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Intellectual Liberty and the Public Regulation of Scientific Research

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Intellectual Liberty and the Public Regulation of Scientific Research

Abstract
Calls to regulate or restrict scientific research are often a matter of politics, and public desire to regulate science may have its source in several different underlying interests: on one side, people may be motivated by an interest to control risks, prevent harms, or limit access to powerful or dangerous technologies. These interests are easy to understand, and often provide entirely appropriate and creditable grounds for regulation. In a darker vein, people may be motivated by more general mistrust of science, or by moral or religious disapproval of some kinds of research. While these motives may be easy to understand, clearly they should be resisted. But if researchers hope to avoid inappropriate regulations, we need to be prepared to explain our research to the public. And when research is funded by tax dollars, it is especially important that scientists should be able to justify its benefit to taxpayers and legislators.

Disciplines
Intellectual Property Law | Philosophy of Science

Comments
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I. FORBIDDEN KNOWLEDGE AND POLITICAL SCIENCE

Calls to regulate or restrict scientific research are often a matter of politics, and public desire to regulate science may have its source in several different underlying interests: on one side, people may be motivated by an interest to control risks, prevent harms, or limit access to powerful or dangerous technologies. These interests are easy to understand, and often provide entirely appropriate and creditable grounds for regulation. In a darker vein, people may be motivated by more general mistrust of science, or by moral or religious disapproval of some kinds of research. While these motives may be easy to understand, clearly they should be resisted. But if researchers hope to avoid inappropriate regulations, we need to be prepared to explain our research to the public. And when research is funded by tax dollars, it is especially important that scientists should be able to justify its benefit to taxpayers and legislators.
Regulation of science can either promote or inhibit research. Either way, things can go well or badly. When Galileo’s great work on celestial mechanics was suppressed because his results were inconsistent with the teachings of the church, we recognize this as censorship. And we recognize as similarly bogus Trophim Lysenko’s receipt of the Stalin Prize for his ideologically informed and bogus “research” on agronomy and crop genetics. Contemporary US policy also promotes and inhibits research in select areas: special incentives are available for scientists whose work promotes “clean energy” (itself a questionable term that gets its meaning from nonscientific legislative fiat), and there are disincentives for research on human embryonic stem cell lines. Here as in other cases, regulation limits research and inquiry. Since freedom of inquiry and freedom of intellect are among the most precious liberties we possess, it is relevant to try to specify the circumstances (if any) in which these liberties can appropriately be constrained and identify very clearly the interests (if any) that justify such constraint. Those who are engaged in scientific research often regard public scrutiny and regulation as an unwarrantable intrusion and as the inappropriate incursion of political interests where they do not belong. A theory of regulation should explain when this attitude is justified and when it is not.

In science, we can have some confidence that the truth will eventually rise to the top, even when science is regulated and inquiry is curtailed. Today we celebrate Galileo’s brilliance and vision and condemn Lysenko as a pseudoscientific fraud. But our confidence about these judgments should not engender a complacent attitude toward regulation. Some contemporary examples of the political regulation of science are quite as contentious as those of Galileo and Lysenko: In the United States, politics have entered the research process in a variety of different ways, specifying which kinds of research may be done with public funds and at public universities (example: stem cell research), how research is communicated (example: global climate change research), and how new technological developments are made available (example: RU-486, the “abortion” drug). This paper begins with questions that should be taken seriously by anyone engaged in scientific research:
What business do nonscientists have to regulate science?

What legitimate interest (if any) do legislators and the public have to restrict and regulate the professional activities of scientists engaged in research?

These questions are especially pressing, since laypeople and lawmakers typically do not understand the science they hope to regulate. Consequently, their regulations may often be badly framed and poorly conceived. This lack of understanding, however, is not just the unfortunate result of ignorance or inadequate science education. Most cutting-edge research is complicated and specialized: even scientists working in the same field often have difficulty understanding the work of researchers in an adjacent laboratory. It is inevitable that regulations governing scientific research will be framed and approved by people who do not fully understand the research in question. Such regulations do limit the liberty of scientists and their ability to pursue their goals, and they have a decisive influence on which research will be undertaken and how it will be pursued.

In some cases, such regulation constitutes "political science" in the worst possible sense: if the interests that guide regulations are inappropriate or ideological, the result can be science that is inappropriately influenced by political or other interests. Just as "scientists" working for the US tobacco companies produced "research" to undermine evidence that smoking causes cancer, there have been more recent events in which political interests inappropriately influenced climate research.

Many observers regarded the Bush administration's efforts to regulate human embryonic stem cell research as a clear case of inappropriate incursion of political ideology into the research process. Barack Obama later issued an executive order (Executive Order No. 13,505, Fed. Reg. 10,667, March 9, 2009) in which he attempted to remove the barriers that prevented federal funding for this research, but his order was challenged in court and subsequently ruled to be illegal. In a controversial ruling, Chief Justice Royce Lambeth, of the US District Court for the District of Columbia ruled in August 2010
An Editor In the White House

Handwritten revisions and comments by Philip A. Cooney, chief of staff for the White House Council on Environmental Quality, appear on two draft reports by the Climate Change Science Program and the Subcommittee on Global Change Research. Mr. Cooney's changes were incorporated into later versions of each document, shown below with revisions in bold.

"STRATEGIC PLAN FOR THE U.S. CLIMATE CHANGE SCIENCE PROGRAM," DRAFT TEXT, OCT. 2002

14 wetlands will expand in areas where meltwater resulting from deeper and longer thaw
15 periods does not have a natural drainage path to the ocean.
16
17 Warming will also cause reductions in mountain glaciers and advance the timing of the melting
18 of mountain snowpack in polar regions. In turn, runoff rates will change and flood
19 potential will be altered in ways that are currently not well understood. There will be
20 significant shifts in the seasonality of snowfall that will have serious impacts on
21 populations that rely on fishing and hunting for their livelihood. These changes will be
22 further complicated by shifts in precipitation regimes and a possible intensification and
23 increased frequency of extreme hydrological events. Reducing the uncertainties in current
24 understanding of the relationships between climate change and Arctic hydrology is critical

PUBLIC REVIEW DRAFT, NOV. 2002

Warming could lead to changes in the water cycle in polar regions. Reducing the uncertainties...

FINAL REPORT, JULY 2003

The paragraph does not appear in the final report.

"OUR CHANGING PLANET," DRAFT TEXT, OCT. 2002

019 the next, and perhaps even beyond.
020 The challenge for the USGCRP is to provide the best possible scientific basis for documenting,
021 understanding, and projecting changes in the Earth's life-support systems, and the role for CCI is to
022 facilitate full use of scientific information in policy and decision-making on response strategies
023 for adaptation and mitigation at international, national, and regional scales. The final
024 report, "From "Discovery" to "Comparative Analysis" - reduce the remaining uncertainties associated with human-
025 induced climate change", will move into a new "period of comparative analysis of response strategies". In this new phase of the climate science programs, information
026 on the potential consequences of different responses to global changes, including climate change, will be developed in a context-oriented national decision-making forum.

FINAL REPORT, 2003

The challenge for the USGCRP is to provide the best possible scientific basis for documenting, understanding, and projecting changes in the Earth's life-support systems, and the role for CCI is to reduce the significant remaining uncertainties associated with human-induced climate change and facilitate full use of scientific information in policy and decision-making on possible response strategies for adaptation and mitigation.

Figure 11

that Obama's executive order violates the Dickey-Wicker Amendment of the appropriations bill for Health and Human Services (US District Court for the District of Columbia, Civ. No. 1:09-cv-1575 [RCL], August 23, 2010). This amendment prohibits the federal use of funds for "(1) the creation of a human embryo or embryos for research purposes; or (2) research in which a human embryo or embryos are destroyed, discarded, or knowingly subjected to risk of injury or death greater than that allowed for research on fetuses in utero" under other applicable federal regulations. While some hailed
this decision as an appropriate interpretation of the law and as enforcing needed protections for fetal life, others regarded it as an inappropriate judgment in which Judge Lambeth allowed his private moral convictions to influence his legal judgment.

While we will consider the case of stem cell research later, we must recognize in general that regulatory restrictions do limit and frame research, and as such they limit the liberty of scientists. Such limitations can undermine the ability to pursue responsible research. Because of this, it is crucial to consider and evaluate the public reasons for such regulations.

II. THE CASE FOR SCIENTIFIC LIBERTY

It is easy to sketch the case in favor of the liberty to pursue scientific research without undue impediments: In part, the freedom to pursue scientific research is simply one aspect of the more general liberty we enjoy, or should enjoy as participants in a free society. But beyond this, freedoms of intellect and thought are special freedoms, regarded as fundamental in US constitutional law, and by many political theorists. Still, while freedom in the practice of scientific research is closely related to intellectual liberty, it may be somewhat broader in scope: scientific practice is not typically expressive activity, and the liberty to pursue empirical research is distinct from, though perhaps no less important than, the liberty to believe what one's intellect and conscience may dictate. These principles of liberty of action, intellect, and conscience are very general considerations, and they apply not only to scientific research but also to all our actions and pursuits.

Beyond these very general considerations, there are special reasons why we might hope to give special protections to scientific enquiry: scientific advance and innovation are important public goods, and we have a strong public interest to promote them. In the modern world, scientific advancements and the infrastructure necessary to generate them are important sources of culture, resources, and social wealth. To produce these benefits, scientists need
resources, infrastructure, support, and liberty. The wealth and welfare of nations that are unable or unwilling to provide these necessities will be very seriously at risk as information and technology become increasingly important to global economy and culture.

But the notion that scientific knowledge is a public good is sometimes called into question. In the modern world, the most economically significant advances in scientific knowledge are usually private intellectual property. Privately owned and controlled knowledge might be thought to benefit its owners, not the general public. In response to this concern, it's worth noting that the aim of intellectual property law is itself to promote the public good: Intellectual property protections, in fact, are among the ways in which scientific knowledge is regulated, since regulations can be designed either to promote what is regarded as desirable or prevent what is regarded as dangerous or undesirable. But intellectual property rights are (supposed to be) designed to promote the public good by providing an incentive for innovation and research. This is specified in Article 1 Section 8 of the US Constitution, which grants Congress the power "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The purpose of intellectual property (IP) law is to "promote progress of science and useful arts" by providing an incentive for those who pursue them. This underlying aim provides a standard that can be used to evaluate existing laws: where IP laws stifle or constrain innovation, they fail to serve the purpose for which they were enacted. But the Constitution only protects intellectual property rights that "promote the useful arts," and the constitutional reasons for patent legislation are framed to promote the public good. It is noteworthy that the Constitution permits the creation of patents but does not require it. The framers evidently viewed patent law, and intellectual property law more generally, to be justified by the public benefits they provide and not by any view that inventors and researchers have an independent nonlegal right to control the intellectual goods they produce. Where private intellectual property rights don't serve this objective, they raise both constitutional and legal concerns. As I will argue, this provides very good
reason why scientists who use the US patent laws should feel (and fulfill) an obligation to ensure that their work really does have net public benefits. Scientists should also be prepared to explain these benefits to the public that pays a substantial portion of the research costs that produced, and which is supposed to benefit from, the institutions that create and enforce inventors’ rights.

III. POLITICAL AUTHORITY, REGULATION, AND CONSTRAINT

Given the general right to liberty and the instrumental value of scientific advance, what considerations justify regulation? In US law it is the constraint of liberty, not its exercise, that requires justification. That is, in the absence of a sufficient and compelling reason in favor of constraint or regulation, people are understood to have a right to do as they please. This thought is sometimes called the "presumption in favor of liberty." Under this presumption, if Alph wishes to engage in some behavior but Beth wishes either to prevent him from doing so, or to regulate him as he does so, the burden lies on Beth to show that there is a good and sufficient reason that justifies the limitation of Alph’s liberty.

Should we accept this presumption in favor of liberty? In one sense, this presumption simply embodies what it means to live in a free society. Liberty is an important good, and the right to liberty is a fundamental value. United States legislatures and courts have recognized such a presumption in a variety of different contexts: The Ninth Amendment of the US Constitution specifies, “The enumeration in the constitution of certain rights shall not be construed to deny or disparage others retained by the people.” Discussion surrounding the enactment of this amendment shows that the framers regarded it as necessary to insure that later legislators and courts would not assume that people don’t possess a right simply because it is not specified in the Constitution. The Constitution ceded a limited set of rights to the government, which then was understood to have only those powers that were expressly given.
In another context, John Stuart Mill articulated a powerful defense of individual liberty and the limits of regulatory legislation. Mill famously writes:

The only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others. His own good, either physical or moral, is not a sufficient warrant. He cannot rightfully be compelled to do or forbear because it will be better for him to do so, because it will make him happier, because in the opinion of others, to do so would be wise, or even right. These are good reasons for remonstrating with him, or reasoning with him, or persuading him, or entreating him, but not for compelling him of visiting him with any evil in case he do otherwise. . . . Over himself, over his own body and mind, the individual is sovereign.

The principle that limitations on liberty are permissible only when they aim to prevent harm to others is usually called the Harm Principle. Mill intended this principle, for which he provides a detailed defense, to provide a complete theory about the rightful limits of the coercive power of the state. Mill’s view is plausible and has been defended by many contemporary theorists. Applied to the context of scientific investigation and the public regulation of science, this view would imply that the only reason that can justify the regulation of scientific activity is the imposition of harm or risk of harm on others. Thus, on this view restrictions that specify the treatment of research subjects would qualify as legitimate, as would restrictions that regulate risky research that imposes risks on non-participants. If this were the sole justification for the restriction and regulation of scientific research, then many such regulations would be unjustified and unjustifiable.

IV. REASONS FOR REGULATION

It is useful to consider reasons that have actually been cited to justify the regulation of scientific research. This section will consider
reasons based on the "Faustian Myth" (if myth it is) that science must be regulated to prevent scientists from "going too far," and the notion that research may be regulated when people regard the methods or intended result to be "immoral."

(i) Regulation to Prevent Scientists from "Going Too Far": Faust and Forbidden Fruit

One motive to regulate science may be found in public mistrust of scientists and public concerns about research or technology "going too far." This concern has found its expression in literary works: In Goethe's *Faust*, a researcher sells his soul to the devil in his effort to gain knowledge and mastery over nature. In Mary Shelley's *Frankenstein*, science gone awry literally produces a monster. Timothy Ferris has dubbed this notion that "science must be reined in lest it go to far" the "Faust Myth." This myth, if a myth it is, stretches back to some of our oldest stories—to Adam and Eve and the forbidden tree of knowledge, and to the earlier stories that have been identified as progenitors of that story from *Genesis*. In one of its most appealing representations, this view appears in John Milton's epic poem *Paradise Lost*. In an early section of Milton's poem, Adam and Eve are amazed to find themselves in the Garden of Eden. They ask for information about their circumstances and their origin, and the angel Raphael responds:

I have received, to answer thy desire  
Of knowledge within bounds; beyond abstain  
To ask, nor let thine own inventions hope  
Things not revealed, which the invisible King,  
Onely Omniscent, hath suppressed in Night,  
To none communicable in Earth or Heaven:  
Enough is left besides to search and know.

Raphael makes it clear that they will receive only as much knowledge as fits their limited capabilities, and that there are other realms of knowledge that have been reserved for God alone. But Raphael explains his reasons for this constraint:
Knowledge is as food, and needs no less
Her Temperance over Appetite, to know
In measure what the mind may well contain,
Oppresses else with Surfeit, and soon turns
Wisdom into Folly, as Nourishment to Wind.\(^\text{10}\)

Explaining these lines, Wendell Berry writes: “Raphael is saying, with angelic circumlocution, that knowledge without wisdom, limitless knowledge, is not worth a fart; he is not a humorless archangel.”\(^\text{12}\)

The view that scientists “should not go too far” has contemporary defenders. Echoes of the view can be found in the works of some authors I admire very much, including Wendell Berry and Bill McKibben.\(^\text{13}\) But as the underlying source of this concern, in many cases, these writers are animated by their sense that science has provided technical mastery that threatens harm. Thus McKibben is concerned that new technologies will harm people and the environment, and Berry is concerned to argue that economic “knowledge” of the workings of free markets is dangerous because, as he argues, it’s essentially false and leads us to bad policy, not because it reflects an intemperate pursuit of essentially forbidden knowledge. Perhaps, in the face of motives to regulate scientific research to prevent scientists from “going too far” we should simply maintain our commitment to liberty and permit regulation only to prevent harm and risk of harm to others. It would clearly violate the presumption in favor of liberty and Mill’s harm principle to constrain or regulate scientific research in order to prevent scientists from discovering knowledge that some may regard as hidden or forbidden.

(ii) Public Reasons and Regulation to Prevent “Immoral Science”

In other contexts, regulation seems to be based on a desire to prevent the pursuit of scientific projects that are regarded as “immoral.” For example, efforts to regulate the development and distribution of RU-486, the so-called abortion pill, were pursued by people who regarded the use of this drug to be immoral. Efforts to prevent and constrain
research involving fetal stem cells also seems to have been pursued by people who regarded this research to be immoral and believed that the method used to obtain these cells was similarly immoral.

The belief that stem cell research is immoral is controversial and debatable. Polls consistently showed that a strong majority of Americans did not agree with this judgment, and regarded this research as important and promising. Nonetheless restrictions on this research were imposed by a presidential order restricting the set of cell lines that could be used in publicly funded research and forbidding the use of public funds for research involving any other lines. Because the available lines were few, and because they had been contaminated with mouse DNA during the process used to "immortalize" them, these restrictions did, at least temporarily, tightly constrain research on human stem cells.

Critics of the Bush administration decision to restrict stem cell research argued that Bush was imposing a parochial moral and religious agenda on others whose convictions were different. A New York Times editorial made this case:

Mr. Bush is adamantly opposed to such research, which involves creating microscopic embryos to derive stem cells that genetically match a diseased patient, thus facilitating research on particular diseases and ultimately potential cures. There, too, he seeks to impose his morality on a society with pluralistic views.14

The implicit argument of this passage is that public policy had wrongly been motivated by private moral reasons that were not widely shared. In this case, the reasons in question were the president's private religious convictions, which included the conviction that life begins at conception and that fetal life should be protected as sacred. The Times urged that it is wrong for the president to appeal to his private moral or religious convictions when enacting public regulations.

The foil to this view, not logically implied but indicated by this writer, is that it would be more proper to permit regulation only when it could be supported by public reasons.15 Where public rea-
sons for regulation cannot be found, people should be left free to do as they wish, without any regulatory impediments. But which reasons are public?

A theory of public reasons is a theory of which reasons justify public action or public regulation. A commitment to public reason involves recognition that public actions must be explained and justified to the people to whom they apply. John Rawls expresses this view as a condition for the proper exercise of power of the government over individuals. He writes, "Our exercise of political power is proper and hence justifiable only when it is exercised in accordance with a constitution the essentials of which all citizens may reasonably be expected to endorse in light of principles and ideals acceptable to them as reasonable and rational." Since regulation involves an exercise of power, we should consider the implications of this strong view for the problem under consideration here. Rawls's requirement for public reason is strong: others should be reasonably expected to endorse the underlying principles that justify the exercise of power. They need not agree with the specific exercise of state power in question, but the exercise of power will be unjustified, on this view, if they could not be expected to accept the underlying principle that justifies the use of power. Rawls's view implies recognition that the justification of coercive power is justification to fellow members of our political community on whom this power may be exercised, and must be based on principles that they would accept.

In a similar and closely related sense, public reasons may be distinguished from "merely" private reasons that apply to us as individuals, or to members of our smaller private communities. Religious reasons, for example, are "private" in the sense that they apply among fellow believers but would not provide justification for broader public policy. Indeed, religious reasons are sometimes taken as a paradigm case of private reasons that may justify individual action and choice but cannot rightly justify restrictions on the liberty or choices of other people who do not share the same convictions. By contrast, the paradigm examples of reasons that are public are (1) constitutional reasons, and (2) reasons that justify regulation or law by reference to our right to protect others from harm.
Perhaps we should provisionally accept the view that scientific research may appropriately be regulated only when the reasons for regulation are based on public, not merely private reasons. On this view, wherever restriction or regulation of science cannot be justified by reference to public reasons, it is illegitimate and unjustified.

(iii) Public Skepticism about Science

Another motivation for the regulation of science is public skepticism. In the United States, many people are skeptical of scientific results and theories. A significant number of Americans, for example, do not believe the theory of evolution. Many deny the view embodied in the broad consensus among climate scientists, showing the connections between global climate change and anthropogenic greenhouse gas emissions. In both cases, skeptics have made a concerted effort to influence the way science is taught, pursued, funded, and reported. 18

V. THE LIBERTY TO PURSUE SCIENTIFIC RESEARCH

The discussion above has identified three principal considerations that militate strongly in favor of the liberty to pursue scientific research without impediment. It will be useful to state each of these considerations clearly:

1) Presumption in favor of liberty: The liberty to pursue scientific research is simply one aspect of a more general right against interference from others, at least where our behavior does not threaten harm or risk of harm to others.

2) Freedom of conscience and expression: The liberty to pursue scientific research is implicit in broader protections for other intellectual liberties, including freedom of conscience and free expression.

3) Public reasons requirement: Restrictions on research are only appropriate when they can be supported by public reasons. If
regulations are based only on private reasons (the religious or moral convictions of the legislator, for example) they constitute an unacceptable limitation of liberty.

If accepted, these three considerations constitute powerful reasons to avoid many restrictions and regulations that impede scientific research.

VI. PUBLIC FUNDING AND REASONS IN FAVOR OF REGULATION

The arguments listed above address direct regulation of research: regulations that unconditionally restrict research activities, or which (like IP law) create a regulatory regime that provides incentives. Where research is publicly funded, the case for liberty is different, since there are liberty interests on both sides of the case. Public research funding is effected through taxation, and those who are taxed to support research have a legitimate interest in the research they pay for. In effect, where research is publicly funded, the case one needs to make in order to justify regulation is lighter than it is in the case of privately funded research. Consider the arguments that might be made by a taxpayer whose money is used to support research she might find questionable.

First, such taxation involves both coercion and limitation of liberty, and thus requires justification under the presumption in favor of liberty discussed earlier. While direct restrictive regulation of scientific research would require similar justification, the argument from liberty would seem, in this case, to favor the rights of taxpayers and not the rights of scientists and researchers. In this case, if regulations are necessary to ensure that research funding can answer the challenge from the presumption for liberty, this would constitute a good argument in favor of regulation.

A second argument from the principle of freedom of conscience also provides support for the regulation of funded research: In general, our right of freedom of conscience protects our right to believe
and to express whatever we wish, and is considered to be violated where one is forced to express a view one does not accept. But people frequently take this value to be compromised when their tax dollars are used to support endeavors they do not support. Thus during the war in Iraq, many Americans who disapproved of the war regarded it to be a violation of their right of freedom of conscience that their tax dollars were used to fund a war they did not support. In a similar sense, some people regard it as a violation of conscience that their tax money is used to support research that violates their moral principles. Sometimes this was articulated as an expressive harm: “By funding the war with my money, the government forces me to express support for a war I do not support.” While paying one’s taxes is not usually considered to be a fundamentally expressive action, it is easy to understand the view of people who object to their tax money being used in this way. We might call this the “Not with my money!” argument.

But a similar argument arises in the case of controversial research: For example, if federal funds are used to support human fetal stem cell research, taxpayers who are opposed to such research might feel that they are being forced to express support for activities they regard as deeply immoral. In this sense, the argument from freedom of conscience provides some significant initial support for the view that this research should not receive public funding. Whether this view is convincing all things considered will depend on whether an adequate response can be given to this objection.

A third and closely related argument derives more directly from the requirement that coercive public policies require public reasons for their justification. The fact that people disagree about controversial research immediately raises the concern that this expense might not be justifiable to them in light of “principles and ideals acceptable to them as reasonable and rational.”

Notice that these are the same values we cited earlier in defense of scientific liberty. It seems that the same principles and considerations that support the liberty to pursue research may also provide justification for constraints on research that is supported by public funds.
VII. PUBLIC FUNDING, PUBLIC REGULATION, PUBLIC RESPONSIBILITIES

While the considerations cited in the previous section might be thought to call into question the entire institution of publicly funded scientific research, it would be inappropriate to conclude that we should eliminate such funding in an effort to protect the interests of the public. There is a strong public interest in pursuing scientific and technological progress, and without public funding this interest would be poorly served. It is crucial, however, to recognize that the arguments in favor of regulation impose a burden of justification on those who allocate funds for research and those who receive and use them.

Without doubt, some public funds will be used to support research that some people will regard as immoral or morally questionable. If universal consent and approval were necessary, then it would be difficult or impossible to justify the public support of any science at all. Since we do have good reasons to provide public support for science, we must conclude that the requirement of universal consent is simply excessive. But this conclusion comes at a cost that must be counted: in this case, the cost is borne by citizens who are compelled, through taxation, to provide funds for research they do not understand and of which they may not approve. I would argue that this justifies reasonable public regulation of funded research, and that it also imposes an important obligation on scientists whose research receives this funding. The obligation in question is not simply an obligation to do good science—it goes without saying that those who receive public support have an obligation to deliver quality. But in addition, there is an obligation to do what one can to ensure that the projects one pursues really do serve the public interest in the end and to do what one can to explain one's research to the public whose tax dollars make it possible. Scientists need to be able to explain the value of their work and to show that it really does merit the use of public resources.
IX. CONCLUSION

This paper began with two pointed questions:

*What business do nonscientists have to regulate science?*

*What legitimate interest (if any) do legislators and the public have to restrict and regulate the professional activities of scientists engaged in research?*

When considering regulation in the abstract, it may seem that there are overwhelming reasons to leave scientists alone, as free as possible from regulations that might impede or constrain the process of inquiry. Beyond the minimal restrictions necessary to ensure the integrity of the research process and to protect the rights and interests of those who might be harmed or put at risk by some research, scientists should be free to do as they please.

But where public funds are provided to support research, I have argued that researchers should hold themselves to a higher standard, and the case against regulation is weaker. In effect, the burden imposed by the presumption in favor of liberty falls on scientists, not on regulators. Scientists who are granted public support must, through their research, be able to show that the value of their work justifies the infringement of liberty involved in gathering public funds. Even so, not just any reasons will justify the regulation of scientific practice. We should still avoid regulation that cannot be supported by good and sufficient public reasons.

I have argued that the burden is on scientists to defend the value of their research and their claim to public funding. Since public funding relies on taxation, the presumption in favor of liberty imposes the heaviest burden of proof on scientists, not on regulators. Scientists who hope to avoid inappropriate regulations had better be prepared to explain their work, and its value, to those who are compelled to support it.
DEBATING SCIENCE

DELIBERATION,
VALUES,
AND THE COMMON GOOD

EDITED BY
DANE SCOTT AND BLAKE FRANCIS