The crisis of politicization within and beyond science

Science, by its nature, is open to uncertainty and interpretation, but politicization — fuelled by motivated reasoning and advances in the technological environment — is leading to a new level of science scepticism among citizens and scientists themselves. What can be done to address these crises?

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In 2010, *Nature* published an editorial stating, "there is a growing anti-science streak … that could have tangible societal and political impacts"[1]. Six years later, *Nature* published results from a study showing that about half of researchers surveyed agree that "there is a significant 'crisis' of reproducibility" in science[2]. The former concern perhaps makes sense in light of the latter: if science itself is in the midst of a crisis, then those outside of science may rebel against it. Regardless of whether any 'anti-science' trend actually reflects the state of science, both stem from a mix of politicization, human-reasoning tendencies, and an evolved technological environment. What this means is that there are common solutions, some of which entail recognition that the two trends have not developed in isolation from one another.

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The problem

References to the politicization of science are common, but it is not always clear exactly what this means. Any issue can be politicized in the sense of provoking conflict across partisan divides or being discussed by a political source (for example, an elected official, candidate, or activist). Politicization of this kind regularly occurs around issues invoking science (for example, health care, environment, and education) and the basic science itself (for example, models of climate change) — there is no doubt science is manipulated and misused to advance political agendas. A critical, but often overlooked, point is the ease with which science can be politicized because it is inherently uncertain; as one scholar puts it, "scientific information is always, to some degree, vulnerable to concerns about uncertainty because scientists are trained to focus on uncertainty"[3]. The bottom line is that science is easy to challenge because uncertainty always exists and questioning extant knowledge is part of the research process.

How politicized science plays out — in both the political and research domains — depends on human reasoning. One well-documented process is motivated reasoning, people's tendency to seek out information that confirms prior beliefs, view evidence consistent with prior opinions as stronger, and spend more time counter-arguing and dismissing evidence inconsistent with prior opinions, regardless of objective accuracy. Motivated reasoning requires that individuals have a directional or defensive processing goal — in other words, they aim to uphold and maintain a desirable conclusion consistent with their standing attitude, even if it involves rejecting disconfirming information. For example, someone who believes human-induced climate change is not occurring may consequently view evidence about anthropogenic climate change as weak, regardless of the 'objective quality'; this allows one to confirm his or her extant belief.

The final piece of the puzzle is the transformed twenty-first century technological environment. Information is now readily available from a multitude of sources at any time; people expect to obtain information or data with near immediacy. The technological change is so fundamental that the very nature of memory has evolved due to information storage and accessibility. This has substantial implications for the public impact of science and how science itself proceeds.

Limiting the public impact of science

Political actors and other advocates regularly question science when it contradicts their agendas. By planting uncertainty about a scientific finding in citizens' minds, these actors can undermine the effect of the science on beliefs. For example, one experimental study (randomly) exposed some respondents to an (actual) consensus statement about the environmental advantages of nuclear energy, relative to fossil fuels[4]. These respondents became more disposed to support the use of nuclear energy. Yet, other respondents lowered their support for nuclear energy when the consensus information was preceded by a politicization statement that pointed out that it is difficult to evaluate science given it is often used selectively for political agendas. In short, the politicization statement caused individuals to dismiss ostensibly consensual scientific evidence due to their prior belief regarding politicization. The implication is that those who do not benefit from a particular piece of science can exploit the uncertainty of science to their advantage.

The ease with which science sceptics can reach the mass public facilitates the undermining of science via politicization. Mass communication no longer revolves around a few outlets with which science can assert a cultural authority; rather, citizens who may be predisposed to question science selectively choose outlets that confirm their scepticism. Exposure to science conspiracy information can have far-reaching implications. One study reports that briefly watching a global warming conspiracy theory video decreased belief in a scientific consensus on human-induced climate change, decreased the likelihood of signing a petition to stop global warming, and decreased the likelihood of prosocial intent (that is, donating to a charity or volunteering in the community)[5]. In sum, the nature of (even sound) science makes it vulnerable, and both human-reasoning tendencies and the saturated information environment exacerbate this vulnerability.

The crisis in science

Technological evolution has altered the conduct of research — this is most obvious when it comes to computing power but also involves the ease of data collection and sharing. This development, in turn, has enabled large-scale re-analyses of data and replications of studies. Many view the results of these efforts as signifying a crisis in science, with much of the published scientific literature being inaccurate — for example, a recent widely discussed paper found that only 39 of 100 psychology studies could be unambiguously replicated[6]. These and other results have led to the aforementioned crisis of reproducibility.

A number of factors may be at work, including publication bias. The likelihood of a study's publication depends on the result, typically whether or not a statistically significant relationship is found. For example, consider the hypothesis that sending text messages to remind people to exercise causes them to take more steps (that is, walk more). Imagine that 5 out of 100 studies conducted, with distinct samples, find that the texts significantly lead to more steps. If only statistically significant studies are published, then only those five enter the literature. This leads people to believe that there is a relationship even though the full range of evidence clearly shows there is not (that is, five significant studies would occur by chance). Low levels of replication may reflect a skew in what is being replicated. An additional issue is questionable research practices — researchers selectively report results that support their hypothesis (for example, by reporting the results on self-reported steps but not on fit-bit-recorded steps, by reporting the results on a subset of data, and so on).

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While technology contributes to the state of science (that is, a crisis), it also reflects the nature of scientists. For one, the very reason that science is easy to politicize with the public is why scientists themselves seek to challenge extant results: they seek to understand the uncertainty of any result and work towards vitiating that uncertainty via reproduction, replication, and generalization. Additionally, scientists, just like non-scientists, engage in motivated reasoning. A report by the National Science Foundation advisory committee states that "scientists may actively seek out and assign more weight to evidence that confirms their hypotheses and ignore or underweight evidence that could disconfirm their hypotheses"[7]. This can lead to questionable research practices and publication bias, with the latter also reflecting a long-held scientific belief that only statistically significant results should be published.

What to do

The mix of inherent scientific uncertainty, motivated reasoning, and technological evolution contributes to what many believe is a tenuous state of science, within both the public's mind and science itself. Remedies do exist, such as inoculating the public against disingenuous politicizing messages and other types of misinformation. For example, when people receive warnings that they may later receive inaccurate information (for example, a consensus of scientists do not believe humans are a primary cause of climate change), they are less likely to be influenced by that misinformation when they receive it (that is, they are inoculated against it)[8]. Yet, even in light of such remedies, two points stand out.

First, motivated reasoning can be countered by altering individuals' goals and incentives. For the public, this means making a concerted effort to communicate science in a way that leads people to realize the connection to their everyday lives and values (for example, the local effects of climate change, the effects of social interventions on communities). The key is to think about incentives for how science is approached or processed, which is often orthogonal to informational deficits. A similar solution may be needed within science, entailing a fundamental shift in incentives. Institutions (for example, universities, associations, journals, and foundations) would have to reward efforts in ways not contingent on developing or defending a particular theory or statistical significance[9]. This is challenging given change can be slow in science (for example, when scientists are aware of publication bias, they still may privilege statistically significant results); the 'messy' nature of research (for example, publishing everything is informationally overwhelming and some selection system may be needed); and the possibility of over-correcting (that is, replications that more dramatically overturn extant knowledge are published more often).

Second, it is critical that scientists recognize the public face of their practice. Ioannidis notes that the types of problems occurring within science "can decrease the credibility of the scientific literature and the validity of what is communicated about science in the wider community… [and] offer ammunition to science deniers"[10]. This is not to say scientists should avoid rigour in addressing the aforementioned processes of science, but they should realize that the audience is potentially beyond academia. This accentuates the importance of working towards consensus when possible and taking steps to publicize the successes of science in guiding sound policy-making and implementation. ❐

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Competing interests

The author declares no competing interests.