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THE SOUND CONDUCT OF SCIENCE AND THE SOUND CONDUCT OF DEMOCRACY BOTH DEPEND ON THE SAME SHARED VALUES.

The Essential Parallel Between Science and Democracy
D.C. SCIENCE BY SHEILA JASANOFF / FEBRUARY 17, 2009

Presidential speeches are symbolic acts. The momentous ones, which inaugural speeches often are, capture the spirit of the nation at a turning point in its history. They diagnose a set of needs and they put forth a vision of how to meet them. So the question for thoughtful Americans, interested in the future of science and technology and reflecting on President Barack Obama's historic inaugural address, is not, What is science's rightful place?, but rather, What do the president and his administration see as science's rightful place? And, as critical consumers of both science and democracy, is it a vision that we, the people, can comfortably embrace?



Let's begin by recognizing that there is no place in modern societies from which science is wholly absent.

A few months ago, I heard a distinguished biologist declare, holding his laptop in his hands, "Without these things, we all die." A bit of hyperbole perhaps, but not so far from the truth. We are citizens of the empire of technology founded on the bedrock of scientific knowledge, from the moment we wake to bursts of radio news and cups of automatically brewed coffee, through the innumerable daily routines of transportation and communication, of meeting and eating, all regulated by expert advice, to the ends of days on which, thanks to lightbulbs, email, and global call centers, the sun never sets. Judged by our consumption habits, we are all science junkies, since we are irredeemably addicted to the technologies that science enables. Science, as opinion polls continually remind us, underwrites our most fervent hopes for the future, whether they center on education or health, on sustainable environments or relief from hunger, on better jobs or more efficient production, on winning wars or keeping peace.

That science has a place in our lives is not in doubt. The question is, what is that place? As a nation, we Americans own science: We accept it, we support it with money and enthusiasm, we celebrate it, and considerable numbers of us practice it. But public respect for any institution, no matter how powerful or pervasive, requires visible affirmation. For the law to enjoy respect, for example, justice must not only be done but also done visibly. The same is true for science and technology. That public show of support has been noticeably absent in the past eight years. The new administration has signaled that disregard for science is neither its intent nor its policy.

The main lines of the "Obama Restoration" of science are already clear, and many of the president's early actions deserve praise. In speech after speech, Obama has stated that science and technology will feature in his administration as both instruments and objects of public policy. Prominent scientists and engineers, with long experience of public service and advising governments, were named to key posts early in his presidential transition. The administrative rank of the president's science adviser has been raised, placing him on an equal footing with the president's other top aides. The alliance between the White House and religious extremists on science and medicine has been decisively broken, and policies ranging from development aid to stem cell research will now be carried out without ideological constraints reflecting America's peculiarly corrosive politics of abortion. The hollowing out of scientific competence at federal regulatory agencies will cease, as will the dangerous US fence-sitting on climate change. Programs to benefit the environment through green innovation and renewable energy research will not go begging as in recent years. On a host of technology-intensive policy issues, there is reason to believe that a president who prides himself on listening to all sides will not be afraid to heed uncomfortable advice conveyed by the nation's brightest.

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Many have interpreted these moves as welcome signs of Washington's renewed respect for science, and they are right to do so. But if understanding stops there, then we're in trouble. For the restorative steps Obama has taken vis-à-vis science are praiseworthy not so much because they respect science as because they respect the grand institutions of democracy. This is no accident, because the very virtues that make democracy work are also those that make science work: a commitment to reason and transparency, an openness to critical scrutiny, a skepticism toward claims that too neatly support reigning values, a willingness to listen to countervailing opinions, a readiness to admit uncertainty and ignorance, and a respect for evidence gathered according to the sanctioned best practices of the moment.

A common mistake is to claim these virtues for science alone. Writing in the *New York Times* on January 26, 2009, six days after the inauguration, veteran science writer Dennis Overbye said about science: "That endeavor, which has transformed the world in the last few centuries, does indeed teach values. Those values, among others, are honesty, doubt, respect for evidence, openness, accountability and tolerance and indeed hunger for opposing points of view." Elevating science, Overbye argued, elevates democracy. This gets cause and effect backward. The values Overbye rightly cherishes are not taught by science, as if the scientific enterprise has some unique claim on them. Rather, the sound conduct of science and the sound conduct of democracy both depend on the same shared values.

History supports this analysis. For all practical purposes, the birth of experimental science coincided with the rise of democratic accountability in politics. Where democracy is strong today, there science also enjoys a respected place. In strengthening democratic values, we also renew the preconditions for scientific discovery and technological innovation.

The converse, however, is not always true. Modern science is a clutch of complex institutions and practices, carrying tendencies that do not always converge with the aims of democracy. Accordingly, simply throwing more money at science, or even listening to the best-qualified scientists for policy advice, may not ensure that research and development are conducted for the public good. Care must be taken to avoid the tunnel vision that frequently accompanies expertise. Studies of disasters — Challenger, 9/11, the financial meltdown — all confirm a sadly recurring story. Complacent or arrogant technical experts refused to heed early warning signs that could have prevented the worst consequences from materializing. It would be a pity if the present administration lost sight of the need for powerful countervailing voices to question conventional technocratic wisdom.

There are other reasons to cultivate the critical sensibility that a robust democracy encourages. For one thing, much of science today is closely linked to special economic and political interests. Indeed, in the effort to speed discoveries into commerce and everyday lives, US public policies have fostered a partnership between science and business that strikes many as too intimate for detached inquiry and the disinterested pursuit of knowledge. For science to regain its rightful place, it will be necessary to rebalance the portfolio of public science, rethinking the mix of curiosity-driven and mission-oriented research, of science that tackles fundamental questions and science that serves corporate interests, of science for pleasure and science for pay. It will be necessary to create more safe havens where smart minds can tackle hard questions without any expectation of immediate applications. It will be necessary to reward discovery as well as invention, and to reaffirm that ours is a society that values the pursuit of knowledge for its own sake. Scientific knowledge is a public good, and courageous policymakers should be prepared to pay for that resource without imposing the same utilitarian calculus on all publicly funded acquisition of knowledge.

Science, moreover, should be nested in spaces for intellectual endeavor more broadly defined. A useful reminder in this context is that the word "science" does not mean the same thing to all people. The German word *Wissenschaft* is translated as science, but its scope is much wider than the natural sciences alone. It encompasses all branches of systematic or disciplined study. In his inaugural address, President Obama called for a union of imagination and of common purpose. Imagination, however, is not uniquely the preserve of science. It is fed by language, watered by history, nourished by art, and liberated by social thought. Many developing countries invested narrowly in science and engineering education in the postwar period. Some have attained higher levels of scientific and mathematical literacy than the US, but there is no evidence that they have made the great leaps forward in science and technology that remake an era.

Returning to our own context, rebalancing the incentive structures for science will call for a revision of current intellectual property laws and practices. The old Jeffersonian dichotomies between discovery and invention, and between laws of nature and their useful applications, are too simplistic to serve a scientific culture in which even abstruse mathematical formulas can acquire unexpected economic value and the first person to identify a new biological structure stands to profit hugely from simply naming it. There is great need for a renewed societal conversation about what in our natural environment should be viewed as humankind's common property and what can be owned by the fortunate few who first gain access to it.

These questions will raise hackles and temperatures because they are both hard and pervasive. May a scientific journal require corporate researchers to disclose less of what they know than is asked of university professors? Can a multinational company own a plant long known to local people for its medicinal properties because company scientists were the first to genetically sequence it? Is the insertion of a single gene enough to convert an animal from a thing in nature to a product of human invention? Which biological structures derived from the human body can be treated as property without violating human integrity? Should scientists be required to make public their data-sharing practices, and should the same rules apply whether a research institution is publicly or privately funded? When, if ever, should intellectual property rights take a backseat to ethics? Questions such as these have been germinating on the internet, in NGO campaigns, in relatively unpublicized lawsuits, in letters to editors, on op-ed pages, and in doctoral dissertations — but not in the halls of government. If science is to regain its place as one of our most valued democratic institutions, then it's time for such issues to be widely and publicly debated.

In restoring respect for science within government agencies, the new administration should recognize that our understanding of the relations between knowledge and power have changed fundamentally over the past 50 years. A new branch of research — science and technology studies (STS) — has sprung up that takes the interplay of science, technology, and society as its object of investigation. STS scholarship suggests that science's role in “speaking truth to power” is much more complicated than was once thought. The old formulation suggests both the accessibility of an unambiguous truth and a clean separation between knowledge and power that are radically at odds with the ways in which knowledge actually develops in disputed policy contexts. Rather than claiming the rarely attainable high ground of truth, scientific advice should own up to uncertainty and ignorance, exercise ethical as well as epistemic judgment, and ensure as far as possible that society's needs drive advances in knowledge instead of science presuming to lead society.

Such humility requires experts to sometimes bow to others who are less technically informed, but subordinating expert preferences to democratic priorities may be a tough act. The roots of resistance run deep. They are grounded partly in the innocent, wishful, antiquated notion that science would be apolitical if only it could be left alone. Today science neither wants to nor can be left out of political calculations and policy choices. In part, opposition to public involvement in defining the goals of science reflects a horror of disastrous state-sponsored scientific projects, such as Lysenkoism in the former Soviet Union and race science in Nazi Germany. Many scientists also unconsciously buy into the logic of technological determinism: the belief that certain technological advances are inevitable, and that societal responses must follow the paths carved out by technology's forward march. All we can do, on this view, is act collectively to prevent technology's most harmful consequences, such as risks to health, the environment, or human well-being on a mass scale. And guarding against risk only reinforces the need to rely on science and expertise.

A paradigmatic moment in postwar American history illustrates how firmly these views are lodged in the most brilliant minds. Robert Oppenheimer emerged from the Manhattan Project and the bombing of Hiroshima and Nagasaki as a committed opponent of an atomic arms buildup and research into still more lethal nuclear weapons. Yet he famously changed his position on the development of the hydrogen bomb when he learned that it was a feasible project. His words are well known to historians of the period:

The program we had in 1949 was a tortured thing that you could well argue did not make a great deal of technical sense. It was therefore possible to argue that you did not want it even if you could have it. The program in 1951 was technically so sweet that you could not argue about that. The issues became purely the military, the political, and the humane problems of what you were going to do about it once you had it.

In this short text reflecting some of the most wrenching moral conflicts of the past century, we see the dynamics of scientific separatism and technological determinism at work. For Oppenheimer it was possible to argue that a technological program was unnecessary only so long as “it did not make a great deal of technical sense.” Once the sweetness of the technical solution became apparent, he felt one could no longer argue about its further development. At that point, the scientist's responsibility turned to making the thing; all other issues — “the military, the political, and the humane” — became someone else's concern, as “problems of what you were going to do about it once you had it.”

Here in the early years of the 21st century, we need a more sophisticated reading of history and a clearer understanding of what it means to link scientific and technological developments to democratic ends. Today's dangers are not mostly those of totalitarian societies, in which the ideologies and aims of a murderous few deprived people of any say in their scientific, technological, or political futures. Today we are more likely to suffer from a largely unregulated relationship between science and private interests that drives discovery without attention to the collective good. We remain captive to expensive defense projects, justified by appeals to fear, that

stand outside the processes of democratic control. And we risk the possibility that, fueled by financial greed and media hype, ethically and environmentally problematic inventions will be launched into the world before thoughtful people have had a chance to reflect on why we need them.

Finding the rightful place for science in these circumstances demands a Second Enlightenment. This time, we do not need to overthrow the false gods of superstition or the self-serving autocracies that thrive by creating their own reality. This time, like the fox of Greek philosophy, we already know a great many things about how to examine life, harness energy, measure society, create incentives, and use statistical evidence to support rational public decisions. Nor should we hesitate to learn more. But do we, like the hedgehog, also know the big things? What makes for human happiness? Which manipulations of nature are we too ignorant to safely undertake? When might attempts to enhance human capability bump up against deeply held beliefs about the value of being human?

The Second Enlightenment must be the enlightenment of modesty. All through the 20th century, grand attempts to remake nations and societies failed. Today, as this nation heeds its president's call to "begin again the work of remaking America," it would do well to reflect on those modest virtues that underlie the long-term successes of both science and democracy. These are not the programmatic ambitions of revolution or of wholesale system redesign, but rather the skeptical, questioning virtues of an experimental turn of mind: the acceptance that truth is provisional, that questioning of experts should be encouraged, that steps forward may need corrective steps back, and that understanding history is the surest foundation for progress.

In rejecting "the specialness of science," and in accepting the essential parallelism between scientific learning and democratic learning, science in the new administration will find its rightful place. — *Sheila Jasanoff is Pforzheimer Professor of Science and Technology Studies at Harvard University's John F. Kennedy School of Government.*