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Interactivity Foundation

Science

Policy Possibilities for Public Discussion

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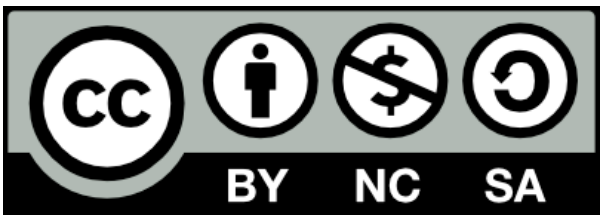

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ILLUSTRATIVE POLICY POSSIBILITIES
FOR PUBLIC DISCUSSION

A. Clarify What Counts as Reliable Scientific Knowledge—And Use It
- *Tries to clarify what is and is not regarded as reliable scientific knowledge*
- *Requires the use of reliable knowledge in public projects, programs, and policy decisions*
- *Supports efforts to organize and distribute scientific knowledge for scientific and public use*
- *Supports efforts to improve science education*
- *Supports efforts to improve scientific literacy*

B. Ensure Fidelity to Reliable Scientific Methods
- *Tries to ensure the quality of scientific methods and to improve public understanding of them*
- *Refuses to support science projects that do not adhere to reliable scientific methods*
- *Encourages the deliberate use of scientific methods, even in areas that are far-removed from science*

C. Let the Scientific Community Govern Itself
- *Allows the scientific community to govern itself*
- *Provides only limited public oversight and direction*

D. Let Those Who Fund Science Govern It—But Require Transparency & Accountability
- *Allows the interests that support science to govern it*
- *Seeks disclosure of those interests to make science open, transparent, and accountable*
- *Supports scientific research that reflects public interests when private interests fail to do so*

E. Promote Technology to Fuel Our Economic Engine—But Beware of Detrimental Consequences
- *Promotes research on technological projects that have foreseeable useful applications*
- *Allows industry and the market wide leeway to set the priorities for research and development*
- *Encourages government to regulate research that has potentially detrimental consequences*

F. Support Pure Inquiry, Creativity, and the Free Flow of Ideas
- *Supports pure scientific inquiry about fundamental scientific questions*
- *Supports creative investigations that challenge well-entrenched ideas and interests*
- *Welcomes, protects, and promotes the free flow of ideas*

G. Encourage International Science—But Protect our National Power and Interests
- *Encourages international scientific collaboration and the sharing of scientific information*
- *Balances support for international science with attention to our own national power and interests*

H. Balance Science with Humanistic, Religious, & Other Cultural Institutions
- *Treats science as only one among several valid ways of knowing*
- *Tries to bring science under democratic control*
- *Supports humanistic, religious, and other non-scientific cultural institutions as a counter-weight to public support for science*

The IF Discussion Process

Public policy discussions in America too often focus upon the specific actions that governments might take instead of focusing upon the broader, more conceptual possibilities that might motivate them. This is unfortunate, since the wise choice of a public policy requires an exploration of a wide range of conceptual possibilities—including the different possible concerns, interests, questions, beliefs, values, and goals that might inspire them. The Interactivity Foundation (IF) believes that governments too often act without considering a wide range of conceptual possibilities for public policy, and that citizen discussions of such possibilities can help to improve both our public policy choices and our ability to make them. IF thus supports discussion projects that are designed to explore, develop, articulate, and test contrasting conceptual possibilities for public policy in selected areas of concern. We believe that these discussion projects and the conceptual possibilities that we develop in them can help citizens to explore an area of concern with their neighbors and to make individual choices about which policy possibilities might be worthwhile to pursue.

The aim of IF is *not* to recommend or advocate specific policy possibilities or actions. It is to improve public policy by encouraging citizens to discuss their governance concerns, and the different ways in which we might address them, with their fellow citizens. The conceptual possibilities that we present in our reports are developed by citizens in confidential, 'sanctuary' discussions, for use by their fellow citizens. We hope that they will provide both a starting point and a conceptual springboard for those who wish to explore the different policy possibilities and ends that we might want to achieve as a society.

With the support of IF, two discussion panels met in Washington, DC on a monthly basis from August 2005 through February 2007 to explore and develop contrasting conceptual possibilities for public policy pertaining to Science.

One panel consisted of interested citizens, the other of citizens who have worked with issues pertaining to science in their professional lives. Our panelists met for over 175 hours of sanctuary discussions in which they explored contrasting conceptual possibilities and developed their ideas as individuals rather than as representatives of groups, institutions, or special interests.

The aim of IF is not to recommend specific policy possibilities or specific actions. It is to improve public policy by encouraging citizens to participate in democratic discussions.

This report describes eight contrasting conceptual possibilities for public policy pertaining to science that our panelists explored, developed, articulated, and tested during the course of their sanctuary discussions. It also describes the panelists' governance concerns about science; their thoughts about the actions we might take to implement each of the conceptual possibilities that they developed; and their thoughts about the future consequences that those actions might have for individuals, groups, institutions, and society at large. It does not, however, promote or advocate any of these eight possibilities—or any of the actions that might be taken to implement them—for anything other than public discussion. There are possibilities in this report that few, if any, of our panelists would endorse—but which they still thought should be part of the public policy discussion about science. We do not believe that these are the only possibilities that might be useful for future public policy pertaining to Science. But we do hope that they will be illustrative, and provocative, and worthy of public discussion.

We invite you to review and discuss the possibilities in this report. We hope that you will compare each of them with each of the others and develop them further before deciding which, if any, would be worthwhile to pursue.

Science as an Area of Concern

Americans have long regarded science as a model of objective and open inquiry. We have long relied upon scientists to 'speak truth to power'. And we have long appealed to scientists and scientific knowledge in making public policy decisions in a wide variety of areas that concern us. But many people now regard science itself as an area of concern. This may be because scientific theories can be very difficult to understand; because the evidence that supports them can be very difficult to interpret; because scientific knowledge changes with new discoveries, and cannot be shown to be true in any absolute or final way; or because we are often called upon to trust scientists and scientific knowledge about things that we do not really understand. But it may also be because science, scientists, and scientific inquiry often seem to be influenced in questionable ways by a variety of non-scientific factors.

The United States currently spends over $300 billion each year on scientific research and development. This is far more than any other country spends on science and over a third of it comes from public funds. Most of our privately funded research is focused upon applied science. The National Science Foundation, by contrast, has traditionally sponsored basic research. But there is always discussion about whether and to what extent public funds should be spent upon projects that offer no foreseeable tangible benefits to the public. At the same time, science and scientists seem to have become more sensitive to non-scientific pressures. Today, scientists regularly testify in the courts and before legislators about the safety and use of new technologies, and many universities have become business partners in commercial ventures involving the scientific research that they are supposed to monitor. It is thus becoming increasingly difficult to find scientists who do not have a professional, financial, or political stake in their research. Finally, as science seems to intrude more and more as a controlling factor in our lives, more and more people seem to have become intimidated by and alienated from it.

This situation raises difficult questions, such as—

- ***What is science? What is its function and use? And how might it relate to policy?***
- ***What is scientific knowledge? How certain is it? And why and how might it change?***
- ***What are some of the possible dangers to science? What non-scientific interests and activities might compete with it? And how might they affect inquiry, the search for truth, the development of technology, and the objectivity of scientific knowledge?***
- ***What are some of the possible consequences of science? What benefits and dangers might it present to the world? And what effects might it have upon society?***
- ***What are some contrasting governance possibilities for science in the 21st century?***

Our panelists used these questions and questions like these as springboards for their discussions. They developed long lists of questions about science, its possible aims, and the governance concerns that people might have about it. They explored and developed many different concepts of science, and a wide range of governance concerns associated with each of them. And they eventually developed a wide range of conceptual possibilities for public policy that might address their concerns. This material formed the basis for the eight conceptual possibilities for public policy pertaining to science that our panelists eventually selected for inclusion in this report.

The panelists voiced many different concerns and questions about the knowledge claims and technologies that science and scientists produce, about the methods they use to produce them, about who should 'govern' science, about the influence that funding may have upon the conduct of scientific inquiry, and about the overall affect that science has had upon our lives. But they seemed to repeatedly return to several themes during the course of their discussions.

They thus repeatedly voiced concerns that—

- *the body of scientific knowledge is fragmented and dispersed; that it changes over time; and that the general public, and even scientists, often have difficulty knowing what they should currently regard as reliable scientific knowledge*
- *economic, political, and social forces both in and outside the scientific community may tempt scientists to cut methodological corners in their pursuit of new discoveries and technologies*
- *the governance of science requires a special knowledge and expertise that non-scientists generally do not have*
- *the interests that support science and scientists may exert hidden influences over the direction and conduct of scientific work in ways that might compromise the objectivity of science*
- *new technologies may introduce potentially detrimental changes that we do not want and can neither control nor accommodate*
- *the need to secure funding to support their work may tempt scientists to ignore pure scientific inquiry and ultimately harm applied science as well*
- *the United States may lose its scientific, economic, and military superiority by spreading its science and technology around the world, and*
- *science is a powerful and expansive force that may overstep its proper boundaries and undermine other useful ways of knowing, moral values, traditional ways of living, and societal norms.*

Our panelists explored a wide-range of possibilities for addressing these concerns, and eventually selected eight of them for inclusion in this report. The following pages present brief descriptions of the possibilities that they selected, together with their ideas about what we might do to implement each possibility and the possible future consequences that those actions might have for individuals, groups, institutions, and society at large. These eight possibilities present eight different ways of thinking about science—and eight different ways of addressing it as a public policy concern. This means that the possibilities themselves may arise from different beliefs, interests, values, and goals. And it may even mean that they arise from different concepts of science and scientific knowledge.

Thus, some possibilities conceive of science as a body of knowledge, some as a collection of methods, some as a community of scientists and institutions, some as tools and technologies, some as pure inquiry, and some as combinations of these and other concepts. Indeed, our panelists collectively explored and developed over twenty different concepts of science in their discussions.

We want to emphasize that this report is not intended for policy makers, but for citizen discussion. It thus does not advocate the adoption of any one of these possibilities—or, indeed, of any particular policy pertaining to science at all. It instead describes policy possibilities that our panelists thought might be useful for public discussion, along with their possible practical consequences and the concerns, values, interests and beliefs that inspired them. We also want to emphasize that the 'possible implementations' and the 'possible effects of these actions' that we have listed after each possibility are not intended to be necessary, certain, complete, or even consistent with each other.

Predicting the actual consequences of adopting a conceptual possibility is always a difficult task. This is because we can usually implement the possibility in several different ways, and because its actual effects will depend upon how we actually implement it. Our panelists often disagreed about how a possibility might be implemented and about the future consequences that those actions might have. You and others will probably think of different ways to implement each possibility, and of different consequences that they may have for individuals, groups, institutions, and society at large as well. We have nonetheless included our panelists' speculations about them in this report—

- partly to illustrate how a discussion about conceptual possibilities might lead to a discussion about possible actions and their possible consequences in the real world
- partly to give you a better idea of what the panelists were thinking about, and
- partly with the hope of stimulating further discussion about the conceptual possibilities themselves.

These differences and uncertainties mean that it is pointless, and perhaps even counter-productive, to try to evaluate the possibilities in this report in terms of any one concept of science, policy issue, or governance concern. Some possibilities may be consistent with each other. Others are mutually exclusive. Some see science as a very reliable and certain form of knowledge. Others see it as inherently fallible and subject to revision. And still others regard it as but one among a number of different ways of knowing; as no more certain, valid, or reliable than any of the others; and as one that may all too easily undermine our confidence in other forms of knowledge, as well as our social and moral values. But each of these conceptual possibilities represents a broad and general governance approach toward science that should be explored in its own right. And taken together, they represent a wide range of the different concepts, beliefs, values, interests, concerns, and goals—or '*contrasting governance possibilities*'—that might motivate government action regarding science.

Finally, we want to emphasize that the Interactivity Foundation is not ***advocating*** any of these conceptual policy possibilities for anything other than your further consideration and discussion. Indeed, we have, in describing each possibility, offered several reasons why you might not like it—and we have tried to direct your attention toward other possibilities in the report that you might prefer if you do not like it. But we do believe that each possibility deserves your thoughtful consideration, and that they should all be included as part of our public discussions about our public policies pertaining to science. We thus hope that you will discuss these possibilities with your families, friends, and neighbors. We hope that you will explore and develop them as you see fit. And we hope that you will explore and develop some new conceptual possibilities of your own

As you consider these issues yourself and discuss them with others, you may wish to ask yourselves some of the following questions:

- *What are the values that motivate this particular possibility?*
- *Why might someone hold these values?*
- *Why might someone be opposed to them?*
- *What goals is this possibility trying to achieve?*
- *Why might someone have those goals?*
- *Why might someone be opposed to them?*
- *What actions might we take to implement this possibility were we to adopt it?*
- *What effects might those actions have upon individuals, groups, institutions, and society at large?*
- *How might they affect you personally?*
- *What are the strengths of this possibility?*
- *What are its weaknesses?*
- *Who would be likely to benefit from the adoption of this possibility?*
- *Who would be unlikely to benefit from the adoption of this possibility?*
- *What other approaches are available for pursuing the values and goals that inspired this possibility?*
- *Who might be more likely to benefit from choosing those other approaches?*
- *Who might be less likely to benefit from choosing those other approaches?*
- *What actions, given our current political realities, would we be likely to take to implement this possibility were we to adopt it?*
- *What effects would those actions be likely to have upon individuals, groups, institutions, and society at large?*
- *How effective would this possibility be in achieving its desired ends if we were to adopt it?*
- *What would you do to strengthen this possibility?*
- *How would you compare this possibility to each of the other possibilities in this report?*

CLARIFY WHAT COUNTS AS RELIABLE SCIENTIFIC KNOWLEDGE— AND USE IT

This possibility would take steps to clarify what is and is not reliable scientific knowledge. It would also require the use of reliable scientific knowledge in public projects, programs, and policy decisions. And it would support efforts to organize and distribute scientific knowledge for scientific and public use, and efforts to improve science education and scientific literacy among the general public.

Do you want to use the best scientific knowledge that is currently available, but often feel unsure about what it is? Do you sometimes feel confused by claims that this or that theory is really 'junk science'? And do you wish you knew for sure which scientific theories are reliable and which are not?

This possibility flows from a concern that scientific knowledge is so fragmented and so dispersed in books, journals, and libraries that it is often difficult for the public to know which scientific claims are regarded as reliable at any given time. It also flows from a concern that we may too often ignore the best available scientific knowledge in making public policy decisions. If you share either of these concerns, then you may think that scientific knowledge has, or should have, a special authority in our society—and that we should preserve records of what is currently 'known' by science. You may also think that it would be a good thing to clarify which scientific knowledge claims are, or should be regarded as, reliable. And you may think that it would be good to promote the use of reliable scientific knowledge in any public program, project, or policy decision that might require it. This possibility would support efforts to identify reliable scientific knowledge—and efforts to collect, codify, and organize it so that we can make it more accessible to scientists, teachers, and the general public. It would also support efforts to improve scientific literacy and science education, so that citizens know what counts as reliable scientific knowledge and would thus be better able to make informed judgments about policy questions that might involve it.

Far from maintaining that it is but one way of knowing and on a par with religious and other beliefs, this possibility regards science as the only way knowing and as the only kind of knowledge that we should use when it comes to publicly funded projects and programs.

This possibility would support efforts to identify reliable scientific knowledge—and efforts to collect, codify, and organize it so that we can make it more accessible to scientists, teachers, and the general public. It would also support efforts to improve both scientific literacy and education about reliable scientific knowledge.

Other Perspectives. But even if you would like to clarify what is and is not reliable scientific knowledge, you might wonder about how we could actually do it without turning science into something that it is not supposed to be. New research data, concepts, theories, models, and explanations are added to the body of scientific knowledge every day. We are, moreover, often told that scientists no longer believe what they once did, and that even the most certain scientific knowledge is subject to change. The upshot is that it is often difficult for scientists themselves to know which knowledge claims are reliable. This, indeed, is a large part of the reason why scientific knowledge seems so fragmented and dispersed. So you might ask yourself exactly how we would clarify which knowledge claims are reliable without pretending that science has a much greater claim to certainty and authority than it actually does. If you are inclined to think in this way, then you may think that the best we can do, if we want reliable scientific knowledge, is to ensure that scientists use reliable scientific methods.

Possible Implementations.
We ***could—***

- fund projects that periodically codify, streamline, and correct errors in the currently accepted body of scientific knowledge
- require independent reviews of projects that use scientific knowledge, including thorough searches of the scientific literature, before funding them
- replace juries with scientific panels in court cases that turn on scientific claims
- provide free access to all scientific publications on the internet
- emphasize the teaching of established and reliable scientific knowledge in science courses
- accredit science experts who can speak with clarity and authority to the public
- require journalists to base their science reports only on reliable knowledge
- subsidize movies and television shows about great scientific achievements, and create science and media prizes for explaining them

Possible Effects of These Actions.
These actions ***could—***

- enable people to find the knowledge they want more easily, reduce errors in the literature, and make it easier to expose 'junk science'
- keep scientists and others up to date about currently accepted scientific knowledge, and lead to both better evaluations of proposed scientific projects and better scientific projects
- result in more accountability in the courts, and ultimately in better judicial decisions
- increase public scientific literacy and awareness about what scientific knowledge is reliable
- create two worlds of scientists: those who work within the accepted body of scientific knowledge and those who work outside it
- make the public feel more confident about relying upon scientific knowledge
- result in less 'junk science' in the media, but also less access to controversial theories
- limit our knowledge to what we already know, and stifle progress by diverting funds from projects aimed at developing new knowledge

For Further Discussion . . .

- What does it mean for scientific knowledge to be 'reliable' when scientists themselves tell us that even our best and most established scientific theories might not be true?
- Should we rely upon scientists to tell us which scientific theories are reliable when they often disagree among themselves about just this question? Why or why not? Who else might be qualified to determine which scientific theories are and are not reliable?
- Does the fact that we generally do rely upon certain scientific theories mean that those theories are reliable? Why or why not?
- Is it a sign that we should not regard a scientific theory as reliable if scientists themselves disagree about whether or not it is? Why or why not?
- Do you think that unreliable theories are not really scientific theories? Why or why not?
- Why should we be concerned about what counts as reliable scientific knowledge at any given time, if what counts as reliable scientific knowledge may change over time?
- Do you think that we should regard scientific knowledge as the only reliable form of knowledge for the purpose of public projects and programs? Why or why not?
- Do you think that the fact that scientific knowledge is so fragmented and dispersed might actually be a good thing? Why or why not?

ENSURE FIDELITY TO RELIABLE SCIENTIFIC METHODS

This possibility would promote efforts to ensure the quality of scientific methods and to improve the public's understanding of them. It would also refuse to support projects that do not adhere to reliable scientific methods, even in areas that are far-removed from what is conventionally regarded as science.

Do you think that good science is more a matter of the methods that scientists use than the knowledge claims that they make? Do you think that the public is generally unable to distinguish between sound scientific methods and methods that are not so sound? And do you worry that scientists may not always use the methods that they are supposed to use—especially when new discoveries are at stake?

This possibility flows from the belief that the deliberate and faithful use of reliable scientific methods is the best way of acquiring reliable scientific knowledge. But it also flows from a concern that economic, political, and other social pressures may tempt scientists to use unreliable methods in their attempts to develop new knowledge and technologies; that we may have difficulty recognizing 'junk science' and faulty scientific methods; and that some people may try to stifle the use of reliable scientific methods in favor of non-scientific ways of knowing. If you share any or all of these concerns, then you may think that it would be a good idea to try to ensure the quality of scientific knowledge by ensuring that scientists use reliable methods to acquire it—and that it is also a good idea for people to use reliable scientific methods wherever possible. This possibility would thus try to identify which scientific methods are reliable, to improve the public's understanding of them, and to ensure that publicly funded projects adhere to them. It would also encourage the deliberate use of scientific methods wherever possible, including areas that are sometimes far-removed from what is conventionally regarded as science—such as government, public policy, politics, business, religion, and certain social programs.

Proponents of this possibility also believe that science is the only way of knowing and the only knowledge that we should use in publicly funded projects and programs—but they think that it is its adherence to the scientific method that makes it so good.

This possibility flows from the belief that the deliberate and faithful use of reliable scientific methods is the best way of acquiring reliable knowledge. But it also flows from a concern that economic, political, and other social pressures may tempt scientists to use unreliable methods in their attempts to develop new knowledge.

Other Perspectives. But even if you think that scientists should use reliable methods, you may also think that trying to ensure that they do so may somehow put the cart before the horse. Science is a methodical process of 'trial and the elimination of error' that helps us to recognize problems in our existing knowledge, and to devise new knowledge when we require it. Scientists propose solutions to problems and test those solutions in an attempt to discover and correct the errors that may be lurking in them. Not all ways of knowing have this flexibility—and governments, institutions, and whole societies may collapse if they cannot change with their environments. There are, however, many good methods for conducting scientific inquiry. And these methods, like scientific knowledge itself, have evolved over time. So you may ask how we can ensure that scientists use reliable methods when it is only the use of a method that will enable us to determine whether and to what extent it is reliable. And if you agree with this view of science, then you may think that we should forget about method and let the scientific community govern itself with only limited public oversight and direction.

Possible Implementations.
We ***could—***

- encourage the scientific community to identify and enforce the use of reliable methods
- have government identify reliable methods and enforce their use through oversight, investigation, and the allocation of research funds
- allow the courts to determine which methods are reliable on a case by case basis
- document that public projects are conducted according to reliable scientific methods
- require stringent methodology reviews for grant proposals
- institute contract standards that are sensitive to scientific methods
- focus science education upon training in scientific methods and their limits
- teach judges and journalists about scientific methods
- encourage non-scientific organizations to use scientific methods
- use scientific methods to develop policy

Possible Effects of These Actions.
These actions ***could—***

- lead to more scrutiny of scientific methods and to better science
- make the public feel more confident about science; enable the public to distinguish good science from 'junk science'; take the politics out of science—or make it even more political
- result in a legal morass and wrangling over the reliability of particular methods
- ensure that projects are conducted properly; divert money from scientific research
- ensure that we are spending money on science wisely; divert money from scientific research
- reduce controversy about research results, lead to more bureaucracy in science
- stifle science and innovation if our definition of scientific methods is too narrow
- create barriers to new scientific approaches, since new methods are always evolving
- lead us to see scientific methods as universally applicable
- result in better public policy

For Further Discussion . . .

- What does it mean for a scientific method to be 'reliable'? Does it, for example, mean that the theories we acquire through the use of reliable scientific methods are always true?
- Would using reliable methods in and of itself ensure that scientists would always get reliable results? Why or why not? And why should we care about using reliable methods if it does not?
- Should we care about the methods scientists used to acquire knowledge if the knowledge itself is reliable? If so, why so? If not, why not?
- Is it a good idea for people to use scientific methods in areas that are not usually regarded as scientific? If so, why so? If not, why not?
- Do you think that scientific methods are universally applicable? If so, why so? If not, why not?
- Does the reliability of our knowledge depend upon the reliability of the methods we use to acquire it? Or does the reliability of the methods we use depend upon the reliability of the knowledge we acquire?
- Do you agree with this possibility that science is the only way of knowing, and the only knowledge that we should use when it comes to public projects and programs? If so, why so? If not, why not?
- How might we evaluate the reliability of scientific methods, if not by the reliability of the knowledge that we acquire by using them?

LET THE SCIENTIFIC COMMUNITY GOVERN ITSELF

This possibility would let the scientific community govern itself with only limited public oversight and direction.

Do you wonder how it is possible for non-experts to govern an expert judgment system? Do you worry that policy makers and the general public simply do not have the knowledge that it takes to make good decisions about how much money we should invest in science and how it should be spent? And do you think that the scientific community can be trusted to put the public interest above its own self-interest?

This possibility flows from a vision of science as an expert judgment system and from a concern that non-scientists simply do not have the expertise that is necessary to successfully govern it. If you share this vision and concern, and if you believe that science has greatly improved the quality of human life, then you might think that it is a good idea to let the scientific community govern itself with only limited public oversight and direction. This possibility, in any event, would do just that. It sees the scientific community as different from other communities in our society. The members of other communities often accept their fundamental beliefs on the unquestioned authority of tradition. But the education, values, interests, and methods of the scientific community lead its members to reject beliefs based upon authority and tradition in favor of those that can be tested by evidence and logic. The scientific community has also created such institutions as peer review, journals, conferences, universities, laboratories, professional associations, and foundations to evaluate and govern its work. These science institutions work together with the members of the scientific community to educate new scientists and to determine which research data, knowledge claims, methods, theories, and technologies are 'scientifically reliable' at any given time. The upshot is that the scientific community has become a self-perpetuating meritocracy that is unlike any other sub-community in our society in that its members have an expertise that makes it almost ludicrous for others to presume to govern them.

It is easy, however, to see the problems that might arise from allowing science to govern itself. This possibility recognizes that scientists often have beliefs, values, and interests that are at odds with those of the general public; that science institutions may sometimes impede the free flow of ideas and stifle truly creative and innovative thinking; and that the costs to the public that are associated with science have dramatically increased. But it nonetheless regards the scientific community as best qualified to govern science. Just as democracy is often said to be the worst form of government except for all the others, this possibility would give the scientific community the autonomy and power to govern itself because the other possibilities for governing it seem even more problematic.

This possibility flows from a vision of science as an expert judgment system, and from a concern that non-scientists simply do not have the expertise that is necessary to successfully govern it.

Other Perspectives. But even if you believe that attempts on the part of non-scientists to govern science would pose more problems than they solve, you might still be reluctant to let the scientific community govern itself. You may feel that the scientific community has an interest in its own survival, and that allowing it to govern itself is like putting the fox in charge of the henhouse. And you may feel that it will only increase the cost of doing science while at the same time stirring up defensive attitudes that, in order to protect the *status quo*, will sometimes be hostile to new and creative ideas. If you share any or all of these concerns, and if you think that they outweigh the problems we might encounter if we allow non-scientists to govern science, then you might prefer to let the interests that support science govern it—or to support pure inquiry, creativity, and the free flow of ideas—instead.

Possible Implementations.
We ***could—***

- dismantle the current regulatory and oversight systems, including restrictions on research
- fund science at a certain percentage of the Gross Domestic Product and let the scientific community decide which projects, institutions, and individuals to fund
- provide oversight and direction by controlling the funding for science
- set broad annual science priorities, and encourage scientists to address them
- offer prizes for solutions to pressing scientific questions
- have the scientific community develop self-regulation boards, set research standards, and establish norms about research ethics, transparency, and conflicts of interests
- have the scientific community require its members to take a Hippocratic Oath to do no harm
- have the scientific community exert moral pressure to report the possible detrimental consequences of their work

Possible Effects of These Actions.
These actions ***could—***

- foster innovation, creativity, and better science; lead to deaths from a failure to regulate drugs
- allow scientists to follow their own research interests; lead to battles for domination within science; impede innovation; foster scientific group think and an 'Old-Boy/Old-Girl' system
- result in scientific research being driven even more by immediate needs for funding
- increase the amount of science being done in the public interest
- enable government and 'Fat Cat' control of scientific research through patronage
- make it difficult for American science to participate in international discussions about the regulation of science, since such discussions currently involve governments
- lead to more theoretical research and less applied research; result in less harm being done to humans and the environment
- lead to greater transparency and fewer unexpected problems; lead to confusion, since detrimental consequences are always possible

For Further Discussion . . .

- Do you believe that there really is such a thing as the scientific community? Why or why not?
- Do you think that the scientific community, assuming that it exists, is as different from other sub-communities in our society as this possibility suggests? Why or why not?
- Do you think that science is identical with the scientific community? If so, why so? And if not, then how do they differ?
- Why do we regulate science? Is it about prioritizing funding and research to serve the public interest? Is it about controlling the disclosure and use of scientific knowledge in certain areas? Or is it something else?
- Do you agree with the idea that it is ludicrous to allow non-experts to tell experts what they should and should not be doing? If so, why so? If not, why not?
- What other problems, aside from the ones mentioned in the description of this possibility, might we encounter if we allow the scientific community to govern itself?
- Do you think that we should base our public policy decisions upon the advice of the scientific community? Why or why not?
- Can we fix the problems that might arise from allowing the scientific community to govern itself without undermining this possibility? Why or why not?

LET THOSE WHO FUND SCIENCE GOVERN IT—
BUT REQUIRE TRANSPARENCY & ACCOUNTABILITY

This possibility would generally allow the public and private interests that support science to direct inquiry in order to ensure that it is responsive to public concerns and values. But it would seek disclosure of those interests in an effort to make the competitive battles for resources both accountable to the democratic process and as open and transparent as possible. It would also actively support scientific research that reflects public interests when private interests fail to do so.

Do you think that the interests that provide the financial support for science and scientists should be able to direct the course of research? Do you worry that they may all too easily exert an influence over the conduct of scientific inquiry that might somehow compromise its objectivity? And do you think that the credibility of scientific knowledge and science itself might ultimately suffer as a result?

This possibility flows from a belief that the political interplay between competing interests is both fundamental to our democratic process and a generally good thing. It would thus allow the public and private interests that support science to set the direction for new scientific research. But it also flows from a concern that policy makers may meddle in, suppress, or even ban research that undermines their own political interests—and that those who fund science may undermine its integrity by influencing the kind of research that is and is not done, by tempting scientists to cut corners in their interest, and by restricting the publication of research results. If you share these beliefs and concerns, then you may think that we should try our best to ensure transparency and accountability in our public decision-making processes regarding science. This possibility, in any event, would require full disclosure of scientific research—including its funding sources, methods, findings, and the potential effects of its possible applications—so we can better assess the validity of its knowledge claims and technologies, and so we can more easily hold the right people accountable for them. It would also urge government to support science in the public interest when private interests fail to do so.

This possibility flows from a concern that policy makers may meddle in, suppress, or even ban research that undermines their own political interests—and that those who fund science may undermine its integrity by influencing the kind of research that is and is not done, by tempting scientists to cut corners in their interest, and by restricting the publication of research results.

Other Perspectives. But even if you agree that the one who pays the piper should be able to call the tune, you may worry about how this possibility might affect our trust in scientists and scientific knowledge—or our ability to assess their claims, technologies, and research projects. Evaluating scientific work on the basis of the interests that support them is a very superficial and dubious enterprise at best. But this is just the tip of the iceberg. Science is supposed to be an objective source of reliable knowledge, and many patrons support it with the hope that it will produce results that bolster their interests. Some of these interests may be economic. Others may be governmental, legal, political, social, cultural, or even religious. But it is all too easy for patrons to find reputable scientists whose work can be used to support their interests—regardless of what they are or how they might conflict. This may well be the nature of science. But the more that scientists produce results that support their patrons' interests, the less objective they may seem to be—and the more they may appear to be 'hired guns' supported by their patrons to do just that. If this is the way you see science today, then you may want us to clarify what counts as reliable science instead of letting special interests govern it.

Possible Implementations.
We ***could—***

- set up a process to mediate the competing interests that affect science
- regulate the competing interests and let the science take care of itself
- create strict disclosure requirements for the funding of science
- create forums to inform people about the public and private interests that support science
- require strong oversight of the executive branch's decisions regarding science
- impose penalties for suppressing information and doing harm for financial gain
- have government agencies do science that reflects the public interest
- create public interest panels to prioritize and represent public interests
- encourage non-profit institutions to support science in the public interest
- put public representatives on the boards of directors of private companies
- fund science projects proportionately to the public's support for them
- encourage public referendums on the funding of specific projects

Possible Effects of These Actions.
These actions ***could—***

- result in less science being done on behalf of those who cannot afford to pay for it
- result in scientists cutting methodological corners to serve their patrons
- lead to private companies controlling and hoarding scientific knowledge
- lead the public to regard scientists as lawyers who can support any issue; lead it to adopt a 'buyer beware' attitude toward science
- make the executive branch more responsive to the public will
- prevent harm and the suppression of scientific information by making it less lucrative
- balance the influence of private agendas on the research direction of science
- help the public to make more informed decisions about specific research projects
- result in controversy and conflict regarding what is and is not in the public interest
- undermine certain companies by exposing their proprietary information
- result in more research that reflects the public's real interests and values
- suppress resources for useful research that is of limited public interest

For Further Discussion . . .

- What kinds of interests currently support scientific inquiry?
- How might the results of scientific inquiry bolster those interests?
- Do you believe that scientific inquiry can be objective and disinterested? If so, why so? If not, why not?
- Should the patrons that fund a research project be allowed to keep the results secret? Why or why not?
- Do you think it might ultimately be better for us treat scientists more as advocates for their patrons' interests than as disinterested researchers? If so, why so? If not, why not?
- Will taking steps to ensure the transparency and accountability of science suffice to protect its integrity? Why or why not?
- How can we determine what kind of scientific research is really in the public interest?
- Do you think that there really is such a thing as the public interest? Or are there just a lot of different interests competing for funds?

PROMOTE TECHNOLOGY TO FUEL OUR ECONOMIC ENGINE—
BUT BEWARE OF DETRIMENTAL CONSEQUENCES

This possibility would promote scientific research on technological projects that have foreseeable useful applications. It would generally allow industry and the market to set the priorities for research and development in an effort to reap their economic benefits. But it would encourage government to regulate scientific research that has potentially detrimental consequences—and scientists to anticipate and disclose the potentially detrimental consequences of their work.

Do you value science for its technological and economic successes, but worry about their unintended consequences? Do you think that the economic motives that fuel science and technology may somehow impede truly useful research? And do you think that scientists should, in any event, try to anticipate the potentially dangerous effects of their work?

This possibility sees science and technology as driving our economy through their continual development of new and better goods and services—and as being driven by our economy's need to continually develop new and better goods and services. But it flows from concerns that the economic motives that fuel research and development may stifle new research directions if and when it seems profitable to do so—and that they may lead to the creation of tools and technologies that we do not want and can neither control nor accommodate. If you share these concerns, then you may think that it would be a good idea to promote new technologies in an effort to stimulate economic growth, but to try to anticipate and prevent their potential detrimental consequences. This possibility, in any event, would generally allow industry and the market to set research priorities in an attempt to provide the tools and technologies that we actually want. But it would have government regulate inquiry that we think might be dangerous—and scientists disclose the potentially dangerous consequences of their work. It would, in this way, encourage the development of useful tools and technologies while trying to limit the detrimental effects that they may have upon individuals, society, and the environment.

This possibility sees science and technology as driving our economy through their continual development of new and better goods and services—and as being driven by our economy's need to continually develop new and better goods and services. But it flows from concerns that the economic motives that fuel research and development may stifle new research directions if and when it seems profitable to do so—and that they may lead to the creation of tools and technologies that we do not want and can neither control nor accommodate.

Other Perspectives. But even if you agree that we should generally support technology, you may wonder whether and to what extent this possibility can work. Science enables us to predict and control many events in the world—but it cannot help us foresee the unforeseeable. The truth is that technology can transform our lives and the world around us in ways that we may not like and simply cannot predict. Public policy and science itself may take a long time to respond to unforeseen detrimental consequences once the cat is out of the bag. And some tools and technologies may have consequences that are so detrimental and irreversible that no response could be effective. Scientists will always be able to find potentially detrimental consequences of their research if we ask them to look for them. But if you think that the potential consequences of some technologies are so dangerous that we should not permit their development and use, then you might also think that it would be better to forget about our economic engine and support pure inquiry, creativity, and the free flow of ideas instead.

Possible Implementations.
We ***could—***

- provide less money for pure research and more money for applied research
- consider the practical applications of research more carefully before funding it
- focus science education upon producing solutions to practical problems
- reduce government regulations on science wherever possible
- maintain free markets and low taxes to encourage private sector spending
- create tax incentives for corporate and academic partnerships
- extend patent protections and enforce strong intellectual property rights laws
- require government oversight of technologies developed by private industry
- encourage the courts to go after the producers of harmful technologies
- fund studies to determine the future consequences of research advances
- forego studies of future consequences and fund compensation for damages instead
- require scientists to disclose the possible detrimental consequences of research

Possible Effects of These Actions.
These actions ***could—***

- result in more and better technologies in the short run, but probably fewer in the long run
- lead science and scientists to focus upon short term monetary goals and 'rent-seeking'
- undermine the pleasure that pure scientists take in knowledge as an end in itself
- reduce the suppression of innovation by government regulations
- provide a good economic climate and optimal levels of investment in science
- lead to industrial concentrations and to domination by the industrial powers
- result in legal wrangling over rights to products created with public support
- undermine human freedom and dignity if technology is used to control people
- provide compensation to people harmed by certain technologies
- divert funds from real research, leading to a deceleration of scientific progress
- lead to a 'monetization' of science and to a 'hollowing of the nation's soul'
- stop the development of harmful technologies, resulting in fewer unpleasant surprises

For Further Discussion . . .

- Do you think that public funding for science should be used only for research that has foreseeable useful consequences? If so, why so? If not, why not?
- How does scientific research fuel our economic engine?
- Can you think of cases in which scientific research has been driven by a need to fuel the economy?
- Do you think that trying to predict the potentially detrimental consequences of new technologies is a waste of time and money? Why or why not?
- Do you think that some technologies are so dangerous that we simply should not allow their development and use?
- Do you think that it is possible to successfully outlaw certain kinds of research? Why or why not?
- Would the adoption of this possibility help or hinder science? And why?
- Is there a conflict between the aim of science and the economic motives that fund it? Why or why not?

SUPPORT PURE INQUIRY, CREATIVITY AND THE FREE FLOW OF IDEAS

This possibility would support and foster pure scientific inquiry about fundamental scientific questions, regardless of its foreseeable practical applications. It would also support creative scientific investigations that challenge well-entrenched ideas and interests both in and outside of science. And it would welcome, protect, and promote the free flow of ideas as a universal public good.

Do you think that science has become far too concerned with developing useful tools and technologies, and that it has lost touch with the goal of explaining what we do not understand? Do you think that it has become more concerned with what is profitable than with what is true? And do you worry that even scientists today sometimes seem to react with hostility to truly new and creative ideas?

This possibility sees scientific inquiry as a free, creative, and open-ended process of asking fundamental questions about the natural world, society, and the cosmos—and exploring their possible answers without any concern for their practical applications. But it flows from concerns that today's scientists too often seem to be driven by a desire to profit from practical applications; that the demand for useful tools and technologies may direct their attention exclusively toward applied research; and that the institutions that fund them, together with the emphasis that is placed upon scientific methods and the currently accepted body of scientific knowledge, may impose harmful constraints upon pure scientific inquiry. If you share these concerns, then you might think that it is a good idea to support pure scientific inquiry, creativity, and the free flow of ideas. This possibility maintains that the truth of a theory does not depend upon the methods that we use to obtain it, and that we can raise very interesting questions without knowing how to investigate them or test their possible answers. It recognizes that pure scientific inquiry has often provided the seeds for useful technologies that have paid real dividends. But it maintains that it may be worthwhile even when we cannot foresee any practical applications coming from it—and even when we think that we already have a true theory at hand.

Scientists who engage in pure inquiry often challenge well-accepted ideas and theories. Their questions may jangle our nerves. And their theories may force us to reexamine our beliefs—including our social and ethical values—and to see the world in new and even disturbing ways. But they may also lead us to a new and better understanding of the changing world and to a more sustainable, just, and ethically responsible society. This possibility, as a result, aims at protecting pure scientific inquiry as a universal public good.

This possibility sees scientific inquiry as a free, creative, and open-ended process of asking fundamental questions about the natural world, society, and the cosmos—and exploring their possible answers without any concern for their practical applications.

Other Perspectives. But even if you share this vision of science as pure inquiry, and even if you think that scientists today seem much too concerned with profiting from the practical applications of their theories, you may still have doubts about whether and to what extent it is good to support inquiry that challenges well-accepted ideas. You may feel that such inquiry must inevitably have a destabilizing effect upon society that can lead to potentially detrimental consequences. Or you may think that the results of pure scientific inquiry about the 'big questions' are difficult to evaluate. Or you may feel that scientific inquiry is simply too expensive for the public to support without the promise of at least some practical benefits. If you share any or all of these concerns, then you might prefer to promote technology and applied scientific inquiry to fuel our economic engine.

Possible Implementations.
We ***could—***

- spend more money on pure scientific inquiry and less on applied research
- create more research centers for pure inquiry
- educate decision-makers about the value of pure scientific inquiry
- focus science education at all levels on pure scientific inquiry
- encourage philosophers and historians of science to highlight pure scientific inquiry
- encourage popular media accounts of science that highlight pure inquiry
- fund grant proposals primarily on the basis of their originality
- develop a science curriculum that cultivates creative thinking
- fund creative scientists instead of projects and institutions
- fund research that challenges dominant ideas
- give greater autonomy to science teachers in an attempt to keep them creative
- teach the rationale for encouraging open inquiry and criticism

Possible Effects of These Actions.
These actions ***could—***

- result in less technology and knowledge about the practical applications of scientific theories
- advance science and our understanding
- make pure scientific inquiry more legitimate and admirable
- require more time and resources for science education
- lead segments of the public to resent scientists as a self-perpetuating elite group
- lead people to regard science as impractical as more pressing practical issues loom large
- result in blatant favoritism in funding decisions, leading the public to cut its funding for science
- result in more daring research projects and more creative scientific theories
- increase public awareness of the creative aspects of science
- lead to greater tolerance of new ideas
- result in more creative science teachers with more autonomy and time for creative projects
- result in a tolerable level of public confusion about science

For Further Discussion . . .

- It is often said that we need pure scientific inquiry in order to develop new tools and technologies. Do you think this is true? Why or why not?
- Do you believe that pure scientific inquiry, as opposed to its practical applications, can be dangerous? If so, why so? If not, why not?
- Why might people be hostile to new and creative ideas? Why might scientists be hostile to them?
- Is it a good idea to fund good scientists instead of good science projects? Why or why not?
- What is the rationale for encouraging open inquiry and criticism? And is it valid?
- Why might the emphasis that is placed upon scientific methods and the currently accepted body of scientific knowledge impose harmful constraints upon pure scientific inquiry?
- Is there a necessary tension between the goals of pure scientific research and the goals of applied scientific research? If so, why so? If not, why not?
- Is it still useful to distinguish between pure science and applied science at all? Why or why not?

ENCOURAGE INTERNATIONAL SCIENCE—
BUT PROTECT OUR NATIONAL POWER AND INTERESTS

This possibility would generally encourage international scientific collaboration and the sharing of scientific information, methods, and technologies in an effort to promote progress in science and international friendships. But it would also try to balance our support of international science with protecting and developing our national power and interests.

Do you feel that international science is a good thing—but worry that we may lose our scientific, economic, and military superiority by spreading our science and technology around the world? Do you think that we may spend more money on international science than we actually get from it? And do you worry that our enemies may someday use our own science and technology against us?

This possibility flows from a belief that science progresses faster as an international enterprise, and that our support for international science may advance our national interests by fostering international friendships and the development of governments and leaders that are friendly to our national interests. But it also flows from a concern that it is becoming increasingly difficult for us to control the use of our scientific information and technologies abroad, and that we may already be losing our superiority in science—and our military and economic superiority along with it. If you share these concerns, then you may think that it would be a good idea to try to balance our support for international science with actions that are designed to protect and develop our own national power and interests. This possibility, in any event, would treat international science as a universal public good, and it would try to eliminate some of the barriers that still exist to it. But it would, at the same time, take actions to balance our support for international science with protecting our own national power and interests.

This possibility flows from a belief that science progresses faster as an international enterprise. But it also flows from a concern that it is becoming increasingly difficult for us to control the use of our scientific information and technologies abroad, and that we may already be losing our superiority in science—and our military and economic superiority along with it.

Other Perspectives. But even if you think that we should support international science, you may still wonder whether and to what extent this possibility could work. We were able to influence the direction of science and maintain our national power in the past by investing more money in science than other countries, by training foreign scientists at our universities, and by limiting their access to sensitive information and technologies. But other countries are increasingly investing more money in science, their students are increasingly studying science at home, the internet is making it increasingly more difficult to control the flow of scientific information, and our own students are increasingly pursuing careers outside of science. You may wonder how we can maintain our current scientific superiority in the face of these trends. But you may also worry that trying to protect our national power and interests might lead us to clamp down on our borders, hoard scientific information, and restrict international collaboration in ways that might ultimately impede both international science and our own scientific development.

Possible Implementations.
We ***could—***

- create and fund international science centers
- offer incentives to private industry to develop science abroad
- fund the development of science in underdeveloped countries as foreign aid
- fund the publication of science journals, textbooks, and courses on the internet
- set research goals with other countries and work together to achieve them
- make it easier for scientists to immigrate, emigrate, and work abroad
- have government decide whether, when, and how American scientists can collaborate with foreign scientists
- invest in projects aimed at maintaining our military and economic power
- make national power and interests our criteria for public funding of research
- regulate private science funding with respect to its effects on national power
- share science that improves standards of living to reduce foreign threats
- clamp down our borders in an effort to keep our science internal

Possible Effects of These Actions.
These actions ***could—***

- result in more and better science worldwide
- result in more investment in science abroad, and more political pressure against outsourcing jobs
- result in more scientists and more humanitarian science in countries that cannot afford it
- ultimately harm American science by deflecting money from it
- result in traditional societies losing their cultural identities and integrity
- result in increased tolerance of other cultural values and ways of thinking
- reduce foreign threats, if we disseminate science that improves life; result in some countries rejecting our science for cultural reasons
- give us the best science and highest standards of living, power, and security
- lead to conflicts about what constitutes national power and interests
- lead us to accept a 'zero-sum', 'get tough' model of national power
- reduce foreign threats; lower standards of living, if we emphasize guns over butter
- lead other countries to distrust us and regard us as a threat

For Further Discussion . . .

- Are there scientific problems that can only be addressed through international collaboration?
- Is it possible to control how scientific knowledge and technologies will be used? Why or why not?
- Do you think that supporting international science would strengthen our national power and interests? If so, why so? If not, why not?
- Do you think that we should support international science if doing so means outsourcing jobs abroad? If so, why so? If not, why not?
- This possibility suggests that we should support international science because it is in our political interest. Do you think it might also be in our scientific interest? Why or why not?
- Do you think that we are in danger of losing our superiority in science because we have spread our science and technologies abroad—or because our own students are no longer interested in science? And why?
- Do you think that we need to import foreign scientists and students to retain our scientific superiority? Why or why not?
- Do you think that we have an ethical obligation to support international science? Why or why not?

BALANCE SCIENCE WITH HUMANISTIC, RELIGIOUS, AND OTHER CULTURAL INSTITUTIONS

This possibility would treat science as only one among several valid ways of knowing. It would take steps to bring it under democratic control. And it would support humanistic, religious, and other cultural institutions—sometimes at the expense of its support for science—as a counterweight to the unsettling effects that science may have upon society.

Do you sometimes feel that science is a little dangerous, that it exerts too much influence upon society, and that it has a greater effect upon your life than you really want? Do you think that it is only one 'way of knowing' among many others? And do you think that it may lead us to ignore insights that we can gain from non-scientific ways of knowing?

This possibility flows from concerns that science can shape the future in unpredictable ways that are beyond our control; that it can present us with physical, social, legal, and ethical problems before we have developed ways of dealing with them; that it may lead us to neglect insights that may be gained from non-scientific ways of knowing; that governments may impose its theories and technologies upon us in areas that impinge upon our cultural values and political processes; and that many people have become alienated from it and intimidated by its authority as a result.

Many people today seem to feel that science is aggressive and over-reaching by its nature, that it can destroy traditional cultures and values, that it fosters an 'objective' frame of mind that is often oblivious to these consequences, and that it would overwhelm other social institutions and other ways of knowing if left unchecked. If you feel this way too, then you might think that we should try to bring science under democratic control to prevent it from encroaching upon other societal institutions and ways of knowing. You might also think that it would be a good idea to support certain non-scientific social institutions, ways of knowing, and authorities to balance the influence of science.

Far from seeing science as the best or only source of knowledge, this possibility holds that scientific knowledge is always subject to revision, that scientific methods have their limits, and that there are non-scientific ways of knowing that may be complementary and even superior to science. It also holds that the authority of science can be used to control individuals and whole societies in ways that are subject to abuse. And it criticizes science and scientists for dismissing knowledge gained from other sources as irrational and subjective; for exerting a pressure upon us to use its discoveries and technologies regardless of whether we really need them, have chosen them, or fully understand their consequences; and for making people feel alienated from what matters to them most. It thus rejects the presumptions that science and scientists have a special authority that non-scientists should not question, and that we should do anything that they discover we can do. It maintains, instead, that non-scientists should have a greater say in decisions about what we should believe and do as a society—including a right to say 'no' to science, regardless of how good it may be.

This possibility rejects the widespread presumptions that scientists have a special authority that non-scientists should not question, and that we should do anything that they discover we can do.

Other Perspectives. But even if you think that science can be aggressive and over-reaching, you may nonetheless wonder how we would determine where the proper domains of science begin and end, whether it would be a good thing to bring it under democratic control, and how we could possibly do it.

Possible Implementations.
We ***could—***

- publicly affirm the validity of multiple non-scientific ways of knowing
- try to clarify the boundaries and limits of each different way of knowing
- create a political process to adjudicate possible boundary disputes
- allow the courts to adjudicate boundary disputes on a case by case basis
- promote education in different ways of knowing and their limitations
- fund other ways of knowing at the expense of funding for science
- have Congress prioritize research efforts and restrict fields of inquiry
- fund studies to determine the social and ethical impact of new technologies
- fund remediation for harm instead of trying to determine future consequences
- stop lines of research if the public does not wish to pursue their consequences
- tolerate civil disobedience aimed at stopping scientific avenues of research
- help people create special communities to buffer them from scientific change

Possible Effects of These Actions.
These actions ***could—***

- help the public understand that science can answer only certain kinds of questions
- lead to a better understanding of the various different ways of knowing
- lead to a more tolerant society based on respect for different ways of knowing
- lead to debates about which views are settled and unsettled in science
- lead to the teaching of religion and other non-scientific theories in science classes
- divert research funds into culturally popular issues, such as creationism
- result in less funding for politically and culturally unpopular scientific projects
- waste money studying the consequences of things we cannot fully understand
- ultimately save us money, but lead to harmful consequences that we might have avoided
- result in less useful guidance about which issues merit study, and in a drop in funding for science
- lead to civil disobedience, demonstrations, and terrorist attacks on nuclear reactors
- help to protect people from unwanted changes in their lifestyles

For Further Discussion . . .

- What are some of the 'other ways of knowing' that might be equally valid as science?
- Do you believe that all ways of knowing are equally valid? If so, why so? If not, how can we determine which are valid and which are not?
- Why do you think so many people find science and scientists intimidating? Do you think that the problem is with science or with them?
- Do you agree that science is overreaching and out of control? If so, why so? If not, why not?
- What would it mean to bring science under 'democratic control'? How might we do it? And do you think it would ultimately be a good move or a bad move?
- This possibility says that we should be able to say 'No' to science regardless of how good it might be. But if the science is very good, then why might we want to say 'No' to it?
- Do you think that this possibility is simply a way for people to hold on to their own beliefs?
- Do you think that science is a way of life? And if so, then how does it differ from religion?

On Contrasts and Choices
Among the Possibilities

There are many contrasts among our conceptual possibilities for public policy, and many choices that you would have to make in order to adopt any of them. Some of these contrasts and choices deal with what science is, others with who should govern it, others with what scientists ought to produce, others with how we should understand science in relation to other social institutions, still others with what kind of science we should support, and still others with the proper place of science in an open democratic society. I will make no effort to describe all of these contrasts and choices. But a few examples of some of the more salient ones might help you to recognize others, and to better understand the need to choose among the eight possibilities in this report.

Thus, Let the Scientific Community Govern Itself and **Let Those Who Fund Science Govern It—But Require Transparency & Accountability** give different answers to the question 'Who should govern science?' The first says that the scientific community should govern itself with minimal public oversight and direction, while the second says that the interests that fund science should govern it. We do not think that you can consistently adopt both possibilities at the same time. You must, on the contrary, choose between them.

Ensure Fidelity to Reliable Scientific Methods and **Support Pure Inquiry, Creativity, and the Free Flow of Ideas** seem, in the same way, to give mutually exclusive answers to the question 'What kind of science should the public support?' The first would refuse to support projects that do not adhere to scientific methods that are generally accepted as reliable. But the second might well support such inquiry under the guise of creativity and the free flow of ideas. We do not think that you can consistently adopt both of these conceptual possibilities at the same time. We think that you must, once again, choose between them.

Support Pure Inquiry, Creativity, and the Free Flow of Ideas also differs from **Promote Technology to Fuel Our Economic Engine—But with an Eye toward Potential Detrimental Consequences**. But here, the difference is about the kind of science that the public would support. The former says that the public would support scientific research on technological projects that have foreseeable useful applications. The latter says that the public would support pure scientific inquiry about fundamental scientific questions, regardless of its foreseeable practical applications. It may be possible to adopt both possibilities at once. But they obviously point in very different directions.

Several of the conceptual possibilities differ in their very concept of what science is. Thus, **Clarify What Counts as Reliable Scientific Knowledge—and Use It** conceives of science as a body of knowledge. **Ensure Fidelity to Scientific Methods**, by contrast, conceives of it as a set of methods that we use to conduct scientific inquiry. **Support Pure Inquiry, Creativity, and the Free Flow of Ideas** conceives of science as a free and open-ended process of asking, and exploring possible answers to, questions about the natural world, society, and the cosmos. And **Let the Scientific Community Govern Itself** conceives of it as the community of scientists and the science institutions that support its work. Since these possibilities differ about how they conceive of science, they also differ about what they are trying to govern when they try to govern science. **Clarify What Counts as Reliable Scientific Knowledge—and Use It** would thus govern a body of knowledge. **Ensure Fidelity to Scientific Methods** would govern the methods by which it is acquired. **Support Pure Inquiry, Creativity, and the Free Flow of Ideas** would govern the process of scientific inquiry. And **Let the Scientific Community Govern Itself** would govern the community of scientists and science institutions.

I should point out that each of the conceptual possibilities in this report might be regarded as presenting at least two possible policy choices. For you might choose to accept it or to reject it—or to modify it in some way to make it acceptable. I should also remind you, once again, that we have developed these possibilities for the purpose of public discussion, and not because we want to recommend or advocate that you adopt them. Our panelists selected the possibilities presented in this report with these ideas very much in mind. They discussed a number of possibilities that they eventually decided not to include in this report. They generally selected possibilities that they thought would be most provocative of citizen discussion, regardless of whether they agreed with them. They chose ***not*** to include possibilities that are direct negations of each other—such as 'Let the Scientific Community Govern Itself' and 'Do Not Let the Scientific Community Govern Itself' in the report—since a discussion of either of them naturally involves a discussion of the other. And they decided to present some of the reasons why someone might oppose each possibility to help those people who might feel skeptical about a given possibility but have difficulty saying why.

I should also point out that a few of the possibilities may seem to embrace contrasting governance directions even within themselves. Thus, **Encourage International Science—But Protect our National Power and Interests, Let Those Who Fund Science Govern It—But Require Transparency and Accountability,** and **Promote Technology to Fuel Our Economic Engine—But with an Eye Toward Potential Detrimental Consequences** each describe a certain conceptual possibility, only to then qualify it in a way that seems to move in the opposite governance direction. We could have split each of these possibilities in two by describing their qualifications as separate conceptual possibilities. But we felt that the discussion of either of the resulting possibilities would involve a discussion of the other. And we also felt a need to limit the overall number of conceptual possibilities in the report to one that would be useful for public discussion.

Finally, while most of our possibilities reflect a generally positive outlook toward science, **Balance Science with Humanistic, Religious, and Other Cultural Institutions** reflects concerns that science today has somehow gotten out of control; that it exerts an intimidating, alienating, and even destructive influence upon individuals, institutions, and society at large; and that we need to somehow regain control over it. **Clarify What Counts as Scientific Knowledge—And Use It, Ensure Fidelity to Scientific Methods**, and **Let the Scientific Community Govern Itself** might all be grouped under the heading 'Let Science Rule, Regardless of What You Think It Might Be'. But **Balance Science with Humanistic, Religious, and Other Cultural Institutions** is very different. It conceives of science as but one of several valid ways of knowing, and as one that we should not privilege.

These, again, are just a few of the ways in which the conceptual possibilities in this report differ from each other. There are, of course, many different ways in which the possibilities overlap. And some of the possibilities, as I indicated in the introduction, are mutually consistent and could be adopted together—though even then, you would probably have to make difficult choices about which ones take priority. I hope, however, that pointing out these differences will dispel the idea that we are advocating the possibilities or that we somehow intend for you to interpret them as planks in a unified or comprehensive platform for governing science.

We hope, instead, that these contrasts, and the need to choose among the conceptual possibilities that we have presented, will help to stimulate and enhance your exploration of science as an area of concern. We hope that you will enjoy discussing the possibilities in this report with your families, friends, and neighbors. And we hope that you will also explore your own views about the possible ways to implement each possibility, and the likely future consequences of those actions, as you think about which of the possibilities, if any, might be worthwhile for our society to pursue as policy.

An Open Invitation to Further Discussion & Interactivity

We hope that you will use this report to carry forward the discussion begun by our project panels.

We have developed a discussion process that may be helpful for groups interested in discussing the ideas presented in our reports or in discussing matters of public interest more generally. We have also developed facilitation and discussion guidebooks to assist in the planning and conduct of these discussions. These materials, as well copies of this and other Interactivity Foundation reports, may be downloaded from our website (listed below). You can also obtain additional printed copies of any of our publications (at no cost) by sending us a request that briefly indicates their intended use. See the contact information listed below.

Finally, we welcome your comments, ideas, and other feedback about this report, its possibilities, any of our publications, or our discussion processes.

You may contact us via any of the addresses listed below.

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