

The Art of Communicating Science: traps, tips and tasks for the modern-day scientist

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In a true test of modern-day communication, the participants at the 2nd PAGES Young Scientists Meeting travelled virtually from the 26°C heat of a Goan afternoon to a brisk -2°C morning in New York City to join Gavin Schmidt (NASA, USA) for a lesson in the art of science communication. During this session, Gavin then delved into the nuts and bolts of why scientists are ethically obligated to publicly communicate their science and how communicating it *well* is an increasingly challenging but important aspect of our profession. This article highlights Gavin's tips for effective public communication, some common traps scientists fall into, and tasks or next steps our community needs to take to improve the public's access to accurate, high-quality scientific information.

Despite the general public's interest in science, it is often hard to know where to go for accurate (and understandable) scientific information. In a world of rapid and wide dissemination of knowledge and opinions, it is increasingly important to communicate outside the scientific community. Not only do we have an obligation to communicate broadly, due to the typically high proportion of science funding coming from the taxpayer, but broad communication is essential to avoid misuse or misinterpretations of our work and to slow the propagation of scientific misconceptions.

Crucially, many of the important scientific concepts that need to be conveyed are simply not "news". For example, the physics of greenhouse gases will undoubtedly never make the headlines yet it is a fundamental building block to being literate in the issue of climate change. Communicating these types of facts requires scientists to step beyond traditional avenues of communication. Gavin emphasizes that we, as a community, need to engage with social media and web-based communications, in addition to traditional means of communication (e.g. press releases, interviews and essays). People increasingly rely on the internet as a primary source of information, which means there is a need to provide more accurate and appropriate information online through scientists' blogs, videos, and social media platforms. We need to use this diverse set of tools to not only convey our expertise but importantly, to engage with different audiences.

The challenge of *clearly* communicating the intended scientific message to the

public is not insurmountable but requires an understanding of what works and what does not work. Falling into typical science communication traps can quickly turn an interview, article or outreach event into a counterproductive debate or an unintended source of misleading information. Here are some common traps and points on what does not work:

- Avoid talking too much about technical details and avoid technical debates
- Avoid using jargon that you don't take time to explain
- Avoid scientific stereotypes, e.g. arrogance or elitism
- Avoid triggering issues of free speech, data access, and secrecy
- Do not respond poorly to criticism by getting angry or taking it personally
- Always distinguish between personal opinion and scientific consensus
- Try to understand the context in which your statements will be heard or read
- Try to defuse pseudo-debates but do not ignore them
- Avoid sensationalism and over-extrapolated conclusions

In order to get your audience to engage with your science, you have to engage with your audience. Several easy tips that can improve the strength and resonance of your message include:

- Listen to what your audience is interested in or concerned about
- Use imagery and animations. These can often create a deeper connection for the audience (e.g. see Fig. 1)
- Make it personal: use personal, relatable stories that remind people that we are "normal". Personal anecdotes often generate excitement and engagement
- Always remember the big picture and the reasons why you are a scientist
- Be a credible and trustworthy guide and take advantage of the generally held feeling of public admiration towards scientists
- Promote the investigative nature of science
- Provide accessible context outside of the technical literature
- Always underscore what can and cannot be concluded from your work

As mentioned above, we live in an increasingly connected world with growing access to information (and misinformation).

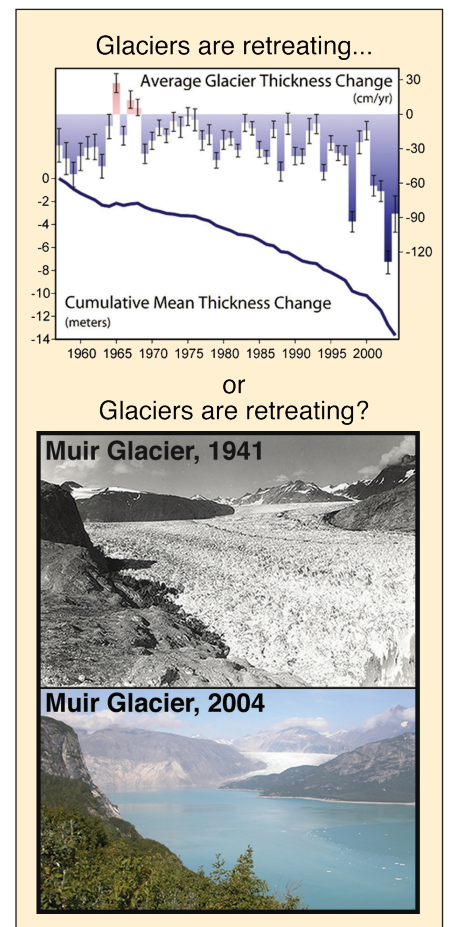


Figure 1: The use of imagery is an effective way to convey messages to the general public. Which illustration would you choose for a public lecture? Image sources: US National Snow and Ice Data Center.

Our collective task is to ensure access to appropriate and understandable scientific information. The key to success relies on a collaborative approach in which we all rally together and begin to communicate the importance of science and the scientific process. En masse we can begin to change the public perception of science, and can contribute to developing a more scientifically literate society. Making use of the above tips, learned from the frontlines of public science communication, can help to initiate this process and move our community in the right direction. Now it is time to get blogging, writing, and tweeting!

For further reading, see Gavin's recommendation: www.skepticalscience.com/docs/Debunking_Handbook.pdf

