Further Reading:

Bell, Tom W., and Solveig Singleton. *Regulators' Revenge: The Future of Telecommunications Deregulation*. Washington, D.C.: Cato Institute, 1998; Carter, T. Barton, Marc A. Franklin, and Jay B. Wright. *The First Amendment and the Fifth Estate: Regulation of the Mass Media*. 3rd ed. Westbury, N.Y.: Foundation Press, 1993; Diamond, Edwin, Normal Sandler, and Milton Mueller. *Telecommunications in Crisis: The First Amendment, Technology, and Deregulation*. Washington, D.C.: Cato Institute, 1983; Krasnow, Erwin G., Lawrence D. Longley, and Herbert A. Terry. *The Politics of Broadcast Regulation*. 3rd ed. New York: St. Martin's Press, 1982; Newcomb, Horace, ed. *The Encyclopedia of Television*. 2d ed. New York: Routledge, 2004; Parents Television Council. "TV Bloodbath: Violence on Prime Time Broadcast TV." Available online. URL: www.parentstv.org/PTC/publications/reports/stateindustryviolence/main.asp. Accessed May 25, 2009; Zarkin, Kimberly A., and Michael J. Zarkin. *The Federal Communications Commission: Front Line in the Culture and Regulation Wars*. Westport, Conn.: Greenwood Press, 2006.

– Laurie L. Rice

nanotechnology

Nanotechnology is an emerging multidisciplinary area of scientific research based on the ability to observe and manipulate matter at an incredibly small scale. To get some idea of how small, a nanometer is *one billionth* of a meter—or approximately 1/100,000 the width of a human hair. In the last two decades of the 20th century, technological breakthroughs, such as the Scanning Tunneling Microscope (STM) and Magnetic Force Microscopy (MFM), have allowed scientists and engineers across multiple disciplines to work at a nearly molecular scale with unprecedented precision and specificity, in the process enabling the production of new types of materials with novel properties.

At this scale of matter, the properties of physics, chemistry, and biology merge. Indeed, an element at the nanoscale often looks and acts differently from that same element at larger sizes. For example, in its "natural" form titanium oxide is a white substance used frequently as a pigment in paints or, even, to whiten skim milk. At the nanoscale, however, titanium oxide is a clear substance, and seen as useful in sunscreens that are almost transparent but still block harmful ultraviolet (UV) rays. At the nanoscale, silver acts as an antimicrobial agent, while aluminum becomes highly unstable and even explosive.

Whatever their other effects, nanomaterials are exciting to scientists and engineers because they display increased bond strength and surface area and exhibit notable differences in conductivity, electrical resistance, and optical absorption. These different properties allow for incredibly stronger, lighter materials that are highly reactive and responsive. The most famous examples so far are carbon nanostructures based on the so-called fullerenes, which can be produced in the form of a ball—known as a buckminsterfullerene in honor of Buckminster Fuller, the famed architect and futurist—a sheet, or a tube. Carbon at the nanoscale exhibits amazing strength and conductivity, possibly ideal for a new and impressively small generation of computer circuits that will run on much less power than current systems. Such properties may also lead to, for example, more efficient storage and transmission of energy, lighter and stronger building materials, and major breakthroughs in biomedical devices designed to detect and deliver therapies to diseases such as cancer.

There are many nanotechnology-based applications already in use and even more in production. The Woodrow Wilson Center's Project on Emerging Nanotechnologies has identified over 800 products using some variation of nanotechnology, with more arriving on market every week. Some of the most exciting nanoenhanced products on the market today include electronics and computer devices such as a high-capacity memory chip utilizing semiconductors manufactured at the nanoscale; applications in solar energy (photovoltaics); more sensitive medical sensors for the detection of disease; in sporting equipment, the use of woven carbon nanotubes to make lightweight high-performance equipment for cycling, golf, and motor vehicles; household cleaners with strong concentration and low environmental impact; and a wide range of products from socks to toothpaste that use the antimicrobial properties of nanosilver.

However, these consumer products only begin to capture the incalculable possibilities that nanotechnology has to offer, particularly in ways that promise to enhance human health and, even, extend human longevity. Next generation nanomedical devices have the potential to deliver anticarcinogenic drugs directly to a tumor site without harming other tissues, while new nanomaterials form the basis for lighter and stronger artificial joints. Nanofiltration systems will provide affordable, effective, and low energy means to desalinate saltwater and screen out waterborne microbes, thereby providing sufficient clean drinking water in areas where drought and disease are severe problems. Nanotechnology, in short, holds the promise of transforming every material we use, every day, with possibly revolutionary impacts on our lives and societies.

U.S. federal policy on nanotechnology is based on the desire to harness the vast economic potential of this emerging technology and to ensure American competitiveness in the global market. To achieve these goals, nanotechnology research and development (R&D) sponsored by the federal government is coordinated under the multiagency National Nanotechnology Initiative (NNI). In 1996, based on recommendations by federal science advisers, the Bill Clinton administration commissioned an interagency working group that determined the need for an aggressive and coordinated national strategy on nanotechnology development. Emphasizing the potential of nanotechnology for innovation and national economic strength, President Clinton in January 2000 announced his intention to establish the NNI in a speech, "Leading to the Next Industrial Revolution." The succeeding George W. Bush administration expanded the initiative through enactment of the 21st Century Nanotechnology Research and Development Act, passed into law with strong bipartisan majorities by Congress in 2003. The act has been introduced to the House for reauthorization in 2009, with the clear support of the new Barack Obama administration. Such bipartisan support for nanotechnology research and development funding through the past decade reflects both the noncontroversial nature of current policy as well as the wide and diverse range of private and public sector institutions and companies invested in exploiting nanotechnology's potential.

Currently, 25 different federal agencies comprise the NNI, ranging from research and development offices within the Departments of Agriculture, Energy, and Transportation to regulatory bodies such as the Food and Drug Administration and the Environmental Protection Agency. Primary funding for nondefense-oriented basic science and engineering research comes through the National Science Foundation (NSF), while considerable health-related research is funded through the National Institutes of Health (NIH). The Departments of Defense and Homeland Security also have major nanotechnology R&D efforts designed to produce next-generation defense technologies. Annual federal funding for nanotechnology research and development grew over time from $464 million in 2001 to $1.5 billion in 2009, a figure that does not include expenditures in classified defense and intelligence R&D programs.

The NNI, through the president's National Nanotechnology Coordinating Office, seeks to set priorities for and coordinate research activities among universities, industry, and government. As such, the NNI effectively sets U.S. national nanotechnology policy. In this regard, it is clear that U.S. nanotechnology policy did not emerge out of strong public demands for action. In fact, most citizens still know relatively little about nanotechnology. Instead, nanotechnology policy evolved out of early leadership by strategically placed government and university scientists, elected and appointed federal policy makers, and representatives of private industry, who argued that national government leadership—and money—was needed to catalyze the overall nanotechnology research and development effort that would eventually drive future economic growth and maintain American economic advantage globally. They argued that coordinated and sustained federal funding was needed to spark the kind of large-scale, high-risk scientific research and development projects—either within an academic setting or in cooperation with private enterprise—that may take years to pay off and thus may be too substantial or too uncertain for private industry to pursue on its own. So, in this sense, federal nanotechnology policy is as much about U.S. economic competitiveness—and national security—as it is about technological innovation.

Congress, as the nation's legislative body, always reserves the right to set priorities for the NNI. In this regard, it is notable that Congress, in enacting the 21st Century Nanotechnology Research and Development Act, mandated specifically that the NNI support the "responsible development of nanotechnology" and set aside a small portion of its annual budget on research into potential health, environmental, and safety (EHS) hazards of nanotechnology as well as it its broader ethical, social, and legal implications. Congress did so in part out of concern that research on societal impact issues keep up with the rapid pace of technology development so that government could be proactive in safeguarding public health from the inevitable and often unforeseen side effects of new applications and materials. Leaders in Congress and the NNI also were worried about the potential for negative public reaction to any possible harmful side effects or, perhaps, applications that could spark ethical debates about the wisdom of manipulating matter at the molecular level. Uninformed public reactions, policy makers warn, could harm innovation and retard human progress itself. According to this view, the absence of public understanding about genetically modified organisms (GMOs) in agriculture during the 1990s led to controversies that impeded innovations in, for example, new drought-resistant strains of grains. Congress has acknowledged the need for more public discussion on, and education about, nanotechnology, if only to enhance public receptiveness to innovations as they begin to flow out of the laboratory.

In some ways the NNI has already proven successful. It has stimulated significant private sector investments in nanotechnology research and development, both as a result of government underwriting of the most financially risky research projects in university and research laboratory settings as well as through programs designed to provide funding for small businesses with interest in nanotechnology research and development or the manufacturing of nanomaterials or applications. The NNI estimates that the private sector each year spends at least an amount comparable to the annual NNI budget to fund nanotechnology R&D.

Many state governments also have invested in nanotechnology initiatives to boost their own future economic competitiveness and to protect already established industry sectors. To mention two examples: The New York State Foundation for Science, Technology, and Innovation reported that the state of New York recently decided to invest up to $1.2 billion dollars into R&D and manufacturing facilities to support its well-established semiconductor industry. According to the Massachusetts Nanotechnology Initiative, Massachusetts aims to reap the benefits of its prominent research universities and hospitals by investing in a multidisciplinary R&D program with a strong focus on the life sciences and additional emphases in electronics, instrumentation, energy, materials and manufacturing, and environmental applications. The Project on Emerging Nanotechnologies found that, taken together, the combination of federal and state investments has prompted nanotechnology R&D in some form in all 50 states.

The National Nanotechnology Advisory Panel found that another measure of policy is the number of U.S. patent applications based in some way on nanotechnology, which have grown from around 600 per year in 2001 to almost 1,500 in 2006. Lux Research, a private firm that tracks the economics of nanotechnology worldwide, estimates that approximately $13 billion of manufactured goods in 2005 incorporated some form of nanotechnology, and it has made a projection that, by 2015, nanotechnology will be a $1 *trillion* a year global industry.

Such economic promise—no doubt spurred by fear of falling behind—has prompted governments throughout the world to fund their own nanotechnology R&D activities, with the most notable efforts made by South Korea, Germany, the United Kingdom, Japan, and China. In some ways the NNI has become a template for other countries looking to capitalize on the economic promise of nanotechnologies, with comparable initiatives including Cordis, the program of the European Union (EU), and the Nanotechnology Research Institute (NRI) in Japan. Many smaller or less affluent countries, unable to generate enough money or scientific talent to drive their own nanotechnology sectors, have started efforts to leverage resources in multistate initiatives: for example, members of Mercosur, South America's common market, led by Brazil, Argentina, and Mexico, have initiated an information exchange on nanoscience and nanotechnology.

As almost always is the case in emerging technologies, the scientific breakthroughs in nanotechnology and the parallel excitement about the potential for revolutionary innovations in broad array of sectors comes first, while recognition of broader and perhaps less benign societal impacts almost always lags behind. Nanotechnology has been no different in this regard, although the gap between innovation and recognition of potential harmful effects has been much shorter in the case of nanotechnology than for previous emerging technologies, ranging from post–World War II chemical pesticides to late 20th-century breakthroughs in genetics. Indeed, the memories of previous experience with the side effects of technological innovation led Congress to require environmental, health, and safety research as part of the NNI throughout.

Of particular early concern are the environmental, health, and safety effects of nanoparticles. While some argue that nanoparticles are simply common materials such as carbon or aluminum at a very small size, many others affirm that it is the minute size of the particles themselves that may cause harmful side effects when in the environment or the human body. Much uncertainty remains, and it is not yet well established what, if any, risks exist. According to J. Clarence Davies of the Project on Emerging Nanotechnologies, preliminary data show that nanoparticles can enter the body through inhalation, contact with the skin, and ingestion, and they can subsequently enter into the bloodstream and possibly cross the barrier into the brain, with unknown potential impacts on the nervous system.

The dilemma for government at this point is to fashion a regulatory response that balances the potential for major technological advances—and their attendant economic benefits—with the need to safeguard against potential harm for human beings or the natural environment. To date, federal agencies have displayed varying degrees of regulatory response in devising policies designed to monitor and, if necessary, regulate the production and use of nanomaterials and related structures. At one level, the National Institute for Occupational Safety and Health (NIOSH) conducts tests on nanotoxicity and advises industry on the safe handling of nanoparticles in the workplace. In 2008, NIOSH presented a strategic plan concerning workplace safety with nanomaterials that included a broad research agenda to address knowledge gaps concerning workplace safety for nanotech laboratories and manufacturing venues.

Other federal regulatory agencies have begun to address the broader potential side effects of nanomaterials. The Environmental Protection Agency (EPA) has been involved in nanotechnology research since the creation of the NNI. A 2007 EPA intra-agency working group nanotechnology white paper led the EPA, under its established authority under the Toxic Substances Control Act (TSCA) of 1976, to call for the mandatory registration of all corporations that manufacture carbon nanotubes (CNTs) until further environmental, health, and safety testing on the toxicity of nanoparticles is carried out. That same year, a Food and Drug Administration (FDA) task force on nanotechnology concluded that it would not require new nanospecific regulations and rules on product labeling. Even so, the task force acknowledged, the minute size of nanoparticles causes some concern about the FDA's capacity to assess the human health risk of new products, particularly cosmetics. On the medical side of FDA's jurisdiction, new types of nanomedical applications may erode the agency's long-standing distinction between "drugs," which are subject to strict premarket scrutiny, and medical "devices" such as heart stents that so far do not require similar levels of review, thereby compelling alterations in the agency's regulatory approach. In response, the FDA has opened nanotechnology divisions in its various departments to track expected breakthroughs in nano-based drugs and devices.

The relative restraint exercised by federal regulators to date has created room for efforts at local and state levels to establish their own oversight of nanotechnology research, manufacturing, and production. These efforts were typically initiated after expressions of public concern about the potential harmful effects of nanoparticles. In fact, first attempts at regulating nanotechnology came from local governments concerned by the absence of toxicology data on nanoparticles even as local universities and industries were escalating their development and production effort.

Local government actions on manufactured nanomaterials came in two cities with significant research and development sectors and highly educated residents with long histories of active engagement in monitoring the production of novel technologies in their respective jurisdictions. In December 2006 the city of Berkeley, California, home to the University of California, Berkeley, and close to the affiliated Lawrence Livermore National Laboratory, became the first local U.S. government to enact legislation specifically addressing nanotechnology. The ordinance, which came in response to public concerns about the potential environmental and health impacts of nanoscale materials, implements a mandatory reporting system for all facilities in the city that use, handle, or manufacture nanoscale materials. Although this ordinance does not impose specific limitations or regulations on nanoscale materials, it is the first deliberate government action to monitor the activities of nanotechnologies with the purpose of protecting public safety and the health of the environment.

News of the Berkeley ordinance traveled across the country. In January 2007, the City Council of Cambridge, Massachusetts, home to Harvard University and the Massachusetts Institute of Technology as well many major biotech and pharmaceutical companies, voted to review the Berkeley ordinance to determine whether similar regulatory action would be appropriate for the oversight of engineered nanomaterials in Cambridge. This review was led by the Cambridge Public Health Department, which defined the scope of the review to focus on the threats to public health and the safety and protection of workers in facilities handling or manufacturing nanoscale materials. The department created the Cambridge Nanomaterials Advisory Committee, composed of a broad spectrum of Cambridge residents and experts in various nano-related fields. Following a six-month analysis, the committee determined that a new nanotechnology ordinance would not be appropriate in the absence of consensus among scientific data on the toxicity of nanomaterials. The committee also agreed that the city should carefully monitor scientific findings on the toxicity of nanoparticles in case future action was needed.

Actions at the state level have so far been as muted as at the federal level, though the Project on Emerging Nanotechnologies foresees states such as California, Michigan, Massachusetts, New York, and New Jersey, all housing emerging nanoindustries, to shortly enact their own nano-related regulations. California has a noted prior history of leadership on environmental issues. Under the California Toxic Substance Control Code, the state already includes nanoparticles under its state toxic materials law and began legislative efforts in 2008 to regulate the production and manufacture of nanotechnologies through the state's environmental protection agency (Cal/EPA). In April 2007, the Commonwealth of Massachusetts created an interagency working group on nanotechnology, housed in the Massachusetts Department of Environmental Protection, to gain a better understanding of the emerging field of nanotechnologies and to foster communication among state regulatory agencies about any potential public health and environmental hazards. The interagency group has focused its early efforts on promoting National Institute of Occupational Health and Safety workplace standards for the safe handling of engineered nanomaterials and on reaching out to nanoindustries in the state.

Internationally, the NNI and U.S. regulatory agencies collaborate with agencies in other countries to coordinate efforts on standardization, communication, and basic research with regard to nanoscience and nanotechnology. Nanotechnology is explicitly covered under the European Union–USA Agreement on Scientific & Technological Cooperation, through which the EU and the United States work to overcome knowledge gaps and enhance the pace of nanotechnology research and development. The cooperation has led to workshops and proposals for joint research funding, which, if achieved, would change the practice whereby American scientists are funded by the U.S. government and European scientists by the EU Commission.

As always with new social or technological phenomena, the possibility exists that the applications and transformations promised by nanotechnology will appear to have been exaggerated. Despite clear advancements in nanotechnology research and the growing number of nanoscience and technology applications entering the market, a notion still lingers that the promises of nanotechnology are exaggerated and will be temporary—a promising technological marvel that will pass and leave nanomaterials as nothing more than ordinary materials of a very small size. If such proves to be the case, one might argue that a specific nanotechnology policy platform as the NNI today might become redundant once nanotechnology has become an integrated part of mainstream industrial applications and manufacturing.

At another level is the long-standing debate over the extent of government involvement in science and technology and in the free market generally. The free market (or laissez faire) perspective argues that market demands should drive development, and that any technology that requires significant government subsidies in the absence of private sector investment is a technology that perhaps should not be developed. The opposite view is one traditionally espoused by defenders of government investments in science and technology generally, that is, government funding for early stage basic research, the kind of fundamental work that may not have immediate economic payoff, is essential to stimulate scientific progress and often leads to applications that were unforeseen in the early phases of research. Insofar as nanotechnology is concerned, private enterprise, despite increasing investments in nanotechnology, has not yet been able to identify sufficient economic incentives to fully fund basic nanoscience and technology research and development. Government funding will remain an important part of the equation, and probably for decades to come.

The level of scientific uncertainty concerning nanomaterials is likely to remain high, and the rapid pace of research and nanoscience and technology development puts government in a complicated position. Policy makers naturally seek to avoid disasters wrought by the unforeseen side effects of any new technology, yet the relative absence of information about the potential hazards of nanotechnology makes it especially difficult to plan. Faced with acute uncertainty, policy makers (and the general public) might be tempted to take a conservative approach, placing restrictions on new technologies until a scientific consensus emerges that there is little risk from their use. Yet taking an overly cautious approach toward an emerging technology might result in lost scientific and economic opportunities. On the other hand, letting technological development proceed without some sense of caution may almost guarantee significant unforeseen public health consequences.

At another level, new opportunities offered to mankind by emerging technologies often come with ethical and moral complications attached. Nanotechnology promises a wide range of applications that may improve human health and the quality of life significantly. Yet, who will benefit from these opportunities, and who will not? Will the benefits of nanotechnology be enjoyed equitably and improve the quality of life of all? Or will differential access to new technologies serve only to reinforce existing social and economic divides among the population? What are the ethical issues attached to nanomedical technologies that may offer dramatic extensions to human longevity? How will a new generation of nano-based sensing devices affect citizen privacy? Who will decide? Policy makers, and citizens themselves, will need talk openly about such ethical and moral concerns.

An important element in all of this is the role of citizens in deciding how and if new technologies will affect their lives. The NNI allocates a part of its budget on research to address such issues, for instance, citizen concerns about nanotechnology R&D as seen in Berkeley and Cambridge. Such federally funded outreach and education efforts include public information forums on nanotechnology possibilities and potential hazards, the introduction of nanoscience and technology in school curricula, "informal" education efforts through a national network of local science museums, and nanotechnology programs at colleges and universities. Such efforts are laudable in their own right, arguably promoting the ideal of the educated citizen. Skeptics wonder, however, to what extent efforts to foster public participation will affect nanotechnology development. Indeed, despite significant media coverage on nanotechnology, much of it funded through the NNI, the general public remains largely uninformed and even misinformed about nanotechnology and its potential impacts. The question is how much knowledge is needed to foster effective public participation in decisions about nanotechnology. In some ways this question is simply a more technological variation on the fundamental dilemma of democratic government.

At its heart, the current debate is about whether more knowledge about nanotechnology's potential will lead citizens to develop generally favorable views toward further development or, particularly for those already concerned about the impacts of technology on human health and the environment, more information about nanotechnology will serve only to exacerbate fears about the future. While the NNI has funded efforts to expand public education about nanotechnology, information alone is not likely to shape citizen attitudes about nanotechnology or its applications. More critical will be the actual uses for which nanotechnology is put, who will benefit, and, finally, how well government is able to safeguard citizens from technology-induced risks they cannot personally control. In short, debates about nanotechnology are likely to be variations on arguments that go back as far as technology itself: who benefits, who loses, who decides?

Further Reading:

California Department of Toxic Substances Control, Section on Nanotechology. Available online. URL: http://www.dtsc.ca.gov/TechnologyDevelopment/Nanotechnology/index.cfm. Accessed March 23, 2009; Cordis, Nanotechnology homepage of the European Union. Available online. URL: http://cordis.europa.eu/nanotechnology/. Accessed March 23, 2009; Davies, J. Clarence. *EPA and Nanotechnology: Oversight for the 21st Century*. Washington, D.C.: Project on Emerging Nanotechnologies, Woodrow Wilson International Center for Scholars, 2007. Available online. URL: http://www.nanotechproject.org/file_download/files/Nano&EPA_PEN9.pdf. Accessed March 23, 2009; Keiner, Suellen. *Room at the Bottom: Potential State and Local Strategies for Managing the Risks and Benefits of Nanotechnology*, Project on Emerging Nanotechnologies, Woodrow Wilson International Center for Scholars, 2008. Available online. URL: http://www.nanotechproject.org/publications/archive/room_at_bottom. Accessed March 23, 2009; National Nanotechnology Initiative. Available online. URL: http://www.nano.gov. Accessed March 23, 2009; National Science and Technology Council. *National Nanotechnology Initiative Strategic Plan 2007*. Available online. URL: http://www.nano.gov/NNI_Strategic_Plan_2007.pdf. Accessed, March 23, 2009; National Science and Technology Council, *Strategy for Nanotechnology Related Environmental, Health, and Safety Research*. Washington, D.C., 2008. Available online. URL: http://www.nano.gov/NNI_EHS_Research_Strategy.pdf. Accessed, March 23, 2009; New York State Foundation for Science, Technology, and Innovation. *NYSTAR Newsletter*, April 2008. Available online. URL: http://www.nystar.state.ny.us/nl/archives2008/capitalA04-08.htm. Accessed March 23, 2009; U.S. Environmental Protection Agency, Section on Nanotechnology. Available online. URL: http://www.epa.gov/oppt/nano/index.htm. Accessed March 23, 2009; U.S. Food and Drug Administration. FDA Nanotechnology Public Meeting. Available online. URL: http://www.fda.gov/nanotechnology2008/. Accessed March 23, 2009.

– Hans Eijmberts, Sean O'Donnell, Caitlin McAllister, and Christopher Bosso

* *Research support for this article was provided by a National Science Foundation Nanotechnology Interdisciplinary Research Team grant (SES #0609078), Christopher Bosso, principal investigator.*

science research

Science is a broad term that refers to the systematic collection of knowledge. Each time a person engages in scientific activity, he or she is contributing to our understanding of the world. Much science is dedicated to studying natural phenomena. Termed hard or *natural* science, historically this is where most scientific research has taken place. Recently, especially in the last century or so, individuals have also begun to study human society. This relatively new form of science is often referred to as *social* science.

Especially in modern society, government is actually responsible for many of the scientific advances that take place. Throughout history, science has been recognized as a very important tool that allows humans to live healthier and more comfortable lives, and science has typically held a central place in most societies. In the United States, many groundbreaking achievements have been made by researchers who received support from the U.S. government. For example, the development of the Internet was largely funded by the U.S. government and guided by governmental policy.

However, many scientific advances pose numerous risks and ethical concerns since technology sometimes progresses at a high rate of speed. Oftentimes, when scientific advances do seem to progress too quickly, government is asked to step in and ensure that basic human values are not being ignored in the pursuit of some scientific advance. Thus, the role of government in creating policies related to scientific research is extremely important in advanced societies.

It is this fact, namely, that where government is responsible for encouraging scientific advances at the same time that it is expected to ensure that science is done in an ethical way, that makes it important to understand government's role in developing science policy. Knowing what government's role in science policy is allows one to evaluate whether government is behaving in an appropriate manner when it comes to formulating science policy.

From the time the United States declared its independence from Great Britain, the issue of science policy occupied part of the discussion of the new government. The issue of government's stance toward science was discussed at the Constitutional Convention in 1787. At the convention, the framers of the U.S. Constitution considered creating universities that would foster the advancement of scientific knowledge. While no clear statement of the government's ability to establish a national university was provided, the Constitution did grant Congress the power to "promote the Progress of Science and useful arts . . . ." The federal government, though, actually did very little in the pursuit of scientific knowledge very early in the nation's history.

One of the first and most well-known governmental scientific efforts was the Lewis and Clark Expedition. While it is not normally thought of in this way, the expedition was primarily a scientific one, in which Meriwether Lewis and William Clark, both working for the federal government as members of the U.S. Army, led exploration of western portions of the United States from 1803 to 1806. One of the main purposes of the expedition was to find an all-water passage to the Pacific Ocean. As part of this task, Lewis and Clark were also asked to record the geology, geography, botany, and wildlife in the region. The recording and classification of such facts contributed greatly to the scientific knowledge of the natural world of the United States.