

Here's a brief summary of the main takeaways from the Workshop on Science, Communication, and Uncertainty, UC Santa Barbara, May 4

<http://sustech.ucsb.edu/conferences/2017-science-communication-and-uncertainty-workshop>

Scientific Uncertainty

Journalism

Public Understanding of Science

How to Communicate Uncertain Science?

Story & Narrative

Miscellaneous

Scientific Uncertainty

- Some things just can't be fully understood, yet.
- Be sure to pay attention to the difference between error and uncertainty.
- You can actually make very *certain* statements if you know the error and uncertainty.
- Science is not only inherently uncertain, but seeks out uncertainty in order to reduce it, often by changing one's model. Perhaps better measurement or methods become available, or a better conceptualization. So science provides the process to learn from these and improve the model for further testing.
- Distorted incentive structures for publishing in academia may reduce high quality publications that deal carefully and thoughtfully with error & uncertainty.
- Since science is open to correction, and cannot assert a final truth. Even if we arrive at the "truth" we won't and can't know that (because of the inherent potential for some change). (e.g. the "cathedral of science")
- Scientists are (ideally) trained to not try to design studies or interpret results to support their initial beliefs. This can be a challenge for most people, including scientists.
- Different kinds of science may have different kinds or levels of uncertainties, making it more difficult to convey the concept of uncertainty to the public. Indeed, there are so many nuances in any area of science.
- Embrace and discuss the related uncertainty. We may not know completely, but science has the methods to try to find out. The scientific process can change and reduce uncertainty, though it may also raise new areas of uncertainty.

Journalism

- The problem of journalistic norms of "balance", how to present opposing or multiple positions while also representing the actual very different percentages of those positions.
- Aspects of conducting and reporting science have implications for trust in and communication of science. These include replicability, fake science, fake academia (paid new commercial journals) fragmentation of projects into small articles, drive to publish and obtain citations and resume/CV entries, increasingly overstated results in titles or news releases. The increased number of submitted articles and rush to publish also degrade the preparation and editing process, more pressure on reviewers, so decreasing effort to assess and improve.
- Initially, blame was assigned to the public for not knowing enough about science, then to scientists. Later, journalists were/are blamed. Recent studies of both textual and visual aspects of climate change news show that journalists are not actually doing a bad job.

- We need to continue to bridge the gap between the general public and scientists.
- Communication campaigns incorporating social media, websites, and compelling multimedia are essential.

Public Understanding of Science

- Science is seen frequently as a “commodity,” rather than a process; there is a breakdown in communication between producers and consumers of science.
- Thus science communicators should avoid conflating science with its commodities. Science is more verb than noun.
- Across almost all science topics, public knowledge is extremely poor. How can we find ways to engage public in the discoveries of science? Space exploration captured the public’s awe of the unknown. How about filmed expeditions into the deep oceans?.
- We know there are tensions between the standards of science and the public understanding of science. This is huge. When producing films for scientists, there is always a compromise between relating all the nuance and detail of a complex science topic and keeping the public’s minute attention span.
- Science and public do not share the same meanings of “theory.”
- How much understanding of knowledge/science about a topic do we need before we will then take action – consider the case of receiving information from our doctor: what is needed to get us to change our behavior?
- Ira Flatow noted that there is extensive interest in science by the public, as evidenced by science topics in a wide range of popular media (films, TV, books, games).
- Science communicators should help the lay public separate good science from bad. Publicly recognizing scientific excellence will be educative and inspiring to budding scientists.

How to Communicate Uncertain Science?

- We need to prepare and explicitly state what the question is, as that affects the nature and form of the answer. This was highlighted by the discussion of one of the “pillow problems” of “Lewis Carroll” (real name Charles Dodgson).
- Is it more difficult to communicate about sustainability issues than about other sciences? Is this because of the multiple dimensions, criteria, and values? It is certainly less difficult to communicate known laws (gravity) vs theories (climate change). Challenge seems to be when there is a giant, profitable industry that benefits from challenging scientific theory (oil vs Climate Change).
- We need brokers and other professionals to help communicate science (process, results, issues). It is not necessarily the scientist’s job or ability. Indeed, those not deeply trained in science might be better science communicators because they can understand the public’s perspective and interpretations, and would be less likely to use technical terms. We need dedicated communication professionals trained in scientific theory and methodology, coupled with strong writing, speaking, multimedia production skills.
- Training young people to be the bridge is key.
- Can multimedia help in presenting scientific information and insights? Especially using multimedia to convey the story, narrative, personal aspects, which are important contexts and structures.

- We need more human interest stories that explain how scientists use uncertainty--like risk assessment--to do the business of science.
- It may be more or less difficult to explain aspects of different disciplines (e.g., physics, biology) so they may need different communication strategies.
- Know your audience(s).
- What frames are of the most interest to specific audiences?
- Understand the perception of the sources and influence of the norms associated with different scientific issues and positions.
- Try to counter or avoid the use of one part of a study that is rejected or challenged as the basis for rejecting or challenging the entire study or its goal.
- Some/much science communication is quite ad hoc; so need to first identify the goal or purpose of the communication. What is the process, and the outcome; what do various stakeholders value and know and what should they know. Develop and assess audience; message; best method/vehicle for delivering that message to that audience; tone; evaluate; repeat.

Story & Narrative

- We need good storytelling about the process of science leading to the outcomes, not just the “results.”
- We need good characters. We need drama, a ticking clock, emotion — must give audiences the ‘why should they care.’
- However, narratives, characters, metaphors, analogies may provide vague boundaries and possibilities for multiple interpretations.
- Several people emphasized the human aspects of doing science, and being scientists. Science is a human behavior. Scientists are part of the public. For many, science and scientists are part of an elite (or perhaps geeky club) that they are not members of and do not understand. This is important to overcome.
- What is the role of emotion in generating trust in science communicators?

Miscellaneous

- Does a scientist’s research quality and reputation change over time? Reputation in science is/should be based on the results, not on the person.
- Sometimes even a small percentage risk is used to reject the entire project or intervention. The “precautionary principle” is relevant here: how much action should you take now when we do not and will not know the possible harms or unintended consequences until later?