

The Pitfalls and Perils of Communicating Science

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Key Words

Communicating Scientists
Scientists and Communicators
Best Practices

It's hard to say when scientists realised that policy makers were not always going to make the best decisions regarding science funding, but a safe bet would be somewhere before 3000 BC. In the intervening 5000 years, not a lot has changed in how well scientists, politicians and the public really understand each other. A week doesn't go by when there isn't an article lamenting that one project or another doesn't get funding, or that one government bureau is over-zealous or too conservative. Scientists learned early that the best way to get the message across to the people who can truly influence policy makers was to consult them directly. In past ages it was advisers to kings. Later it became the voters themselves.

Yet along the way something changed in the science approach to communication. Science became more insular, more demanding, and the perception was that the public was not qualified to understand. The concept of the "citizen scientist" went the way of the homing pigeon. In the 20th century specialty journals written by scientists for peers became the norm. "Popular" science was still popular but scientists were no longer the folk heroes of yesteryear.

The internet changed that, along with a number of other things in our culture. A subset of scientists, frustrated with journalism in the general publications or lack of exposure in peer-reviewed journals, took to communicating science directly to the people. Other groups followed and, today, NASA and the

National Institutes of Health are the most visited science sites on the internet.

As the age of the "citizen scientist" dawns again, some science topics, like global warming, have become part of the international lexicon and are ingrained in our culture while others, such as space exploration, that once held the public's imagination have lost their way and are only seriously discussed by the most devoted advocates in the general population. Why and how does that happen?

Instant Access to the World Gives Us a Unique Ability — along with Everyone Else

Instant communication opportunities mean there is a true confluence of science, culture and policy in the world today, and that means the opportunity for scientists to get their message out to the public in a way that delivers the most accuracy with the least amount of delay. Yet instant access by the public can be a blessing or a curse.

I don't think readers of a medium like this need to have it explained philosophically why communicating science with the public is essential. Most scientists are in the field because they care, and as science has improved society the social consequences of the science and the technologies that have resulted fall back on the general population.

Yet often it seems as if the onus of communicating science should fall on someone else. Not only is there no one else to do it, there are reasons why you shouldn't want anyone else to do it.

The Pitfalls of Science Communication

If you're going to communicate science effectively, there are a few pitfalls you should avoid:

1. Avoid the belief that the public is uneducated and that you will correct it. This seems like common sense, yet we can all recall examples of scientists using that sort of "deficit" thinking about the general public and believing that nothing except their force of will and the right information will "correct" it. We may believe that data speaks for itself, but data is also subject to interpretations, including by laypeople, that are completely valid though not in line with the conclusions of scientists. Few aspects of science are so simple that data is impervious to perception.
2. Avoid the belief that science and society do not need each other. In my favourite movie, *The Right Stuff*, the astronauts know something the semi-fictional NASA heads do not: "*No bucks, no Buck Rogers.*" The space programme of the 1960s was an aggressive vision that appealed to society to such an extent that even rocket

failures and a Gemini I disaster did not deter people. The success of that vision inspired an entire generation of young men and women who are now in positions to impact science policy in important ways. They remember the magic of the stars, but scientists need to reach them on a level that is practical to society as well.

3. Avoid advocacy. No one is trusted less than politicians. "Framing" was a big topic in 2007, mostly among scientists who regard the public as educationally defective, as in item 1, and simply need to be corrected. If scientists "frame" too much, they become advocates and the public is far too savvy to not look for suspicious motivation, even if there is none. No matter how you portray it, people will regard framing as either "spin" or an insult to their intelligence. Show respect for your readers. If you're successful, you will have a cross-section of readers of varying education levels but they're all important.

The Perils of Science Communication

1. It's not publish or perish, it's publicise or perish. No matter which country you are in, you have competitors and you will be in a constant struggle to defend your science during times of increased budget competition. You can privately ridicule scientists who do more successful self-promotion but they will set the agenda for the public if you do not. Open access and peer-reviewed journals are an increasingly effective measure to get the word out to the public about your work.
2. Avoid looking like a political mouthpiece. If you're communicating science in a detailed, effective way and it's remotely controversial, someone is going to attribute an agenda to you but the only alternative is to not be in the public at

all. However, the higher your profile the greater the potential to look like an advocate. Using the global warming example, again, both Richard Lindzen and James Hansen have impeccable credentials and valid expertise on the subject yet each is dismissed by one side of the global warming debate or the other because of financial ties to Exxon and George Soros. Is either of them paid to speak out? Not at all, they are both honest professionals with differing views, but their value in the discussion is limited because they polarise the population due to their political exposure. When the world is a mix of politics and culture and science, it's best to let people know where you are. If your science is most often political, your value in science discussions is marginalised by a large chunk of the population. Politicians engage in polemic, not scientists.

3. Avoid thinking that promotion is unethical. It happens on occasion that the best work doesn't get drowned out in a sea of noise but it's rare. Every day I read science press releases, at least 40 of them, and they run the gamut from the ridiculous to the understated. Not every news outlet is devoted to science so some will go with the most outrageous headline, some will think in terms of "what sells" to their audience, most will not sift through elaborate jargon or subtle nuance to find out what makes your finding spectacular. If you have a study that you want publicised, work with the marketing department to make sure it gets the point across clearly, but also has enough sizzle to make the steak appealing.

Communication Is One of Your Tools

Scientists use tools to learn things about the world. Some tools are physical, like observations through a telescope, and some are numerical, like simulations that tell us about objects in space we can't detect in ordinary

ways. Communication should be considered another tool of the scientist. Like all other tools of science, communication should be used for the best possible reasons and it should adhere to the scepticism and objectivity that is foremost in science.

Most people know less about your discipline than you do, but everyone gets a say with policy makers so their opinion counts. Online open access and peer-reviewed journals are excellent tools for reaching the public in a way that gets the information out quickly. I wrote an article, "Sharing Research Leads To Good Citations"¹ and the most interesting factoid to me was that in an examination of 85 cancer microarray clinical trial publications, 48% percent of the trials with publicly available data accounted for 85% of the aggregate citations — so most of those citations were due to its easy availability. Lots of citations means your work has value in the science community and that's an excellent source of credibility for reviews and proposals. The public, and fellow scientists, are catching on to the value of science communication and it's something our ancient ancestors knew as well. The second age of the "citizen scientist" is here and as long as we avoid some of these perils and pitfalls of communication, that will be a good thing for everyone.

Notes

1. Sharing Research Leads To Good Citations, Scientificblogging.com, 20 August 2007, http://www.scientificblogging.com/hank/sharing_research_leads_to_good_citations

Bio

Hank Campbell is a long-time physics software industry veteran, including direct accountability in taking one company from \$6 to \$60 million in annual revenue and an IPO. Currently he is CEO of ScientificBlogging.com, the world's largest Science 2.0 community and one of the top 25 science sites on the internet.



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