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SCIENCE & TECHNOLOGY

Defending science in a post-fact era

Naomi Oreskes' latest book lays out an argument for why the process of proof is worth trusting

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Just back from sabbatical Naomi Oreskes has published “Why Trust Science?,” a timely book that examines the value of the scientific process of proof and verifiable facts in an era when both are under fire. Though the geologist-turned-history-of-science professor’s field is climate, she turned a critical eye to research ranging from sunscreen to birth control. Oreskes, who has co-authored or edited seven books and has a forthcoming one on Cold War oceanography, talked to the Gazette about the five pillars necessary for science to be considered trustworthy, the evidentiary value of self-reporting, and her Red State Pledge.

Q&A

Naomi Oreskes

GAZETTE: “Why Trust Science?” came out of a Tanner Lecture you gave at Princeton three years ago. Why did you feel it needed a broader audience?

ORESKE: I’ve given more than 100 lectures on climate change over the years. In the past, a lot of my work was about the history of climate science and telling the story of how and why scientists even got interested in this question about whether greenhouse gases would change

the Earth's climate. Part of the point of telling the story this way was to show our concern wasn't some fad or the latest environmental anxiety. It was something scientists had been tracking for a long time. Many of these scientists weren't even environmentalists; they were just scientists interested in how the world works, but who realized there was this potential problem. This was increasingly in a context of climate change skepticism, a public that was at best confused about the issue and sometimes in denial.

As a speaker and teacher I always try to take questions seriously, but because of the topic, sometimes people are belligerent, sometimes hostile. I can almost tell when a belligerent question is coming. (And I have to say, and this is my empirical experience: They're always men, almost always over 50-ish, and they stand up using belligerent body language.) So this man stands up in a very aggressive way and tone of voice and says: "Well, that's all well and good, but why should we believe you or trust the science anyway?" I went home that night and thought: "Yeah, that's a fair question." There's an implicit argument that science is trustworthy, but if a person doesn't assume science is trustworthy, then my story breaks down. Maybe five years ago I started to begin forming a mental argument. Then I was asked to give a TED talk. It was very successful for a serious intellectual topic. People liked it, but I felt that 18 minutes was, frankly, not enough for a topic of this gravity. Also, the title I had been given, by the TED folks, was "Why Trust Scientists?" Later I realized that title was wrong. It wasn't about trusting *scientists*; it was about trusting science as a process, an enterprise, or an activity. So when I was approached about the Tanners, I knew what I wanted to say.

"The dismissal of self-reporting is a big issue in medicine. It's one of the reasons why women's complaints have not been taken seriously."

GAZETTE: Can you talk about the way you have thought about your career as an academic that has taken you far from TED Talks and Tanner Lectures?

ORESKEs: There's a lot that's good and important about sustaining the intellectual enterprise and not having it be driven by short-term considerations, but there's also a way that academic life can be very ingrown, and inwardly focused, and preoccupied with speaking to "the right people." What that means often at a place like Harvard is that if people get invited to talk at Princeton, we say yes. But sometimes when you're working on an issue like climate change, Princeton is not where you're needed. You're needed at South Dakota State University. Often people there have interesting things to say *because* they live in South Dakota and see the world from a different perspective. It makes you a better scholar and a better human being when you engage with people who are viewing the world from a different perspective. So I embrace the

opportunity to go to places that other people might not embrace, and I have what I call my Red State Pledge, which is if I get invited to a Red State, I do everything in my power to accept that invitation.

When “Merchants of Doubt” came out, we had a wonderful publisher, but when it came time to do a book tour, they were only planning to send us to big cities on the coasts where people buy and read a lot of books. That’s understandable from a business-model standpoint, and if your goal is to simply sell books and get a review in *The New York Times*, that makes sense. But if your goal is to reach people with a message you think they need to hear, it’s incomplete. I was lucky when “Merchants of Doubt” came out that people wanted to help get the word out. I got a phone call — out of the blue — from a reporter in Manhattan, Kan. He said, “If I can arrange logistics on the ground, would you come to Kansas?” And I said, “Yes, absolutely.” He arranged a three-city book tour for me of Lawrence, Manhattan, and Hays. Hays is serious wheat country. After giving the lecture in Hays, I’m signing books and a woman came up to me and said, “God bless you for coming to Hays.” That moment summarized everything I needed to know about the choices I was making. I’m not going to win a book prize for going to Hays, Kan., but I won a different kind of prize.

GAZETTE: In the book you lay out five pillars for how to think about science that can be trusted. How did you come to them?

ORESKEs: I’m an empiricist, not a theorist: All of my work is based on upon studying the world as it is, in its historical complexity. When I was a scientist, I was the same way. The transition from science to history was easy for me because it involved almost no methodological/intellectual adjustment. I had been an empirical geologist, and in geology the world is really complicated. Theory plays a role in the sense that theory from physics or chemistry or biology constrains the possibilities for what can be happening on the Earth, but you cannot deduce geological processes from the laws of physics or chemistry. So there’s a limit to where theory gets you in geology. Ultimately to understand the Earth you have to go out and look at it and study it. That’s my approach to history as well. I’m very empirical: I don’t assume up front that I know what the structure of something is before I study it. Over the course of 100–150 years, a lot of really smart people thought really hard about what makes science science. They kept trying to come up with the *one thing*. Essentially my argument is: It isn’t one thing. Letting go of the notion of the one thing is hard in a European-derived culture. Unlike politics or human relationships, science is a success story, so we need an account that both embraces the reality of how complex it appears to be when you look at it, but also can explain how it has been efficacious. I didn’t start out thinking there would be five key elements, but that’s where I got to: consensus, diversity, method, evidence, and values.

GAZETTE: You take a writer to task for calling self-reporting “iffy” science. Can you elaborate?

ORESKE: The dismissal of self-reporting is a big issue in medicine. It’s one of the reasons why women’s complaints have not been taken seriously. But they should be. If a patient goes to a doctor and says, “I’m depressed and I’ve been depressed since I’ve gone on this medication,” that’s evidence. It might not be an RCT [randomized clinical trial], but it’s still evidence. The writer in question recapitulated that error, saying that previous studies were right to dismiss self-reports as “iffy.” I think that is wrong. This is where it gets personal for me because I got depressed being on the pill. I’m up front with this. I was very lucky that my doctor did not dismiss my self-report. I went off the pill and recovered almost immediately. But imagine the horrible path one could go down being put on antidepressants when the cause of your depression is hormonal contraception. Since I wrote “Why Trust Science?,” I read Hilary Mantel’s memoir “Giving Up the Ghost.” She spent 20 years of her life in pain, being told that her pain was all psychosomatic, being put on antidepressant drugs that made her fat and created all kinds of other side effects. It turns out she had systemic endometriosis, which can spread beyond the reproductive organs. She spent an incredible amount of her time suffering physical pain that her doctors did not take seriously and being mistreated. It’s pretty scary. It makes one wonder how many people are out there suffering because of misdiagnoses, because doctors didn’t take seriously their self-reports? Because self-reports aren’t “hard data.” One thing history tells us is that people sometimes dismiss evidence because it doesn’t fit some notion they have of what should constitute good evidence, and often those judgments are incorrect.

GAZETTE: In a chapter about science gone awry, you cite provocative research about dental floss and about sunscreen that lands loudly in the press. So what is the role of media in shaping what science is trustworthy?

ORESKE: One thing that happens in the media is the desire to be different, to report something surprising, unexpected. The article in *Outside* magazine, which claimed that sunscreen is bad for us, had a gotcha, contrarian tone, with a bit of schadenfreude thrown in. It also followed the cliché of the renegade scientist who turned out to be right. Well, sometimes renegades are right, but most of the time they are just renegades.

The editors at *Outside* believe that being outdoors is good for you, and so do I. Being outdoors is *good* for your overall health, but that doesn’t mean that it’s good to get a sunburn, especially if you are a white person living in a very sunny place. If you think about people who live naturally in those climates, typically they are dark-skinned or they have adaptations to protect

themselves. In a way, sunscreen is *our* adaptation. And there is a large body of data to say that using sunscreen is beneficial. But the magazine ran with a claim based on one very small study, and a second larger study that has not yet been published. That was very irresponsible journalism.

Schadenfreude was definitely in play with the dental floss story, which claimed there was very little “solid” evidence to support the conclusion that flossing is good for your health. The journalist who wrote it was obviously very pleased with himself, as if he had unmasked a great dental floss conspiracy.

If you know anything about science, you can understand why we don't have any good studies about flossing. You can't do a double-blind clinical trial of flossing. You can't even do a single-blind trial. Most of the time you can't even get people to floss. This is the point: Nobody likes flossing. So there's a way in which it was very satisfying to conclude that flossing is no good. The fact is dentists aren't idiots; they look at teeth every day and they can see that people who floss have healthier gums than people who don't. That's evidence, so why would we dismiss it?

GAZETTE: How can science be value free?

ORESKE: It isn't! All people have values, and we always will have values. We do the things we do because we care about things. And that's a good thing. And if you had scientists with no values, that would be truly scary. That's the Frankenstein myth, Mary Shelley's argument that if you let science run amok without thinking of the moral consequence of the action you end up with a monster. What people often forget is that Frankenstein is the doctor, the scientist. The monster he creates is called the Monster, but the point of the book is: The science is the monster. We don't do anywhere near enough to talk about this in our classrooms, or in our research. As a serious question in the practice of science, what are the values driving the science, and are they good or bad? I think that is a conversation we need to have.