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Dissent in Science

Dissent is questioning or challenging an established idea, practice, or policy. It occurs in all sorts of areas. For example, people can dissent against wars, school rules, or evolutionary theory. Dissent is usually expressed in words, for example in blogs, articles, and speeches, but it can also be expressed in actions or at events, such as a protest rally.

Dissent in science can refer to challenges to dominant scientific theories and also questioning of priorities or practices within science, for example, questioning whether a person should have received the Nobel Prize or whether Nobel prizes are a good idea at all. Dissent can have political ramifications, especially in controversial issues such as climate change and genetic modification.

The Value of Dissent

Dissent about scientific ideas lies at the foundation of the scientific enterprise. For scientific ideas to be accepted as knowledge, they need to be rigorously tested. Scientists subject their own data and conclusions to careful assessment, but on other occasions they are not so critical because they have so much to gain, in terms of career and reputation, by having their work published and recognized.

The role of the dissenter—the scientist who questions standard ideas—is to keep scientists honest, namely, to make them justify every assumption, bit of data, and conclusion. Dissent thus is vital to ensuring that the foundations of scientific evidence and theory are as sound as possible.

Dissenters have a variety of motivations. Some want only to improve scientific knowledge. Some seek personal recognition for their ideas (as do most scientists). Some are pursuing personal agendas. However, for science to benefit, it is the challenge posed by dissenters that matters, not their motivations.

Many scientists say they support dissent, at least in principle, but this does not always happen in practice. Most scientists build their research on established theories and bodies of data, so they have a stake in supporting standard ideas and evidence. If a critic throws these foundations into doubt, this is threatening to many scientists.

The theories of evolution, relativity, and quantum mechanics are well established and are the basis for huge amounts of scientific research. Yet there are some qualified scientists who question aspects of these theories and propose alternatives. Most of these dissidents are ignored; some have difficulties in their careers. Although dissent is officially lauded, in practice it is often opposed or ridiculed.

Some of today's most respected theories were, at their inception, bitterly opposed. The theory of evolution, as proposed by Charles Darwin and Alfred Wallace in the 1850s, was denounced by supporters of the then prevailing view of creation. Ulcers were previously thought to be caused by stress. When two scientists proposed a different cause, namely bacterial infection, they were ignored or rejected for many years—but eventually vindicated, receiving the Nobel Prize.

The message from these and other stories in the history of science is that dissent is vital to the development of scientific knowledge, but often it is ignored, opposed, or attacked.

Historian of science Thomas Kuhn proposed that most research proceeds on the basis of a standard set of assumptions, ideas, and methods, called a scientific paradigm. Most researchers work within the paradigm, not questioning it—they innovate without challenging the foundations of the paradigm. Very occasionally, paradigms are challenged and overthrown, as when creationism was replaced by evolutionism in biology.

The idea of a paradigm, loosely applied, helps explain the response of scientists to dissent. Questioning within the standard assumptions in a field is accepted far more readily than questioning the foundations of the field itself.

Policy Disputes

Some scientific disputes are internal matters, involving only researchers in the field. But many disputes involve nonscientists and have implications for belief, behavior, and policy. The theory of evolution has long been challenged by some religious figures. Also questioned by some religious authorities are stem cell research and the abortion drug RU-486. However, religious belief is only one possible basis for dissent in science and technology. Many new technologies—such as pesticides, nuclear power, genetically modified organisms, and nanotechnology—have been criticized and opposed by some scientists and by many members of the public.

In many public disputes over science and technology, there are powerful groups with a strong stake in one position. For example, manufacturers of pesticides benefit from continuing and increased sales of their products, and therefore have a strong stake—in other words, a vested interest—in the view that the most effective way to deal with crop pests is by using pesticides, a view that can be called the pesticide paradigm. The manufacturers can provide large amounts of money to fund scientific research, which leads many scientists to support the pesticide paradigm. As a result, those few scientists who question the paradigm become dissenters.

Sometimes vested interests are on the side of scientific dissent, as in the climate change debate. The mainstream scientific position is that global warming is occurring due to human activity, especially burning of fossil fuels such as coal, oil, and natural gas. However, a small minority of scientists question the orthodoxy—and these critics are supported by the powerful fossil fuel industry, which has a vested interest in maintaining current patterns of energy use.

In most public disputes involving science and technology, disagreements over the science are mixed with disagreements about ethics and policy. For example, nearly all doctors and health departments support vaccination. Against this orthodoxy, a small number of doctors and others question the standard view about the benefits and risks of some or all vaccines. However, the vaccination debate is not just a matter of science: differences in values are involved. Supporters of vaccination point to the public health benefits of widespread vaccination against infectious diseases, whereas critics refer to the risk to individuals of adverse reactions. The debate thus involves differences concerning public benefits versus individual risk.

In this context, scientific dissent—on vaccination, climate change, AIDS, or any other contentious public issue—can also be considered to be a political act, in the sense that it has a power dimension. Scientific dissent can serve as a tool for campaigners on controversial public issues. Because scientists have authority as creators and interpreters of knowledge about the world, their views about issues are often seen as more credible than those of others. Scientists thus are key players in any controversial issue involving science and technology. Furthermore, when most scientists support one position—scientific orthodoxy—dissent is especially important, because it turns a unanimous position into a contested one. In this sort of situation, dissident scientists can become targets for reprisals.

Suppression of Dissent

When scientists are treated unfairly because of their dissenting research, teaching, or public statements, this can be called suppression of dissent. The most common scenario is that a scientist does something threatening to a powerful group, such as making a public statement or producing a research finding, and is attacked in some way. Methods of attack include ostracism, harassment, censorship, denial of jobs or research grants, reprimands, involuntary transfer, denial of tenure, demotion, dismissal, deregistration, and blacklisting.

The methods used to suppress scientists are sometimes the same methods used when a scientist's performance is inadequate, so it not always easy to distinguish suppression from the normal operation of science. There are several ways to test whether suppression is involved.

First, adverse actions are often initiated soon after a scientist speaks out. For example, a scientist's career might have been smooth until publishing a result challenging orthodoxy, and then allegations are made, research opportunities restricted, and critical comments made.

Second, the performance of the targeted scientist—the scientist subject to adverse action—can be compared to the performance of peers, namely other scientists who have similar experience and performance. If the performance of the targeted scientist is equal to or better than that of peers, this suggests unfair treatment. Making this sort of comparison is called the double standard test. When there is a double standard, it means the treatment of the targeted scientist is different from the treatment of peers: a different standard or expectation is applied.

Double standards are sometimes found when adverse actions involve formal procedures, such as misconduct hearings or dismissal. The procedures used against dissidents may display greater biases and irregularities than when applied to others.

Third, in many fields there is a pattern of attacks on dissidents. If just one or two individuals have apparently been treated unfairly, this might be attributed to chance, personalities, or peculiar circumstances. When there is evidence that larger numbers of dissidents have been adversely treated, systematic discrimination becomes a more plausible explanation. For example, many scientists and engineers critical of nuclear power, fluoridation, pesticides, and genetic engineering have suffered in their careers, suggesting that suppression of dissent is responsible.

Impacts of Suppression

If dissent is what maintains a vigorous culture of questioning and free discussion, then suppression of dissent serves the opposite purpose, squelching contrary views and inhibiting discussion. Scientists who suffer reprisals for their dissent can be severely affected. Some of them lose opportunities to do research; some have their credibility destroyed; some lose their jobs; some are forced out of their careers in the field. This can be called the primary effect of suppression.

Reprisals against dissidents can also have a powerful effect on other scientists, who see what might happen if they step out of line and become afraid the same might happen to them. The result can be a greater reluctance to undertake research in controversial areas and a fear of speaking critically about vested interests. This is a type of self-censorship, which can be called a secondary effect of suppression. Because it is more pervasive but unrecognized, it is possibly more significant than the primary effect.

The effect of suppression is especially potent in areas where there is a near monopoly of scientific credibility, for example in an area such as fluoridation or vaccination in which nearly all scientists, doctors, and dentists support a measure. In such situations, dissidents threaten to turn a monopoly of expert opinion into a debate. Attacking dissidents thus serves to protect the monopoly by discrediting critics and warning others not to break ranks.

On the other hand, sometimes suppression of dissent backfires, giving the dissident greater visibility and support, in either the short or long term. Galileo, who was suppressed by the Catholic Church for his science-based heresy, has become a symbol of freedom of inquiry. In the 1960s, after U.S. consumer advocate Ralph Nader questioned the safety of automobiles, the company General Motors put him under surveillance; when this was exposed, General Motors's credibility greatly suffered.

Whistleblowing

Generally speaking, whistleblowing means speaking out in the public interest. Typically, a whistleblower is an employee who reports on a problem within the organization, most commonly corruption, abuse, or hazards to the public. Whistleblowers can be from any sector of the workforce, including schools, police, hospitals, corporations, churches, and government departments. For example, a teacher might report harassment by the principal, a police officer might report frame-ups, a corporate auditor might report shady dealings, and a church member might report sexual abuse by clergy.

Scientists can be whistleblowers. One way is by reporting problems in the workplace such as financial fraud, hazardous laboratory practices, bias in appointments, sexual harassment, or bullying. These problems are similar in a range of workplaces, whether or not they involve scientists. Bias in appointments, for example, is found in just about every type of work.

A few whistleblowing issues are special to science. One is scientific fraud, which is normally taken to involve altering or manufacturing data, or claiming credit for other scientists' work. Another special problem is conflict of interest, for example when a researcher obtains funding to study a drug from the manufacturer of the drug but does not declare this. Biases occur when scientists use inappropriate research methods, misrepresent their findings, or do not publish findings unwelcome to their funders. When scientists speak out about such problems, they may be subject to reprisals. For example, there are cases in which scientists have exposed cheating by other scientists, and then themselves come under attack.

There is an overlap between whistleblowing and dissenting. Whistleblowing typically involves exposing a problem in the workplace, whereas dissenting typically involves a challenge to dominant ideas; some types of dissent also count as whistleblowing.

In quite a few countries, laws have been passed to protect whistleblowers. These make it unlawful for an employer to take reprisals against an employee who reports wrongdoing; whistleblowers are usually expected to follow a series of procedures such as reporting first to internal authorities. However, it is unclear whether whistleblower laws, in practice, provide much protection to scientists.

These laws have many shortcomings. Only some scientists are protected. Those employed by industry are seldom covered by legislation. Only some sorts of reports are protected. Dissent against a dominant point of view—a paradigm—does not count as whistleblowing and is not protected by any law. Another shortcoming is that some sorts of adverse actions, such as denial of appointments or research grants, are almost impossible to prove are reprisals, because there are other reasons, seemingly legitimate, for making appointments and awarding grants.

When scientists lose their jobs, they can fight their employer in court using whistleblowing or other legislation, but they are at a serious disadvantage, having little income. Their opponent in court, their former employer, usually has unlimited money and time to pursue the case. Court decisions often hinge on technicalities and fail to address the substantive injustice involved. Even when the whistleblower wins in court, the employer can appeal. The whole process often takes years, interrupting or ending the scientist's research career. Because of these numerous shortcomings, it might be said that whistleblower laws give only an illusion of protection. Scientists who believe they can speak out in safety are often disillusioned.

Conclusion

When scientists are subject to threats or sanctions, many are intimidated and acquiesce, for example, by doing what they are told, keeping quiet about their findings, or changing their research directions to something less threatening to vested interests. Some make formal complaints to professional bodies or government agencies, but there is little evidence that this leads to favorable outcomes very often.

A different approach is an activist response based on exposing attacks to wider audiences, showing they are unfair, and refusing to give in to intimidation. However, few scientists are comfortable publicly criticizing their employer. One example of this response involved Jeff Schmidt, a physicist who worked as an editor at *Physics Today* for nineteen years. In 2000, immediately after he published a book titled *Disciplined Minds,* a radical analysis of the training and subordination of scientists and other professionals, he was fired from his job. He responded by mobilizing support within and outside of the physics community; the campaign on his behalf included a petition signed by hundreds of physicists, an amazing display of support for Schmidt against the physicists' own professional body. This public campaign attracted assistance from pro bono lawyers, and Schmidt won compensation, symbolic reinstatement, and even the right to boast about the settlement; he insisted on throwing out the usual confidentiality clause.

Dissident scientists can gain support from social movements. For example, when climate change scientists working for government come under attack—for example, by not being allowed to speak to the media or comment on policy—their situation is sometimes publicized by climate activists, with publicity in social and mass media. The possibility of media coverage discourages attacks on dissent.

Far better than trying to counter attacks on dissent is to prevent them in the first place. Attacks are less likely when there is a culture of openness to controversial ideas, with respectful debate. This is indeed the stated ideal of scientific inquiry, but, due to the influence of vested interests and paradigm commitments, it is realized only part of the time.

Brian Martin
University of Wollongong

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Drug Labeling

According to the U.S. Food and Drug Administration (FDA), prescription drug labeling is the "centerpiece of risk management" in medicine because the drug's label "communicates to health care practitioners the agency's formal, authoritative conclusions regarding the conditions under which the product can be used safely and effectively" (FDA 2006, 3934). Such risk management considerations are critical, particularly since the United States remains the most highly medicated society in the world. According to IMS Health, more than four billion prescriptions were dispensed in the United States in 2011, as Americans spent nearly $320 billion on pharmaceutical products during the year (IMS Health 2012a). In its 2004 survey, *Patterns of Medication Use in the United States,* Boston University's Slone Epidemiology Center found that "55% of subjects reported taking at least one prescription drug during the previous week and 11% took five or more. Prescription drugs were used more frequently by women than men, and by older than younger persons" (2004, 8). Given this scale of prescription drug use, it should not be surprising that despite the substantial technological advances in prescription medicines and the tremendous quality of life enhancements they provide, medication errors can and do pose serious health risks to American consumers. In relative terms, the Institute of Medicine's *To Err Is Human* report noted, "In terms of lives lost, patient safety is as important an issue as worker safety. Although more than 6,000 Americans die from workplace injuries every year, . . . medication errors are estimated to have accounted for about 7,000 deaths" (Institute of Medicine [IOM] 1999, 27). As the "centerpiece" of risk management, the drug's label along with the package insert that accompanies each prescription medicine plays a critical role in communicating essential prescribing information to physicians and patients.

Politics, Policy, and the Law

The modern drug approval process in the United States began with the enactment of the 1938 Food,

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