

ing response, he falls back on the old Cold War standby of strategic ambiguity. This may have been the right way to deal with the Soviet Union. Stopping short of a firm threat to retaliate overwhelmingly to any aggression allowed the United States to avoid a commitment trap, while explicitly keeping all options open preserved deterrence. But it is not clear that strategic ambiguity makes sense for dealing with potential state sources of nuclear terror. In the aftermath of a nuclear attack, the first priority of the United States will be to prevent another strike. That will, in turn, require cooperation. Certainty that states will be spared the brunt of U.S. force—the opposite of ambiguity—may be essential for securing the sort of cooperation that is needed.

Ultimately, these are small flaws in a book that is engaging and illuminating and adds an important new dimension to our understanding of nuclear terrorism—and of nuclear terror. Our imaginations, as Jenkins surely knows, are essential for confronting the real threats of the future, including the threat of nuclear terrorism. But our imaginations can also get in our way. Writing about black markets, Jenkins notes that “Theoretically, there are several ways for terrorists to obtain [nuclear materials].” Wisely, he adds, “Theoretically, just about anything is possible.” The job of analysts is to keep our imaginations at once active and in check, to help policymakers and the public understand the nuclear threat without becoming overwhelmed and paralyzed by it. *Will Terrorists Go Nuclear?* shows how important that task is and how hard it is to do.

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Bent science

Bending Science: How Special Interests Corrupt Public Health Research

by Thomas O. McGarity and Wendy E. Wagner. Cambridge, MA: Harvard University Press, 2008, 400 pp.

Kenneth E. Warner

As Thomas McGarity and Wendy Wagner demonstrate quite vividly, advocates frequently distort policy-relevant health and environmental research—that is, bend science—in order to serve economic or ideological interests. This elaborate charade plays out in the halls of Congress, the regulatory arena, the courtroom, and the media. To some readers, including many scientists with no direct professional familiarity with the world of policy, the well-honed message of this book may be genuinely shocking. To scientists whose work may have intersected occasionally with the policy realm, the message will not surprise, but the pervasiveness of the phenomenon is likely to astonish, and worry.

The authors are well suited to their analysis. Professors of law at the University of Texas, both have focused much of their scholarship on environmental law and its implications for the nation's regulatory apparatus. Each has written previously about barriers to the sound use of science in policy decisionmaking. This book brings together various strands in their complementary scholarly careers, supplemented with substantial new research, in a comprehensive look at a subject of immense public importance and impact.

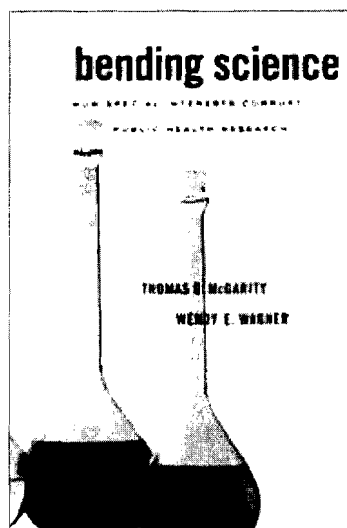
Early on, the authors explain the motivation of advocates who bend science. Organizations with economic or ideological interests to protect will seek

means of blocking, distorting, or subverting threatening science or means of attacking the bearer of the bad tidings, the scientists themselves. Benders include some industries (think Big Tobacco, Big Pharma, etc.); their representatives and surrogates (attorneys and sympathetic experts); politicians and bureaucrats; and even everyday citizens and their representative organizations. The authors also provide a look, via one anecdote after another, at the often horrific consequences of science bending, counted sometimes in thousands and even millions of lives lost prematurely; again, think Big Tobacco.

Such bending, the authors say, is facilitated by the fact that the conventional system of scientific checks and balances does not function well in the realm of policy-relevant science, where most scientists prefer not to mix it up with nonscientist advocates, bureaucrats, lawyers, and politicians. Bent science thus often goes unpoliced by the scientific community itself. The implication that science is well policed outside of the realm of policy may strike some readers as a bit naïve, but it is certainly true that the scientific process is more likely to ensure sound science when the principal rewards at stake are the advancement of knowledge and professional respect.

The substantive heart of the book focuses on the methods—what the authors correctly term “arts”—of bending science. First comes the creation of research to fit advocates' needs. Unlike the hypothesis-driven ideal of true science, this method of bending science begins with a desired outcome. Benders then develop studies intended to confirm the outcome. They may produce such research themselves or contract it out. An integral part of this strategy is the plan to publicize the anticipated results in the corridors of whatever (nonscientific) body the benders have

targeted: a regulatory agency, perhaps, or a legislative body or a court. The strategy includes a “plan B” to bury the results if, for whatever reason, they are not favorable to the desired outcome. But more often than not, the findings favor the benders’ interests. Even when industry funds investigator-initiated research, a clear impact on the direction of findings emerges. Multiple studies, in multiple areas of industrial endeavor, have found that industry-funded studies are far more likely to produce findings consistent with the funders’ economic interests than are studies supported by non-industry sources.



Plan B relates to the second art: the practice of concealing information that is disadvantageous to advocates’ interests. Many examples of drug companies having withheld information on adverse side effects of their products are well known. But the authors also describe a number of less familiar though equally compelling cases, such as the cluster of workers at a popcorn plant who contracted a rare disease, dubbed “popcorn lung,” despite the existence of evidence, known to management, that

exposure to diacetyl, used to provide the artificial butter taste in microwave popcorn, caused the disease in laboratory animals. As the authors document, the incentives to conceal deleterious information are financially profound, and the penalties, in those relatively rare instances in which concealment is revealed and then penalized, are typically so modest as to heavily skew the cost/benefit calculation in favor of concealment.

Another method common among benders is to attack the scientific credibility of policy-relevant research. Frequently, the advocates resist the temptation to do this themselves. Rather, they use hired guns, themselves credentialed members of the academy, who in exchange for monetary payment label the research in question “unscientific,” “fatally flawed,” or even the ultimate pejorative: “junk science.”

Then there is what the authors call “the art of bullying scientists who produce damaging research.” This is the set of practices used to encourage scientists, whose work threatens an economic interest or an ideology, to pursue other lines of research, if not work. At a minimum, it is intended to interrupt their research with time-consuming harassment. Harassment can include flooding researchers with demands for detailed data, correspondence on research, and the like, through Freedom of Information Act requests to their institutions. Advocates can orchestrate legislative hearings at which legislators partial to an advocate’s cause can aggressively attack a scientist, often impugning his or her motivations and hence character. Advocates, typically in the form of wealthy firms, can and do sue scientists, claiming unwarranted damage to the interests of their organizations, even if they have no prospect of recovering a court award equal to the costs of mounting the case. Unpre-

pared for, and typically uncomfortable with, nonscientific adversarial proceedings, many a scientist has wilted in response to the relentless use of this intimidating and time-consuming (and often money-consuming) method of bending science.

Advocates also have various methods of packaging science, orchestrating (usually purchasing) ostensibly “definitive statements” about what science says about a policy-relevant issue. This approach may take the form of a hired-gun scientist’s preparing a review article highly critical of research in conflict with an advocate’s interests. It may be reflected in a consensus statement emerging from a conference convened, often behind the scenes, by an advocate, with participants selected for their known contrarian positions on the issue in question. Another important method, practiced by politicians and bureaucrats and often encouraged by interest-sensitive firms, involves packing federal science advisory panels with experts beholden to specific economic or ideological interests. To many observers, this method found its pinnacle of success during the George W. Bush administration.

In similar fashion, advocates often manipulate public perceptions about credible science. One simple technique: to trumpet the findings of the exception-to-the-rule study that supports an advocate’s interest. At the core of the art of manipulating public perceptions lies the public relations (PR) firm. One of the book’s most telling anecdotes relates the case of farmers using the plant growth regulator Alar in apple orchards. On the left, the National Resources Defense Council (NRDC) mounted a large PR campaign to generate a cancer scare in the general public, especially in parents of young children, who are heavy consumers of apple juice, despite the lack of well-

established evidence indicting Alar as a carcinogenic risk. On the right, the apple industry's PR team represented the scientific evidence of risk as non-existent, which it was not. According to the authors, the Environmental Protection Agency, despite its own concerns about the risks (although far less drastic than proposed by the NRDC), caved to pressure from the Apple Institute and joined the U.S. Department of Agriculture and the Food and Drug Administration in a statement that apples were safe to eat.

Importantly, the authors not only describe the problems caused by bent science but also present answers to the urgent question of what can be done to stop this corruption of the scientific process. The answers are many, including:

- Disclosing interests, a now widely accepted practice in scientific publication.
- Sharing data for all research that informs regulation and litigation.
- Expanding federal agency enforcement resources and requiring unannounced inspections of research facilities and contractors.
- Requiring universities to make annual public disclosures of faculties' significant financial interests and requiring them to ensure unrestricted publication from work supported by all grants and contracts.
- Mandating the disclosure of relevant interests by parties lodging misconduct charges against scientists or requesting data underlying their studies.
- Imposing penalties for frivolous challenges.

Toward the end of the book, the authors observe that their descriptions of how science is so often bent may have left many readers "with a sense of hopeless resignation that was not significantly relieved by the relatively modest reforms suggested . . ." I must

admit, I am one of those readers. As if out of necessity to alleviate our disappointment in this state of affairs, the authors conclude with a proposition that I, for one, found radical and distressing; namely, that the nation may need "to develop better methods for bypassing science altogether when developing policy." Their brief discourse on "science-blind" approaches to regulation and litigation offers enough qualifications to diminish concerns about the conclusion but not to eliminate them.

Personally, I would prefer to contemplate alternative approaches that do not throw out the baby (sound research) with the bathwater. How about impaneling truly expert scientists to judge the validity of challenges to research, perhaps in some cases forcing formal "competitive" presentation of independent- and bent-science interpretations of evidence? Representing the best that science has to offer, and jealously protective of their well-earned reputation for lack of bias, the National Academies would seem an obvious source of such panels. As attorneys, the authors surely must possess some reverence for properly constructed adversarial proceedings. I would have appreciated seeing more of that logic applied to the present concern, although I readily admit that careful consideration of an adversarial approach might find it wanting.

In the spirit of full disclosure, I must note that for more than 30 years most of my research has examined the consequences of tobacco control policy. Given the enormity of the stakes in this contentious arena, science bending has flourished; indeed, it is unlikely that there is an important piece of policy-relevant research that has not confronted an assault of the sort documented in this book. I can vouch for the existence and significance of every

method of science bending described by the authors; I have experienced some firsthand (including having had a prominent U.S. senator from a tobacco state insist that the Department of Health and Human Services cut off my federal research funding). Arguably, millions of people have died prematurely because of the tobacco industry's success at science bending.

The bending of science matters, often profoundly. By exposing the phenomenon so clearly and starkly, McGarity and Wagner have performed a valuable service. One hopes that, having plodded through the book (which feels longer than its 300 pages of text), a readership of scientists, policymakers, judges, and journalists will convert a righteous anger into a meaningful response to those who would intentionally bastardize science.

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The bioterror threat

Bracing for Armageddon?
The Science and Politics of
Bioterrorism in America

*by William R. Clark, Oxford, UK:
Oxford University Press, 2008, 224 pp.*

Michael Moodie

World at Risk, a new report by the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, concludes that "it is more likely than not that a weapon of mass destruction will be used in a terrorism attack somewhere in the world by the end of 2013." The commission, chaired by Bob Graham, a