ISSA Proceedings 2014 – Don't Drink That Water!: The Role Of Counter-Intuitive Science In Conspiracy Arguments

Abstract: In this essay, we focus on one of the most persistent examples of the 'intuitive validation of conspiracy' type of argument—the conspiracy theory that claims that fluoridating public water supplies is an attack on public safety. We argue that the controversy surrounding water fluoridation highlights the potential for conspiracy proponents to supplant complicated phenomena with intuitive observational data used to support the opposite of the scientific consensus.

Keywords: conspiracy theories, counter-intuitive arguments, water fluoridation

1. *Introduction*

How could President Kennedy's head move backward if he was shot from behind? How could the American flag wave on the moon if there was no atmosphere to move it? How could the Twin Towers have collapsed on 9/11 at the speed of free fall if there were no bombs in the buildings? Although these three conspiracy theories span decades of history and locations to the moon and back, they all share a common argumentative feature: they rely on intuition to argue against the scientific explanations for the complicated phenomena involved. In this essay, we focus on one of the most persistent examples of this 'intuitive validation of conspiracy' type of argument – the conspiracy theory that claims that fluoridating public water supplies is an attack on public safety. We argue that the controversy surrounding water fluoridation highlights the potential for conspiracy proponents to supplant complicated phenomena with intuitive observational data used to support the opposite of the scientific consensus.

2. *Counter-intuitive science: the challenge of complicated explanations for a complicated world*

According to the Oxford English Dictionary, the primary definition for intuition is "the action of looking upon or into; contemplation; inspection; a sight or view" (intuition, 2014). Although that definition helps highlight the importance of

observation for intuition, the entry includes another definition that demonstrates the strategic advantage of deploying intuition-based arguments in a public controversy. The alternate definition for intuition is, "The immediate apprehension of an object by the mind without the intervention of any reasoning process" (intuition, 2014). Appeals to 'knowing' the world without the intervention of any reasoning process are antithetical to the basic tenets of the scientific method which prioritize a rigorous process of reasoning, not the immediate apprehension of an object.

History is replete with examples of the tension between intuition and science. Indeed, some of the most famous scientific discoveries were initially rejected because they defied the intuition of the day. For instance, the notions that the Earth is round and that it orbits the Sun not only defied appeals to intuition but also generated immense public controversy (Whitehouse, 2009). There have been numerous scholarly works dedicated to explaining the history of scientific findings that are counter-intuitive including Julian Havil's *Impossible?: Surprising Solutions to Counterintuitive Conundrums* which chronicles paradox after paradox which have counterintuitive solutions that often defy public and scholarly acceptance (Havil, 2008). Our argument here is that conspiracy theories are a special type of argumentative discourse that exploits the tension between intuition and science to generate and sustain public controversies. This pattern of discourse can result in substantial changes to public policy in favor of intuition rather than science. We will now turn to controversy surrounding water fluoridation as an example of this argumentative strategy in action.

2.1 *The water fluoridation controversy: a case study in counter-intuitive science*
On January 25, 1945, the City of Grand Rapids, Michigan, began a public health intervention to prevent cavities and tooth decay by adding fluoride to its public water supply. The experiment was based on a set of medical research findings that had started in 1901 by a dentist named Dr. Frederick McKay who was initially interested in helping diagnose and solve a medical condition that comes from consuming too much fluoride called fluorosis (The Story of Fluoridation, 2014). In the process of studying the condition, Dr. McKay with the help of other dentists, discovered that one of the positive benefits of consuming fluoride was that it reduced the likelihood that people would experience cavities and tooth decay. The key question became: "How much fluoride should a person consume to gain the medical benefits without risking the negative health implications that

come with fluorosis?" A group of researchers, including the head of the Dental Hygiene Unit at the United States National Institute of Health, came to the conclusion that a fluoride level of 1.0 parts per million was a safe amount of fluoride to add to the water supply (The Story of Fluoridation, 2014).

With the research in hand, the City Commission of Grand Rapids voted to become the first city in the world to add fluoride to the public water supply to help prevent cavities and tooth decay. Over the next 15 years, researchers tracked the cavities and tooth decay present in the city's residents, including 30,000 school children. The results were astonishing. The children born after fluoridation had 60% fewer cavities and the treatment also reduced permanent adult tooth decay by 35% (American Dental Association Council on Access, 2005). The results were so impressive that cities across the United States started adding fluoride to their public water sources. Today, nearly 170 million people drink from public water systems that are fluoridated (American Dental Association Council on Access, 2005). According to the National Cancer Institute:

fluoride can prevent and even reverse tooth decay by inhibiting bacteria that produce acid in the mouth and by enhancing remineralization, the process through which tooth enamel is "rebuilt" after it begins to decay. (National Cancer Institute, 2012)

The success of the public health intervention is also, in part, due to the relative costs involved. According to the American Dental Association, for most cities, it costs only 50 cents a person per year to fluoridate the water supply and "every $1 invested in water fluoridation saves $38 in dental treatment costs" (American Dental Association Council on Access, 2005).

After evaluating both the effectiveness of the intervention and the relative costs involved, the United States Centers for Disease Control and Prevention declared that water fluoridation was one of the "Ten Great Public Health Achievements" of the 20th century (Center for Disease Control, 1999). In addition to that impressive designation, fluoridation has also received the endorsement of 95 major medical organizations including the Academy of General Dentistry, American Association for the Advancement of Science, American Association for Dental Research, American Association of Community Dental Programs, American Association of Dental Schools, the American Dental Association, the Centers for Disease Control, and the National Cancer Institute (Barrett, 2002). One might think that the

historic success of the intervention and the widespread medical endorsement of the practice would make this treatment one of the least controversial public health decisions that a local government could confront. After all, unlike public smoking bans, prohibitions on the use of trans fats, or even restrictions on the size of soft drinks, there are no major corporate interests negatively affected by the practice of fluoridation. In fact, the very people that would reap the greatest economic benefit from an increase in cavities and tooth decay, dentists, are among the most vocal proponents of fluoridation.

While our assessment of the motivations involved may be persuasive, the more complicated truth is that fluoridation has been and continues to be one of the most controversial public health interventions of the past 60 years. In just the past two years, approximately 68 cities across the globe have decided to abandon fluoridation including major American population centers like Portland, Oregon (Communities Which Have Rejected Fluoridation Since 1990, 2012). How, then, has it been possible for a practice that is so widely accepted and praised in the scientific community to become so controversial and ultimately to be rejected by communities across the globe? We believe that part of the problem rests in the argumentative obstacles surrounding the counter-intuitive nature of the science. Namely, how could it possibly be good for us to consume a toxic substance that is often scraped from industrial waste and then added to our public water supplies? In the next section we analyze how conspiracy proponents have crafted arguments based on intuition to help convince local governments that the complicated nature of the scientific explanations for the phenomena is in reality a cover-up for the fact that fluoride is a direct attack on the public health of their communities.

3. *Defeating fluoridation with appeals to intuition*

As is the case with most conspiracy theories, there is no single author or text that is the sole authority on the subject. Instead, conspiracy arguments circulate through a variety of discourse communities. As a result, our analysis cannot account for every conspiracy argument that has been lodged against fluoridation. There are, for example, arguments that fluoridation was used by the Nazis in the concentration camps; that fluoridation was a clever way to deal with the industrial waste from our nuclear weapons program; and that the fact that the government hired the godfather of public relations, Edward Bernays, to create a pro-fluoridation public health campaign proves that the goals were nefarious from the

start. Although some of these arguments also include appeals based on intuition, we have focused our presentation today on the arguments that fluoridation is an attack on the public health of the population.

Our review of the conspiracy arguments reveals three sets of objections to the safety of fluoridation that are rooted in appeals to intuition. First, conspiracy theorists attack fluoridation by amplifying the worst case scenarios associated with consuming too much fluoride. Upon initial inspection, this argument makes intuitive sense. After all, Dr. McKay's original research was an attempt to diagnose and cure the molten teeth of communities in Colorado that were consuming too much fluoride and suffering from fluorosis. Rather than engaging in the complicated science of determining what the appropriate level of fluoride consumption is, conspiracy theorists argue that these worst case scenarios are *ipso facto* proof that there is no safe level of fluoride in the water. For example, most of the anti-fluoride conspiracy theorists point to an infamous industrial accident in 1943 when a DuPont factory spilled a massive amount of fluoride into the local environment. According to the conspiracy theorists, the fluoride spill resulted in the death of poultry, sickened horses, destroyed a peach crop, produced high levels of fluoride in the blood of the local people, and resulted in "cows [that] became so crippled they could only crawl on their bellies to graze" (Water, n.d.). We are not attempting to defend the DuPont spill, but we do think that it is important to point out that objecting to the practice of controlled fluoridation because of an uncontrolled industrial accident that had nothing to do with fluoridating the public water supply is a tenuous argument at best.

We do not deny that arguments based on the worst case scenarios of mass fluorosis have an intuitive appeal, but the more complicated scientific method explains why these types of arguments are dangerous for the public decision-making process. There are scientific debates over the appropriate amount of fluoridation. Some argue that over time people have started consuming more fluoride from sources outside of the public water supply – namely toothpaste which includes a greater amount of fluoride today than in 1945. The refusal of the conspiracy proponents to engage the scientific discussion and instead to focus on the worst case scenarios as a justification for doing away with all fluoridation is an appeal to the public and government officials to make impulsive decisions based on intuition rather than to engage in the complex deliberation that comes with assessing scientific risk.

The second set of arguments based on intuition focuses on alternative uses of fluoride to amplify the public's belief in the toxic nature of the substance. For example, one conspiracy theorist writes, "…sodium fluoride is a dangerous poison and has been a primary active ingredient in a wide variety of insecticides and fungicides" (Tracey, 2012). There are other conspiracy websites that list the major manufacturing companies and their products with captions that emphasize how ridiculous it would be for a parent to feed those products to their children. Once again the intuitive appeal is unscientific but persuasive: why would you put something into your body that is so damaging that it is used to kill other organisms?

The answer, of course, is that the science associated with fluoride and proper dosing is more complicated than that disturbing description suggests. At face value, not every active ingredient in a pesticide is the ingredient that is actually doing the killing. Whitney Cranshaw, a professor at Colorado State University, does not even list fluoride in his review of the major active ingredients used in pesticides and insecticides (Crenshaw, 2013). More importantly, fluoride is a *naturally* occurring mineral that is found in different levels of almost all water sources. The fact that it is used in a variety of other ways does not in itself demonstrate that the mineral is dangerous. In fact, the practice of fluoridation often involves *removing* excess fluoride from the public water supply to make sure that it is at safe levels. The conspiracy theorists' intuitive arguments rest on an apparently self-evident appeal that the more natural the water is, the healthier it will be without any discussion of the fact that the fluoride discovered in the people of Colorado came from the natural water supply they were using and not from some industrial additive. The complicated truth is that when a local government votes to end the process of fluoridation it may, in fact, be increasing its residents' consumption of fluoride.

The third set of intuition-based arguments acknowledges the naturally occurring nature of fluoride, but challenge the practice of fluoridation because it involves purchasing sodium fluoride from major industries. These conspiracy theorists are obsessed with pointing out that sodium fluoride is a byproduct of major industrial processes and those industrial manufacturers are making money from an industrial byproduct that they would otherwise have to pay to dispose of properly. They argue that since these industries benefit from selling their industrial waste to public water utilities they are invested in skewing the health data and/or

covering up the true health effects. Here is an example of one of these arguments:

fluoride is a toxic byproduct in the manufacture of nuclear arms, aluminum, cement, steel, and phosphates. Millions of tons of this poison are produced every year. Imagine the cost of containing and disposing of those mountains of waste every year. It's in the billions. But what if lobbyists from these industries could present "scientific studies" paid for by the industries, and provide for a continual stream of media presentations about the health benefits of fluoride, and create unimaginably lucrative positions for "research" and "education" within the American Dental Association and the AMA, and do all these things in a consistent and unending way, year after year? What are the economic advantages of that? Simple: instead of paying money to dispose of toxic waste, money could now be made by selling fluoride to the water companies of the nation. They'll use the public water supply as a sewer for industrial wastes. And now with these new billions added instead of subtracted, there's plenty to go around, for everyone involved. Out of the Red, into the Black. Somewhere Machiavelli smiles. (Water, n.d.)

This argument involves an intuitive appeal to public perceptions of industrial waste and the motivations of large corporations. The simplistic narrative, however, that since fluoride is purchased from corporations then those corporations must be directly involved in skewing the scientific data is overly reductionist at best. Assuming that municipalities want to fluoridate their water supplies, it would be far more expensive to engage in the process of creating fluoride solely for the purpose of fluoridating the water supply rather than using the industrial byproduct. The assumption that the American Dental Association and the 95 other health organizations that have endorsed fluoridation are all in league with big business is a classic conspiracy argument, but loses its persuasiveness when the audience moves beyond the initial shock of its intuitive appeal and into the pragmatic reality of the difficulty in covering up such a conspiracy. Although it is difficult for many people to accept, it is possible that a 'win win' situation involving major corporations and local governments is, in fact, also in the best interest of the public at large.

4. *Conclusion: training advocates to argue against conspiracy intuition appeals*
The world is confronting a greater and greater number of controversies surrounding complex scientific phenomena. As the controversies grow, conspiracy theorists have successfully inserted themselves into the public deliberation

process. From global warming to vaccines to peak oil, conspiracy theorists have used arguments based on intuition to disrupt and short circuit deliberation involving complex science. A recent study conducted by a group of social scientists at the University of Chicago found that 49% of respondents believe at least one conspiracy related to medicine (Oliver & Wood, 2014). It further found that 37% of the respondents agreed, "The Food and Drug Administration is deliberately preventing the public from getting natural cures for cancer and other diseases because of pressure from drug companies" (Oliver & Wood, 2014). We believe that there is no way around the fact that the people responsible for explaining and defending the more complex scientific explanations for societal practices need training in how to argue against appeals based on intuition.

Analyzing the public discourse surrounding the conspiracy over fluoridation reveals three areas of argument studies that advocates would benefit from understanding. First, we believe that advocates need to master the science of the controversy while focusing on translating that science into arguments relevant for public deliberation. Scientists are often very careful in a public setting. They are more likely to use hedging statements and talk in terms of risk. Both practices are helpful for the scholarly study of a phenomenon, but, with rare exception, they do not translate well into public deliberation. In other words, scientists are so careful about drawing conclusions that their arguments appear weaker when contrasted to the powerful pathos appeals that accompany the objections based on claims rooted in intuition. The fact that the anti-fluoride arguments are based on intuition makes them more accessible and thus more appealing to the audience.

Second, we believe advocates need to be prepared to argue by analogy. Relying on scientists as public advocates is helpful, but they are often reluctant to engage in a discussion of analogous scientific controversies because it is beyond their area of expertise. In the water fluoridation controversy, for instance, there are too few advocates for fluoridation prepared to argue based on the analogy to chlorine which is a substance that is also toxic if consumed in an extreme amount, but that few people can deny has helped prevent a widespread set of diseases. The conspiracy proponents who insist that fluoridation is simply not natural and therefore a threat to public health will struggle to explain how public water utilities should deal with cholera, typhoid fever, and hepatitis all of which have been remedied through chlorination (Water Quality and Health Council, 2003). To argue from an analogy, however, requires the advocate to be prepared to speak to

issues beyond their immediate expertise.

Finally, we believe advocates need to construct stronger defenses of the scientific consensus. The global warming controversy and the fluoridation controversy share the rhetorical dilemma that the scientific community does not really consider either of them to be a legitimate controversy. There are, of course, a small number of scientists who resist the consensus and therefore are venerated by conspiracy theorists. If, however, a local government official is listening to a presentation on a complicated scientific phenomenon that has reserved scientists on one side and passionate arguments from intuition on the other side, the advocates of science need to be articulate about the advantages of *preferring* the scientific consensus in public policy. This goal is a difficult task that is growing more difficult by the day as interpretations of science become more politicized. Failure to defend the institution of science encourages crucial policy decisions to be based on "The immediate apprehension of an object by the mind without the intervention of any reasoning process."

In conclusion, we want public advocates to continue to fight the good fight on crucial scientific controversies. In fact, by following our three recommendations we hope advocates will learn to fight the *better* fight. It is work that is often very challenging and comes with all of the sets of difficulties associated with debating strong-willed conspiracy proponents. As communities continue to struggle with complex scientific phenomena, there will be more opportunities for conspiracy theorists to engage in public controversies so we hope that advocates of science will take the conspiracy arguments seriously. It is easy to mock them for their inadequate treatment of science, but mocking cannot deny the fact that these appeals to intuition have succeeded in 68 cities around the globe.

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