

Perspective Piece

Fallacies, Fake Facts, Alternative Facts, and Feel Good Facts; What to do About Them?

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Both sides of the political spectrum now use deception and misinformation to argue their philosophical positions on environmental harm, present and future. And both use common logical fallacies to enhance their views: *cherrypicking* (selecting data fitting their preconceived outcome); *hasty generalization* (suggesting conclusions from a small set of data implies the same conclusion elsewhere); and *ad hominem* (personal attacks on the ethics, funding, or perceived associations of those having different views).

Beyond these long-known logical fallacies, the public debate of science includes outright lies, “fake and alternative facts,” and “feel good facts” information or ideas that *feel* like they should be true but are not. Real facts consist of information that can be reproduced by anyone with the same skills. How many people showed up at President Obama and President Trump’s inaugurations? This information can be found in the public record through photographs made by the U.S. Park Service and those made independently by others.

How do scientists change the conversation to allow for measured civil discourse to solving the large environmental challenges of the future? The fakery in public debate usually starts with the *cherrypicking* and then moves to never setting a bar for collective agreement. If these approaches fail to win the day, the *ad hominem* attacks begin and invocation of conspiracy theories which *appeal to public ignorance* (another fallacy). I became subject to these tactics in debate over

hydraulic fracturing (“fracking”) used to obtain oil and natural gas out of solid rock. I even wrote a paper on what happened to me when the dust settled (Siegel 2015).

Briefly, I challenged the premise of a published paper that concluded groundwater quality in northeastern Pennsylvania could be broadly contaminated by fracking. The paper used flawed statistics and a non-random small data set. I gained access to chemical analyses of groundwater from more than ten thousand water wells in the same area and showed that no broad environmental harm had in fact occurred. Indeed, groundwater quality in that part of Pennsylvania has actually improved since fracking, although this improvement did not relate to fracking (Wen et al. 2019).

Some of those who philosophically felt fracking *should* cause harm to groundwater (for them, a “feel good fact”), could not dispute the science since I effectively used the entire population of water wells. So, they attacked me *ad hominem* and suggested I participated in a conspiracy with the hydrocarbon industry. I ultimately testified at a Congressional hearing over the matter. You can find all the references and pertinent URLs to my unpleasant experience in Siegel (2015).

I see similar discourse happening to scientists across disciplines in almost every part of the environmental sphere. Social scientists know the reasons for the current change in discourse, and their work has been well summarized in more accessible fashion by Kobert (2017) and Beck (2017). Best-selling books have even been written

on the topic (e.g., Gladwell 2007; Kahneman 2013; Wieland 2017).

Basically, people make decisions three ways: they use their head, heart, or “gut.” The head part consists of logical mulling over of real facts to arrive at conclusions or opinions. This takes time and effort. Using one’s heart appeals to good intentions, what feels “right to do,” and takes less time. Using the gut refers to quick intuitive decisions, often without much thought or data to buttress them. Sometimes the heart and gut work well and sometimes they do not. In the public arena, research shows that heart and gut decisions usually win over the head in at least the short term. Social circles - those people with whom you most connect - profoundly affect your heart and gut decisions. Nobody wants to be isolated from their close personal friends, family, and professional contacts because of philosophical differences. The influence of these social circles, based on social media, religion, political party affiliation, or regional cultural differences (e.g., Woodard 2011) cannot be underestimated.

For example, during my involvement in the national debate on fracking, I had the opportunity to discuss water pollution with the chief operating officer of a major national environmental organization. After I explained why fracking would not seriously contaminate groundwater, he agreed that his organization “oversold” water pollution as a talking point, but that he could not retract what it said because his membership would not tolerate it.

In turn, I gave a presentation to leaders in the gas and oil industry, and told them they were very smart people, and so they had to know burning their product affected global climate. They could not admit that for fear of losing economic purchase and the respect of their peers who felt otherwise. In private, the oil and gas leaders agreed with me. The social pressure to conform may be as powerful a driver for human behavior as sex!

So, what can scientists do to move public debate out of this swamp of discourse? I use Randy Olson (2009, 2013) as a guide. Olson suggests that scientists should not be “such scientists” when they explain their work to the public. They need to be “storytellers” - avoid jargon, and certainly not use just their heads (e.g., “the data say this...”). Scientists need to also use their hearts and guts,

tell personal anecdotes, and incorporate humor. I can say from personal experience that this mode of discourse can be difficult.

Most of all, scientists have to *publicly* acknowledge the fears and concerns of those who disagree with them. Acknowledgment does not mean that we agree with the positions. It means we respect that others can *have* another opinion, even if we think they may be wrong.

I also no longer tell people they “are wrong.” Instead, I ask questions: “What led you to think this? That’s interesting. Can you tell me more? What is your goal with your position?” I try to show that I want to understand the position from where they come.

I began to use Olson’s approach toward the end of the fracking debate in my home state of New York and found that many who publicly called me “the frackademic” suddenly began to interact positively with me. We found agreement on many issues related to fracking, including the fact that groundwater would not be seriously contaminated.

How did I do that? I took Olson’s advice to try to tell my “story” in only one word, and then in one grammatically correct compound sentence.

My one word on fracking? “Unscathed (with respect to water quality).”

My compound sentence? “I agree with you that fracking hundreds of thousands of gas wells has caused a few instances of methane contamination to well water and also locally spilled chemicals to streams that temporarily killed fish; but given the tiny number of incidents, can we instead focus on the larger problems: enhanced climate disruption, economic disparity, and stresses on local public services, air quality, and community development?”

This sentence showed that I respected those frightened of fracking by misinformation campaigns and scare tactics. My public respect for their concerns opened the door to communication - along with using more analogies and far less data driven graphs.

Try it. It works.

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DONALD I. SIEGEL earned his BS in Geology from the University of Rhode Island, a MS in Geosciences

at Penn State and his Ph.D. in Hydrogeology at the University of Minnesota. He subsequently worked for the U.S. Geological Survey as a hydrologist/geochemist, and then joined Syracuse University in 1982 and taught and did research there on topics related to hydrogeology and water chemistry for 35 years. His research interests ranged from topics tied to the hydrogeology of deep basins and hydrocarbon-bearing rocks, methanogenesis in wetlands, organic and inorganic groundwater contamination, and drought-induced recharge in arid wetlands. Professor Siegel served as Chairman of the National Water Science and Technology Board of the National Research Council (NRC) and participated on many NRC panels related to water resources. He served as associate editor for most water topic journals and as book editor for the Geological Society of America. Geological Society of America's Hydrogeology Division awarded Professor Siegel its *Distinguished Service Award*, *O.E. Meinzer Award* and *Birdsall-Dreiss Lectureship*, and he is a Fellow of the American Association for the Advancement of Science, the Geological Society of America, and the American Geophysical Union for his contributions to water science. Not retired now but rewired, Siegel now serves as a partner at *Independent Environmental Sciences*, a consulting group specializing in forensic hydrogeology and geochemistry. He recently competed on the *Food Network* in 2016 and is developing a secondary career playing solo jazz guitar at coffeehouses, wineries, and various receptions in upstate New York. He may be contacted at disiegel@syr.edu.

References

- Beck, J. 2017. This article won't change your mind. *The Atlantic*. Available at: <https://www.theatlantic.com/science/archive/2017/03/this-article-wont-change-your-mind/519093/>.
- Gladwell, M. 2007. *Blink: The Power of Thinking Without Thinking*. Back Bay Books, New York.
- Kahneman, D. 2013. *Thinking, Fast and Slow*. Farrar, Straus and Giroux, New York.
- Kolbert, E. 2017. Why facts don't change our minds: New discoveries about the human mind show the limitations of reason. *The New Yorker*. Available at: <https://www.newyorker.com/magazine/2017/02/27/why-facts-dont-change-our-minds>.
- Olson, R. 2009. *Don't Be Such a Scientist: Talking Substance in an Age of Style*. Island Press, Washington, D.C.
- Olson, R, D. Barton, and B. Palermo. 2013. *Connection: Hollywood Storytelling Meets Critical Thinking*. Prairie Starfish Productions, Los Angeles, CA.
- Siegel, D. 2015. 'Shooting the messenger': Some reflections on what happens doing science in the public arena. *Hydrological Processes* 30(5): 830-832.
- Wen, T., J. Woda, V. Marcon, X. Niu, Z. Li, and S.L. Brantley. 2019. Exploring how to use groundwater chemistry to identify migration of methane near shale gas wells in the Appalachian Basin. *Environmental Science & Technology* 53(15): 9317-9327.
- Wieland, J.W. 2017. Willful ignorance. *Ethical Theory and Moral Practice* 20(1): 105-119.
- Woodard, C. 2011. *American Nations: A History of the Eleven Rival Regional Cultures of North America*. Viking, New York.