PUBLIC HEALTH

The Tobacco Strategy Entrenched

Carl F. Cranor

Ever wonder why it has been so slow and difficult to reduce the health risks from tobacco, secondhand smoke, lead, beryllium, or chromium? David Michaels's excellent *Doubt Is Their Product* provides part of the explanation, showing numerous ways in which "the product defense industry" uses scientific (and pseudoscientific) arguments to undermine public health protections, corrupt the scientific record, and mislead the public.

Doubt Is Their Product
How Industry's Assault on Science Threatens Your Health

by David Michaels

Oxford University Press, Oxford, 2008. 384 pp. $27.95, £14.99. ISBN 9780195300673.

The book's title announces its central theme. A tobacco industry strategy memo argues, "Doubt is our product since it is the best means of competing with the 'body of fact' that exists in the minds of the general public. It is also the means of establishing a controversy." (*1*) The aim: to sow doubt in the minds of the public, judges, and even regulatory scientists (if they are susceptible) about the scientific basis for greater public health or environmental protections (think global warming) or tort law actions. Because of the tobacco industry's success in obfuscating, slowing, reducing, and blocking regulatory actions, its approach has been adopted by others, has become institutionalized in presidential administrations, and has been used as talking points by some politicians. Fostering doubt and controversy and demanding high degrees of certainty postpone legal actions, keep products in commerce longer, and perhaps delay improved protections indefinitely. They can also leave the public or work force at risk.

As Michaels (an epidemiologist at George Washington University) explains, this clever strategy permits people to oppose public health rules without arguing the policy point and without being labeled anti–public health. It also uses a common science term that might resonate with some in the scientific community. Scientific articles usually note uncertainties about the research subject and the need for further studies.

Industries and their supporters have also demanded "proof" (more at home in mathematics than science) before agencies can increase public health protections or plaintiffs can successfully receive tort law compensation for injuries suffered. However, even though scientists may not understand all aspects of a problem, public health agencies need to act on the weight of the best science available at the time.

The doubt strategy is most at home in postmarket legal contexts. Public health agencies face the burden of establishing scientific and legal cases that will withstand appellate court scrutiny before they can successfully provide increased health and environmental protections or withdraw drugs or pesticides from the market. Companies that emphasize scientific uncertainties appear to be scientific angels; they only seek to preserve the integrity and certainty of the relevant fields against hasty regulatory action based on incomplete science.

Tort plaintiffs face similar burdens. They must show that the defendant's products or actions more likely than not can and did cause injuries from which the plaintiff suffers. The U.S. Supreme Court's *Daubert* decision requires judges to review the scientific basis of expert testimony; they may bar litigants from trial if the science is insufficient (*2*). Fostering doubt may sway judges, who are typically less informed about science than are regulatory scientists. The product defense industry has also helped to persuade some judges that they should review and exclude scientific studies individually without reviewing the total body of relevant evidence on which scientists rely, a most unscientific way to review the basis of expert testimony.

The book presents examples of product defense experts who have accepted funding to reach predetermined conclusions, misrepresented scientific claims, hidden their affiliations, written articles while using others' names, or had scientific papers ghost-written by lawyers.

What should be done? Among the author's recommendations is to require the testing of chemicals before workers and the public are exposed. If all products were subject to premarket testing for safety and impartial agency review before commercialization, this removes some incentives to raise doubt about the science. Drug and pesticide manufacturers rarely point out that their science is too uncertain to permit their products into the market. Michaels might have said more about additional legal changes that would reduce the influence of the doubt and uncertainty arguments, e.g., shifting legal burdens to the manufacturer once its product's safety was called into question.

Michaels also recommends a number of disclosures: of any and all research sponsors,

Desire for doubt. In April 1994, the CEOs of several tobacco companies told a committee of the U.S. House of Representatives that "Cigarette smoking is not addictive." In January 1998, their successors (shown) would only admit "Under some definitions cigarette smoking is addictive."

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of what manufacturers know about the toxicity of their product (with penalties for covering up or lying), and of hazards in the public's midst (like community right-to-know laws). These recommendations are not panaceas but make good first steps.

In addition, *Doubt Is Their Product* reminds one of deeper risks that threaten scientific fields and democratic deliberation. When science affects commercial interests, there are substantial temptations for researchers or their employers to substitute the ethics of the marketplace for the ethics of careful, objective evaluation of the data to understand the world, environmental threats, and health risks. Such substitution can result in the corruption of the scientific literature and the breaking of incremental links in chains of evidence on which researchers and the public depend, and it also tends to undermine properly informed political and judicial decisions. The scientific community and the public need to be on guard against such abuses; Michaels's history of these events sounds an alert that must not be ignored.

References

1. Brown and Williamson Tobacco Company, *Smoking and Health Proposal* (Brown and Williamson document no. 680561778–1786, 1969); http://legacy.library.ucsf.edu/tid/nvs40f00.
2. *Daubert* v. *Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

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THE GONZO SCIENTIST

Chasing the Biggest Shadow of All

Choosing which extreme sport to pursue in one's life is difficult. Most people are content with the likes of bungee jumping, ice climbing, or street luge, but not scientists. In addition to thrills, they want their sport to produce useful data. I tried out an extreme scientific sport last month: eclipse chasing. The objective is to take very sensitive equipment to very remote locations, very punctually.

Online
sciencemag.org
For more on this episode, go to www.gonzoscientist.org

The roots of the sport go back to ancient China, where astronomers experienced, in the words of the late television anchorman Jim McKay, both "the thrill of victory" (prestige in the emperor's court) and "the agony of defeat" (beheading for miscalculation). Eclipse chasing has come a long way since then (more data, less beheading)—and made headlines around the world in 1919. On 29 May that year, after struggling with biting insects and tropical storms on a volcanic island, a British team recorded starlight bent around the eclipsed Sun by gravity, an observation that was widely trumpeted as confirming Albert Einstein's theory of relativity.

For my first taste of eclipse chasing, I joined a team of scientists (*1*) hoping for a rendezvous with an eclipse 1 August in the wild west of Mongolia. To get to the site, we made a night trek over the Altai Mountains, which nearly killed us when our driver nodded off at the wheel. On the day itself, we worked in the intense heat and dust of the Gobi desert, which actually did kill a telescope motor and camera. But just as the eclipse was getting started, I drove a few kilometers away with astrophysicist Ray Jayawardhana, to take part in a shamanistic ritual that involved a hundreds-strong chorus of screaming, shouting, and clapping at the sky. We found ourselves surrounded by terrified Mongolian locals convinced that a monstrous god called Rah was eating the Sun. But that is another story.

While Rah captured the Sun, our team captured gigabytes of data. Like astro-paparazzi, we harvested hundreds of digital images through a pair of telescopes—a refractor and a reflector fixed to a motor-driven astrograph built by team member Kosmas Gazeas—during the 2 hours of partial and 2 minutes of total eclipse. And we weren't the only ones ogling the darkened sky. A team led by Jay Pasachoff, an astrophysicist at Williams College, Massachusetts, was observing to the north in Siberia (*2*). And to the south, *Science*'s Beijing correspondent, Richard Stone, was watching in western China with researchers from the National Astronomical Observatories, Chinese Academy of Sciences, and other institutions (*3*).

But how useful are all those data? With orbiting telescopes like Hinode trained on the Sun—and capable of creating their own eclipse anytime by simply occluding the Sun's photosphere with a metal disk, can ground-based observation add anything? "I get that question all the time," comments Pasachoff. In fact, he says, data produced by earthly eclipse chasers are more valuable than ever. The space telescopes, put in place at enormous cost, provide only part of the picture. By design, "the spacecraft can't observe a huge region around the Sun, the whole inner and middle corona." Studying the dynamics of these superhot solar gases should lead to better modeling of solar wind and answer a nagging riddle: Why is the corona hundreds of times hotter than the Sun's surface? Not only are the eclipse chasers equipped with "more modern and efficient" charge-coupled device cameras, explains Pasachoff, but "the resolution on the corona that we get by processing eclipse images is finer than that obtainable by any spacecraft." To understand the Sun, astronomers still need the Moon to cover it.

Pasachoff, who has seen 47 solar eclipses, wants to rename the sport. Rather than a chaser, "I am an eclipse preceder," he says. After all, successfully predicting and getting to the site of an eclipse is the name of the game. For next year's eclipse, a blockbuster event in the International Year of Astronomy (*4*), record numbers of people are expected to chase—or rather, precede—the 22 July solar eclipse in Asia. So prepare your telescopes and book your tickets now.

References and Notes

1. The team comprised four astrophysicists—Ray Jayawardhana (University of Toronto), Kosmas Gazeas (Harvard-Smithsonian Center for Astrophysics), Kazuhiro Sekiguchi (National Astronomical Observatory, Japan), and Katrien Kolenberg (University of Vienna)—and remote-sensing researcher Tuvjargal Norovsambuu (National University of Mongolia).
2. www.williams.edu/astronomy/eclipse/eclipse2008.
3. R. Stone, *Science* **321**, 759 (2008).
4. www.astronomy2009.org.

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