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SCIENCE AND SOCIETY

THE PLIGHT OF THE CELEBRITY SCIENTST

Engaging the public has long been taboo in scientific circles, but social media outlets are starting to force a change

By Susana Martinez-Conde, Devin Powell and Stephen L. Macknik **ROGER SMITH (NOT HIS REAL NAME)** never meant to become a popular scientist. But he saw no reason to avoid reporters a few years ago after publishing a major discovery in the research journal *Science*. Suddenly, his work was featured everywhere, including in the *New York Times*. Prestigious "ideas" conferences invited him to speak, and he found that he had a knack for explaining science to a general audience. His online TED talk attracted hundreds of thousands of views.



Increasing fame brought unexpected problems, however. Although Smith continued to conduct high-quality research, and prestigious scientific journals regularly published his results, several of his peers in the scientific community began punishing him for his growing celebrity. Smith's applications to fund new experiments started getting rejected. The anonymous reviewers who evaluated his grant proposals made "terrible comments," he recalls, such as "the 'very well publicized' or the 'overexposed' work of [Smith]." In response to the backlash, he declined an invitation to give a second TED talk and closed his laboratory to the press.

"That's it," he remembers thinking at the time. "I'm not communicating [with the public] anymore."

The kind of professional retaliation that Smith experienced is commonly known as the Sagan effect, named for astronomer and superstar science popularizer Carl Sagan. Largely as a result of his growing public profile, Sagan suffered ridicule among his peers and lost out on various professional opportunities, including tenure at Harvard University in the 1960s and membership in the National Academy of Sciences in the 1990s. "People said that he was spending more time popularizing than doing serious research," says Joel S.

Levine, now a professor at the College of William & Mary, who disagreed with the gossip. The two became friends when both worked on the Viking program in the 1970s.

A quarter of a century after Sagan's letdown at the National Academy of Sciences, his eponymous effect continues to persist. A number of studies over the past few years indicate that scientists as a group still discourage individual investigators from engaging with the populace unless they are already well-established, senior researchers. Such a mind-set deprives society of the full range of expertise it needs to make informed decisions about some of the most complex issues of the day—from genetic engineering to climate change to alternative forms of energy. The silencing of voices in the scientific community also leaves important questions about policy and the economy vulnerable to factchallenged spin doctors of every political persuasion. Fewer scientific voices, for example, mean fewer arguments to counter antiscience or pseudoscientific discourse.

By limiting public engagement to the most seasoned researchers, the Sagan effect also perpetuates the impression that science is the domain of older white men, who dominate the senior ranks. Although the proportion of full professors who are women has increased steadily over the past couple of decades, and the number of minorities in top positions has grown (albeit not as quickly), diminishing the public presence of these groups might discourage women and underrepresented minorities from even considering careers in science.

We recently contacted nearly 200 active scientists who regularly engage the public—as sought-after speakers, influential blog writers or best-selling authors. We wanted to learn how many of these elite popularizers faced professional blowback over their outreach efforts and under what circumstances. In addition to being consistent with

previous peer-reviewed research, our informal survey revealed that a welcome change in culture might finally be at hand. The increased use of social media outlets such as Twitter, Facebook and personal blogs, among other changes in the scientific world in recent years, seems to be breaking down some of the long-standing barriers to greater dialogue between researchers and the community at large.

BACHELOR SCIENTISTS

TO A CERTAIN EXTENT, the Sagan effect traces its roots to a centuriesold view of how scientists are supposed to work. At the height of the scientific revolution in the 1600s, for example, many researchers followed the example of Sir Isaac Newton, who was intensely dedicated to the development and investigation of physics and mathematics and never married. These bachelor scientists (and they were nearly all men) were seen as pure seekers of truth who were not distracted by the more mundane concerns of having a family.

Something of that ethos continues to the present. Whereas today's scientists are much more likely to be married and even to have children, they are still supposed to be devoted to life in the lab, at least according to many graduate school advisers and mentors. Thus, anything that takes them away from their research—such as having a hobby or participating in public debates-can undermine their credibility as researchers. Although few studies have addressed the professional consequences of science popularization across the globe, the research that does exist suggests that the Sagan effect is still a problem.

Unrealistic expectations, however, explain only part of the behavior. Many of the researchers we interviewed for this article suspect that professional jealousy also fueled some of the backlash they experienced. "A lot of this happens behind your back," Frans de Waal, a renowned primatologist at Emory University, wrote in an e-mail. He added that he generally hears indirectly, from friends, about colleagues complaining about his popular work.

Two of us (Martinez-Conde and Macknik) have experienced similar criticisms of our outreach efforts. At an annual performance review when Martinez-Conde worked in a previous institution, the chair of her department complained that her "stellar" academic productivity that year had been overshadowed by her mainstream science writings. Official feedback on one of Macknik's grant applications to the National Institutes of Health advised that his science communication was excessive.

Although our careers did not suffer overall, we became curious about other scientists' experience. We teamed up with co-author Devin Powell and contacted 190 elite communicators by e-mail and telephone and in person. We received 81 responses. Whereas many scientists reported that their outreach efforts had been a positive force in their careers, others had experienced a mixed bag of positive and negative consequences. And some, such as Smith, saw largely negative effects.

A few investigators had found creative solutions to the dilemma by, in effect, leading double lives. Roboticist Dennis Hong of the University of California, Los Angeles, for example, says he is a superstar in South Korea, where he grew up, but keeps quiet about his celebrity in the U.S. "In Korea, people recognize me. They want to take pictures," he says. "These days I have two modes: outreach in Korea but no outside activities in the States. In the research community, in academia, if you're too much exposed, if you're always on TV, always on the cover of magazines, the perception is that you're not a true researcher."

SURPRISING EVIDENCE

THE COMMON ASSUMPTION of the research community that popularizers cannot be serious scientists falls apart when one looks at the evidence. Multiple studies to date suggest that far from being secondrate investigators, researchers who regularly engage the public are more productive in the lab as well.

A 2008 study of more than 3,600 researchers at the French National Center for Scientific Research, for example, found that active disseminators of science had more peer-reviewed publications and their work was cited more often by other investigators than nondisseminators.

Another study measured the numbers of scientific papers and popular science articles published from 2005 to 2007 by scientists in Argentina, Australia, Brazil, Canada, Finland, Germany, Hong Kong, Italy, Malaysia, Mexico, Norway, the U.K. and the U.S. The results indicated that scientists with popular science writing credits were more prolific academic writers and worked harder than most of their peers (an average of 49.3 versus 47.8 hours per week). Sagan himself matched this profile: he averaged more than one scientific publication a month over the course of his 40-year career, until his death in 1996.

We had expected that the successful science popularizers who answered our survey would be supportive of junior researchers following their lead. But even they sometimes cautioned that most researchers who want to achieve tenure should probably delay interacting with the general public until after they have secured their university position. Daniel Kahneman, who won a Nobel prize for economics in 2002 and published the best-selling book *Thinking*, Fast and Slow in 2011, says that becoming a public figure too early in one's career challenges the norms of the scientific community. Fame should come from scientific publications, he argues, not engagement with the public. "If you're writing books for a general audience while you're an assistant professor, it's likely you won't get tenure because you're not serious," Kahneman says. "When you're talking about research universities, that's the rule. You're supposed to do research until you get tenure and quite a bit later."

Daniel Gilbert, a professor of psychology at Harvard and author of Stumbling on Happiness, agrees. "I started [writing for popular consumption] in 2000, when I was a full, tenured professor at Harvard," he says. "I wouldn't advise young, untenured professors to do this."

Yet unintentionally, the net result of this "wait until tenure" caution often ends up hurting women and minorities because they are not well represented at the top ranks of academia. Perhaps partly as a result of this lack of representation, some minority academics find themselves under intense institutional pressure to communicate whether they have an inclination for it or not. "In essence, this amounts to an additional job that they are expected to do because of their background (rather than their desire to participate in public communication)," Lucianne Walkowicz, an astronomer at the Adler Planetarium, wrote in an e-mail.

"If you're articulate, if you look halfway decent on camera, you get asked to do this," says J. Marshall Shepherd, who is African-American, directs the atmospheric sciences program at the University of Georgia and hosts his own television show. Raychelle Burks, an assistant professor of chemistry at St. Edward's University in Austin, Tex., jokes that she sometimes feels as though journalists find her by Googling "minority scientist." "As a black woman, I'm all for getting opportunities," she says. "But there's a difference between 'Are you the best person for the job?' or

'Are you a token?' because someone said, 'We need a person of color.'"

CHANGING NORMS

SOME OF THE RESPONSES to our survey suggest that engaging with the rest of society is becoming less hazardous to a scientist's career—and can prove beneficial. So many people have social media accounts these days that becoming a public figure is just not as unusual for scientists as it once was. Further, as traditional sources of funding continue to stagnate, "going public" sometimes leads to new, unconventional revenue streams for worthy projects.

The social media explosion of the past decade has nonetheless exposed a generational rift between digital natives and older investigators. "I've heard 'What are you doing on Twitter? That's a waste of time," says Chris Gunter, a professor at Emory School of Medicine who goes by the handle @girlscientist. "But I had a paper come out in Nature in 2014 that started as a discussion on Twitter."

Nevertheless, our survey suggests that a handful of forwardlooking institutions (such as Emory and the Massachusetts Institute of Technology) may have begun to appreciate outreach as a core area of academic performance—in addition to the traditional roles of research, teaching and administration. "At Emory during my midterm review, I had really made it clear to my own institute what I was doing," says Jaap de Roode, a biologist who studies parasites. "They said it was a very positive thing for me and for the university. It gives a lot of visibility."

Exceptional among federal funding agencies, the National Science Foundation has adopted an official position in favor of popularization. In addition to intellectual merit. grant proposals to the foundation are also evaluated for their "broader impacts" on society, including the wide dissemination of research findings to the public. Less friendly organizations and senior researchers should follow these examples.

Only by communicating our discoveries widely can we, as scientists, climb down from our ivory tower and play a larger role in shaping the kind of society in which we wish to live-one that values facts, encourages scientific endeavors and continues to grow.

MORE TO EXPLORE

HOW TO SPIN THE SCIENCE NEWS

The Embargo Should Go. Vincent Kiernan in Inside Higher Ed. Published online August 21, 2006. www.insidehighered.com/views/2006/08/21/embargo-should-go

Should Reporters Have Agreed to the Vertex Embargo? Matthew Herper in Forbes. Published online June 24, 2014. www.forbes.com/sites/matthewherper/2014/06/24/ should-reporters-have-agreed-to-the-vertex-embargo/#122ba96b2282

Embargo Watch: https://embargowatch.wordpress.com

The FDA's news media policies: www.fda.gov/NewsEvents/Newsroom/NewsEmbargoPolicy/default.htm

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The Measure of a Life: Carl Sagan and the Science of Biography. Michael Shermer in Skeptic, Vol. 7, No. 4, pages 32-39; 1999.

Scientists Who Engage with Society Perform Better Academically. Pablo Jensen et al. in Science and Public Policy, Vol. 35, No. 7, pages 527-541; August 2008.

Academic Staff and Public Communication: A Survey of Popular Science Publishing across 13 Countries. Peter Bentley and Svein Kyvik in Public Understanding of Science, Vol. 20, No. 1, pages 48–63; January 2011.

Gap between Science and Media Revisited: Scientists as Public Communicators. Hans Peter Peters in Proceedings of the National Academy of Sciences USA, Vol. 110, Supplement No. 3, pages 14,102–14,109; August 20, 2013.

Has Contemporary Academia Outgrown the Carl Sagan Effect? Susana Martinez-Conde in Journal of Neuroscience, Vol. 36, No. 7, pages 2077-2082; February 17, 2016.

FROM OUR ARCHIVES

Smart People Believe Weird Things. Michael Shermer. Skeptic, September 2002.

scientificamerican.com/magazine/sa