The March for Science Through the Eyes of History

by Dean Moosavi

In March, 2017, I was in Washington, DC, completing service on a review panel for a prominent federal science agency. Colleagues from various scientific societies were encouraging me to become involved in the March for Science that was being organized in that city for Earth Day, April 22. The March had been a topic of discussion for months, billed as an historic event not to be missed. As a professional geoscientist, I faced the question of whether I should participate. During a free afternoon to explore the Tidal Basin and monuments along the Washington Mall before returning home, I found myself evaluating the March through the eyes of history, in search of answers to my question.

PART 1: To March or Not To March

The March for Science was billed as a non-partisan event to build support for science. The validity of this claim needs to be explored. Let's begin with why such support for science might be needed.

Is American Science in Trouble?

Coming straight from a review panel, it was fresh in my mind from the reviews that the health of American science has become increasingly precarious due to overall constraints on funding, concentration of scientific resources in ever fewer institutions and research groups, a lack of diversity in participation in the scientific enterprise and increasing politicization of key areas of research. Having spent several decades involved in efforts to broaden participation in science, I would be strongly in favor of major change, given how far the academic system has strayed from the egalitarian, merit-based ideas that Vannevar Bush laid out for American science after World War II.

In Bush's time, nearly all faculty members were on a tenure track and could submit grant proposals for consideration based on the merit of their ideas. But over the last 60 years, the situation has been allowed to deteriorate significantly. Some three-quarters of academic faculty work in contingent faculty positions and do not have access to funding support as they are ineligible to even submit their ideas for consideration. Indeed, many of these scientists lack such minimal working conditions as travel support to conferences, full-time salaries, equitable pay and even health insurance. An adjunct faculty member teaching five classes spread across multiple institutions earns less than a PhD student despite having the teaching load of two to three tenure-track faculty members. To address this issue, I submitted a proposal to the Geological Society of America to create a portal giving access to federal science grant programs and opportunity to ALL qualified scientists by allowing them to apply for federal funds. This small reform of the academic system and the federal policies that restrict eligibility to even apply for federal funds to tenured and tenure-track faculty would lift the single greatest impediment to access to science for all

ideas based on merit. This proposal was offered during the first Obama administration and was well supported by the GSA division officers, but was not supported by the tenured – dare we say privileged – faculty that dominate the GSA Council. GSA Council has a history of issuing position statements on important issues in the geosciences. Despite support from the divisions which represent the membership, GSA council did not see fit to even offer a position statement on behalf of the contingent faculty whose research potential is being wasted by the current academic system. All self-serving claims to the contrary, the American scientific system at the end of the eight years of Barack Obama's presidency has more in common with apartheid-era South Africa than with Vannevar Bush's vision during the Truman and Eisenhower era.

The federal science agencies did not create this situation within academia, but they have been complicit in its creation by failing to address the class-based, anti-merit evolution of the academic system. The same agencies that have spent billions of dollars annually to increase the diversity of those participating in research haven't lifted a finger to alter their own grant-making policies to allow contingent faculty the opportunity to even submit their ideas for consideration. While other federal agencies have legal requirements for hiring women and minorities to increase participation from these under-represented groups, the closest the federal science agencies have gotten is to fund a few outreach efforts to help community college faculty collaborate with tenured faculty at four-year institutions – but only as a means of gaining access to their students and not to support those faculty members to develop a scientific research program. The only way for contingent faculty to get support for a research proposal is to allow a tenured colleague to submit their ideas for review. Of course, a comparable suggestion to female faculty to just submit their ideas under their husband's name would never be acceptable, yet the scientific community has remained silent in the face of such treatment of contingent faculty. How many of the Marchers have raised their voices to address these problems in science within their own academic institutions?

The fact that the protesters were not marching on the National Science Foundation, Department of Energy, NASA, NOAA, EPA, etc., or their own academic institutions and professional societies whose policies maintain the apartheid wall suggests that addressing the problems inherent to the modern scientific system was not an objective of the March for Science.

Motivations for the March

Since promotion of an inclusive, merit-based scientific system was clearly not a motivating factor in the March for Science, we must examine the claim that the March is not driven by partisan politics. Given that the problems in science have been developing over decades, the March for Science could have occurred at any time during the last 20 years. Indeed, in the face of the apartheid nature of the academic system, the opportune time to march for massive change would have been after Barack Obama came to office in 2009, when the House, Senate and presidency were all controlled by the Democratic party, or after Obama's re-election in 2012, when he had more freedom to act without having to face re-election and could take political risks to make fundamental change in the scientific system. There was no call for a March for Science under Obama nor did Obama show any inclination to address the problems of science in academia during his eight years in office.

Unlike Barack Obama, a former professor of constitutional law, Donald Trump came to the White House from the private sector construction industry. Trump may be many things, but he is NOT an academic and had no role in creating the problems besetting science. The organizers of the March indicated that they began planning the protests in response to the election of Donald Trump despite Trump's having played no role in creating the problems we see in science. Apparently, their fear that Trump's skepticism regarding climate change, desire to curb regulatory overreach at the Environmental Protection Agency (EPA) and attempt to address the threat posed by Islamic ideology by imposing travel bans from countries that are hotbeds of Muslim terrorism might be

detrimental to science was more important than addressing the serious problems besetting science.

The fear that scientists' ability to speak and publish freely will be impaired as government scientists are silenced to fit the current political agenda, and that areas of research will be limited by political considerations, are also not new concerns. Planning for the March began more than two months before Donald Trump assumed office or had implemented a single policy or executive order. The March itself occurred three months after Trump assumed office, when his policies would not yet have had an opportunity to affect science. Clearly, the March for Science was political from its inception and based not on addressing problems actually facing science but on fears of what President Trump *might* do versus anything he had actually done.

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A Partisan Political March?

So…with the March for Science being political, the question remains whether or not the March was partisan in nature. Scientists might be expected to object whenever policies are initiated contrary to scientific advice. Certainly the climate change community would have reason to object to Trump's questioning of the veracity of their research. But, the same scientific community would also be expected to protest other instances when scientific expertise was ignored by a president. The scientific community spent years and billions of dollars researching the viability of using Yucca Mountain as the nation's sole repository for high-level nuclear waste. Despite the scientific evidence for the reasonable safety of the reservoir over the 10,000-year designed lifetime, President Barack Obama chose to cancel the project despite have no alternative solution for disposing of the existing waste. Leaving the waste in its current dispersed storage pools at nuclear plants around the country is certainly a greater risk to the environment than even an imperfect Yucca Mountain repository would have been. The Marchers for Science said nothing about this decision to ignore science in making policy. Similarly, Obama ignored the scientific expertise of his own nominee as Director of the US Geological Survey, Marcia McNutt, when she determined that the Keystone XL Pipeline was the safest, most environmentally benign way to transport oil from the tar sands of Alberta, as laid out in her editorial in *Science* magazine. Again, the Marchers for Science saw no need to raise their voices on behalf of science.

The silence of the Marchers for Science on issues so critical for their fellow scientists before the election of Donald Trump suggests that the March for Science had less to do with science being used to guide policy and more to do with the opposition to the incoming president's policies. Let us examine how the objections to Trump's policies stand up to the light of reality.

Opposition to Trump: EPA and Climate Change

The Marchers claim that Trump's election represents a threat to the freedom of the scientific community. For example, they object to President Trump's nomination of Scott Pruitt to serve as EPA administrator on the basis that Pruitt would undermine the science of his agency for ideological reasons stemming from his industry background. They point out that Pruitt has sued the EPA on a number of occasions over its regulations. Indeed, the EPA is an agency with a long history of litigation. Industries facing interference with their ability to produce goods and services demanded by society have used litigation to object to environmental regulations with the support of the

millions of workers they employ. They are acting in their own economic and political interests. But they are hardly the only litigants of EPA policies. Environmental groups such as the Sierra Club, Natural Resources Defense Council and Union of Concerned Scientists brag about their ability to influence government policy via litigation at the EPA and other agencies. Are the dues-paying members of these organizations, most of whose livelihoods do NOT depend on the regulations in question, any less guilty of a conflict of interest than those representing industry in these lawsuits? Both parties are seeking to set policy that suits their own interests through litigation. If being a party to such suits renders an individual unfit to serve as a senior EPA administrator, then the same standard would preclude every member of these environmental organizations and indeed every scientist who advocates for environmental policies from serving in such a role. Is this really the standard the scientific community wishes to set and live under?

The Marchers' objection to Pruitt includes the belief that he will undermine climate change researchers by silencing them because he is a climate change denier. This mirrors a similar claim made in Al Gore's *An Inconvenient Truth* by NASA scientist James Hansen. Hansen claimed that Bush administration officials altered his testimony to remove conflicts with administration policies. This is a disingenuous complaint as it conflates the role of a scientist with that of a policy maker. Hansen's right to speak and ability to hold his job were no more infringed by his stance than were Marcia McNutt's when she editorialized about the Keystone XL pipeline. Being a government scientist does not mean that one's policy preference will be enacted. A scientist who is not permitted to speak FOR her agency when her policy preference has not been adopted by the agency's political leadership is not being silenced. It is a condition of employment, which the scientist accepted by taking the job. By contrast, a scientist willing to self-fund her research, as contingent faculty must do, has the freedom to speak about the results of that research in unfettered fashion. It is ironic that this objection was raised against the Trump administration for what it MIGHT do when actual examples of government interference by dismissal of scientists based on their statements about the science went unremarked by the scientific community under President Obama. The State Climatologists of Oregon and Delaware were both dismissed by the Democratic governors of their states for daring to question the veracity of climate change claims. Did the Marchers for Science rally in the streets on behalf of these silenced voices of the scientific community? Not a peep!

Sadly, these two prominent cases are hardly the only examples of scientists being bullied or defunded into silence for daring to question the climate change "consensus." I attended a session by solar physicists at the 2005 Geological Society of America Meeting in Salt Lake City, in which several scientists had discussed the strong correlation between sun spot cycles and temperature, an alternative to the greenhouse gas theory of the "consensus" crowd. They discussed how a coming drop in solar emissions predicted cooling over the coming decade while accelerating greenhouse gas emissions indicated accelerating global warming. In either case, the diverging predictions would allow for a test of which of the competing theories about the control of atmospheric temperature was correct. The speakers and session organizers were attacked for even allowing the presenters to share their work in a scientific venue although science is supposed to work by allowing the presentation of competing hypotheses based on the observational data. When I raised the observation during the question and answer period that I too had been pressured during my own graduate work to alter my results to provide a stronger endorsement of the global warming narrative, I too was accused of being a climate change denier! It should be noted that 12 years of data obtained since the Salt Lake City meeting show that the denounced solar physicists were correct while the consensus global warmers were not, as global temperatures have been so flat that the warming "hiatus" has become a serious problem for the climate change community to explain.

The rhetoric of the scientific community about being silenced is a bit much given that they themselves silence opinions that challenge

the favoured paradigm. It should be noted that NASA's James Hansen, the "silenced scientist," had no problem calling for oil company executives to be charged with crimes against humanity for questioning climate change. The Marchers appear to stand for the freedom of scientists to speak only when the scientist holds a point of view they agree with. While this might be typical conduct for a political operative, it is antithetical to the philosophy of science. Clearly concern for the freedom of scientists to speak the truth isn't motivating the Marchers.

In line with this discussion, it is interesting to note that many scientific societies have resolutions supporting or demanding the teaching of the climate change consensus while ignoring the fact that the history of science is replete with examples in which the "consensus" on a major scientific paradigm was overturned by the work of scientific outsiders. From Galileo and Copernicus to Alfred Wegener and Barbara McClintock, the scientific community never seems to learn that the skeptic is its most important member and that the freedom to speak and publish for those who are NOT of the majority opinion is vital to both the functioning and credibility of science. The National Science Education Standards adopted in the 1980s under President Reagan understood this and clearly articulated the importance of understanding the history of science and its relationship with the wider society. The presence of this component of the Standards was a great source of irritation to many secular progressive scientists who seek to exclude religion and history from the teaching of science. Should we be surprised that the Next Generation Science Standards released under President Obama unceremoniously dropped all mention of the history of science, a tragedy that actually undermines the quality of science education for all students in states which model their standards on NGSS.

Given this reality, EPA Director Pruitt and other members of the Trump administration's skepticism of the EPA and climate change science is warranted and is in fact a direct consequence of the behavior of many climate change scientists, which the rest of the scientific community has declined to correct. Science is going to have to make a stronger case for climate change than marching in the streets shouting that "we are the experts" so trust us that the scientific community seems to believe passes for evidence.

Opposition to Trump: "Muslim Travel Ban"

Another argument for the March for Science is the charge that Trump's executive orders imposing a ban on travel from seven (later six) Muslim-majority countries would be detrimental to the future of American science. Let's examine the credibility of this alleged threat to science by separating fact from fiction. First, the alleged "Muslim" ban is anything but. It originally included Iran, Iraq, Syria, Yemen, Libya, Sudan and Somalia, but not most Muslim countries which are home to some 88% of the world's Muslim population. The nations covered by the ban had been identified as terror threats by the previous Obama administration, a government that could hardly be considered hostile to Islam. The Marchers did not find fault with the Obama list or the periodic travel bans imposed by the Obama administration for national security reasons during his tenure. The scientific community also did not object when the Carter administration used the same premise to impose travel bans on Iran in the late 1970s. None of these earlier travel restrictions caused the collapse of American science. Given that Trump's travel bans were 90 days in duration, one must compare the impact of such delays to disruption of science in other instances.

Let us keep our perspective. A 90-day delay in travel from one of the "banned" countries is shorter in duration than the turn-around time on the submission of most journal articles, let alone grant proposals. Many scientific efforts are subject to much longer delays than the Trump travel ban out of concern for environmental and policy requirements and none of these resulted in Marches for Science as the following examples portray.

- Collection of seismic data for studying the crust has been derailed in response to lawsuits by environmental groups out of fear for the damage that such studies can cause to marine mammals.
- Similarly, following the 2010 BP Oil Spill, the Obama administration issued an executive

order banning drilling along large stretches off the American coastline. Such a ban had the direct effect of eliminating installation of oil-rigs and other operations which scientists use as research platforms as well as acquisition of seismic data from oil exploration.

- My own research into methane oxidation was impeded because the critical reagent, methyl fluoride, used by scientists as a selective inhibitor to tease out methane biochemistry, was banned as a CFC under the Montreal Protocol despite its scientific uses being so minimal as to have no impact on ozone levels.
- In the 1990s, erosion along the Columbia River in Washington State revealed the body of Kennewick Man, a skeleton with great scientific potential to reveal the origins of Native Americans. Study of the body was prevented for years as Native American tribes sued under NAGPRA (Native American Graves Protection and Repatriation Act), demanding that the body be repatriated and buried by the local tribes. Despite no national security issues being at stake, research was put on hold for years, risking the permanent loss of irreplaceable data for the purely political objective of fulfilling legal obligations under NAGPRA. This occurred despite the fact that Kennewick Man's grave had not been disturbed by human activity but by natural geologic processes that would have destroyed the body had scientists not recovered it.

In each of these cases, scientific process was delayed or halted outright to comply with federal law, international treaties, presidential executive orders to protect the environment or for other political purposes. In no case was there a threat to human life or national security. Not one generated protests or marches for the science that was negatively impacted. How is a 90-day travel ban imposed by a Trump executive order for the sake of national security so much worse as to require a march?

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Advocates for the March come up with a variety of arguments. One argument claims that international collaborations will suffer because the best scientific minds from around the world, including students, will be unable to travel to meetings in the United States. Certainly the inability to travel to meetings is a hindrance to one's career. In fact, the careers of most contingent faculty are impeded because they can't afford to travel to meetings. If the permanent inability of these American scientists to attend meetings isn't worthy of a March for Science, then why is a 3-month delay imposed on some foreign scientists?

A second argument claims that scientists and students from the banned countries will avoid coming to study or work in the United States and go elsewhere for opportunity. America is not the only country that has visa requirements and limitations on who is welcome for national security and cultural reasons. Residents of these countries are likely to encounter barriers to travel and study in quite a few nations for many of the same reasons as in Trump's ban. While the individual scientists involved are not responsible for the actions of their governments, they are not immune to the consequences of their government's actions. The solution to removing those barriers is to address the problems in one's own society, not to complain about other societies exercising precautions intended to protect themselves from foreign threats but that are inconvenient to you. Foreign scientists need to take responsibility for their own governments.

A third argument, related to the second, is that citizens from third party nations not covered by the ban will be disinclined to come to an America that has become intolerant as reflected in Trump's travel ban. Of course, those making this argument

must acknowledge that international travel for the sake of science is a two-way street. How many of the countries on Trump's list are open to travelers and students from across the world – such as Jewish Americans or Israelis? These regimes engage in anti-Semitic discrimination over whom they admit. Any prospective colleague who objects to coming to America on behalf of regimes that practice anti-Semitism has no place in American science and is free to go elsewhere.

A fourth argument states that American academia and industry will lose out on too many students, collaborators and foreign workers because of the impact of arguments 2 and 3 hurting its role in global science. This argument fails based on its own inherent contractions. If science is a global endeavor whose participants must be allowed border-free access around the world for the benefit of all humanity, then it also follows that science benefits when the scientific infrastructure and talent pool are developed abroad. This is particularly true in underdeveloped regions of Latin America, Africa and Asia. Not all science must pass through the United States nor should America expect to have first pick of all the world's scientific talent as if we were the 21st century version of the British Empire leveraging resources from global colonial possessions to the tune of Rule Britannia. De-emphasis of America, leading to a more diverse and equitable distribution of scientific talent across the planet, values which we claim to support, is healthier for science around the world as surely as more equitable use of the world's oil, mineral and other resources is.

So how do we fill the gap? The scientific community continually promotes the importance of diversity and the inclusion of underserved populations for the future of science. The underserved populations of America's inner cities and small towns, filled with first generation students, need opportunities also. Loss of a few scientists and engineers from the "banned" counties affords the opportunity to invest in the underserved American populations that the Marchers claim to be so concerned about. "Put your money where your mouth is," for a change. My diverse community college students certainly could use the opportunity and they come with some advantages: they are eager, speak good English, and don't have visas that can be revoked!

All the arguments against the travel ban ultimately depend on the belief that the convenience of individual scientists, research groups and universities in America outweigh other considerations. How much is the convenience of American science worth in comparison to American national security?

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Yes, it is hard to tell a prospective student or colleague that their research will be delayed by a few months. But how hard is it compared to telling the family of a person killed in a terror attack that they will never see their loved one again because inconveniencing an American scientist was deemed to be more important than securing the border from terrorist infiltration? Unless that colleague from a banned nation is bringing the cure for cancer, it's hard to imagine how the scientist can expect to win this argument. Neither scientists nor the activist judges who ruled against the travel bans face the prospect of having to explain to the families of the victims of terror attacks how their loved ones' safety was deemed less important than global scientific collaboration. The president, however, has no such luxury. The president has the burden and responsibility to protect the nation and its citizens from harm. As the duly elected president, Donald Trump, not a court of appeals, not a scientific society, and not any group of scientists marching in the street, has the legal and moral authority to make policy. Until such time as a scientist stands for election and prevails against other challengers to be elected president, then, and

only then, is it the place of scientists to make the decisions regarding travel policy. The Marchers for Science are quick to argue that Trump appointees lack the scientific credentials to run their agencies, but have yet to offer any credentials of their own for dictating foreign and national security policy. It's time for scientists to stop the flawed academic practice of acting as if their PhDs applied to all realms of knowledge and stay within the sandboxes of their actual expertise.

The Marchers for Science argue that there is no credible threat addressed by the travel ban, or certainly not a threat that warrants tossing aside "our values" as Americans. This argument is worthy of exploration in the context of American society and its 240-year history and is the subject of another discussion. It must be noted, however, that the values argument arises from the Marchers' status as individual persons, not from any connection to science. As such, it is improper to refer to the march of April 22, 2017, as a March for Science. It is, rather, a march by a group of people who happen to be scientists and their sympathizers in opposition to the policies of President Trump. To claim otherwise is dishonest and harmful to all those scientists who strive to conduct their work in an objective, apolitical fashion.

Conclusion

For science to function in the service of society, it must carefully guard its credibility as an objective source of knowledge and expertise. By claiming that the March for Science was not a partisan political event, a falsehood obvious to even relatively uneducated members of the public, the scientific community forfeits much of its credibility regarding its motivations and intentions. How much that credibility has been damaged will become apparent in an analysis of the "values" argument, the subject of Part 2 of this discussion.

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