

Commentary

Editor's Note: In 2003, the Society for Neuroscience initiated the Science Educator Award to recognize an outstanding neuroscientist who has made significant contributions to the education of the public. For a description of the award, see <http://www.sfn.org/sea>. Previous awardees are Eric Chudler (2003), Rochelle Schwartz-Bloom (2004), Colin Blakemore (2005), and Roberta Diaz Brinton (2006). The Journal asked the 2007 winner, David P. Friedman, to give us his views on the importance of neuroscience education and public outreach.

Public Outreach: A Scientific Imperative

David P. Friedman

Department of Physiology and Pharmacology, Wake Forest University School of Medicine, Winston-Salem, North Carolina 27157

Animal activism, intelligent design, stem cell research—hot-button issues at the interface of science and society that remain as open debates. The conflicts generated by each of these divisive issues, and many others, may be characterized by the cerebral dependence on data and logic of science on the one hand and the often more limbic emotionalism arising from ignorance, intellectual rigidity and political opportunism on the other. As scientists, we have all despaired when we've seen or heard discussions about policy influenced more by clever but empty sound bites than the weight of evidence. In a society increasingly dependent on science and technology, these kinds of outcomes can be damaging. Arguably, one reason for the failure of science to play a more dominant role in public discourse is that scientists have not engaged the general public so that they understand who we are, what we do, and why the way we look at the world matters. And what I want—and I'm certainly not the first to make this call (Merenstein et al., 2001; Leshner, 2005, 2007a,b)—is for you to go out and change that.

Neal Lane, the former director of the National Science Foundation, called scientists who involve themselves in the public discourse “civic scientists” (Lane, 1997, 1999). Such scientists, according to Lane,

“step beyond their campuses, laboratories, and institutes and into the center of their communities to engage in active dialogue with their fellow citizens.” The Society for Neuroscience has long embraced many aspects of this concept, including public outreach in science education and lobbying legislators for better budgets. As members of a scientific society with >38,000 members, it is easy to fall back on the notion that some other member of the Society will do this. That is a mistake. Engagement with the public is a responsibility that many, if not most, of us should accept. I would even argue that it is a moral imperative (Marincola, 2003), to be ignored at our own risk.

There are many options for working with the public and many paths that can make these activities an integral part of your career. Although I never made an intentional decision to take science into the public domain, and I hadn't heard the term Civic Scientist until relatively recently, a Civic Scientist is indeed what I have become. I'd like to share my journey with you in the hope that it may help you think more clearly about how you might get involved and to motivate you to take that first step, whatever it may be.

As recently as the middle 1980s, neither the National Institutes of Health (NIH) nor the Society for Neuroscience was very invested in lay science education or any other kind of public outreach, except to our funding sources. The rise of animal activism played a big role in changing that attitude. By the middle 1980s, the People for the Ethical Treatment of Animals, which was formed in

1980, had already started to spread its message to K-12 students in public schools, where they were essentially unopposed. Life scientists in general just didn't spend much time in classrooms except on their own campuses. Middle- and high-school science teachers were being targeted by activists over dissection, but they had no allies to help them make the case for what they knew was a useful learning tool. Kids were being taught that scientists who use animals were evil and that the use of animals in research or teaching was both immoral and unnecessary.

This motivated Dr. Frederick K. Goodwin, then administrator of the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA), to propose that bench scientists should form partnerships with school teachers to get scientists into the classroom, encourage students' interest in science, and blunt the influence of animal activists. By the end of the decade, ADAMHA representatives began attending meetings of the National Association of Biology Teachers (NABT) and the National Science Teachers Association to represent itself to the world of science teachers. As a program manager at the National Institute on Drug Abuse (NIDA), I was one of those first ADAMHA representatives. With a few others, I helped to staff a small booth that offered a paltry selection of mostly out-of-date handouts targeted almost exclusively to adults. In contrast, we were stunned to see huge exhibits from federal agencies like NASA and the Department of Energy. Obviously, our colleagues in the physical sciences had long ago figured out the value of being in

Received Oct. 16, 2008; accepted Oct. 16, 2008.

Correspondence should be addressed to Dr. David P. Friedman, Department of Physiology and Pharmacology, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157. E-mail: dfriedmn@wfubmc.edu.

DOI:10.1523/JNEUROSCI.0005-08.2008

Copyright © 2008 Society for Neuroscience 0270-6474/08/2811743-03\$15.00/0

the public schools, something that we biological scientists were just starting to become aware of.

But we caught on quickly. By the early 1990s, other neuroscientists started attending these meetings to talk about their research and the issue of animals in research. ADAMHA announced the first Science Education Partnership Awards, the Society had formed a partnership with NABT, and was funded to create some of the very first scientist-teacher partnerships and a workbook of lesson plans that could be used by neuroscientists visiting K-12 classrooms. In 1991, the Committee on Animals in Research devoted its standing panel session at the annual meeting to a high-school science teacher and a college professor who prepared science teachers to do their jobs. They taught us how to talk to kids in schools. Encouraged by the very positive response to this, then Society President Dr. Robert Wurtz created the Committee on Neuroscience Literacy, first chaired by Dr. Stephen Lisberger. This committee, which has now become the Public Education and Communication Committee, has helped to generate numerous resources, which are now compiled in the Society's brand-new Neuroscience Education Resources Virtual Encycloportal (NERVE). If you are interested in speaking with the public, whether it is school children or any other audience, you will almost certainly find supporting materials on NERVE (<http://www.ndgo.net/sfn/nerve/>). At the same time, the Society was organizing large-scale activities, such as the now widely observed Brain Awareness Week, and individual members were creating their own approaches, many funded by NIH. The Science Educator Award was created to recognize the importance of these activities and the creative neuroscientists who undertook them.

Working with K-12 students is both important and rewarding. It is also great training in how to communicate science to lay audiences. Elementary and middle-school children in particular are full of enthusiasm, and incredibly forgiving of awkward explanations. If you want to make sure your visit is a success, just bring a real brain or two into the classroom; you'll be memorable no matter what you say. Teachers are an even more eager and engaging audience. In many ways, being treated as important by scientists validates what teachers do, and they are grateful for our time and attention. Because the students who will eventually go on to become scientists pass through the classrooms of these teachers, their importance to the fu-

ture of science is enormous. Working with teachers also multiplies the educational effect—an hour spent with a class of 30 kids reaches 30 kids, but an hour spent with a dozen teachers reaches all of their students as well.

Once you begin to understand how to use lay language to explain science to kids, you become increasingly well equipped to explain it to almost anyone. In fact, it sets you up to work with one of the most important audiences out there—the media. Until relatively recently, many scientists would not even consider speaking with the media. It just wasn't something we did, and the media knew it. According to one study (Hartz and Chappell, 1997), scientists viewed journalists as “imprecise, mercurial, and even dangerous.” They, in turn, saw us as “narrowly focused, self-absorbed, cold-eyed, and arrogant.” Another sin was that even when media outlets had only one or two deadlines each day, we didn't seem to understand or appreciate the tight deadlines driving journalists. Today's 24 hour news cycle makes their deadline urgency even more critical. Now, of course, we do understand that we have to work with the press because it is the most efficient way to contribute to the public conversation about science policy, to educate the public about new discoveries and simply to transmit the excitement we feel about our work. Conversely, every time you as a scientist walk away from a potential interview or any other type of media interaction, you miss an opportunity to educate the public about science.

My first experiences with reporters occurred in the 1980s while I was at NIDA. We got many calls from the media about drug-related questions, and fielding such calls was part of our jobs. I still recall one of my first telephone interviews with a reporter, who asked a question about how cocaine worked. I decided to start my explanation by describing synaptic transmission. I hoped to explain how molecules of dopamine diffused across the synaptic cleft, bound to dopamine receptors, and then got taken back up into the presynaptic terminal by the dopamine transporter. So I said to him, “You know what a molecule is, don't you?” He, like many Americans, didn't. At that moment, I realized that if I was to explain to journalists how cocaine worked, I needed new ways to do it, perhaps even a new vocabulary. The one thing that was completely clear was that scientific jargon was not an option. It quickly became apparent that metaphors and analogies (e.g., “the axon is like a telephone wire”; “dendrites are

like leaves on a tree”) would be essential tools in communicating with the public. Reaching for just the right one, however, has its own risks. This was brought home to me by another reporter who knew nothing about science, but needed to understand, very late in the day, why scientists didn't think marijuana had much acute toxicity. I tried without success to explain this idea, reaching further and further for an appropriate image, but to no avail. I finally said, “The most dangerous thing about marijuana would be if a bale of it fell on you.” This particular quote appeared the next day in *The Washington Post*. This was in the days of “Just Say No,” and for a while I feared for my job. The upside, I guess, was that the entire scientific staff of the NIDA extramural program got media training. For my part, I gained an acute appreciation for the need to think before I speak, something I'm still working on. Nonetheless, with continued practice, I have represented NIDA, the Society for Neuroscience, my university, and even media-shy colleagues to the press. It's a learnable skill.

In the middle 1990s, I was approached by Ms. Sue Rusche, a former journalist and the president of a drug-abuse prevention organization called National Families in Action, to teach the science of addiction to journalists. This immediately caught my interest, and with the encouragement of Dr. Timothy Condon, now deputy director of NIDA, we created the Addiction Studies Program for Journalists. During the past 10 years, with funding from a NIDA Science Education Drug Abuse Partnership Award (SEDAPA), we have trained >200 journalists in twice-yearly workshops. These are held in conjunction with a scientific meeting, usually the meeting of the College on Problems of Drug Dependence or the Robert Wood Johnson Foundation Substance Abuse Policy Research Program. We work with the journalists for two days, and then they spend another day or two at the meeting. This has been very successful. Journalists who are not on a deadline are among the best of audiences. They are curious, engaged, and smart, and they love to ask questions. Over the course of two days, these workshops cover everything from the neurobiology of addiction, to treatment, prevention, and policy issues. The journalists who have attended our workshops have produced several hundred stories for all kinds of media, including newspaper, radio, television, and magazine stories, multistory series, a book, a movie script, and even a master's thesis, which

consisted of three magazine articles from a student in the Medical and Science Journalism Program of the School of Journalism and Mass Communications at the University of North Carolina. To encourage our attendees, we instituted an awards program. The work of the winners can be seen at <http://www.addictionstudies.org>.

But you do not have to get a grant to work with the media. There are many means that reporters use to find knowledgeable scientists to address a whole array of issues, including questions about the use of animals in research. Just let the public relations and marketing office at your institution know of your interest and expertise.

An alternative to the mass media is the web. Blogs play an increasingly important role in public discourse and there are many, many science-related sites that sponsor conversations about scientific topics. One does not have to stand up in front of a camera to reach the public.

The ultimate translation of scientific findings is into public policy. The Society has for years successfully worked to get neuroscientists to the Hill to visit their senators and congressional representatives. Although I urge you to take advantage of those opportunities, you don't have to wait to visit Washington D.C. to do that. Write emails (letters take forever to reach their destination because of security concerns), or better yet, visit the local offices of your representatives to offer your point of view and your expertise. Get to know their staffs and take the time to form relationships. The better they know you, the more credible you become.

Because support for the prevention

and treatment of substance abuse arrives at the states as block grants from the federal government, decisions about how that money is spent are made at the state level. Based on the success of the Journalists' program, we were able to form a relationship with the National Conference of State Legislators, which gave us access to state legislators across the country. We then developed another proposal, the Addiction Studies Program for the States (<http://www.addictionstudies.org>), which was also funded by a SEDAPA grant from NIDA. We ask states to form teams of 12 people, all involved in substance abuse policy making. Typically, these teams include four experts from the executive branch and four members each from the upper and lower houses of the state legislature. In two and a half days of lecture and extensive discussion, we bring the attendees up to date on the latest science and, through the use of facilitated discussions, help them to create plans to implement policies based on their new knowledge. This program is relatively new, and we have only worked with six states thus far, so we don't know how valuable this may be. It is, however, a model for how scientists can work constructively with their states to translate scientific understanding into scientifically informed policy.

So what was this all about? I guess the first part of my message is that anyone can do things like these. I never had any specialized training to do this until the bale of marijuana incident, and it wasn't a part of my career plan. Instead, I gave myself plenty of practice at outreach by grabbing opportunities as they came along. At first,

those opportunities were classrooms full of kids. That led to teachers and other adult learners. When it came to the media, I got tossed into the deep end and was forced to swim, but that experience led to funded grants to do science education and outreach on a larger scale. I also have to say that although I love doing science, the civic part of my scientific career has been remarkably rewarding as well. It's a different kind of work, but it's a commitment we all must be willing to undertake if we are to have the impact on society that our training, scientific expertise, and knowledge make possible for us.

References

- Hartz J, Chappell R (1997) Worlds apart: how the distance between science and journalism threatens America's future. Nashville, TN: First Amendment Center.
- Lane N (1997) An open letter to scientists and engineers: "Let's get the word out together about why science matters." Arlington, VA: National Science Foundation. Retrieved October 25, 2008 from <http://www.nsf.gov/od/lpa/news/media/nlaaultr.htm>.
- Lane N (1999) The civic scientist and science policy. In: Science and technology policy yearbook. Washington, DC: American Association for the Advancement of Science.
- Leshner AI (2005) Where science meets society. *Science* 307:815.
- Leshner AI (2007a) Outreach training needed. *Science* 315:161.
- Leshner AI (2007b) Beyond the teachable moment. *JAMA* 298:1326–1328.
- Marincola E (2003) Research advocacy: why every scientist should participate. *PLoS Biol* 1:E71.
- Merenstein R, Bowdy MA, Woolley M (2001) Participating in science outreach: a civic responsibility for scientists. *Mol Interv* 1:138–140.