

## Scientific Life

# Scientists Should Oppose the Drive of Postmodern Ideology

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**The National Academies of Sciences of the USA recently published a report entitled *Gene Drive on the Horizon*. This commentary discusses the ‘Aligning Research with Public Values’ aspects in this report, the topic of public engagement, and the worrying ideological shift towards postmodernism which aims to deconstruct Enlightenment values.**

### The ‘Gene Drive on the Horizon’ Report

The National Academies of Sciences, Engineering, and Medicine (NAS) of the USA recently published a report on gene drives [1], which is timely in the context of recent developments in gene editing and CRISPR technologies. A gene drive is defined as the preferential increase in a population of specific genetic elements. Case studies examined include controlling populations of disease-spreading insects or of other species threatening biodiversity. This commentary will not deal with these aspects but with those concerned by the subtitle of this report, namely *Advancing Science, Navigating Uncertainty, and Aligning Research with Public Values* and, more particularly, its last proposition focusing on ‘public engagement’ (PE; Box 1).

### Shifting Views on Science and Society

Nobody objects to PE where it is understood as ‘sharing knowledge’. PE becomes problematic when it becomes a ‘mode of governance’ of research. First, as admitted in the NAS report, ‘there is not a standard approach’ for PE, and the cited

examples range from communication to active participation in research. Second, according to this report, PE can ‘support democracy and justice’, making it a moral imperative for researchers.

‘Aligning Research with Public Values’ is not only worrying because it potentially restricts academic freedom and because of its intrinsic relativism, but also because it illustrates a clear ideological shift. Whereas at the end of the 19th century philosopher Ernest Renan and others considered science as ‘the first need of humanity’, and that society must organize

itself scientifically to ‘improve the established order’, the NAS report bows to an opposed thinking where science must organize itself according to ‘public values’. While the 20th century has rightly moved away from Renan’s views, this new shift is gaining ground, and it is also problematic. For example, as the report mentions, in 1982 the President’s Commission stated that (on human genetics) ‘the public could rely on the judgments of experts in the field’, while in 2010 it insisted (regarding synthetic biology) on ‘justice and fairness’ and called for a principle of ‘democratic deliberation’.

#### Box 1. What Are ‘Public Values’ and What Does ‘Public Engagement’ Mean?

##### Public Values

In Chapter 4 (Charting Human Values), the NAS report [1] defines ‘values’ as ‘critical components of human identity and society’. More precisely, they are ‘deeply held, complicated, sometimes evolving beliefs about what kinds of things . . . should be fostered, protected, or avoided, and therefore about what people should and should not do’.

This Chapter first considers values as ethical principles guiding science and medicine. In the case of medical research, it cites the requirement of a positive balance of benefits over harms. Case studies are put forward that bear potential public health, agricultural or environmental benefits, or potential harm. The report also mentions that ‘finding intrinsic value in knowledge is also very much part of the tradition of science’.

The section ‘Intrinsic and Anthropocentric Values’ states ‘Different people may understand and value environmental outcomes in very different ways’. Some people may ‘evaluate environmental outcomes in terms of human outcomes’, while others will ‘think of naturally occurring environmental phenomena as intrinsically valuable’. The report ‘does not side with any particular way of understanding these issues and does not resolve them’.

The section ‘Concerns about Justice’ deals with ‘questions about who would be affected by the benefits and harms, and who decides’.

##### Public Engagement

In Chapter 7 (Engaging Communities, Stakeholders, and Publics), the NAS report first defines engagement as ‘Seeking and facilitating the sharing and exchange of knowledge, perspectives, and preferences between or among groups who often have differences in expertise, power, and values.’

The report then shifts from ‘sharing knowledge’ to ‘Public engagement as a mechanism to identify and incorporate cultural values of communities, stakeholders, or other publics’ in the ‘probabilistic definition of risk’. Recommendation 7.2 proposes to ‘integrate engagement into the construction of risk assessment models’.

‘Communities’ are ‘people who live near enough to a potential field trial’, reflecting the ethical necessity to obtain consent of local populations (see above). ‘Stakeholders’ are defined as having ‘professional or personal interest sufficient to justify engagement’, while ‘Publics lack direct connection to a project . . . but nonetheless have interests, concerns, hopes, fears, and values that can contribute to democratic decision making’.

These views are not limited to field trials and not even to risks at large, but ‘research plans to develop gene drives should include a thoughtful engagement plan . . . throughout the process of research’ (Recommendation 7-1). ‘Such deliberation may enable participants to reflect upon their own beliefs and understandings in new ways’.

### A Shift Called Postmodernism

Postmodernism is an ideology whose aim is to deconstruct Enlightenment values [2]. Implicitly, postmodernism considers that scientists cannot be trusted, and that their research must be subject to a democratic process, more precisely to a 'participative democracy'. Undeniably, human activity enabled by science and technology may create risks. The principle of 'communities' (Box 1) having a say in the implementation of a technology that bears risks for them is perfectly pertinent. However, whether 'stakeholders' or 'other publics' should participate by principle in upstream research is a different question. Participation of non-professional researchers or laypersons in scientific activities has always existed and is valuable, for example, to collect large amounts of data. In the latter case, the common goal of all participants is more science, and it does not interfere with the scientific method. The implications are completely different when the participating 'public' wants a different science, depending (to quote the NAS report) on its 'interests, concerns, hopes, fears and values'.

This report goes further, stating that engaging communities, stakeholders, and the public is critical not only for 'development and potential release of gene drive technology' but also for 'successful decision making regarding the research'. The report endorses the view that PE will create 'mutual learning' that will foster 'reflective deliberation'.

Science and technology studies (STS) is a social 'science' school of thought concerned with the defense of such a 'co-construction' of science. 'Reflective deliberation', like participative democracy, and more generally 'democracy' used in conjunction with science (e.g., 'CRISPR democracy' [3]), is a typical marker for postmodern sociology: 'reflective deliberation stands at the core of the citizens' forum model' [4]. This model aims to undermine 'technocratic and elitist approaches to policy making' (which is

a legitimate conversation) but also to science itself. The strategy is to introduce 'new players' (citizens, stakeholders, etc.) to challenge the scientific method.

### Failed Postmodern Experiments

Interestingly, this 'model' has been applied on several occasions in the context of genetically modified organisms (GMOs). For example, the French National Institute of Agronomic Research (INRA) used it regarding research on vines (Box 2). Despite the efforts of INRA biologists to engage stakeholders in the field trial and in upstream research, the truth is that this trial was vandalized, like previous transgenic research by the INRA [5]. The future will tell us whether this experiment has 'stimulated institutional learning' for INRA to never again perform such an experiment inspired by a single sociology school.

Another example of using postmodern recipes is provided by 'consensus conferences', first implemented in Denmark and then in other countries ([www.ivm.vu.nl/en/Images/PT3\\_tcm234-161508.pdf](http://www.ivm.vu.nl/en/Images/PT3_tcm234-161508.pdf)). In the case of GMOs, judgments on their outcomes need to be nuanced. In a French example [6] from 1998, while many recommendations of this 'citizen conference on the use of GMOs in agriculture and in food' were sound, the recommendations also stated 'it would be good to focus on research aimed at creating, in some cases, sterile transgenic plants unable to reproduce themselves'. These same

technologies were later vilified as 'Terminator' by anti-GMO activists and were not developed owing to an international outcry based on moral grounds. Significantly, neither this 'conference' nor the debates – open to stakeholders – organized by members of the French Parliament or Senate [7] prevented the destruction of transgenic experiments [5].

The European Food Safety Agency (EFSA) goes to great lengths to manage conflicts of interest, to engage with stakeholders, and show openness ([www.efsa.europa.eu/en/topics/topic/openefsa](http://www.efsa.europa.eu/en/topics/topic/openefsa)). However, this has not stopped activists from repeatedly attacking the honesty of its members when they dislike the EFSA's conclusions. An activist intrusion occurred on its Parma premises in March 2014. On 7th June 2016, a package containing explosive material was addressed to the EFSA intended for a scientist providing advice on GMOs ([www.sciencemag.org/news/2016/06/italy-investigates-explosive-letter-sent-european-food-safety-agency](http://www.sciencemag.org/news/2016/06/italy-investigates-explosive-letter-sent-european-food-safety-agency)).

Regrettably, the NAS report fails to mention the failure of the 'public engagement' attempts by INRA or EFSA. Although this report recognizes that there are different types of 'public' and 'local understanding', it fails to stress that some have no interest in 'mutual learning' and that some aim to combat the industrial society and technological innovation; because innovation is based on science, they want to control upstream research.

#### Box 2. The Failure of an 'Interactive Technology Assessment'

The French National Institute of Agronomic Research (INRA) used such an approach regarding research on vines with a genetically modified rootstock potentially resistant to a virus. It organized a 'consensus conference' type of public consultation in 2002, in which 'science and technology studies' sociologists took leading roles. The conference led to the creation of a 'local steering committee' (involving 'stakeholders') to supervise a field trial. This applied sociology experiment was first judged to be 'highly productive' [12], and this 'midstream engagement' was praised because it 'improves the robustness of decisions by taking into account the diversity of world views and interests' and 'stimulates institutional learning'. It seems likely that the INRA management team considered this approach as a way to prevent destruction not only of this field trial but also to render its biotechnology research more consensual. The fact that some stakeholders were unwilling to compromise was downplayed as a 'structured dissension' [13]. The fact that they managed to reorient research from biotechnology to organic farming-oriented research became a 'driver for a creative dynamic' in the postmodern vocabulary. INRA's attempt failed after this field trial was vandalized twice and was discontinued [5].

### Postmodernism Spreading within Scientific Institutions

This idea is especially worrying at the NAS because at least one member of its 'Committee on Gene Drive' has written elsewhere that 'upstream engagement tends to push dialogue towards issues of value and ideology and in such cases there is much less willingness on the part of protagonists to reconsider evidence on the basis of its scientific merit' [8]. In the same article, J. Tait accurately analyzed that STS sociology 'challenged the authority of science, particularly its presumed impartiality and its role as provider of public benefits . . . and sought to change the political landscape, again towards greater public participation'. Further, it sought to 'reshape . . . the very foundations on which the scientific enterprise rests'. In this context, the NAS report recommendation to 'align research and policy with public values' and to consider it as 'particularly important for ecological risk assessment' is simply a delusion.

The report ambiguously fluctuates in its definition of what 'engaging the public' actually means. It is viewed either as being open to dialogue (a value of Enlightenment) in relation to the idea that 'technical expertise is insufficient for ensuring good governance' (which is obvious) or even to 'the recognition of the contributions of local understanding to the practice of science' (which all depends what 'local understanding' entails). The latter assumption is allegedly illustrated by examples provided exclusively by again the same school of sociology. One publication [9] criticizes the lack of a 'reflexive capability' of scientists regarding the radioactive fall-out from Chernobyl experienced by sheep-farmers in England, stating 'that scientific knowledge tacitly imports and imposes particular and problematic versions of social relationships and identities'. This criticism represents an extension to science of the postmodern 'tyranny of guilt' [10]: scientists should feel guilty for being 'imperialistic' and for defending their own identity (at the expense of others). Another publication

claims that scientific knowledge is shaped by struggle for power and by controversy [11]. The example cited is that of AIDS research, described as a social and political phenomenon because the AIDS movement is considered as having transformed biomedical research practices. In my humble opinion, the identification of the AIDS causative agent owes more to the expertise of virologists and molecular biologists (who probably had limited 'reflexive capability'!).

### Why Postmodernism as an Assault on Science Has Been Difficult to Grasp by Scientists

Postmodernism is often confused with values of respect and democracy [2]. However, science is not a matter of democracy – it is about the application of a method, and it is an elitist activity, open to all provided that one learns and applies the scientific method. Scientists should be able to 'reflect upon and revise their own opinion' without injunction from postmodern political correctness.

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## Science & Society

### In Vitro Biofilm Models for Device-Related Infections

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Many promising antimicrobial materials fail to translate from bench to bedside, in part owing to a lack of *in vitro* biofilm models that can be used to predict their long-term *in vivo* antimicrobial and anti-biofilm activity. Various factors need to be considered for predictive modeling to mimic the conditions *in vivo*.

### Biofilm Models to Prevent Device-Associated Infections Are Needed

Medical device-associated infections are generally caused by microorganisms that form biofilms on devices such as orthopedic implants, central venous catheters, and urinary catheters. A recent prevalence survey included geographically diverse locations and showed that 4.0%