Facts, Opinions, and the Alt-Fact Society

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I prepared this document as a strawman discussion for the radio show on KHUM. I had a conversation with Lyndsey Battle on 2/4/17 at noon. Here I discuss facts, science, and scientific philosophy. My discussion is outlined generally like this:

Facts

Facts are things that have actually occurred or correct. If these things did not occur or are incorrect are not facts. How can we tell if something is a fact? Facts are verifiable based upon empirical observation (see scientific method below), as opposed to theoretical statements.

Opinions are statements or viewpoints. Opinions can be based upon facts. Opinions can be based upon theories. Fact-based opinions generally are more "real" than theory-based opinions because they are based upon real and verifiable observations. Anyone and everyone can have opinions, but we need to evaluate opinions based on their credibility. If someone has an opinion that is theoretical but in opposition to a fact, their opinion loses credibility. Likewise, if someone has an opinion that is based upon a fact, their opinion gains credibility. As Scotty (the engineer) on the Star Trek the original series said, "Everyone is entitled to an opinion," those stating their opinions may be incorrect if they are not based upon fact.

Scientific Method

I start every single science class that I teach with a review of the scientific method as all science is based on this process. There are no hard rules about these steps as when one asks 5 scientists what the steps are, one will get 5 or more answers. Here are the steps that I propose to students.

1. Make an/some observation(s)
2. Form an/some hypothesis/hypotheses to explain the observation(s)
3. Formulate an/some experiment(s) to test the hypothesis
4. Conduct the test
5. Evaluate and analyze the results to accept, reject, or modify the hypothesis/hypotheses.

I use a part of the story from Star Trek Nemesis, a film with the cast from The Next Generation television series. In short, the Enterprise crew finds the prototype artificial person for Data on a planet. Geordi, the engineer, downloads all of Data's "memories" into the prototype (named "Before," heheh). Data hypothesized that "Before" would be as perfect as he is after he knew all that Data knows. After Data's memories are downloaded and "Before" is disconnected from Data, Data asks "Before" where he is. They are in the Engineering section of the Enterprise and if everything worked correctly "Before" should

know this. Before answers to Data, “I am in a room with lights.” Data’s test failed, but the reason I use this story is to help students know that they all have the basic skills required to be a scientist, the skills of observation. Before made the basic observations that he was in a room and that there were lights on. It is ironic that the scene also represents an example of the entire scientific method, in addition to being an easy to remember analogy about simple observational skills. Also, this can empower students to realize that they are capable of being scientists and all they need to do is rely on their basic senses. I remind students that when they are confronted with challenges to understand things, if they rely on these basic senses, they can reason through these challenges.

Here is a great overview video about the scientific method as shared on social media by Dr. David Bazard, Dean of the Department of Science at the College of the Redwoods.

https://www.youtube.com/watch?v=JH0_xC7q9tU&feature=youtu.be&t=25

Facts vs. Alt-Facts

This is one of the simplest principles of all. Alt-Facts are not facts because they violate the definition of what a fact is. They are not based upon real observations. They are not based upon verifiable tests. Alt-Facts are not real. Alt-facts are an imaginary representation.

To present an Alt-Fact as a fact is a dishonest representation of reality. Recently I heard an interview on NPR (while listening to KHSU public radio) of a journalist. They were asked why they did not state that the comments from a particular political entity was a lie. The journalist claimed that because they had not been able to establish intent [to be dishonest], they could not call it a lie. However, the difference between being dishonest and telling a lie is not that much different, in my opinion.

My friend, Stephen Tillinghast, likes to use the phrase “post-factual” society to describe our culture. This makes me think about what my professors used to say when I was a younger student in the early 1990s. My professors would discuss how they would need to lower their standards and level of academic scholarship each year because the students were sequentially lesser prepared. They would discuss how entering students would be covering material that used to be covered in High School. I came up with the term “the dumbing down of America.” I am sure I did not coin this phrase, but it was my first observation of this phenomena as presented to me by professors and mentors who had decades of observations prior to my coming on the scene. Now that I have been teaching introductory science courses for 5 years, I have found that, in large part, the observations from my mentors of decades past are cogent and applicable today. Considering the recent political cycle and the formation of a political group called the alt-right, I coined a term “Alt-Fact.” Of course, I learned shortly after that David Frum had coined the term a day or two before I did. I am sure there are probably others who also used this term.

Why are people so fooled to believe Alt-Facts? There are probably many reasons ranging from exposure or lack of exposure to television, books, science classes, video games, social media, etc. Perhaps the largest factor may be the overstimulation from information presented online. With the plethora of information online, it is challenging to evaluate the credibility of all this information. It is time consuming and requires a certain amount of expertise in a certain subject matter. I first started developing my skills to distinguish fact from alt-fact when I was taking an atmospheric science class at Oregon State University. I started evaluating websites that discussed the anthropogenic forcing of

climate change. Some websites promoted a climate change denial perspective. I learned that there was a wide range of strategies that websites like these used to promote misinformation as fact based reasoning. I soon realized that I could quickly evaluate the credibility of a source of information based upon some simple rules. These rules were based upon my observation of the climate change denier websites. I discuss this below when I talk about my website about the radiation from the Fukushima-Daiichi Nuclear Power Plant. http://earthjay.com/?page_id=910

There are many aspects of websites that reveal that they are not credible sources of information and I reveal these aspects as I evaluate each source of information about Fukushima radiation on that webpage. I put together a similar page for modern climate change websites. http://earthjay.com/?page_id=1029

Scientific Philosophy

I present some great quotes from an editorial presented by Atul Gawande on 6/10/2016. This article came to my social media feed as tweeted by Rich Boone, the Dean of the College of Natural Resources and Sciences. Below are some cogent observations by Gawande, interspersed with some observations of my own.

THE MISTRUST OF SCIENCE: http://www.newyorker.com/news/news-desk/the-mistrust-of-science

> "The great physicist Edwin Hubble, speaking at Caltech's commencement in 1938, said a scientist has "a healthy skepticism, suspended judgement, and disciplined imagination"—not only about other people's ideas but also about his or her own. The scientist has an experimental mind, not a litigious one."
>
> "Ultimately, you hope to observe the world with an open mind, gathering facts and testing your predictions and expectations against them. Then you make up your mind and either affirm or reject the ideas at hand. But you also hope to accept that nothing is ever completely settled, that all knowledge is just probable knowledge. A contradictory piece of evidence can always emerge. Hubble said it best when he said, "The scientist explains the world by successive approximations." "
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> "People are prone to resist scientific claims when they clash with intuitive beliefs."

This reminds me of a book I read for one of my anthropology courses about women who lived in Cairo, "Baladi Women of Cairo: Playing With an Egg and a Stone." https://www.rienner.com/title/Baladi_Women_of_Cairo_Playing_with_an_Egg_and_a_Stone

I was growing up in a world (in the 1990s) that was dominated by allopathic medicine while I was surrounded by naturopaths and herbalists, who certainly bring value to our health. The stories in the book rang true with me because they told of how the Baladi Women (women living in an urban setting) in Cairo were also living in a juxtaposition of sometimes competing health care techniques. When confronted with healthcare choices, they challenged themselves to consider either western medicine or traditional medicine. There were values from using either modality. This ethnology is a work of cultural anthropology in that it seeks an understanding of others based upon their beliefs and how these become developed often as a learned perspective.

> "The sociologist Gordon Gauchat studied U.S. survey data from 1974 to 2010 and found some deeply alarming trends. Despite increasing education levels, the public's trust in the scientific community has been decreasing."
>
> "Today, we have multiple factions putting themselves forward as what Gauchat describes as their own cultural domains, "generating their own knowledge base that is often in conflict with the cultural authority of the scientific community." "
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> "They [the groups] all harbor sacred beliefs that they do not consider open to question."
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> "Science's defenders have identified five hallmark moves of pseudoscientists. They argue that the scientific consensus emerges from a conspiracy to suppress dissenting views. They produce fake experts, who have views contrary to established knowledge but do not actually have a credible scientific track record. They cherry-pick the data and papers that challenge the dominant view as a means of discrediting an entire field. They deploy false analogies and other logical fallacies. And they set impossible expectations of research: when scientists produce one level of certainty, the pseudoscientists insist they achieve another."

I have found some of these practices on a variety of websites that promote alt-fact views about chemtrails, climate change, and radiation from Fukashima. The first major effort I used my website was to help people develop their own critical skills to distinguish between more and less credible sources of information regarding the dangers of radiation from the terrible and continuing disaster at the Fukashima-Daiichi Nuclear Power Plant following the 2011 Tohoko-oki magnitude M 9.0 earthquake and tsunami. Many of my friends on social media are not scientists and they were sharing these conspiracy theory websites like globalresearch.ca. I found myself spending too much time explaining my rationale to everyone individually. Therefore, I put together a web page where I model how to form ways to distinguish more and less credible information. I did not want to tell people what to think, but what skills they can use to distinguish these information sources on their own. I created three categories of decreasing credibility and placed every source on the subject matter into one of these categories.

Turns out it was a good strategy, to avoid arguing with people about their skewed views, but to help them develop their own critical skills. As Gawande mentions, "Describing facts that contradict an unscientific belief actually spreads familiarity with the belief and strengthens the conviction of believers. That's just the way the brain operates; misinformation sticks, in part because it gets incorporated into a person's mental model of how the world works. Stripping out the misinformation therefore fails, because it threatens to leave a painful gap in that mental model—or no model at all." But more importantly, "Rebutting bad science may not be effective, but asserting the true facts of good science is. And including the narrative that explains them is even better." In my Fukashima radiation page, I explain why I place each sources of information into each category.

It is difficult to tell the difference between fact and opinion these days, especially with the tremendous amount of information on the internet. It is almost impossible, in many cases, to be able to completely review a subject if one is not an expert in that subject. Even individual scientists, who are subject matter experts, cannot do this. As Gawande mentions, "Few working scientists can give a ground-up explanation of the phenomenon they study; they rely on information and techniques borrowed from

other scientists. Knowledge and the virtues of the scientific orientation live far more in the community than the individual."

For people live in a world of belief. And modern science is founded on this, the belief that there is a natural systems explanation for observable phenomena. Modern Science arose as a response to the dark ages when religious philosophy dominated our belief systems. Science sure existed before that, but modern science was a rebirth of older practices.

Some quotes I like to use that reflect how people incorporate science into their belief systems, some more successfully than others.

- "correlation is not causation"

  This is possibly the most common mistake that people make. For example,

  - Someone sees a plane fly overhead, they get sick, and blame the airplane. Maybe they got sick because they were losing sleep worrying about planes that might cause them to get sick.
  - Someone measures differences in radiation between a parking lot and the beach and conclude Fukushima radiation has reached California. The higher radiation at the beach is actually from the feldspar being moved around by the waves.

  Determining causality is one of the most important parts of science because understanding causality allows us to form policy and make smart decisions.

- "the absence of evidence is not evidence of absence"

  In other words, it is possible that there is evidence to support or reject an hypothesis, but we have not (1) observed it or (2) been able to observe it. This is related to the next quote:

- "we cannot test hypotheses about phenomena for which we cannot yet observe"

  In other words, one needs to be able to (1) observe phenomena and (2) measure those phenomena before these phenomena can be evaluated with science. Prior to our ability to measure the presence and abundance of different isotopes of Carbon, we could not use radiocarbon dating to evaluate the time when something died. Or, prior to the development of lenses and microscopes, we could not evaluate the existence nor function of cells and subcellular structures.

  The development of new abilities to make observations (and to causal linkages between observations) is the key to scientific discovery. It is extremely unlikely that we know everything that there is to know. For example, recently there was a discovery of a new organ in our body, the mesentery. Scientists needed to be able to measure its structure and function.

  http://www.thelancet.com/journals/langas/article/PIIS2468-1253(16)30026-7/abstract

Scientific Discovery requires imagination. One needs to think outside of the box in order to create new discoveries. I love using the word create in my science classes.

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Gawande concludes with some thoughts on truth that I fully agree with. That there is no truth, but that scientists (all of us) are truth-seekers. The scientific method is a cycle with ongoing improvements in methods, observation techniques, and inventions (creativity). There is no end.

> "The mistake, then, is to believe that the educational credentials you get today give you any special authority on truth. What you have gained is far more important: an understanding of what real truth-seeking looks like. It is the effort not of a single person but of a group of people—the bigger the better—pursuing ideas with curiosity, inquisitiveness, openness, and discipline. As scientists, in other words."

I guess the cliché that goes along with this is, "the more one knows, the more they know that they don't know." Like life, the seeking of scientific facts in a journey, not a destination.

Resources

- "The Mistrust of Science" a News Desk post on the New Yorker

  http://www.newyorker.com/news/news-desk/the-mistrust-of-science

- Politization of Science:

  http://www.asanet.org/sites/default/files/savvy/images/journals/docs/pdf/asr/Apr12ASRFeature.pdf

- Metabunk: a website dedicated to scientific investigation

  https://www.metabunk.org/about-metabunk.t1966/

- The Debunking Handbook

  https://skepticalscience.com/Debunking-Handbook-now-freely-available-download.html

- Denialism

  http://scienceblogs.com/denialism/about/

- Climate Change

  https://skepticalscience.com/

- "Scientists must fight for the facts" an open source editorial in Nature

  http://www.nature.com/news/scientists-must-fight-for-the-facts-1.21347?WT.mc_id=TWT_NatureNews

- "People Behind the Science" a website with people discussing their science

  http://www.peoplebehindthescience.com/