

1. Taking science directly to the public through books, op-eds, and public appearances

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2. Susanna Priest introduced you to the social scientific study of science communication.

I'm going to introduce you to the humanistic study of the subject. Scholars who do research on the rhetoric of science apply concepts developed in the humanities to analyze and evaluate the persuasive communication of scientists. By understanding the available means of persuasion, scientists can not only improve their communication practices, but get a better sense for how their often unconscious rhetorical choices shape the way their work is perceived by others. Today, I'm going to talk to you about some rhetorical scholarship on the messages that scientists direct to the public in the form of popular books, essays, and speeches. Some of the case studies that I'm going to introduce on public scientific rhetoric are from my own research, others are the work of my doctoral students, and one was a study written by someone I know at another university.

3. Each focuses on a single term of art in the field of rhetorical inquiry. I'll start with some cautionary tales -- examples of what scientists *shouldn't* do when translating their journal articles to nonexpert publics. Then I'll talk about a couple of exemplary cases where scientists were put in a difficult situation and comported themselves admirably, with savvy rhetorical strategies. My hope is that by telling you about these negative and positive cases, you might get some ideas about how to better manage your own opportunities to address the public about science.

4. The first case study I'll introduce as a negative example is part of a recently published article on the rhetoric of science by one of my doctoral students, Lauren Archer. The term of art that I'm going to introduce in this case is the hedge, that is, a word or arrangement of words that limits or qualifies a statement, making truth claims less bold and thus more acceptable to a skeptical audience. Archer explains how a 1992 article in the prestigious British medical journal, *The Lancet*, authored by Andrew Wakefield and several others, used this standard convention in the genre of the journal article to slip some pretty iffy research past the journal's reviewer. The article was about a possible link between the MMR vaccine and autism. Words such as "may" and "possible" and "some" were used to temper the claims of the article, so that the scientific censors who served as the journal's blind reviewers wouldn't reject the article's claims as too bold and therefore unsupported by the evidence.

5. But what works as a perfectly legitimate strategy in a scientific journal article got twisted into something different when Wakefield used the article as a warrant for holding a press conference warning parents to think hard about whether their children should be subjected to the MMR vaccine. Here Wakefield used hedged statements too, but these new hedges were interpreted by the public as warranting a stronger claim than the scientific reviewers of his article had originally accepted. In the press conference, Wakefield said: "It is our suspicion that there may well be [a genuine causal association between the vaccine and autism], but that is far from being a causal association that is **proven beyond doubt**." In the context of a public pronouncement, this hedge suggests that a causal association *has* been determined, just not yet proven *beyond doubt*, a standard of proof that reaches well beyond what many frightened parents needed to hear

to decide to withhold vaccination from their children. Later in the press conference, Wakefield responded to a question about whether the measles portion of the MMR vaccine is the cause of autism, with “as yet we don’t know, but **there is no doubt** that if you give three viruses together, three live viruses, then you potentially increase the risk of an adverse event occurring.” This sentence is so hedged as to be logically meaningless. There’s no doubt that you *potentially* increase the risk? But in the context of a press conference, the assurance that there’s “no doubt” is heard first and influences all else. Newspaper headlines responded as Bryn Nelson would tell us to expect, by dropping the hedges altogether, shouting “Child Vaccine Linked to Autism” and “Doctors Warn of New Childhood Vaccine Danger.” In short, Archer’s rhetorical analysis suggests that what works perfectly well as a legitimate tradition of scientific journal articles, the hedged claim, can work against the interest of science when used in the context of a public pronouncement directed to nonexpert decision-makers. Wakefield utilized the discursive gaps left by hedges in the *Lancet* article to authorize public claims about the MMR vaccine that were not actually supported by his research data. Of course the risk wasn’t real, and Wakefield, who eventually lost his license to practice medicine because of ethical lapses in this research, suffered the consequences, as did the children whose parents chose not to vaccinate them, and the communities in which those families lived.

6. The second case study that I want to introduce today is part of an ongoing research project by another one of my doctoral students, Miles Coleman, on the rhetorical figure known as hyperbole, or intentional exaggeration for emphasis or effect. In 2009, a team of scientists published an article in the peer-reviewed, interactive open-access journal *PLoS ONE* that characterized a primate fossil known as the “Ida” skeleton.

7. They carefully planned this publication to be simultaneous to publication of a popular book on the find as well as a high-production-value BBC documentary narrated by David Attenborough, and a website, with each of these popular accounts sharing the common title *The Link*. As Coleman explains, what was a fairly muted and standard journal article description of a fossil that shares certain characteristics of both the “strepsirrhine” line of primates (like modern lemurs) and the “haplorhine” line of primates (making up modern monkeys, apes, and humans), is transformed by some of those same scientists in *The Link* into the hyperbolic claim that scientists have discovered *the* missing link between humans and all other mammals. As one of the scientists put it in one of his public pronouncements: The message of the fossil known as Ida is that “Humans are not special – we’re related deep in time to more primitive mammals.” The unfortunate result of this hyperbolic claim about the significance of a single fossil was that creationist foes of evolutionary science jumped all over the scientists’ public pronouncements, contrasting them with the more sober claims appearing in the scientific article itself, and concluding for their audiences that the scientists were being inauthentic, acting as scientific cheerleaders in their public pronouncements rather than as disinterested researchers. While the rhetorical figure of hyperbole might seem to be a useful way to garner attention for scientific research in the public sphere by making that research seem more groundbreaking or shocking, in practice, it can weaken the credibility of scientists when turned against them as easily as it was in this case.
8. My third example is actually two case studies that come from my new book on the frontier of science metaphor in the rhetoric of American scientists. When addressing popular audiences, scientists like to draw from the resources of eloquence that make up

their cultural heritage. Biologist E. O. Wilson has done so for a very long time, winning a couple of Pulitzer prizes for the beautiful prose of his popular science books. But sometimes the use of a clever metaphor can backfire on a scientist when the unexamined entailments of that metaphor happen to push against the goals that scientist is seeking. For example, Wilson wrote a couple of books arguing for the support and development of biodiversity research. In those very books where he argued that Brazilians need to stop cutting down the Amazon rain forest so that the many species of plant and animal there that haven't yet been adequately catalogued can be preserved for scientific study, Wilson also used metaphors to characterize American scientists as frontier explorers bioprospecting the land for its hidden treasures. Unsurprisingly, Brazilians were alarmed by the prospect of foreign scientists entering their forests to remove their natural resources, and subsequently closed off the Amazon to biodiversity study by American scientists, the very opposite of what Wilson wanted.

9. A similar frontier metaphor was used unreflectively by genomic scientist Francis Collins in the White House press conference announcing the completion of the first draft of the Human Genome Project. Collins explained that this press conference was called because the competition between public and private teams to sequence the human genome was starting to become unseemly. Collins wanted to show the public that scientists from both teams were working together, rather than scrambling against each other for financial advantage. But by filling his speech with an extended comparison between the Lewis and Clark expedition and his own team's scientific mapping of the genome, Collins only succeeded in confirming for public observers that a race for genomic territory was underway, with profits at stake for the explorers and their sponsors, and the bodies of

those who occupy that territory only as secure in their rights as American Indians had been during that earlier scramble for profitable frontier territory. A later opinion editorial that he wrote for the *Seattle Times* repeated the same metaphor, and invited the same reading of genomic science. Sometimes the metaphor that a scientist chooses when addressing a popular audience undermines the intent of that scientist, and a critical reflection on the rhetorical implications of that metaphor before deciding to use it would really help matters.

10. O.K., that's enough bad examples for now. Let's look at some examples of beneficial rhetoric. The first case study that I'll offer up as exemplary involves the use of *litotes* by climate scientists to manage critique of their work in the wake of a scientifically inaccurate but emotionally charged science fiction movie. Litotes is a figure of speech that works as an understatement, an anti-hyperbole if you will, usually by affirming the negation of its opposite. For example, a colleague commenting on your research award with the phrase: "not bad," or a friend hinting that an invitation to visit would "not be unwelcome." A rhetoric of science scholar by the name of Ron Von Burg, at Wake Forest University, points to this strategy in the public discourse of climate scientists responding to questions about the blockbuster movie *The Day After Tomorrow*. This 2004 movie portrayed climate change as happening over the course of a few days, with a paleoclimatologist dramatically racing a superstorm across the northeastern seaboard as it creates an instant ice age. The movie's promotional materials created a sense of verisimilitude by citing real scientific journal articles from *Nature*, *Geophysical Research Letters*, and *Science* that affirmed the reality of climate change. Jumping on this pairing of hyperbolic story line and citations of scientific journal articles, global warming

skeptics were quick to denounce the movie as evidence that unscientific alarmism plagues climate change science. Climate scientists were thus faced with a difficult situation. They hadn't produced the movie, of course, but they were being tarred with supporting it because of the hyperbolic claims of its marketing professionals. They could have just denounced the movie as unscientific, or complained that their scientific journal articles were being misinterpreted and misused by Hollywood. But that would have played into the hands of the global warming skeptics, confirming the argument that climate change isn't really so bad and we shouldn't be alarmed by it. So instead of just denouncing the movie, climate scientists pointed out the scientific inaccuracy of a story line about *instant* climatic shift, and then, through the rhetorical strategy of litotes, argued that the overall message of the movie, that climate change requires our attention, was "not untrue." Identifying the movie's portrayal of climate change happening in a few days, instead of the more scientifically valid few decades, as a typical Hollywood dramatization, they insisted nonetheless that "the film is not scientifically invalid" insofar as the events it depicts – melting ice sheets, powerful hurricanes – are likely to occur, but just over a longer time frame. As Von Burg puts it, this use of litotes enabled scientists to maintain their credibility and displace the inaccuracies of the movie "onto the convention of a Hollywood film" while simultaneously suggesting that such "dramatics should not mask the larger truth that global warming is real." It was a particularly savvy rhetorical response to the skeptics' critiques.

11. The second case study of exemplary rhetorical strategy by scientists addressing a general public audience also involves climate scientists, although the same strategy can be used by other scientists countering pseudoscientific claims in the public sphere, like AIDS

denialism or Intelligent Design creationism. It's a strategy called *metastasis* and it involves denying and turning back on your opponents the charges that have been directed against you. I'm reporting here on research that I've done on the debate tactic that I've called "manufactroversy," that is: scientific controversy that's manufactured for a public audience by special interest groups with a financial or ideological reason for creating uncertainty about inconvenient scientific truths. The tactic of these self-named scientific skeptics is really clever, because it draws on American values like democratic and journalistic balancing norms and respect for freedom of speech to claim that there should be open debate on a particular scientific matter that the vast majority of scientists have already settled to their satisfaction. When scientists protest that the claims of climate skeptics (or AIDS denialists, or intelligent design creationists) shouldn't be published in the popular press and such scientific debates shouldn't be engaged in public forums because there *is* no scientific controversy over whether climate change is happening (or whether HIV causes AIDS, or whether species evolve), the skeptics, who are often mercenary scientists funded by industry or partisan special interest groups, claim that they're being silenced in a decidedly unfair, unscientific, and undemocratic way. How then can mainstream scientists respond to this kind of manufactroversy? The rhetorical strategy that seems most suitable is one that denies the charge of unfairness and turns it back on the skeptic by pointing to the way they're ignoring the lengthy debate that has already occurred in scientific journals. An example of a response that involves this rhetorical strategy is seen in a letter to the editor written by UW Atmospheric scientist R. A. Brown in response to a *Seattle PI* opinion editorial with the title "Global Warming is Alarmism." Most letters from scientists responding to this editorial just claimed that the

skeptic's claim shouldn't have been published in the first place. But Brown did something different; he pointed out that given the fact that over 20 years of scientific debate has already resulted in 99 out of 100 climate scientists being convinced that climate change is happening, it's the responsibility of the skeptic to offer proof that current scientific understanding is wrong before demanding to restart the debate in a public forum. Climate skeptics (or AIDS skeptics, or evolution skeptics) are thus characterized as the ones who are acting unfairly by trying to restart a debate in the public sphere that's already come to a natural end in the technical sphere. They're like the sore losers who insist that a contest continue in the parking lot past the point at which it's already come to a conclusion in the stadium. This sort of metastasis, or turning of the tables on the science skeptics, is a particularly savvy response to claims that scientific debate should continue in the public forum about issues that have already been argued and decided in the scientific literature.

12. So here's my advice to scientists in a nutshell: be careful about the use of hedges in public discourse – they don't serve the same function there as they do in scientific journals; resist the urge to offer hyperbolic significance claims in public reports of your scientific journal articles; and think carefully about the metaphors you use in public communication. When responding to politically-motivated critics who lambast your findings in the public forum, use rhetorical strategies like litotes and metastasis to turn the tables on your opponents and restore public credibility to the scientific journal articles under attack. Once you become aware of the available means of persuasion, and begin to see how rhetoric can be used to achieve specific goals, you can gain more control over

how you present your work, and thus develop public communication that's better for you, for science, and for the public good.