Cases for Teaching Responsible Communication of Science

Arsenate Bacterium Press Conference: Discussion version

In December 2010, Felilcia Wolfe-Simon [FWS] presented a press conference, organized by NASA's Astrobiology Unit. Astrobiology is the study of possibilities for life on other planets. But since we do not know of any biological systems on other planets, astrobiologists investigate the *possibilities* for life on other planets. Sometimes this involves the study of unusual or *extremophile* organisms that thrive in conditions of extreme heat, cold, or pressure, or in the presence of substances that would usually be toxic or deadly. At the press conference, FWS introduced the bacterium GFAJ-1, which, she claimed, was able to use arsenic in place of phosphorus in the basic structure of its DNA. This was a stunning claim that promised entirely to change our understanding of life on earth, and the possibility of life on other planets. Her experimental design involved placing GFAJ-1 in an arsenic-rich-phosphorus-poor environment to see whether it would survive and grow. It did.

Shortly after the press conference, significant questions were raised about FWS's research. Rosie Redfield, a Canadian researcher who runs an internet blog discussing research in biological sciences, posted a detailed critical discussion of FWS's work, including arguments that specifically identified where she thought things had gone wrong. Eventually Redfield analyzed the DNA of GFAJ-1 using liquid chromatography-mass spectrometry, and found that she could not detect any arsenic. Redfield and others regarded this as a "clear refutation" of the central claims made in FWS's paper. Over time, a growing consensus of scientists concluded that GFAJ-1 did not substitute arsenic for phosphorus. Instead, it was capable of *tolerating* arsenic. FWS's experimental design, they argued, was faulty since she had not eliminated trace amounts of phosphorus in the original trials.

While it can be embarrassing, it is not unusual for initial findings to be disproven by subsequent investigation. Unless the problematic findings are the result of scientific misconduct, researchers whose findings are disconfirmed by later tests just move on to the next project. In this case, however, the scientific community responded to the disconfirmation of FWS's work with harsh condemnation that threatened to be a career-endingly disaster for FWS herself.

Your task in this case is to view and evaluate the press conference at which FWS introduced her work. You should identify the things that were done well, and things that were done less well. Note that this press conference was not selected as an example of what *not* to do: FWS clearly does some things very well. As you watch, you should identify both what went well, and what might have been improved.

Background Preparation: Watch FWS's presentation at the press conference either in class or at home. It's available from 2:45-9:45 on this video:

https://www.youtube.com/watch?v=JVSJLUIQrA0

As you listen, write down in a list what you believe FWS did well, and what she might have done better. Your instructor may also assign you the task to do some web-research to find responses to FWS's press conference and her research, and to bring in excerpts from three different responses from press or blog sources available on the web.

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Question for Discussion

Since it is not uncommon or reprehensible for published scientific results to turn out to be questionable or false, why was condemnation of FWS so harsh? The hypotheses below offer an opportunity to consider alternative explanations. You should not feel limited to the explanations posed here, however.

Hypothesis 1: Her study was not just flawed, but flawed in ways that suggest incompetence or misconduct. The response of her critics reflects their disapproval of her misconduct, not the failure of the study itself. Note that this is not a communications issue.

> **Response for Consideration:** FWS is a *young* researcher, but there were many other people, including senior scientists, involved in this research. If the work of a young researcher shows lack of expertise, it may simply be a sign that she is less experienced. In such a case, blame should fall more squarely on the senior scientists who are participating in and (one would hope) checking over the work as it is done and as it is reported.

Hypothesis 2: The strong negative response reflects that other people in the scientific community regarded this finding to have been hyped from the start.

> **Response for Consideration:** The press conference was organized as a press event by NASA. NASA is funded by a direct allocation from Congress, so the agency has an interest in promoting important findings in public. If the work was hyped beyond its appropriate significance, should the blame go to FWS or to NASA? FWS had a paper accepted (after peer review) in a major journal, and was offered an opportunity to speak to an international public about her work. She clearly believed in her own work, and recognition from senior colleagues, peer reviewers, and NASA must have boosted her confidence. In such a circumstance, would *you* turn down the opportunity for a press conference?

Hypothesis 3: The strong response reflects, in part, the fact that FWS did not do well in her press conference. She overstated the significance of her findings, and vastly overstated the degree of confidence her experimental work could properly support. She looked awkward. Perhaps it was a response to nervousness, but she smirked, seemed theatrical, and came off as excessively self-satisfied.

> **Response for Consideration:** When the subject is a young researcher who is presenting herself, for the first time in her life, in front of an international audience, these foibles are surely forgivable. How many of us could be confident that we would present ourselves well in such a context? NASA should have provided more effective media training for FWS so that she could have been appropriately prepared.

Hypothesis 4: She could have avoided these negative repercussions by responding differently to the criticism she received. (How should she have responded?)

> **Response for Consideration:** FWS was perceived as responding by digging her heels in, rather than acknowledging the force of critical response. This may, in part, reflect the fact that she was still convinced that her findings were correct. But it may also, once again, reflect the fact that FWS is a young scientist without much experience responding to criticism in public. Surely the senior scientists involved in the project should have helped her to respond more appropriately?

Hypothesis 5: The response she received was informed by, or exacerbated by the fact that she is a woman. The over-the-top response is the result of sexism.

Response for Consideration: There *is* reason to think that part of the response to FWS reflects implicit sexist bias. While some of those who responded on the web (Notably Rosie Redfield) were professional and (arguably) show no evidence of sexism, other responses are clearly gendered.