported by science," he asserted. Claiming that they "could not rule out other factors . . . such as diet, outdoor air pollution, genetics, prior

lung disease, etc.," he charged that the EPA had "rig[ged] the numbers" by accepting the 90 percent confidence level instead of a 95 percent one.[40]

Why would the EPA "rig" the numbers? Singer's answer: Controlling smoke would lead toward greater regulation in general. "The litany of questionable crises emanating from the Environmental Protection Agency is by no means confined to these issues. It could just as easily include lead, radon, asbestos, acid rain, global warming, and a host of others." By the early 1990s, every one of these items—lead, radon, asbestos, and global warming—had come under serious scrutiny because of substantial scientific evidence, and in every case that concern has been legitimated by further scientific work. The EPA had a legal obligation to be concerned about these things. But the agency had not called ETS a "crisis." That was Singer's word. EPA had called it a carcinogen and therefore a risk.

Was there any substance to Singer's complaints? The short answer is no. The EPA scientists *had* considered and ruled out other factors. That is what it means to do epidemiology. No one had denied that genetics and lifestyle played a role in health and disease, but the statistical evidence was overwhelming that ETS was an *added* risk. It is not plausible to suppose that Singer did not understand this—he was a highly educated and intelligent man—but the reality wasn't convenient to his motivation. He was not practicing science; he was attacking it. His broader purpose, the historical evidence suggests, was to undermine the EPA in order to stop or delay regulation regarding secondhand smoke.

Consider a handbook the tobacco industry distributed that same year, which drew on Singer's work.[41] *Bad Science: A Resource Book* was a how-to handbook for fact fighters. It contained over two hundred pages of snappy quotes and reprinted editorials, articles, and op-ed pieces that challenged the authority and integrity of science, building to a crescendo in the attack on the EPA's work on secondhand smoke. It also included 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.[42]

Bad Science was a virtual self-help book for regulated industries, and it began with a set of emphatic sound-bite-sized "MESSAGES":

1. *Too often science is manipulated to fulfill a political agenda.*
2. *Government agencies . . . betray the public trust by violating principles of good science in a desire to achieve a political goal.*
3. *No agency is more guilty of adjusting science to support precon-*

ceived public policy prescriptions than the Environmental Protection Agency.

4. *Public policy decisions that are based on bad science impose enormous economic costs on all aspects of society.*

5. *Like many studies before it, EPA's recent report concerning environmental tobacco smoke allows political objectives to guide scientific research.*

6. *Proposals that seek to improve indoor air quality by singling out tobacco smoke only enable bad science to become a poor excuse for enacting new laws and jeopardizing individual liberties.*

Bad, bad science. You can practically see the fingers wagging. Scientists had been bad boys; it was time for them to behave themselves. The tobacco industry would be the daddy who made sure they did. It wasn't just money at stake; it was individual *liberty*. Today, smoking, tomorrow . . . who knew? By protecting smoking, we protected freedom.

As we saw in chapter 3, science really *was* manipulated for political purposes in the case of acid rain, but not by the scientists who had done the research. It was Bill Nierenberg who changed the Executive Summary of the Acid Rain Peer Review Panel, not the EPA, which played no role in the Acid Rain Peer Review. Still, if the best defense is a good offense, the tobacco industry now took the offensive. To anyone who understood the science, their actions were pretty darn offensive, indeed.

Bad Science was divided into six chapters, each one beginning with a list of sound bites entitled "What others are saying." On page 1 an economics professor was quoted: "Crises can be exploited by organized groups to justify government action . . . If a real crisis is not available, an artificial crisis . . . will serve just as well." The professor was Dwight Lee, the paid consultant working alongside Fred Singer, via APCO, for Philip Morris. Another quote claimed that undue regulation cost a family of four $1,800 per year. What was that claim based on? No one knew, because *Bad Science* contained no primary sources or annotations. Nearly all the quotes were assertions presented as facts. "Costly solutions are . . . enacted into law . . . before they are scientifically justified," said one. "Publicly funded scientists may be playing fast and loose with the facts for political reasons," said another. "Many environmental zealots in and out of government . . . have

proved themselves quite willing to bend science to the service of their political . . . goals." And so on.

If the quotable quotes were assertions without evidence, so too were many of the articles, often taken from the *Wall Street Journal* and *Investor's Business Daily*, and written by individuals with long histories of defending risky industrial products. Michael Fumento, for example, a syndicated columnist for Scripps Howard papers and a longtime defender of pesticides, asked, "Are Pesticides Really So Bad?" in *Investor's Business Daily*. (Fumento was later fired from Scripps Howard for failing to disclose receiving $60,000 from Monsanto, a chemical corporation whose work he covered in his columns.)[43] "Frontline Perpetuates Pesticide Myth," "Earth Summit Will Shackle the Planet, Not Save It," and other articles from the *Wall Street Journal* variously attacked efforts to control pesticides, stop global warming, and limit the risks of asbestos. A *St. Louis Post-Dispatch* headline declared, SCIENTISTS RIPPED AS ALARMISTS IN ECOLOGY WARNING above an article quoting Candace Crandall—Singer's wife.

If *Bad Science* often quoted "experts" who were paid consultants to regulated industries, sometimes it followed a more sophisticated strategy: reminding readers of the fallibility of science. Reprints from respected media outlets provided well-documented examples of scientific error and malfeasance. "The Science Mob," from the *New Republic*, recounted the David Baltimore case, where a postdoctoral fellow in Baltimore's lab falsified experimental results, and the scientific establishment closed ranks to defend Baltimore—a giant in his field—rather than support the whistleblower who exposed it. Other pieces discussed bias and distortion in medical research caused by industrial financing (the irony of this was unremarked). Several pieces from the *New York Times* focused on the limits of animal studies, while a special issue of *Time*, "Science under Siege," described growing public distrust of science in the face of mistakes like the premature announcement of cold fusion and mismanagement of the Hubble telescope.[44] Collectively, the articles created an impression of science rife with exaggeration, mismanagement, bias, and fraud.

The strategy was nothing if not clever, for these articles were based on real events and real concerns within the scientific community. David Baltimore did dismiss evidence of malfeasance in his lab, animal studies do have serious limits, and science has been corrupted by industry funding. Yet not a single piece reported an actual study demonstrating that these problems were widespread—or any more widespread than in any other place where politics and business intersect. More to the point, not one of

these studies showed that assertions of an environmental hazard had later been proven wrong. In fact, no scientific results were *corrected* by any of these articles, because the point wasn't to correct particular scientific mistakes. It was to provide the reader with materials to challenge science in general, as a means to challenge science on any topic. And the topic at issue was secondhand smoke.

Message #3 from *Bad Science* declared, "No agency is more guilty of adjusting science to support preconceived public policy prescriptions than the Environmental Protection Agency." The resource book outlined in chapter and verse the tobacco industry's complaint about EPA on ETS: that their conclusions were politically motivated, that they were based on inadequate science, that the EPA had no right to accept the 90 percent confidence level, and so on. "The EPA report has been widely criticized within the scientific community," the book proclaimed, but in truth very few scientists had criticized the EPA report, except ones linked to the tobacco industry. This was the *Bad Science* strategy in a nutshell: plant complaints in op-ed pieces, in letters to the editor, and in articles in mainstream journals to whom you'd supplied the "facts," and then quote them as if they really were facts. Quote, in fact, yourself. A perfect rhetorical circle. A mass media echo chamber of your own construction.

The phrases "excessive regulation," "over-regulation," and "unnecessary regulation" were liberally sprinkled throughout the book. Many of the quotable quotes came from the Competitive Enterprise Institute (CEI), a think tank promoting "free enterprise and limited government" and dedicated to the conviction that the "best solutions come from people making their own choices in a free marketplace, rather than government intervention."[45] The Institute's "Science Policy Clips and Highlights" compiled articles by Institute staff that had been published in mass media venues such as the *Washington Times*, the *St. Louis Post-Dispatch*, *Reason*, *Advertising Age*, and *Insight*. The CEI compilation for January 1993 through April 1994 included "EPA's Bad Science Mars ETS Report," "EPA and the Pesticide Problem," "When Chemophobia Ruled the Land," and "Safety Is a Relative Thing for Cars: Why Not Cigarettes?"[46]

In short, *Bad Science* was a compendium of attacks on science, published in places like the *Washington Times*, and written by staff of the Competitive Enterprise Institute. The articles weren't written by scientists and they didn't appear in peer-reviewed scientific journals. Rather, they appeared in media venues whose readers would be sympathetic to the Competitive Enterprise Institute's laissez-faire ideology.

And that was precisely the point. The goal wasn't to correct scientific mistakes and place regulation on a better footing. It was to undermine regulation by challenging the scientific foundation on which it would be built. It was to pretend that you wanted sound science when really you wanted no science at all—or at least no science that got in your way.

Bad Science lambasted the EPA for not "seek[ing] out the nation's leading scientists [to] conduct a peer-reviewed study" on ETS, but the EPA *had* sought leading scientists and their work *had* been peer-reviewed. Had the EPA commissioned a brand new study, the industry would no doubt have attacked them for wasting taxpayer money on superfluous work. But that was precisely the point: to attack the EPA, because it was just about impossible to defend secondhand smoke any other way. At least, this was what Philip Morris had concluded.

Blaming the Messenger: The Industry Attack on the EPA

Craig Fuller was a former chief of staff to Vice President George H. W. Bush; in 1993 he also worked with Ellen Merlo to defend ETS by attacking the EPA. Desperate times called for desperate measures, and the industry now appeared desperate indeed. In July, Fuller paid $200,000 to a group called Federal Focus, Inc., run by James Tozzi.[47] Tozzi had been an administrator at the Office of Management and Budget in the Reagan administration, and was well-known among public health officials for his resistance to the scientific evidence that aspirin causes Reye's syndrome in children. (Critics charged him with perfecting the strategy of "paralysis by analysis": insisting on more, and more, and more, data in order to avoid doing anything.)[48] After reading Seitz's report on ETS, Tozzi suggested that Federal Focus could channel money to the Marshall Institute for further work on ETS. The Marshall Institute would be good for this, Tozzi suggested, because of its lack of obvious links to Philip Morris: "Possibly PM [Philip Morris] could provide funding, through Federal Focus, to the George C. Marshall Institute . . . they could address the ETS conclusion . . . I think the Marshall Institute will have considerable credibility since it does not take funding from private companies nor the government. It is funded solely through foundations such as Federal Focus . . ."[49]

When *Investor's Business Daily* ran a front-page article favorable to the tobacco industry, Fuller sent a memo to his team saying, "[It] ought to be mailed to every one of our allies and any opinion leaders we can get it to as

quickly as possible. It offers a comprehensive review that is among the best I've seen." But this was no coincidence, as Fuller acknowledged, no doubt grinning as he wrote: "(And, I know that it's no coincidence . . . it is very fine work!)" On the bottom of the memo he added in pencil: "This is Tom Borelli's work."[50] (Borelli was Philip Morris's manager of Corporate Scientific Affairs.)[51]

As we saw in chapter 1, the tobacco industry had long tried to make its case for "balance" to writers, editors, and radio and television producers. Now they targeted particular journalists of a "revisionist ilk," whom they considered susceptible to the suggestion that environmentalism had run amok. These included Nicholas Wade, science editor of the *New York Times*, P. J. O'Rourke at *Rolling Stone*, and Gregg Easterbrook, a frequent writer for the *New Republic*. (Wade was the coauthor of a 1983 book, *Betrayers of the Truth*, which asserted that fraud and deceit were endemic to science; the industry saw him as a potential ally, carefully tracking his work and places where he was quoted. Easterbrook we shall meet again in chapter 6.) Other targets for influence were the First Amendment Center, "a media peer group that is respected and has the capability of changing reporters' attitudes on issues on a wholesale basis"; the national meeting of mayors conference and the mayors' regional meetings, who would be approached through the issue of unfunded mandates; and proindustry groups such as the Institute for Regulatory Policy and Citizens for a Sensible Environment.[52] Later the industry would also enlist Rush Limbaugh.[53]

Most of the science upon which the EPA relied was independent—it came from academic researchers and other federal agencies, such as the National Institutes of Health, the Food and Drug Administration, and the Department of the Interior—so attacks on the EPA as a corrupt bureaucracy wouldn't work alone; they'd have to be coupled with attacks on the science itself. "Without a major, concentrated effort to expose the scientific weaknesses of the EPA case, without an effort to build considerable reasonable doubt . . . then virtually all other efforts . . . will be significantly diminished in effectiveness," ran a memo from Philip Morris communications director, Victor Han, to Ellen Merlo.

The EPA was "an agency that is at least misguided and aggressive, at worst corrupt and controlled by environmental terrorists," Han asserted.[54] Since few people were sympathetic to secondhand smoke, attacking the EPA offered "one of the few avenues for inroads." The industry would abandon its defensive posture—defending smokers' right to smoke—and argue instead that "over-regulation" was leading to "out-of-control expenditures of

taxpayer money."[55] Much of this would be done through a newsletter called EPA Watch—an "asset" created by Philip Morris through the public relations firm APCO.[56]

Han concluded, "The clock is ticking."[57] This is where EPA Watch came in, as Han, Merlo, Fuller, and their associates developed "a plan for EPA Watch," and to use a man named Bonner Cohen as an "expert on EPA matters." Cohen was associated with the Committee for a Constructive Tomorrow—a Cornucopian group committed to harnessing "the power of the market combined with the applications of safe technologies . . . [to address] the world's pressing concerns." Cohen had written extensively for the *Wall Street Journal*, *Forbes*, *Investor's Business Daily*, *National Review*, and the *Washington Times*.[58] Merlo and Fuller's group resolved to do "whatever can be done to increase his visibility and credibility on matters dealing with the EPA."[59]

No one in 1993 would have argued that the EPA was a perfect agency, or that there weren't some regulations that needed to be revamped; even its supporters had said as much. But the tobacco industry didn't want to make the EPA work better and more sensibly; they wanted to bring it down. "The credibility of EPA is defeatable," Victor Han concluded, "but not on the basis of ETS alone. It must be part of a larger mosaic that concentrates all of the EPA's enemies against it at one time."[60] That mosaic would soon be created.

"Junk science" quickly became the tag line of Steven J. Milloy and a group called TASSC—The Advancement of Sound Science Coalition—whose strategy was not to advance science, but to discredit it. Milloy—who later became a commentator for Fox News—was affiliated with the Cato Institute and had previously been a lobbyist at Multinational Business Services (MBS)—a firm hired by Philip Morris in the early 1990s to assist in the defense of secondhand smoke.[61] (Milloy's supervisor at MBS had been James Tozzi.)

TASCC was launched by APCO Associates, in November 1993, with measures taken to hide the Philip Morris connection.[62] APCO was enlisted because Philip Morris's main PR agency, Burson-Marsteller, was too obviously associated with the tobacco giant.[63] John Boltz, a manager of media affairs at Philip Morris, supplied APCO with a list of sympathetic reporters, but APCO, not Boltz, placed the calls to "remove any possible link to PM [Philip Morris]."[64] The launch would be focused on "receptive" secondary markets, rather than in conventionally attractive cities for PR

like New York and Washington, "to avoid cynical reporters from major media" who might be inclined to dig.[65]

Philip Morris executive John C. Lenzi summarized for Ellen Merlo how TASSC had "launched itself" with the help of selected media and sympathetic scientists. "As you know, The Advancement of Sound Science Coalition (TASSC) publicly launched itself . . . with a national, five-city media tour . . . Rather than do a press conference at each site . . . TASSC elected to conduct one-on-ones with interested media . . . This appears to have worked well, particularly when combined with TASSC's effort to highlight a regional 'bad science' problem of interest, and appear with a known and respected member of the local scientific community who is also a member of TASSC . . . In total TASSC created coverage that potentially reached approximately 3 million people."[66]

The launch was particularly successful in Albuquerque. Former New Mexico governor Garrey Carruthers, now TASSC's honorary chairman, was the keynote speaker at the American Farm Bureau Federation state convention in New Mexico; Carruthers used the occasion to introduce "TASSC, its goals, and its objectives." In Denver, the launch was featured in the *Post* and *Denver Business Journal*, and on three radio programs; in San Diego, in the *Union Tribune* and *Daily Transcript*; in Dallas, in various newspapers, radio stations, and at least one television network. Lenzi boasted to Merlo that the people reached included "more than 350,000 by television, 850,000 by radio and more than 1.7 million by print." The launch was deemed sufficiently successful that they budgeted over $500,000 for TASSC efforts in 1994.[67]

Scientific advisors to TASSC included Fred Singer, Fred Seitz, and Michael Fumento—names familiar from both *Bad Science* and from earlier arguments over tobacco, acid rain, and ozone. Richard Lindzen, a distinguished meteorologist at MIT who was a major global warming skeptic and industry expert witness, was also invited to join.[68] The goal, as Craig Fuller put it, was to mobilize as many "third party allies" as possible.[69]

Meanwhile, Milloy wrote articles for the *Wall Street Journal*, the *Washington Times*, and *Investor's Business Daily*, and created a Web site, JunkScience .com, that freely attacked science related to health and environmental issues. It didn't matter who had done the work—the EPA, the World Health Organization, the U.S. National Academy of Sciences, or distinguished scientists at private universities. If the results challenged the safety of a commercial product, Milloy attacked them.

TASSC also ran ads in commercial and campus newspapers across the country, and developed potential congressional testimony on "public health priorities."[70] They also created a "Sound Science in Journalism Award," first granted to *New York Times* reporter Gina Kolata, "who responsibly detailed . . . how science has been distorted and manipulated to fuel litigation" on silicone breast implants.[71] (Kolata has subsequently been heavily criticized by scientists, environmentalists, and her journalism colleagues for a persistent proindustry, protechnology bias, and an overt skepticism about environmental causes of cancer.)[72] Still, despite their managing to place their views in so many media outlets—and even finding a voice through Kolata at the *New York Times*—TASSC faced an uphill battle, as the American people were increasingly turning against smoking, and industry attacks over arcane scientific issues like confidence limits got scant traction. So the industry now launched a flank attack through yet another think tank, this one called the Alexis de Tocqueville Institution.

In the mid-1990s, the Tobacco Institute identified Alexis de Tocqueville as one of many organizations that it would support in its effort to fight higher tobacco taxes; and members of Tocqueville's advisory board—among them Dwight Lee and Fred Singer—had links to the tobacco industry.[73] One industry document described the connection this way: "TI's chief economist works closely with leading figures at the Alexis de Tocqueville Institution (AdTI). Some member companies [also] support the organization. Opinions expressed and promoted by AdTI frequently support industry arguments on economic and other matters."[74]

Officially the mission of the Alexis de Tocqueville Institution is to promote democracy; in 1993 the Institution decided to promote democracy by defending secondhand smoke. "EPA and the Science of Environmental Tobacco Smoke" was written by Fred Singer and Kent Jeffreys.[75] The Tocqueville Institution had anointed Jeffreys with the title of "adjunct scholar," but he was in fact a lawyer affiliated with the Cato Institute, the Competitive Enterprise Institute, and the Republican Party. He was well-known for his attacks on Superfund—the federal fund designed to pay for the cleanup of toxic waste sites—and for his advocacy of "free-market environmentalism." One of his slogans was "behind every tree should stand a private . . . owner." To prevent overfishing, Jeffreys wanted to privatize the oceans.[76]

The defense of secondhand smoke was part of a larger report criticizing the EPA over radon, pesticides, and the Superfund, but the center of it—and the focus of the accompanying press releases—was what Singer and Jeffreys called "Case Study No. 1: Environmental Tobacco Smoke." It be-

gan by accusing the federal government of seeking a ban on smoking—although there was no pending legislation to do so—and asserting that the vehicle of the alleged ban would be the EPA. But the EPA had not asked for a ban, so how did Singer and Jeffreys build their case? By asserting that "scientific standards were seriously violated in order to produce a report to ban smoking in public settings."[77] What was the alleged violation? The EPA panel had assumed a linear dose-response curve. They had assumed the risk was directly proportional to the exposure.

Singer and Jeffreys argued that the EPA should have assumed a "threshold effect"—that doses below a certain level would have no effect. Citing the old adage "the dose makes the poison," they insisted that there might be a threshold value below which no harm occurred. Since the EPA had failed to provide proof that this wasn't so, the linear-dose response assumption was "flawed."[78]

A memo from the Tobacco Institute to the members of its Executive Committee in August 1994 described the report's release at a press conference held by two members of Congress—Peter Geren, Democrat from Texas, and John Mica, Republican from Florida—joined by the executive director of the Alexis de Tocqueville Institution and "co-authors Dr. S. Fred Singer and Kent Jeffreys." Singer stressed how money was being wasted on "phantom" environmental problems; Jeffreys focused on the Clinton administration's "lying to or withholding information" from Congress, implying the EPA was doing the same. He concluded by invoking the hobgoblin of absolute proof: "I can't prove that ETS is not a risk of lung cancer, but EPA can't prove that it is."[79]

Were any of these charges true? Should the EPA have insisted on 95 percent confidence limits? Should they have used a threshold? Were scientific standards violated? Was this bad science? And how's an ordinary person to judge?

Scientists are confident they know bad science when they see it. It's science that is obviously fraudulent—when data have been invented, fudged, or manipulated. Bad science is where data have been cherry-picked—when some data have been deliberately left out—or it's impossible for the reader to understand the steps that were taken to produce or analyze the data. It is a set of claims that can't be tested, claims that are based on samples that are too small, and claims that don't follow from the evidence provided. And science is bad—or at least weak—when proponents of a position jump to conclusions on insufficient or inconsistent data. (As we saw in chapter 4, Sherwood Rowland had used his AAAS presidential lecture

to show how Dixy Lee Ray, Fred Seitz, and Fred Singer had relied on bad science to challenge ozone depletion; they had made demonstrably false assertions and ignored widely available, published evidence.) But while these scientific criteria may be clear in principle, knowing when they apply in practice is a judgment call. For this scientists rely on peer review. Peer review is a topic that is impossible to make sexy, but it's crucial to understand, because it is what makes science science—and not just a form of *opinion.*

The idea is simple: no scientific claim can be considered legitimate until it has undergone critical scrutiny by other experts. At minimum, peer reviewers look for obvious mistakes in data gathering, analysis, and interpretation. Usually they go further, addressing the quality and quantity of data, the reasoning linking the evidence to its interpretation, the mathematical formulae or computer simulations used to analyze and interpret the data, and even the prior reputation of the claimant. (If the person is thought to do sloppy work, or has previously been involved in spurious claims, he or she can expect to attract tougher scrutiny.)

Scientific journals submit all papers to peer review. Typically three experts are asked to comment. If the reviewers are very divided, the editor may seek additional voices, and he may weigh in his judgment as well. Many papers go through two or more rounds, as authors try to correct mistakes and address concerns raised by the reviewers. If they fail, the paper will be rejected, and the authors go back to the drawing board—or try another, less prestigious, journal. Conferences are usually less strict, which is why conference papers are generally not considered serious—and generally do not count in academic circles for promotion and tenure—until published in peer-reviewed journals. (This is also why the industry could exploit an apparent loophole by sponsoring their own conferences and publishing their proceedings.) The reviewers must also be real experts—they must know enough to be able to judge the methods used and the claims made—and they must not have a close relationship, either personal or professional, with the person whose work is being judged. Editors spend considerable time finding people who meet these criteria. And this is all done for free. Scientists review papers as part of a communal system in which everyone is expected to review other people's papers, with the understanding that others will in turn review theirs.

The EPA report on passive smoking was reviewed not just by three experts, but by an entire panel commissioned by the EPA's Science Advisory Board: nine experts and nine consultants, aided by staff members from

the Advisory Board.[80] Unlike Singer (a physicist), Jeffreys (a lawyer), and Milloy (a lobbyist), these were true experts: a professor of medicine at Yale University; a senior staff scientist at the Lawrence Berkeley Laboratory; the chief of Air and Industrial Hygiene for the California Department of Health, and six others, all medical doctors or Ph.D. scientists. And they reviewed it not once, but twice. What did these experts have to say about the EPA's report? "The Committee concurs with the judgment of EPA that environmental tobacco smoke should be classified as a Class A carcinogen."[81]

Typically, reviewers are skeptics. They challenge scientists on the claims they make, often demanding more evidence, more clarification, more persuasive arguments. The reviewers of the draft EPA report did request more discussion of certain matters: the uncertainties and confounding effects, the limits of using spousal exposure as a surrogate for total ETS exposure, and the recent work on ETS and respiratory disorders in children. But they did so not because they thought the report had overstated the case. On the contrary, their major concern was that the report had *understated* the risks. Its conclusions were not too strong, but too weak.

The major issue involved the epidemiological data. Ill effects of chemicals in the environment are detected through epidemiology: statistical studies of affected populations. If a chemical is very toxic, or exposures are very high, then ill effects are easy to detect: lots of people get sick, far more than you'd otherwise expect for a population group of that type. But if the chemical is only mildly harmful, or exposures are low, then the task is much harder. Only a few people get sick, and it's hard to say for sure that the observed effect isn't just random variation.

How do you judge epidemiological evidence when there's only a modest effect? You judge it in light of what else you know about the issue. If strong epidemiology is a red flag, then weak epidemiology is a pink one. Imagine placing both against a wall: a white one if you know nothing else (a blank slate, if you will), a black one if you already have good reason to think there's a problem. If the wall is white, the pink flag barely shows up, but if it's black, then you've got no problem seeing that flag. ETS was a pink flag against a black wall.

Here's why. Secondhand smoke is quickly diluted in the air, so most people's exposures are low, and epidemiology is a weak tool with which to detect effects: a pink flag. But scientists already knew that active smoking causes cancer, and that passive smoking introduces the same toxins into the lungs. That was the black wall.[82] The reviewers put it this way: "The causality of the connection between direct inhalation of tobacco smoke

and excess risk of lung cancer cannot be in doubt . . . and ETS resembles mainstream tobacco smoke in terms of particle size distribution and composition of carcinogens, co-carcinogens, and tumor producers."[83] So even if the statistical effects were modest, there was good reason to believe that they were real. The reviewers wanted the EPA panel to make this explicit, "with each step in the argument . . . carefully addressed."[84]

The reviewers especially found the report too weak on its discussion of the impact of ETS on children. They "found the evidence for respiratory health effects in children to be stronger and more persuasive" than stated, and suggested that the panel consider the possibility that "the impact of ETS on respiratory effects in children may have much greater public health significance than the impact of ETS on lung cancer in nonsmokers."[85] In other words, while 3,000 additional adult lung cancer deaths per year was a serious public health concern, 150,000 to 300,000 cases of bronchitis and pneumonia in infants and young children was even worse.

The panel revised their report in light of the peer review, and five months later it was reviewed a second time. The panel found the overall assessment of risk to children to be still "on the conservative side."[86] On the central question of labeling ETS as a class A carcinogen, "the Committee was unanimous in endorsing this classification."[87]

Here's what the reviewers did *not* criticize: They did not reject the use of spousal smoking as surrogate for exposure or the studies from other countries, which they considered appropriately included as part of the "totality of evidence." They did not criticize the 90 percent confidence limit or the linear dose-response model. And they did not suggest that EPA should have presumed a threshold effect. On the contrary, they noted the "clear dose-related association of lung cancer risk with exposure to [mainstream] smoke," accepting that a similar relationship would likely apply to sidestream smoke.[88]

Why didn't the peer reviewers address the issue of confidence limits? This was a major point of Singer and Jeffrey's contention, so we might expect the peer reviewers to have at least mentioned it. The answer is simple. There's nothing magic about 95 percent. It could be 80 percent. It could be 51 percent. In Vegas if you play a game with 51 percent odds in your favor, you'll still come out ahead if you play long enough.

The 95 percent confidence level is a social convention, a value judgment. And the value it reflects is one that says that the worst mistake a scientist can make is to fool herself: to think an effect is real when it is not. Statisticians call this a type 1 error. You can think of it as being gullible,

naïve, or having undue faith in your own ideas.[89] To avoid it, scientists place the burden of proof on the person claiming a cause and effect. But there's another kind of error—type 2—where you miss effects that are really there. You can think of that as being excessively skeptical or overly cautious. Conventional statistics is set up to be skeptical and avoid type 1 errors. The 95 percent confidence standard means that there is only 1 chance in 20 that you believe something that isn't true. That is a very high bar. It reflects a scientific worldview in which skepticism is a virtue, credulity is not.[90] As one Web site puts it, "A type I error is often considered to be more serious, and therefore more important to avoid, than a type II error."[91] In fact, some statisticians claim that type 2 errors aren't really errors at all, just missed opportunities.[92]

Is a type 1 error more serious than a type 2? Maybe yes, maybe no. It depends on your point of view. The fear of type 1 errors asks us to play dumb. That makes sense when we really *don't* know what's going on in the world—as in the early stages of a scientific investigation. This preference also makes sense in a court of law, where we presume innocence to protect citizens from oppressive governments and overzealous prosecutors. However, when applied to evaluating environmental hazards, the fear of gullibility can make us excessively skeptical and insufficiently cautious. It places the burden of proof on the *victim*—rather than, for example, the manufacturer of a harmful product—and we may fail to protect some people who are really getting hurt.[93]

And what if we aren't dumb? What if we already have strong, independent evidence to support a cause-and-effect relationship? Let's say you know *how* a particular chemical is harmful, for example, that it has been shown to interfere with cell function in laboratory mice. Then you might argue that it is reasonable to accept a lower statistical threshold when examining effects in people, because you already have good reason to believe that the observed effect is not just chance. This is exactly what the ETS reviewers did argue. Even if 90 percent is less stringent than 95 percent, it still means that there is a 9 in 10 chance that the observed results did not occur by chance. Think of it this way. If you were nine-tenths sure about a crossword puzzle answer, wouldn't you write it in?[94]

"The extent of the consistency defies attribution to chance," the EPA stressed when the final report was released.[95] Consistency—not any arbitrary significance level—is the real gold standard of scientific evidence, and this was the key point that Singer and Jeffreys had obfuscated. It was true that some of the included studies were small, and alone could not

prove a causal connection, but when you looked at *all* the studies, you found that twenty-four of thirty showed increased risk associated with increased exposure—and the odds of that happening by chance were less than 1 in 1,000.

What about the threshold effect? Why didn't this come up in the peer review, either? The answer here is simple, too: the reviewers did not need to comment because the panel had followed EPA guidelines.[96] One chemist who has worked closely with the EPA for decades put it this way. "Linear dose-response is the 'official' EPA default [position]. If there is sufficient evidence for a non-linear mode of action then that is used. Otherwise, it is linear."[97]

This is true, but it isn't just EPA guidelines; it's normal scientific practice, too. The logic is twofold. One reason derives from centuries of scientific practice and the principle known as Ockham's razor. Use the simplest theory that accounts for the evidence. Just as a well-designed machine has no unnecessary parts, a well-designed theory does not introduce additional assumptions that are not supported by evidence. If you have evidence for complications like threshold effects at low doses (or amplifying effects at high doses) then of course you pay attention, but absent evidence you don't make complications up.

The second reason is just common sense. If something is harmful, then more exposure means more risk. At least, that is what one would expect. However, not all poisons work this way. Some do show threshold effects: up to a point, your body can deal with it. Certain substances, including some vitamins and minerals, are poisonous at high doses but actually helpful or even essential at low ones. This effect has a scientific name: hormesis.[98] But as a rule of thumb, if a little of something is known to be bad, a lot is probably worse, and if a lot of something is known to be bad, then a little is probably not great either. And while Ronald Reagan infamously claimed that ketchup was a vegetable, no one, not even Fred Singer, would claim that cigarette smoke was a vitamin.

How did the EPA defend itself against these attacks? In normal scientific practice, the mere fact of withstanding peer review is the first line of defense, but Singer and Jeffreys had misrepresented the peer review process, claiming that the EPA report had been widely criticized in the scientific community, ignoring that the report had not only been unanimously endorsed by the independent experts, but that those experts had encouraged EPA to make it *stronger*. So the EPA established a Web site: Setting

the Record Straight: Secondhand Smoke is a Preventable Health Risk. The site said everything that needed to be said, so it's worth quoting in full:

> A recent high profile advertising and public relations campaign by the tobacco industry may confuse the American public about the risks of secondhand smoke. EPA believes it's time to set the record straight about an indisputable fact: secondhand smoke is a real and preventable health risk.
>
> EPA absolutely stands by its scientific and well documented report. The report was the subject of an extensive open review . . . by EPA's Science Advisory Board (SAB), a panel of independent scientific experts. Virtually every one of the arguments about lung cancer advanced by the tobacco industry and its consultants was addressed by the SAB. The panel concurred in the methodology and unanimously endorsed the conclusions of the final report. The report has also been endorsed by the U.S. Department of Health and Human Services, the National Cancer Institute, the Surgeon General, and many major health organizations.

The criticism had come not from the scientific community, but from the tobacco industry and groups and individuals funded by it. The peer review panel endorsed the EPA conclusions, and so had every other relevant major agency and organization. As for the 90 percent confidence limit, this was "a standard and appropriate statistical procedure" given the prior evidence, and had been used in many other EPA cancer risk assessments when there was similarly strong prior evidence; there was nothing special or irregular about how the EPA had treated secondhand smoke. Moreover, in the portions of the report dealing with other respiratory effects, where there wasn't as much prior evidence, 95 percent confidence intervals *were* used.

Singer and Jeffreys had focused their attention on cancer risk, but the bombshell of the report was the danger to children. "The tobacco industry neither acknowledges nor disputes EPA's conclusions on respiratory effects on children. It focuses instead on EPA's findings on lung cancer," the EPA noted. This silence was telling, as both the peer review panel and the secretary of Health and Human Services highlighted the impact on children as the most important finding—as no doubt most of the public would, too. It was one thing for adults to choose to take risks, another thing to impose those risks on children (or anyone else). The EPA wisely

refocused attention on this crucial distinction: "Having a choice to take a risk for themselves should not permit smokers to impose a risk on others."[99] This was the crux of the issue. But we've found no evidence that the mass media paid any attention to the EPA Web site. And what impact *could* a lonely Web site have against a multimillion-dollar disinformation campaign?

The EPA made clear that the fuss about confidence limits was a red herring, but what about the threshold issue? Was there any substance to Singer's insistence that there might be a threshold effect for secondhand smoke? The EPA's answer was simple: "There is no evidence that this threshold exists."[100] So where did Singer get the idea from? Did he just make it up? Should the EPA have considered the threshold effect in analyzing smoking?

In the report with Jeffreys, Singer was promulgating an old adage: that the dose makes the poison. Where did that come from, anyway? The answer is Paracelsus, a Renaissance medic who died in 1541. Singer and Jeffreys were challenging the EPA with a five-hundred-year-old aphorism.[101] While it's possible that Singer was reading Latin medical texts, it seems more likely that he got the argument from a contemporary debate about radioactivity.

Many Japanese citizens exposed to the devastation of the atomic bomb developed cancer in later years—many, but not all. What protected the resistant survivors? Some scientists argued for a threshold effect: that up to a certain point, radiation does not cause cancer. People who were far enough away from the blast, or protected by thick walls or metal plates, might have received exposures below the level required to cause cancer.

This was a reasonable argument, because radiation is a natural phenomenon to which we are all exposed every day. Many ordinary elements, including carbon, potassium, and uranium, have naturally occurring radioactive varieties, found in rocks, minerals, soils, and even in the air. Cosmic rays from outer space add a bit more to this "natural background" radiation. While the natural background varies from place to place, it's always present, so it stands to reason that living creatures might be used to it. Having evolved on a planet that has always had background radiation, we may have evolved natural defenses against it. So the concept of a permissible, safe, or "threshold" dose gained currency, and this was used to set standards in industries where workers were exposed to radiation, such as uranium mining and nuclear power generation.

Some people went even further, arguing for radiation hormesis—that

small doses of radiation were actually good for you. One of these people was Chauncey Starr, the physicist with the Electric Power Research Institute who we met in chapter 3 writing to George Keyworth and Bill Nierenberg to persuade them that "public anxiety" was being unnecessarily inflamed about acid rain.[102] (We will meet Starr again in chapter 6.)

By the 1970s, the threshold concept was being used by all sorts of people to defend all sorts of hazardous materials. This was illogical, because the threshold argument was about *natural* hazards—like background radiation and trace metals that occur in soils—but that didn't stop some people from using it to defend unnatural ones, too.

In 1973, Emil Mrak, a former chancellor of the University of California, Davis, was invited to the Philip Morris laboratories to speak about food safety. Mrak was dubious about the alleged dangers of DDT and other artificial pesticides, and he used the threshold argument to defend them. "Is there a level below which compounds have no effect?" he asked rhetorically, referring to chemicals in the environments suspected of causing cancer. Most cancer experts said no—meaning no, there wasn't evidence to support that claim, because if a chemical is hazardous at some dose, then the only dose that is guaranteed to produce no harm is no dose—but Mrak rejected this, arguing hyperbolically, "If this is the case, we can start right out by outlawing almost everything."[103] He ended his speech with the reductio ad absurdum that, if you didn't embrace the threshold concept, then you ended up concluding that "everything is harmful."[104]

Mrak was pulling a rhetorical switcheroo because it wasn't *environmentalists* who argued everything was harmful; it was the *tobacco industry*. The industry insisted that everything from crossing the street to riding a bicycle was harmful, so tobacco should be viewed as just one of the routine risks that people accept by living life. The menace of daily life, some industry apologists called it.[105] Life is dangerous. So is tobacco. Get used to it.

So the tobacco industry argued. But there's a world of difference between risks we choose to accept in exchange for rewards we want—like driving a car, drinking alcohol, or having unprotected sex—and having those risks imposed upon us against our will. There's also a world of difference between the idea that evolution has equipped humans with some immunity to natural hazards and the idea that we somehow have immunity to something we'd never been exposed to in two million years of evolution. The secondhand smoke debate was crucial precisely because the risk wasn't a choice and it wasn't natural. It was a man-made risk that was being imposed without consent.

The very fact that Singer was recycling arguments from earlier debates about nuclear power and pesticides—alongside Singer's previous activities to defend acid rain and CFCs—suggests that none of this was really about the science of secondhand smoke. Singer simply was not an expert on every one of these issues. Modern science is too complex and specialized for that.

For the tobacco industry, of course, the goal was to protect profits. Indeed, in 1995, Philip Morris reported record profits; *USA Today* reported that "the Marlboro Man continues to ride high."[106] Philip Morris was the highest-yielding stock on the Dow Jones Industrial Average that year, and *Money* magazine noted that while "uncertainties created . . . by smoking liability lawsuits" continued to keep a lid on stock values, "cigarette makers have never had a judgment go against them."[107] Philip Morris was determined to maintain that winning streak.[108]

But what about the scientists who helped their effort? What was this about for Fred Singer, Fred Seitz, and the other scientists who made common cause with the tobacco industry?

One answer has already emerged in our discussion of acid rain and ozone depletion: these scientists, and the think tanks that helped to promote their views, were implacably hostile to regulation. Regulation was the road to Socialism—the very thing the Cold War was fought to defeat. This hostility to regulation was part of a larger political ideology, stated explicitly in a document developed by a British organization called FOREST—Freedom Organisation for the Right to Enjoy Smoking Tobacco. And that was the ideology of the free market. It was free market fundamentalism.

Using Tobacco to Defend Free Enterprise

FOREST was a British group that purported to be a grassroots organization, defending the rights of smokers. In fact, it was the creation of the British Tobacco Advisory Council, an industry group that served much the same function in the United Kingdom as the Tobacco Institute did in the United States.[109] Its chair was Sir Christopher Foxley-Norris, a retired Royal Air Force commander (and confirmed smoker) who had fought in the Battle of Britain. One industry memo recounted in the late 1970s that Foxley-Norris had approached British tobacco executives about "adopting a more robust public stance" in the face of "increasing interference by Govern-

ment and other do-gooding bodies in many aspects of people's private lives."[110]

More than three thousand documents in the Tobacco Legacy Documents Library detail FOREST's activities.[111] FOREST organized campaigns to defend smoking, particularly in the workplace, and to challenge the scientific evidence that secondhand smoke was dangerous. They launched an attack on the London Science Museum for an exhibit on passive smoking that they labeled "junk science," and issued a "Good Smoker's Airline Guide" steering readers to smoke-friendly airlines and encouraging them to boycott British Airways for its smoking ban. In 1997, FOREST made plans for a pair of research conferences designed to convince business executives that "anti-smoking policies can have serious consequences for staff morale, commercial viability, and public relations."[112] They conducted campaigns to fight smoking bans in hotels and pubs, to challenge antismoking education in British schools, and to defend the rights of smokers to adopt children. FOREST also sought to fund research to highlight the social and economic costs of smoking restrictions and high tobacco taxes.[113]

A 1994 FOREST report entitled "Through the Smokescreen of Science: The Dangers of Politically Corrupted Science for Democratic Public Policy" claimed much the same thing as Fred Singer had: that science was being rigged to advance a political agenda. Whether or not that was true, this report made clear that the inverse was certainly true: science was being attacked to advance their agenda, the defense of free market capitalism.

The introduction to the report was written by Lord Harris of High Cross, the economist who ran the British Institute of Economic Affairs and who is widely considered the architect of Thatcherism. An avowed free market ideologue, Harris idolized Adam Smith; his nemesis was John Maynard Keynes. In one of her first appointments, Margaret Thatcher had made Harris a peer of the realm, but he allegedly declined a coat of arms on the grounds that the invisible hand could not be blazoned.[114]

The Lord Harris laid out the stakes on page 1. Public health officials were "puritan paternalists . . . who see other men's lives as the proper end product of their own activity." Antismoking scientists were perverting science "on the age-old pretext that the end, namely banning smoking, justifies any means, including . . . systematic selection or suppression of the evidence." But if their tactics were Communistic—with the ends justifying the means—they were also somehow Nazis, perpetrating "scientific deception worthy of the late Herr Goebbels."[115]

The crucial issue was freedom. "Non-smokers have as much to lose as smokers if they acquiesce in the prostitution of science . . . to justify . . . depriv[ing] free men and women of inexpedient freedoms," Lord Harris warned. "Smoking is only the first target. Beware!" The real aim was to control men's and women's lives. "There is little likelihood that we [will] end up being more healthy—only less free."[116] The same argument was reiterated in the body of the report, which repeatedly stressed that the defense of smoking was a defense of individual liberty. Smoking critics were health paternalists, moving toward the view that "the State is justified in attempting to manipulate and coerce."[117]

This was the ideological core. Indeed, Fred Singer had said virtually the same thing in his attack on the EPA: "If we do not carefully delineate the government's role in regulating [danger] . . . there is essentially no limit to how much government can ultimately control our lives."[118]

Perhaps a man like Foxley-Norris, a hero of the Battle of Britain, could be forgiven for worrying about the specter of totalitarianism. After all, the Nazis *had* been the first government to actively discourage smoking. But forty-nine years had passed since the end of World War II—and for Harris, Singer, and their friends in the Reagan and Thatcher administrations, men who fought not the Second World War but the first Cold War—the enemy was not Nazism but Communism. Anti-Communism had launched the weapons and rocketry programs that launched the careers of Singer, Seitz, and Nierenberg, and anti-Communism had underlain their politics since the days of *Sputnik*. Their defense of freedom was a defense against Soviet Communism. But somehow, somewhere, defending America against the Soviet threat had transmogrified into defending the tobacco industry against the U.S. Environmental Protection Agency.

We saw in chapter 2 how Russell Seitz, a cousin of Frederick Seitz, had been enlisted by the Marshall Institute to attack not only Carl Sagan but the entire scientific community over the issue of nuclear winter, and to insist that the United States could triumph in a nuclear exchange with the Soviet Union—and win the Cold War. In the mid-1990s, the younger Seitz took up the defense of secondhand smoke, and he did it in the fashion of a Cold Warrior, too.

Seitz was affiliated with the John M. Olin Institute for Strategic Studies at Harvard University, so why would a researcher at an Institute for Strategic Studies defend secondhand smoke? An answer is suggested by looking a bit more closely at the Olin affiliation. The Olin Institute was funded by the John M. Olin Foundation, which, like the Cato and the Competitive En-

terprise institutes, promoted free market ideas. (Its president was William Simon, secretary of treasury in the Nixon administration.)[119] The foundation had funded numerous conservative and Libertarian think tanks, including the American Enterprise Institute, the Heritage Foundation, the Hoover Institution, and, through the Olin Center, they funded Russell Seitz.[120]

In an article in *Forbes* magazine, Seitz argued that rather than trying to control smoking, the government should fund research into making a safe cigarette. After all, the government funded all kinds of other safety devices, many of dubious value, so why not put at least some money into creating a safe cigarette? "Vast sums have been spent to good effect on reducing auto emissions and on curing—as well as preventing—AIDS."[121] Why not do the same for cigarettes?

The real culprit in smoking, Seitz argued, was smoke, and this was "no more wanted by smokers than coffee grounds by cappuccino addicts or a hangover by drinkers of red wine." So Seitz suggested that the U.S. government should figure out how to remove the smoke from cigarettes. "Only one-tenth of one percent of a cigarette is nicotine, and it should not take a rocket scientist to devise a means to volatilizing that small drop of active ingredient without generating a thousand times its weight in burning leaves."[122] Seitz was proposing that the government should spend taxpayer money figuring out how to safely deliver nicotine—an addictive and toxic substance—to the American people.

This sort of exigent approach might make sense for methadone since it helps people get off heroin, whose dangers to individuals and society are both grave *and* immediate. But what public good would be served by the government deliberately enabling people to continue to smoke?

The answer was to preserve smokers' right to smoke, and Seitz suggested that smokers should use their liberty to insist on it. "The nation's 50 million smokers remain at liberty to vote *en bloc* for a fussbudget-free Congress. Are the polls ready to accommodate smokers?"

Liberty was of course a keyword of the Cold War. We were free; the Soviet people were not. We cherished liberty; they did not. We believed in liberty and justice for all, and we fought to defend it. When Lt. General Daniel O. Graham (who had served on Team B in the SDI debate) wrote to Bill Nierenberg in 1984 asking him to help Bob Jastrow defend SDI, Liberty—with a capital L—was his catchword, too. This was *their* chance, Graham argued, to recapitulate the work of the Founding Fathers and "secure the blessings of Liberty to ourselves and our posterity."[123]

Russell Seitz and the defenders of tobacco invoked liberty, too. But as

the philosopher Isaiah Berlin sagely pointed out, liberty for wolves means death to lambs.[124] Our society has always understood that freedoms are never absolute. This is what we mean by the rule of law. No one gets to do just whatever he feels like doing, whenever he feels like doing it. I don't have the right to yell fire in a crowded theater; your right to throw a punch ends at my nose. All freedoms have their limits, and none more obviously than the freedom to kill other people, either directly with guns and knives, or indirectly with dangerous goods. Secondhand smoke was an indirect danger that killed people.

The EPA was saying no more and no less than this. It was saying that protecting lambs required the government to control the wolves—and government control was what the Cold Warriors most feared. It was what they had spent their lives fighting.

Marxists were often criticized for believing that the ends justified the means, yet these old Cold Warriors were now the ones using ends to justify means—attacking science in the name of freedom. Suppressing evidence. Misrepresenting what their colleagues had done and said. Taking quotes out of context. Making allegations that were unsupported by evidence. One claim in particular was repeated several times in the FOREST report on secondhand smoke: that of a prominent epidemiologist who had allegedly said of the EPA work, "Yes it's rotten science, but it's in a worthy cause."[125] Did any one actually ever say that? Maybe yes, maybe no—there's no way to tell, because it was given without attribution. It's not the sort of thing that scientists typically say, but even if it were true, so what? It would just be the opinion of one man—and hardly evidence of a conspiracy to undermine the free market.

Like TASSC, FOREST's strategy was to insist that science was being used as a cover for an ideological program. The whole antismoking argument—with its "totalitarian flavour"—would be seen as transparently coercive, they insisted, were it not for the veneer of respectability provided by science. "In a world in which science is increasingly the source of both truth and value the scientific character of health paternalism is decisive," Lord Harris declaimed.[126] It was so decisive, in fact, that it had to be attacked. As the FOREST report put it, "Everything therefore depends on science. And with so much at stake, the pressure to adjust, shave, create, ignore, reevaluate, even manipulate, is enormous."[127] Indeed.

If a reader had any remaining doubt that the objective of FOREST was to undermine science as a "source of truth and value," he would only have needed to turn to the report's appendix, written by Professor Christie

Davies—a sociologist who wrote extensively for the *Daily Telegraph* and *Wall Street Journal* and compared cigarette smoking to drinking tea and eating chocolates.[128] British American Tobacco described him as "one of the most senior and well respected right-wing sociologists in the UK . . . A radical free marketer, he carries sound ideological baggage when it comes to issues of risk and personal freedom."[129]

Davies's appendix was a veritable tirade against "the state control of science." Old-timers would have recognized this as a reprisal of 1930s arguments against Marxist scientists, who were fairly widespread in Britain in those days, but how many British scientists were still Marxists in the 1990s? Not many, but still Davies went on, offering a manifesto for resisting "a system with a potential for repression now that is greater than it has ever been in the past. And this is far more dangerous than any form of tobacco smoking."[130]

FOREST made fact fighting into a cause célèbre: capitalism vs. Socialism, and the way science was (allegedly) being used to push the latter. "In a capitalist society individual economic pressure groups such as the tobacco industry do not have the same kind of power [as state bureaucrats and their scientific lackeys]. Rather power lies with a 'new class' of civil servants." It was class warfare, only the underclass was the tobacco industry.

The final flourish of the FOREST report was a bibliography of attacks on science—four pages on secondhand smoke and three more on "fraud, corruption and politicization" reminiscent of *Bad Science: A Resource Book*. Just about every potential threat to human or environmental health was included: acid rain, ozone depletion, and global warming (all fraudulent scares); pesticides, asbestos, chlorine, nuclear power, genetic engineering, biotechnology, and electromagnetic radiation from power lines (all harmless). Some surprising topics were included too: AIDS and the "myth" of heterosexual transmission, "allegedly disappearing species," forestry (an attack on environmental management), and food, drink, and lifestyle (defending the safety of alcohol and fatty foods—and straining credibility to its breaking point with a defense of British food). Sections were included on "science in general" and "environmentalism in general." Evidently, there wasn't a scientific or environmental claim that couldn't be attacked. Articles ranged from the plausible (Malcolm Gladwell on "Risk, Regulation and Biotechnology" in the *American Spectator*) to the ridiculous ("Is British food bad for you?"). It was all of a piece. If you believed in capitalism, you had to attack science, because science had revealed the hazards that capitalism had brought in its wake.

The biggest hazard of them all—one that could truly affect the entire planet—was just at that moment coming to public attention: global warming. Global warming would become the mother of all environmental issues, because it struck at the very root of economic activity: the use of energy. So perhaps not surprisingly, the same people who had questioned acid rain, doubted the ozone hole, and defended tobacco now attacked the scientific evidence of global warming.