

Science-Engineering-Technology Congressional Visits Day
April 4-5, 2000



Participant Briefing Materials

Contents

About SET Congressional Visits Day	2
Briefings Schedule (preliminary)	3
Coalition for Technology Partnerships Roster	4
Science-Engineering-Technology Work Group Roster	5
<i>How-To Briefing Papers</i>	6
• Organizing your Visit	
• Rules of the Game	
• How Congress Works	
• The Legislative Process	
• Building Relationships with Legislators	
<i>R&D Briefing Papers</i>	13
• R&D Is An Investment	
• R&D – An Integrated, Interdisciplinary Process	
• The Importance of Partnership	
• R&D Linkages to Education	
<i>Issue Briefing Papers</i>	18
• Doubling the Federal Investment in Research	
• Information Technology Initiative and NITRD	
• National Nanotechnology Initiative	
• K-12 Science, Math, Engineering & Technology Education	
<i>Agency R&D Briefing Papers</i>	23
• Department of Agriculture	
• Department of Commerce (NIST & NOAA)	
• Department of Defense	
• Department of Energy	
• Department of the Interior	
• Department of Transportation	
• National Aeronautics and Space Administration	
• National Institutes of Health	
• National Science Foundation	
Appendix	33
• AAAS Preliminary Analysis of R&D in the FY 2001 Budget	

***** For participants only – not for Hill use *****



About Science-Engineering-Technology Congressional Visits Day . . .

Objective

To underscore the importance of science, engineering, and technology through meetings with congressional decision makers.

Core Messages

- ★ Balanced federal investment in science, engineering, and technology (SET) is vital to the future of our Nation's prosperity.
- ★ SET partnerships between government, universities, and industries mean progress, economic growth and jobs.

Other Messages

All participants will advance the "Core Message." To provide flexibility and to acknowledge the fact that many diverse groups will be participating in this effort, each team will decide which additional specific issues it would like to advance. Briefing materials are provided on a variety of federal agencies and partnership programs.

Participants

Members of the Coalition for Technology Partnerships and the Science-Engineering-Technology Work Group and their colleagues in the science, engineering, and technology enterprise.

Schedule

Tuesday, April 4, 2000

1:00 – 2:30 pm
Administration Briefing
Office of Personnel Management
1900 E Street, NW
Metro Stop: Farragut West
-- 17th and I St. entrance

3:00 - 5:00 pm
Congressional Briefing
Office of Personnel Management
1900 E Street, NW
Metro Stop: Farragut West
-- 17th and I St. entrance

6:00 - 8:00 pm
Reception and Awards Ceremony
Room 216, Hart Senate Office Building
Metro Stop: Union Station

Wednesday, April 5, 2000

8:00 - 9:30 a.m.
CVD Breakfast Briefing
B338-339, Rayburn House Office Building
Metro Stop: Capitol South

9:30 a.m. - 5:00 p.m.
Congressional Visits

3/28/00

The **Coalition for Technology Partnerships** is a group of small, medium, and large businesses and trade associations. These groups have joined forces to demonstrate that partnerships between government and industry reflect the realities of today's budget climate and technology development mechanisms. Contact: Kathleen N. Kingscott - Phone 202-515-5193 - Fax 202-515-4943.

The **Science-Engineering-Technology Work Group** is an information network comprising professional, scientific, and engineering societies, higher education associations, institutions of higher learning, and trade associations. The Work Group is concerned about the future vitality of the U.S. science, mathematics, and engineering enterprise. Contacts: Debbie Rudolph (Phone 202-785-0017, Fax 202-785-0835, E-Mail d.rudolph@ieee.org) and David Applegate (Phone 703-379-2480 x228, Fax 703-379-7563, E-Mail applegate@agiweb.org).



Briefings Schedule

d r a f t

Tuesday, April 4, 2000

Office of Personnel Management, 1900 E Street, NW

1:00 -

Administration Briefing

2:30 pm

Host: Dr. Neal Lane, Science Advisor to the President

- Dr. Rita Colwell, Director, National Science Foundation
- Dr. Delores Etter, Deputy Undersecretary of Defense for Science & Technology
- Dr. Ernest Moniz, Under Secretary of Energy (invited)

Office of Personnel Management, 1900 E Street, NW

3:00 -

Welcome & Acknowledgments

Taffy Kingscott (CTP/IBM), Debbie Rudolph (SETWG/IEEE)

5:00 pm

The Protocol of Congressional Visits

Kathi Ream (CCR/SPIE)

Federal R&D Recap

Al Teich (AAAS)

The Insider's View Panel

Sam Rankin (AMS), Moderator

- Bill Bonvillian, Legislative Director and Chief Counsel, Sen. Joseph Lieberman (D-CT)
- Elizabeth Prostic, Staff, Senate Commerce, Science & Transportation Committee
- Bob Palmer, Minority Staff Director, House Science Committee
- Richard Russell, Majority Deputy Staff Director, House Science Committee

Closing Remarks and Logistics Discussion

Room 216, Hart Senate Office Building

6:00 -

Congressional Visits Day Reception and Award Ceremony

8:00 pm

Hosted by CTP and SETWG Member Organizations

Presentation of George E. Brown Jr. Science-Engineering-Technology Leadership Award to

- The Honorable Bill Frist (R-TN)
- The Honorable John D. "Jay" Rockefeller (D-WV)

Wednesday, April 5, 2000

B338-339, Rayburn House Office Building

8:00 -

CVD Breakfast Briefing

9:30 am

Continental Breakfast

- Remarks by Rep. Curt Weldon (R-PA), Chair, House Subcommittee on Military R&D, House Armed Services Committee

Team Logistics

9:30 -

Congressional Visits -- House and Senate

5:00 pm



The Coalition for Technology Partnerships

CTP is a group of small, medium, and large businesses, trade associations, and technical societies that have joined forces to advocate science and technology partnerships -- a vital part of our innovation engine. For further information on the Coalition's activities, contact Kathleen N. Kingscott (CTP Chair) at 202-515-5193 (phone) or 202-515-4943 (fax).

American Electronics Association	San Jose, CA
Becton Dickinson Technologies	Research Triangle Park, NC
Dow Chemical Company	Midland, Michigan
EMC Corporation	Hopkinton, MA
Extrude Hone Corporation	Irwin, Pennsylvania
General Electric Corporation	Niskayuna, NY
IAP Research, Inc.	Dayton, Ohio
IBM Corporation	Armonk, NY
Lamb Machining Systems, UNOVA, Inc.	Warren, MI
National Association of Manufacturers	Washington, DC
National Center for Manufacturing Sciences	Ann Arbor, MI
Ohio Aerospace Institute	Cleveland, OH
Optoelectronics Industry Development Association	Washington, DC
Physical Optics Corporation	Torrance, CA
Princeton Materials Institute, Princeton University	Princeton, NJ
Quantimetrix Corporation	Redondo Beach, CA
Rockwell Collins, Inc.	Cedar Rapids, IA
Semiconductor Equipment & Materials Internatl	Mountain View, CA
Semiconductor Industry Association	San Jose, CA
Wilcoxon Labs	Gaithersburg, MD
XXsys Technologies, Inc.	San Diego, CA



The Science-Engineering-Technology Work Group

SETWG is an information network comprising professional, scientific, and engineering societies, higher education associations, institutions of higher learning, and trade associations. The Work Group is concerned about the future vitality of the U.S. science, mathematics, and engineering enterprise. The **Science-Engineering-Technology Work Group** contacts are Debbie Rudolph (Phone 202-785-0017, Fax 202-785-0835, E-Mail d.rudolph@ieee.org) and David Applegate (Phone 703-379-2480 ext. 228, Fax 703-379-7563, E-Mail applegate@agiweb.org).

American Association for the Advancement of Science	Council of Scientific Society Presidents
American Association of Engineering Societies	Crop Science Society of America
American Astronomical Society	Ecological Society of America
American Educational Research Association	Federation of American Societies for Experimental Biology
American Chemical Society	Federation of Animal Science Societies
American Electronics Association	Federation of Materials Societies
American Geological Institute	Industrial Research Institute
American Geophysical Union	Institute of Electrical & Electronics Engineers - Unites States of America
American Institute of Aeronautics & Astronautics	Massachusetts Institute of Technology
American Institute of Biological Sciences	Materials Research Society
American Institute of Chemical Engineers	The 'M Companies
American Institute of Physics	NACE International
American Mathematical Society	National Academy of Engineering
American National Standards Institute	National Academy of Sciences
American Physical Society	National Association of State Universities and Land Grant Colleges
American Society of Agronomy	National Groundwater Association
American Soc. for Biochemistry & Molecular Biology	National Research Council
American Society for Engineering Education	National Society of Professional Engineers
American Society for Microbiology	National Technology Transfer Center
American Society for Testing and Materials	North Carolina State University
American Society of Civil Engineers	Optical Society of America
American Society of Mechanical Engineers	RAND
American Society of Plant Physiologists	Society of Automotive Engineers
Association for Women in Mathematics	Society of Manufacturing Engineers
Association of American Universities	Soil Science Society of America
Coalition on Funding Agricultural Research Missions	SPIE - The International Society for Optical Engineering
Consortium of Social Science Associations	The Science Coalition
Council for Chemical Research	University of California Riverside
Council for Undergraduate Research	
Council on Agricultural Science & Technology	
Council of Graduate Schools	



Organizing your Visit

Before going into a Congressional Office, choose a leader who will be the focal point of the group. It is best to choose someone from the Member's state or district.

Use the “3” Rule:

Structure your visit into 3 main parts

1. **Who**
 - ✓ Thank the *congress/staff person**
 - ✓ Introduce *participants* - name and organization
 - ✓ Mention the broader community, noting the *SET Congressional Visits Day* effort
2. **What** *
 - ✓ **Science, engineering, and technology** are crucial to the nation, as well as the Member's state/district.
 - ✓ Give examples of *national SET importance* (e.g., use CVD leave-behind materials)
 - ✓ Give examples of *state/district importance* (e.g., use information about your own work/organization).
3. **How**
 - ✓ **Ask** your senator/representative/staffer to maintain a commitment to science, engineering, and technology funding in the FY 2001 budget
 - ✓ **Offer** to serve as a resource on SET-related issues.
 - ✓ Follow-up: *invite* the legislator/staff to visit your facility. Seeing is believing!

* Be sure to acknowledge the legislator's past support for SET, and be specific. If the legislator is already a champion – ask how you can help him or her advance SET among their congressional colleagues.



Rules of the Game for the Meeting

- 1.** Be on time and be prepared to wait. Changes in the legislative calendar and office activity often necessitate Members and staff to deal with other things.
- 2.** You must be prepared and succinct. *If you don't know the answer, be honest! BUT commit to finding out the answer and following up.*
- 3.** Explain how what you are talking about impacts the Senator/ Representative's state or district with a **short anecdote** or facts about the district. (e.g., how many people work for your company and their economic impact)
- 4.** Limit the presentation; not everyone needs to speak to get the point across.
- 5.** Never be negative about politicians; don't whine or lecture to Member or staffer; don't come across as if R&D funding is an entitlement.

After the meeting, Follow Up! Send a letter of thanks to the Member and Staffer offering to be a source of information in the future.



How Congress Works

Members and staff are very busy and often deal with many more issues than the one in which you are interested. They are "jacks of all trades, masters of few or none." Acknowledging the limitations on their time and resources and offering to be a source of information is vital and helps to build a strong working relationship.

1. The legislative process is designed to be complex and deliberative, ensuring that all parties have an opportunity to comment on legislation. Legislation is considered in subcommittees, committees, and on the floor of both the Senate and House, and must be signed by the President. Most proposed laws are never acted upon and few ever become law.
2. Members look to their colleagues for guidance; influencing one can in fact influence many.
3. Staffers are often very influential in advising Members on votes.
4. All government is political and, in the immortal words of former House Speaker Thomas P. "Tip" O'Neill, "all politics is local."
5. Legislative proposals are weighed subjectively. Members of Congress not only consider proposals on their merits but also on these basic political questions:
 - How will the bill affect the legislator's reelection prospects?
 - Is this issue consistent with the legislator's previous votes/positions on related matters, and with his/her political and economic philosophies?
 - What would be the impact on the Member's local economy and jobs?
 - What are the constituents saying, the news media and local interest groups recommending?
 - What are the legislative staff and advisors recommending?



The Legislative Process

There are essentially two types of legislation, both of which follow the same route into law:

- 1) Authorization bills -- establish programs and policies, also set recommended budget levels.
- 2) Appropriations bills -- provide the actual funding for government programs and agencies on an annual basis.

Step 1 - Committees

Most legislative activity occurs in Committee, thus giving Committee members greater influence on specific legislation. Most legislation is given public hearings by subcommittees and full committees of both the House and Senate. Amendments to legislation can be made to the bill in subcommittee and/or full committee during special Committee meetings called "mark ups."

Step 2 - The Floor

Once a bill passes through the committee process, it may be amended further on the floor of either the House or Senate.

Step 3 - Conference Committee

When both the House and Senate have passed versions of the same legislation that are different, a "Conference Committee" of both Representatives and Senators meets to work out the differences -- often additional changes are made during Conference. Both chambers must approve the new version of the legislation.

Step 4 - The President

The President can sign or veto any piece of legislation. The Congress can attempt to override a veto with a 2/3 vote. Congress can also try to amend the legislation in a manner to the President's liking or send it back through the entire committee process. Only if the President signs a bill or a veto is overridden does the legislation become law.

Members of Congress and staff often note how little people know about the legislative process. Showing that you have some knowledge will impress them, leaving a positive impact.



Building Relationships with Legislators

Before academe and industry address legislators and their staff about a particular issue, it is helpful if a professional relationship has already been established. Strong personal relationships are the best means of influencing legislative decisionmaking. Personal visits, letters, phone calls, and other forms of communication also are important, especially when they come from constituents who are well-known, highly regarded, and have gone out of their way to be helpful in a variety of ways in the past. Building relationships takes time and careful effort, but it's the most effective way to shape the thinking of those who decide public policy.

How do you go about building such relationships? In much the same way as you cultivate friendships: by being friendly and personally helpful, by being a useful and trustworthy source of sound information and insight, and contributing your personal time to professional and political needs and interests. Your own party affiliation should not restrict you. Every elected officeholder represents an entire state, legislative district, or local government--Republicans, Democrats, and independents alike. You don't have to be a member of the legislator's political party to work together and even to become friends.

You will need, however, to do some homework about the key issues, economic facts, employment, industry, etc. that are important to the interests and viewpoint you represent. At the same time, familiarize yourself about the legislators with whom you want to build relationships.

Become a fountain of facts. Know the number of employees you represent in the official's state or district, the annual payroll and taxes paid, expenditures for local supplies, materials and services, investments, and philanthropic contributions and corporate sponsorships. Also be aware of the community improvement projects that your company/university or employees support, environmental investments, contributions and activities, and facts about local safety and health standards and performance.

Some relationship-building activities are:

1. Write and/or call legislators on current issues.
2. Make personal visits either in Washington, D.C. or in the home district offices to discuss current issues or broad problems.
3. Organize group visits on issues of mutual importance.
4. Invite legislators to tour local plants and facilities, research and teaching laboratories, and meet with management and employees for discussion of problems and issues.
5. Get personally involved in legislators' campaigns and the activities of your political party.

Here are some ways you can work with your organization's government relations staff to build relationships at the federal level:

1. Develop resource relationships which officeholders can call upon at will for reliable and authoritative economic/technical information.
2. Leverage legislative influence through effective coalitions and third-party activities.
3. Provide financial support for legislators' campaigns, through individual contributions or through your organization's political action committee.

These steps will progressively build your credibility with the officeholder. Establishing a reputation as an objective data source, for example, builds credibility for subsequent communications expressing opinions on issues. Political activity establishes you as a friend whose views are likely to receive more weight than someone who writes from time to time.

Using Economic Data

Economic data and technical information are often essential to support your case on key issues. Use the data you have about operating in your area or state to illustrate how much your organization contributes in terms of wages and benefits, local purchases, taxes, and other concerns. The data can be presented as a sentence or two in a letter to a legislator, as a brief paragraph in position papers, press releases and personal visits, or in a brochure for the public or government audiences.

If scientific data are necessary to address specific issues, they must be used with sophistication. Technical experts on the staffs of policymakers may comprehend and delight in complex charts and tables, but the decisionmakers themselves have very low tolerance for such detail. When using charts to convey information, avoid using scientific jargon. If such terms are required, you should explain them so that a non-technical audience can understand.

When using economic and technical data, use exactly the information you need to build credibility and make the case, and then stop. Stretching data to fit the need would strain your credibility. Test the presentation by showing it to a few friends or neighbors beforehand. If they find it tiresome or confusing, there's a good chance that your target audience would, too.

Personal Visits

There is no better way to effectively make your case on issues with legislators and staff than personal visits. Such visits also are a good way to introduce yourself as a constituent. Personal meeting can be difficult to accomplish with the policymaker's busy schedule, but remember that you are offering an important business contact. You can arrange the meeting with the policymaker directly or through staff aides.

The following suggestions will help make the best use of your time and the legislator's:

1. Always make an appointment. Arranging the first meeting may require patience on your part, but be persistent. Later, as you become known as a resource, gaining appointments will be less difficult. This will occur especially if you also become known as a campaign contributor, political activist, or civic leader who can muster support on the issues from a wide variety of groups through your coalition activities.
2. Be prepared to meet with key legislative personnel or committee staff members if the legislator is unavailable at the last moment. Briefing these people before your visit also may be useful so that they can prepare the legislator. Staff aides are often more knowledgeable about details of a specific issue than lawmakers themselves.
3. If several individuals join you in the visit, decide in advance who will be the principal spokesperson. That individual, of course, should encourage others to participate in the discussion to share particular expertise or experiences.
4. If you want to discuss a specific issue, make sure you are thoroughly familiar with all aspects of it before going into the meeting.
5. When talking to legislators, try to be concise, well organized, and mindful of the other person's time. State your view firmly, but be attentive to the policy-maker's position also.
6. Open the discussion by reminding the legislators who you are, whom you represent (i.e., the Coalition for Technology Partnerships or the SET Work Group), and why you are there. Know the issue and the bill number. State your concern about the issue, how it will affect you and your organization, and the community.
7. Always be truthful and never mislead. Your personal credibility and that of the organization you represent is at stake. If you don't have the answer to a question, do not improvise. Promise to get back to the questioner with the necessary information, and be sure to do so promptly.
8. Come prepared with a brief (one-page) position paper that summarizes your points with facts, and leave it behind with the legislators or staff aides. If a lengthier document or answers to questions is relevant, send it later with a "thank-you" note.
9. To gain a favorable vote, follow up with letter(s) and calls to legislators and their key staff advisors at appropriate points as the issue progresses.
10. Maintain the relationship. Get your name on legislative mailing lists. Find occasions to see the legislators again in appropriate circumstances, and write to them on the issues from time to time. If you obtain reports or data that will be useful to legislators and their aides and that you can share with them, send those documents with a brief personal cover note. Eventually, you may even find policymakers coming to you for information, help, or your point of view on new issues.



R&D Is An Investment

At the heart of SET Congressional Visits Day is the belief that federal support for R&D is an investment in the future of our Nation and its citizens. When push comes to shove and budget decisions are made, federally funded activities such as R&D are often viewed as expenses, with little or no understanding of R&D's long-term nature and the benefits produced. The key word is understanding. The fact is that most people do appreciate science and technology and recognize its key role in the quality of life we all enjoy. And most legislators want to do the right thing. The missing piece -- or some would say "misunderstood" piece -- is how much today's science, engineering, and technology funding decisions can affect our future, and how vital each stage in the research chain is. This is the single most important message for all CVD participants to convey. The task of CVD participants is to engage legislators in the topic of R&D and make this point:

Research is an investment, not an expense.

The federal government supports a unique world-class research and education enterprise that fuels the American economy. This enterprise provides the underpinning of high-technology industries, expands the frontiers of knowledge, and trains future generations of scientists, engineers, and mathematicians. The federal investment in R&D has led to job growth in new and old industries and has produced a standard of living that is unparalleled in our Nation's history.

Today, Congress is challenged with developing a plan that will keep the federal budget in balance. That goal, however, cannot be reached unless the American economy continues to grow, productivity is sustained, and inflation is held in check. According to many economists, technology is largely responsible for the enduring strength of the current economic expansion and the low rate of inflation that we have experienced in recent years. Sustaining the scientific enterprise is the key to future technological advances. Thus, federal support of research is critical to any balanced budget plan.

"Something special has happened to the American economy in recent years...a remarkable run of economic growth that appears to have its roots in ongoing advances in technology."

**Federal Reserve Board Chairman Alan Greenspan,
Testimony before Joint Economic Committee (6-14-99)**

"The first thing I want to underscore, in the clearest possible way, is that science and technology have become the engine of our economic growth."

President Clinton, Speech at California Institute of Technology (1/21/00)

"The highest investment priority in Washington should be to double the federal budget for scientific research. No other federal expenditure would create more jobs and wealth or do more to strengthen our world leadership, protect the environment and promote better health and education for all Americans. For the security of our future, we must make this investment now."

Former House Speaker Newt Gingrich, in *The Washington Post* (10/18/99)

Return on Investment

More than 50 percent of all industrial innovation and growth in the United States since World War II can be attributed to advances pioneered through scientific research. The list of achievements is long and changing minute by minute. Results happen -- sometimes by serendipity and sometimes by design, sometimes in a few years and sometimes not for decades. Whether the applications are broad and enabling, or part of a new product or process, public science is at the core of our society's progress to date. Achievements such as computer modeling of chemical structures to design drugs, the Internet, lasers, magnetic resonance imaging, and global environmental monitoring and management are well known.

A 1997 study prepared for the National Science Foundation by CHI Research found that 73% of scientific articles cited in patent applications are based on research funded by government or foundations, showing industry's dependence on public science in developing the next generation of products and processes.¹

A five-year study released in 1997 showed that technology transfer from academic research added more than \$21 billion – supporting 180,000 jobs – to the American economy each year.²

Although the forecast for federal R&D funding has improved over past budget proposals, the long-term trends are still uncertain. The significant increases for science and technology in FY 2000 indicate that the message of investment for the future has been heard, but it needs to be re-emphasized. For FY 2001, the President has requested a 3.1% increase for overall federal R&D, which includes a 0.2% decrease for defense R&D and a 6.2% increase for nondefense R&D. Congress provided more for R&D than the President requested in Fiscal Year 2000, and it is hoped that Congress will again exceed the President's request.³ It is critical that federal support for research continues to grow at a time when the global competitive marketplace is forcing industry to focus increasingly on shorter-term results in areas of known industrial needs.

"A successful knowledge-based economy requires large public investments in education, infrastructure, and research and development....Private rates of return on R&D spending (the financial benefits that accrue to the firm doing the spending) average about 24 percent. But social rates of return on R&D spending (the economic benefits that accrue to the entire society) are about 66 percent....This result, never contradicted in the economic literature, provides powerful evidence that there are huge positive social spillovers from research and development....Because the government doesn't care exactly which Americans reap the benefits, it has a very important role to play in R&D. Rates of return on R&D spending are far above those found elsewhere in the economy. Government now pays for about 30 percent of total R&D, but with a 66 percent rate of return it should be spending much more."

Economist Lester Thurow, "Building Wealth" article in *Atlantic Monthly* (6/99)

"Because of productivity gains, the economy can now operate at a higher speed without inflation....[P]romoting the New Economy also requires wise policy from Washington. We need to support basic research and education at all levels, the seed corn of innovation."

Editorial, *Business Week* (7/26/99)

¹ The Increasing Linkage between US Technology and Public Science, by Francis Narin, et al., CHI Research (March 1997).

² Association of University Technology Managers Licensing Survey, FY 1991– FY 1995 (February 1997).

³ American Association for the Advancement of Science Preliminary Analysis of R&D in the FY 2000 Budget (2-10-00).

R&D – An Integrated, Interdisciplinary Process

Basic research, applied research, and development constitute a continuum from which arise new products and processes, new ideas and understanding, and new researchers and teachers. Each part of the continuum depends on the other – basic research underpins applied research and the development process, which in turn often stimulate new avenues for basic research to generate deeper fundamental understanding. Moreover, advances in basic research often come as the result of advances in instrumentation that is the product of applied research and development. The R&D cycle operates as a positive-feedback loop, constantly expanding the frontiers of knowledge.

“Advances in one field are often dependent on breakthroughs in other disciplines. For example, advances in computer science are helping us to develop drugs more rapidly, and to move from sequencing the human genome to better understanding the function of individual genes.”

President Clinton, Speech at California Institute of Technology (1/21/00)

The benefits of science and technology flow across sectors, and a box cannot be drawn around any single element of the research cycle. Neither can a box be drawn around individual disciplines; advances are taking place increasingly at the boundaries between disciplines or through collaboration among disciplines. Public- and private-sector institutions that participate in the performance of R&D all directly benefit from the transfer of new knowledge, new concepts and techniques, and new processes gained. Many government laboratories and agencies also promote technology transfer – whether it is improved curriculum for educational institutions, the creation of new businesses, or the dual use of technology across agencies. Industry translates innovation into products and processes, solving national problems and creating economic growth and jobs. Examples of the continuum abound:

- Electronic mail, the World Wide Web, and better international telephone communications all depend on tiny strands of glass – optical fibers thinner than a human hair yet stronger than steel – and light in the form of tightly focused laser beams. These world-shrinking developments came from fundamental discoveries into the nature of light nearly a century ago.
- Basic research into atomic clocks combined with satellite navigation technology led to development of the global positioning system (GPS). The ability to locate an object with pinpoint accuracy gives GPS a wide range of civilian and military uses, including aircraft navigation and collision-avoidance systems, rescue of ships lost at sea, and monitoring forest fires. This new technology has also become an important tool for basic research into earthquakes and volcanoes.
- Ecological observations of rotating crops and livestock and animal husbandry, combined with technological advances such as better irrigation and more efficient plow design, have led to our ability to feed hundreds of millions of people. Mathematical modeling – combined with the research efforts of biologists, geologists, and chemists – is helping to tackle daunting environmental challenges ranging from acid rain to the effects of the world’s oceans on global climate.

The Coalition for Technology Partnerships and the Science-Engineering-Technology Work Group encourage legislators to take into account the need for a balanced federal investment in science, engineering, and technology, and to take a long-term view when making decisions about federal support for R&D.

The Importance of Partnerships

Research conducted in government, industrial, and academic laboratories varies in style and objective. Each sector's efforts complement the others' and reinforce the world-class R&D enterprise of the United States. With recent changes in commercial and financial markets, however, industry is forced to reshape its R&D goals. Not only are foreign competitors challenging U.S. industry's stature in world markets, the pressure for short-term returns from U.S. capital markets forces the Nation's industry to focus its investment on development, which is closer to the marketplace.

"The United States has unparalleled resources of science and technology. Its industrial research capability, universities, nonprofit research institutions, and federal laboratories are great national treasures. But in a time of severe financial constraints and heightened international competition, the Nation must maximize its returns on those assets...The time is ripe for bold steps to capitalize on the promise of partnership."

State-Federal Technology Partnership Task Force Report, co-chaired by former Governors Dick Thornburgh (R-PA) and Richard Celeste (D-OH)

The federal government plays a crucial role in R&D partnerships. It can create an environment conducive to collaborations among federal, industrial, and academic researchers. For example, **Cooperative Research and Development Agreements** give companies access to the expertise and facilities of federal labs for specified R&D. The Department of Energy's Stockpile Stewardship Program creates partnerships with industry and universities to manage our nation's nuclear weapons and develop the most advanced supercomputing capability.

Under the National Institute of Standards and Technology's **Advanced Technology Program**, the federal government shares the costs of research on high-risk technologies that underlie a broad spectrum of potential new applications, commercial products, and services. The **Manufacturing Extension Program** aims to accelerate the transfer of advanced manufacturing technology to small and medium-sized, U.S.-based manufacturing firms.

The newly introduced **National Nanotechnology Initiative** largely is directed toward university-based research across a variety of disciplines. Many advances will come at the interfaces between areas and will require multidisciplinary partnerships involving federal-university-industry teams.

Seven federal agencies support the **Experimental Program to Stimulate Competitive Research** (EPSCoR), a federal-state partnership that provides funds for research activities at universities and non-profit organizations in those states that historically have not received significant federal R&D funding.

The Coalition for Technology Partnerships and the Science-Engineering-Technology Work Group encourage legislators to sustain and enhance the federal government's role in R&D partnerships.



R&D Linkages to Education

The continued vitality of the federal research enterprise depends upon a steady stream of new scientists emerging from our education system. America's educational system for science, engineering, and technology is one of the strongest in the world. Our system is fortunate to have its **diversity** in the kinds of institutions (public and private) that deliver education and the many different approaches states adopt for science education. The **dedication** of many fine scientists and educators helps to **integrate** research and education, especially at the graduate level.

However, our educational pipeline is weak at several points. We are in danger of creating a society that is segregated by the understanding and use of science and technology. Our current system does not deliver the full range of American human diversity and talent to the scientific enterprise. All levels of our education system need work. Graduate students' education provides a narrow view of job opportunities for scientists and technologists - especially disregarding opportunities in education and in government. At the undergraduate level, education often treats science as something to be memorized rather than something alive, personal, and full of creative potential. Undergraduates need more opportunities to know science through research experiences. K-12 education suffers from limited resources, including teachers with depth and experience in the sciences. We need more incentive for scientist-educators to participate in K-12 education, whether as teachers or as external resources. Recognizing that these weaknesses must be addressed at all levels in society, the Federal government can help, and Congress has a role to play:

- We must **strengthen K-12 science and mathematics education** so that all Americans have a fundamental understanding of science, engineering, and technology. Federal programs that provide incentives for scientists to work in K-12 education include the National Science Foundation's (NSF) "Graduate Teaching Fellows in K-12 Education" program for graduate and advanced undergraduate students to serve as resources for local schools. The Eisenhower Grants at the Department of Education (DoEd) provide professional development for mathematics and science educators.
- We must **support undergraduate research** to help provide scientists for the future. NSF plays a major role in supporting undergraduate research. We must continue to support strong programs in NSF's Education and Human Resources Directorate, and to encourage NSF to integrate scientific research and education throughout the Foundation for the entire science education pipeline (K-graduate school).
- We should **encourage education research** programs at NSF and DoEd that provide an environment in which regional and local groups of schools and colleges can experiment, then disseminate the most successful examples to the rest of the nation.
- We must **provide role models and opportunities** for young people to experience the scientific and engineering enterprise, hands-on. Federal laboratories can provide a wonderful opportunity for internships and summer research experiences by undergraduates. Congress should make it clear to the federal agencies that education plays a major role in their missions.
- We need **incentives for science and technology partnerships** between government, colleges and universities, and local industries to provide opportunities for young people to enter science and technology fields.



Doubling the Federal Investment in Research

Last July, the Senate unanimously passed S. 296, the National Research Investment Act of 1999. This bipartisan legislation, which had 41 co-sponsors, was introduced by Senator Bill Frist (R-TN) at the beginning of the 106th Congress to establish "a long-term vision for Federal funding of fundamental scientific and pre-competitive engineering research." The long-awaited House companion bill, H.R. 3161, was introduced on October 28th by Rep. Heather Wilson (R-NM). H.R. 3161 has 14 co-sponsors including Rep. Rush Holt (D-NJ), a physicist, and Ranking Commerce Committee Democrat John Dingell (MI).

S. 296 and H.R. 3161 outline a doubling in funding for non-defense R&D over the next eleven years, from the current 2.11% of the budget to 2.6% of the budget. Agencies included in the bill are NIH, NSF, NIST, NASA, NOAA, the Centers for Disease Control and Prevention, EPA, the Smithsonian Institution, and the Departments of Agriculture, Education, Energy, the Interior, Transportation, and Veterans Affairs. The bills are similar to S. 2217, which passed the Senate during the 105th Congress by a unanimous vote.

The bills recommend that the White House Office of Science and Technology Policy commission the National Academy of Sciences to develop methods to evaluate federally funded R&D. The Academy study is intended to improve the accountability of agencies conducting R&D because the outcomes of R&D are often difficult to predict and do not follow standard performance measures. The bill calls for the termination of programs that are determined to be below the acceptable level of success for two fiscal years in a row, with certain exceptions. The bill was amended in committee with a provision to prevent rapid growth in one agency from causing reductions in others.

Why the need for federal investment in science? As stated in the bills:

- to enhance the quality of life for all Americans,
- guarantee U.S. leadership in science, medicine and technology, and
- to restore science and technology as a priority in the Federal budget (in FY1965, 5.7% of the budget went to non-defense R&D compared to only 2.1% in FY1998).

Implications for Congressional Visits Day

Many in the research policy community see S. 296 and H.R. 3161 as a tremendous opportunity to increase within Congress the visibility of Federal support for research and the important role it plays in strengthening our quality of life, national economy, and position of world leadership. In order to turn this bill into law, it is critical to obtain additional House cosponsors and move the House bill through committee in order to build momentum and serve as a catalyst for further action.

In 1997, the concept of doubling the national investment in research was endorsed by the leaders of 109 science, engineering, and mathematics organizations through a Unified Statement on Research entitled "A Decade of Investment." That statement led to a coalition whose efforts continue to the present.



Information Technology Initiative & NITRD

Information Technology (IT) innovations are transforming the way we live, learn, work, and play. New computing, networking, and communications tools allow Americans to shop, do homework, and get health care advice online, and enable businesses of all sizes to join the international economy. Since 1995, more than a third of US economic growth has resulted from IT enterprises, and during the past decade, more than 40 percent of US investment in new equipment has been in computing devices and information appliances.

The President's FY2001 budget request includes \$2.32 billion for IT R&D, an increase of \$594 million over last year. This multi-agency initiative focuses on fundamental research in software, development of information systems that ensure privacy and security of data and allow people to get the information they want when they want it, in forms that are easy to use; and other impacts of IT with emphasis on ensuring that all Americans will benefit from these technologies. Funding is divided among the agencies as follows:

	FY2000 enacted (\$millions)	FY2001 request (\$millions)	Percent Increase
Department of Commerce (NIST & NOAA)	36	44	22
Department of Defense (DARPA, NSA, & URI)	282	397	41
Department of Energy	517	667	29
Environmental Protection Agency	4	4	0
Health & Human Services (NIH & AHRQ)	191	233	22
National Aeronautics and Space Administration	174	230	32
National Science Foundation	517	740	43
TOTAL	1,721	2,315	35

Networking and Information Research and Development Act (NITRD)

On February 15, 2000, the House of Representatives passed NITRD, a bill introduced by House Science Committee Chairman James Sensenbrenner (R-WI) that would nearly double federal IT research over the next five years. H.R. 2086 refocuses federal IT resources towards fundamental research and establishes the NSF as the lead agency for federal civilian IT programs. The bill now moves to the Senate where the legislation has been referred to the Committee on Commerce, Science, and Transportation.

NITRD groups civilian IT programs at the various agencies (NSF, NASA, NIH, the Department of Energy, the National Institute of Standards and Technology, the National Oceanic and Atmospheric Administration, and EPA) into one legislative authorization package. Furthermore, at the behest of the scientific community, H.R. 2086 provides steady funding increases over multiple years, as opposed to authorization levels that fluctuate each year. This multiyear approach provides the steady stream of funds necessary to fully realize the benefits from basic research.

NITRD bolsters mathematics and science education through the inclusion of \$95 million for universities to establish a for-credit internship program for research at IT companies. NITRD also requires the NSF to report to Congress on the availability of encryption technologies in foreign countries and how they compare with similar technologies subject to export restrictions in the United States.



National Nanotechnology Initiative

President Clinton's FY2001 budget request includes a \$225 million (83%) increase in the government's investment in nanotechnology R&D. This National Nanotechnology Initiative (NNI) will support long-term R&D leading to potential breakthroughs in areas such as materials and manufacturing, nanoelectronics, medicine and healthcare, environment and energy, chemical and pharmaceutical industries, biotechnology and agriculture, computation and information technology, and national security. NNI will strengthen scientific disciplines and create critical interdisciplinary opportunities. The emerging fields of nanoscience and nanoengineering – the ability to manipulate and move matter – are leading to unprecedented understanding and control over the fundamental building blocks of all physical things. These developments are likely to change the way almost everything – from vaccines to computers to automobile tires – is designed and made. Below are the funding levels for agencies involved in NNI:

	FY2000 enacted (\$millions)	FY2001 request (\$millions)	Percent Change
National Science Foundation	97	217	124
Department of Defense	70	110	57
Department of Energy	58	94	62
NASA	5	20	300
Department of Commerce	8	18	125
National Institute of Health	32	36	13
TOTAL	270	495	83

Roughly 70% of the new funding proposed under NNI will go to university-based research, which will help to meet the growing demand for workers with nanoscale science and engineering skills. NNI also addresses development of a balanced infrastructure, novel approaches to the implications of nanotechnology, and rapid transfer of knowledge and technology gained from the R&D efforts. Some of the potential breakthroughs from nanoscale science and technology:

- Shrinking the entire contents of the Library of Congress into a device the size of a sugar cube through the expansion of mass storage electronics to multi-terabit memory capacity that will increase the memory storage per unit surface a thousand fold.
- Making materials and products from the bottom up, that is, by building them up from atoms and molecules. Bottom-up production should require less material and pollute less.
- Develop materials that are 10 times stronger than steel, but a fraction of the weight for making all kinds of land, sea, air and space vehicles lighter and more fuel efficient.
- Improving the computer speed and efficiency of minuscule transistor and memory chips by factors of millions making today's Pentium III seem slow.
- Using gene and drug delivery to detect cancerous cells by nanoengineered MRI contrast agents or target organs in the human body.
- Removing the finest water and air contaminants to promote a cleaner environment and potable water.
- Doubling the energy efficiency of solar cells.



K-12 Science, Mathematics, Engineering & Technology Education

The bulk of all funding for education in America comes from state and local taxes. The federal government provides only seven percent of all education funding. When it comes to education research, the federal government is the primary supporter providing 60 to 70 percent of the funding for education research. Currently, Congress is dealing with two major topics: the reauthorization of the Elementary and Secondary Education Act (ESEA) of 1965, the principal authorizing legislation for K-12 education programs in the Department of Education, and appropriations for federal funding of education research within the Department of Education and the National Science Foundation.

ESEA Reauthorization

The House and Senate decided to approach the ESEA reauthorization in very different ways. The House Education and the Workforce Committee, chaired by Rep. Bill Goodling (R-PA) is reauthorizing each title of the act as a separate bill, whereas Senate Health, Education, Labor and Pensions Committee Chairman Jim Jeffords (R-VT) has decided to reauthorize ESEA as a single bill. Differences of opinion in the federal government's role in education have produced several versions of reauthorization legislation, but these different bills will have to be incorporated into a single bill later in the legislative process.

- **H.R. 2**, the Student Results Act, renews Title I of the ESEA, which includes federal programs to help educate disadvantaged children. Reps. Vernon Ehlers (R-MI) and Tom Petri (R-WI) offered an amendment that requires states to develop standards and testing requirements by 2005 for science – mathematics and reading already have similar requirements.
- **H.R. 1995**, the Teacher Empowerment Act, would allow state and local educational agencies to apply for waivers to consolidate funds from several different federal programs without having to meet the administrative goals of these programs. An amendment introduced by Reps. Ehlers and Rush Holt (D-NJ) would require that the professional development needs of science and mathematics educators are being met when applying for a waiver.
- **H.R. 2300**, the Straight A's Act, authorizes a 10-state pilot block grant program that allows local education officials to combine funds from federal education programs. To qualify, however, states would have to meet a series of academic improvement goals set by the Department of Education.
- **S. 2**, the Educational Opportunities Act, would authorize a pilot program that would permit 15 states to block grant nearly all federal funds without having to meet the specific program regulations. The bill does not include any language specifically for science and mathematics professional development.

The House Science Committee, chaired by Rep. James Sensenbrenner (R-WI), has held a series of hearings on science, mathematics, engineering and technology education as a follow-up to last year's House Science Policy Study, which was led by Ehlers, the Science Committee Vice-Chair.

Education Research

Federal funding for education research is provided primarily from the Office of Educational Research and Improvement within the Department of Education (DoEd) and the Education and Human Resources (EHR) Directorate at the National Science Foundation (NSF). For its education-related programs, NSF is requesting:

- \$760 million, an increase of \$36 million (5%) over FY2000, for EHR
- \$55.16 million, a \$6.13 million increase, for Research on Learning and Education (ROLE)
- \$15 million, same as this year, for the Interagency Education Research Initiative (IERI)

For its educational research programs, DoEd is requesting:

- \$198.6 million for educational research, an increase of \$30 million
- \$20 million for the Interagency Educational Research Initiative (IERI), double current funding

The Senate Appropriations Subcommittee on Education, Labor, and Health & Human Services, chaired by Arlen Specter (R-PA), and the House Appropriations Subcommittee on Education, Labor, and Health & Human Services, chaired by John Porter (R-IL), have jurisdiction over the DoEd budget. The Senate Appropriations Subcommittee on VA/HUD and Independent Agencies, chaired by Kit Bond (R-MO), and the House Appropriations Subcommittee on VA/HUD and Independent Agencies, chaired by Jim Walsh (R-NY), have jurisdiction over the NSF budget.

INTERSOCIETY STATEMENT ON K-12 SCIENCE & MATHEMATICS EDUCATION

(endorsed by 23 science, engineering, mathematics, and technology organizations)

The science, mathematics, engineering, and technology communities strongly urge federal policymakers to make improved student learning in elementary and secondary science, mathematics, and technology education a national priority. For the United States to sustain its economic growth and remain competitive in an increasingly global and technology-driven economy, we need to ensure that we have a scientifically and technologically literate citizenry and workforce.

Employers need workers who have critical reasoning skills and an understanding of scientific inquiry and the concepts of mathematics. To achieve this, our citizens must have a solid education in the sciences, mathematics, engineering and technology.

Empirical evidence clearly shows that quality teachers impact student learning more than anything else. Accordingly, we urge a bipartisan concerted effort that focuses on the recruitment, preparation, and professional development needs of our nation's science, mathematics, and technology education teachers. In order to improve student achievement and the quality of their education, we recommend that policymakers:

- Maintain a federal priority for the professional development activities of science, mathematics, and technology education teachers.
- Increase the federal investment in professional development programs that are intensive, long-term, content-based, and aligned with challenging national or state standards.
- Provide increased resources and incentives for the recruitment and preparation of science, mathematics, and technology education teachers.
- Encourage better coordination of efforts among federal agencies that provide significant support for improving K-12 science, mathematics, and technology education.
- Increase educational research to determine effective science, mathematics, and technology education teaching strategies and how students learn.
- Create incentives and opportunities for partnerships between the private sector, universities and colleges, industry, schools and teachers to develop quality educational programs for students and professional development



Department Of Agriculture R&D

The proposed FY2001 budget for USDA is up nearly 3% from last year to total \$64.95 billion – 74% of this is mandatory spending. Most of the basic and applied research in the agency is conducted within Research, Education, and Economics (REE), which is slated for \$2.1 billion or 3.3% of the USDA budget. Within the REE request:

- \$933 million is budgeted for the Agricultural Research Service (ARS),
- \$1.1 billion for the Cooperative State Research, Education and Extension Service (CSREES),
- \$55 million for the Economic Research Service (ERS), and
- \$101 million for the National Agricultural Statistics Service (NASS).

The National Research Initiative Competitive Grants Program (NRICGP), a CSREES base program initially authorized by Congress in 1990 at \$500 million, requested a 26% increase to total \$150 million. NRICGP funds competitive, peer-reviewed research that leads to improved understanding and direct applications to enhance agricultural productivity, environmental quality, human nutrition and food safety. The USDA budget also assumes the continued availability of \$120 million in mandatory funds for the Initiative for Future Agriculture and Food Systems (IFAFS) and of \$20 million in mandatory funds for the Fund for Rural America (both relatively new competitive grants programs within CSREES). R&D is also conducted in the Forest Service (FS) of USDA, which has requested a total of \$231 million. The budget request for FS research is \$190 million in four categories: vegetation management and protection; wildlife, fisheries, and air; resource valuation and use; and inventory and monitoring.. The FS research budget has been flat for the past two years and would remain so under the proposed budget.

Background Information

Agricultural research is vital to all Americans because scientific discoveries in this area allow us to feed the world, reduce environmental pollution, provide safe foods, improve nutrition and promote the competitive position of U.S. agriculture in the global marketplace. In spite of the significance, only about four percent of the total federal basic research budget is allocated to USDA, which supports basic and applied research through its REE budget and through ARS, as well as support within other agencies such as FS. Half of the total REE budget supports the CSREES, which allocates resources for national and regional priorities through competitive grants programs and other funding methods. The IFAFS essentially doubles the competitive grant funding available from USDA for a unique, stakeholder-based request for proposals; therefore, it is important that it be continued in FY 2001. Increases for specific programs that were requested by the President should not come at the expense of other REE programs.

Champions and Players

Senate Agriculture, Nutrition and Forest Committee	
Richard Lugar (R-IN), Chair	Tom Harkin (D-IA), Ranking Member
Senate Appropriations Subcommittee on Agriculture, Rural Development and Related Agencies	
Thad Cochran (R-MS), Chair	Herbert Kohl (D-WI), Ranking Member
House Agriculture Committee	
Larry Combest (R-TX), Chair	Charles Stenholm (D-TX), Ranking Member
House Appropriations Subcommittee on Agriculture, Rural Development, FDA, and Related Agencies	
Joe Skeen (R-NM), Chair	Marcy Kaptur (D-OH), Ranking Member



Department Of Commerce R&D

National Institute for Standards and Technology

The National Institute of Standards and Technology (NIST) is an agency of the U.S. Department of Commerce. Its primary mission is to promote U.S. economic growth by working with industry to develop and apply technology, measurements, and standards. For FY 2001, the President has requested \$713 million for NIST, an increase of about 12 percent over its FY 2000 budget of \$636 million. NIST's FY 2001 budget proposal includes the following increases:

- \$60 million to protect the nation's critical information infrastructure;
- \$14 million to help accelerate the transition to electronic commerce;
- \$46.3 million to expand the technology horizon by developing the measurements and standards necessary to advance nanotechnology and the application of combinatorial methods; and
- \$15.5 million to strengthen the science and technology infrastructure.

The NIST budget request is divided into three appropriations: 1) **Scientific and Technical Research and Services** (\$337 million), which includes the NIST laboratories that provide industry and the science and technology community with the measurement capabilities, standards, evaluated reference data, and test methods that together constitute the equivalent of a common language needed at nearly every stage of a technical activity; 2) **Industrial Technology Services** (\$340 million), which includes \$175 million for the Advanced Technology Program (ATP) – a program designed to spur private-sector investments in innovative technologies that have the potential for broad national benefit – and \$114 million for the Manufacturing Extension Partnership (MEP) – a program that strengthens the technological capability, productivity, and global competitiveness of small and medium-sized US-based manufacturers by providing access to industrial resources and expertise; and 3) **Facility Construction** (\$36 million) to repair, maintain, and upgrade NIST's facilities.

Our economic competitors are spending billions of dollars to increase their technological research potential. ATP supports market incentives and encourages companies to invest for the long-term, high-risk, high-payoff technologies. It is a cost-effective means for promoting research that strengthens US industry. By sharing at least half of the cost of research, the program encourages firms to develop technologies that they would be unable to do alone, and the cost-share requirement encourages university-industry partnerships. If US industry is to compete effectively with other nations, programs such as the ATP must have continued strong support from the federal government.

National Oceanic and Atmospheric Administration (NOAA)

In the FY2001 budget, the President has requested \$2.9 billion, a \$500 million increase, for the National Oceanic and Atmospheric Administration (NOAA), also an agency within the Department of Commerce. Approximately 20 percent of that total is allocated to R&D. The budget focuses on several administrative initiatives, including: Lands Legacy, Natural Disaster Reduction, Climate Observations and Services, South Florida Ecosystem Restoration, Minority Serving Institutions, Clean Water, and America's Ocean Future. The request for Oceanic and Atmospheric Research includes a 4% increase, totaling \$318.7 million. That request includes \$154.3 million for climate and air-quality research (up \$25.4 million), level funding of \$47 million for atmospheric research, and a \$620,000 increase for the Sea Grant Program, now up to \$59.2 million.

NOAA supports environmental assessment and prediction through research on both weather -- short-term, seasonal to interannual, and decadal to centennial -- and safe navigation. NOAA also promotes environmental stewardship through building sustainable fisheries, sustaining healthy coasts, and recovering protected species. In addition, NOAA educates the public and teachers through the National Sea Grant Program and the National Estuarine Research Service.

Champions and Players for NIST and NOAA

House Appropriations Subcommittee on Commerce, Justice, State and Judiciary	
Harold Rogers (R-KY), Chair	José Serrano (D-NY), Ranking Member
Senate Appropriations Subcommittee on Commerce, Justice, State and Judiciary	
Judd Gregg (R-NH), Chair	Ernest Hollings (D-SC), Ranking Member
House Technology Subcommittee	
Connie Morella (R-MD), Chair	James Barcia (D-MI), Ranking Member
House Fisheries Conservation, Wildlife and Oceans Committee	
Jim Saxton (R-NJ), Chair	Eni Faleomavaega (D-GU), Ranking Member
Senate Commerce, Science and Transportation Committee	
John McCain (R-AZ), Chair	Ernest Hollings (D-SC), Ranking Member

In the 106th Congress, Rep. Jim Saxton (R-NJ), introduced several pieces of legislation aimed at protecting marine and estuarine environments. A House Oceans Caucus aimed at increasing House of Representative awareness about ocean policy is co-chaired by Rep. Curt Weldon (R-PA), Rep. Sam Farr (D-CA), Rep. Jim Greenwood (R-PA), and Rep. Tom Allen (D-ME).



Department Of Defense R&D

Although R&D in the Department of Defense (DOD) increased during FY2000, it is still 25 percent below the FY1993 funding level in real dollars. Last year, Congress passed generous increases for both basic research (6.1) and applied research (6.2) allocations. In the end, 6.1 allocations received a 5.8% or \$64.6 million increase to total \$1.2 billion, and 6.2 allocations received a 6.7% or \$443.1 million increase to total \$3.4 billion. This year, the President's request includes a 4.8%, or \$104 million, increase for basic research and a 7.7%, or \$266 million, decrease for applied research to total \$3.1 billion.

The long-term erosion of DOD R&D has garnered attention on and off Capitol Hill. In 1998, the Defense Science Board (DSB) published a report warning that the Department was not investing enough in its science and technology (S&T) programs. Using the amounts invested in R&D by successful advanced technology industries as its yardstick, the DSB report recommended that DOD should invest approximately \$8 billion in S&T for FY2000. In response to concerns that defense R&D was being cut too deeply, Congress mandated in the 1999 Defense Authorization bill that the Pentagon increase defense S&T programs by 2% above inflation annually. Congress also required the establishment of an independent committee to provide oversight of Defense S&T programs.

Supporting Arguments and Background Information

The DOD basic research budget is approximately 0.5% of the total DOD budget, and until recently has not drawn much attention from members of Congress. The primary objective of 6.1 and 6.2 programs is to provide the means to develop new technologies and capabilities that can be used by the military in order to maintain a technologically superior military force. By making an investment in scientific research, DOD is able to better understand the fundamentals of the areas of science relevant to the military and also help cultivate the scientific and engineering human resources needed by the Nation. Most DOD basic research is performed in academia thus providing a major federal investment in the university research infrastructure and in future US scientists and engineers. Over 250 US universities received research funding from DOD. The Department invests in many fields and is a significant source of funding for engineering (38% of all federal funding, according to NSF publication 97-327), computer science (60%), mathematics (27%), environmental sciences (18%), physical sciences (12%), cognitive sciences (8%), and the life sciences (2%).

Champions and Players

House Appropriations Subcommittee on Defense	
Jerry Lewis (R-CA), Chair	John Murtha (D-PA), Ranking Member
House Armed Services Subcommittee on Military Research and Development	
Curt Weldon (R-PA), Chair	Owen Pickett (D-VA), Ranking Member

Last year, a bipartisan-bicameral group of 76 House members and 20 senators urged the President to increase spending for DOD R&D by at least 2% in his budget proposal for FY2001. The group was led by Senators Jeff Bingaman (D-NM) and Pat Roberts (R-KS) and Representatives Tony Hall (D-OH) and Sherwood Boehlert (R-NY).



Department Of Energy R&D

The Department of Energy's (DOE) R&D budget would increase by 9 percent to \$18.9 billion in the President's FY2001 request, with 40 percent, or \$7.6 billion, going to research and development. DOE's Office of Science would increase 12 percent to \$3.1 billion with the largest increase going to Advanced Scientific Computing Research, up 42 percent. The only other sizable increase would go to the Basic Energy Sciences (BES), which is marked for a 30 percent increase. Like last year, the BES budget is asking for a major increase (138.3 percent) to build the Spallation Neutron Source (SNS). Last year's funding request for SNS was denied by Congress, and FY2000 funding was cut by almost 50 percent. Most other science program increases are linked to presidential initiatives on nanoscale science, high performance computing, microbial genome research, climate change research and technology, and robotics and intelligent machines.

Defense-related R&D would increase 3.1 percent to \$3.4 billion. Language from the FY2000 National Defense Authorization Act formed the National Nuclear Security Administration (NNSA). NNSA is a semi-autonomous agency within DOE that took over its defense missions on March 1st.

Supporting Arguments

Since its creation, the Department of Energy has sought to study and develop energy resources for a country whose population and economy continue to place demands on its fuel supply. Reliable and affordable fuel sources are essential for the United States to safeguard national security, to support a high quality of life, to increase productivity, to improve economic competitiveness, and to protect the environment. Businesses and manufacturing are tremendous consumers of energy, and they require a steady flow of it in order to remain viable in a dynamic world market. These energy demands continue our dependence on foreign oil as an energy source. To assure a reliable and affordable energy supply, we must have a balanced portfolio of energy technologies. Advanced fossil fuels, nuclear fission and fusion, solar and renewables are all important R&D efforts to explore and exploit.

A 1998 report by the President's Advisory Council on Science & Technology (PCAST) on the future of Energy R&D stated: "For reasons of economy, environment, security, and stature as a world power alike, the United States must maintain its leadership in the science and technology of energy supply and use."

DOE's national laboratories are widely regarded as the jewels in the Nation's R&D enterprise. They have received more R&D 100 Awards than any other private or public organization. Nonetheless, with the end of the Cold War, analysts have argued that the national laboratory system is now underutilized.

Champions and Players

House Appropriations Subcommittee on Energy & Water Development	
Pete Domenici (R-NM), Chair	Harry Reid (D-NV), Ranking Member
Senate Appropriations Subcommittee on Energy & Water Development	
Ron Packard (R-CA), Chair	Peter Visclosky (D-IN), Ranking Member

Domenici, a founding member of the bipartisan Senate Science and Technology Caucus and chair of the Energy and Water Appropriations Subcommittee, is regarded by his colleagues as one of the most forceful advocates of scientific research throughout government. His state is home to two DOE weapons laboratories, Los Alamos and Sandia, but his support for the department goes much deeper than its defense programs.



Department of the Interior R&D

The vast majority of Interior's research is conducted by the U.S. Geological Survey (USGS), for which the President has requested \$895 million, an increase of \$82 million over FY2000. This is the largest increase the USGS has ever requested. All four divisions would receive new money with the largest amount going to the National Mapping Division, up \$28.6 million or 22.5%. The Biological Resources Division request is up \$21.9 million or 16%. The Geologic Division request is up \$13.6 million or 6.4%, and the Water Resources Division request is up \$11.8 million or 6.3%. USGS Director Chip Groat emphasized at the budget release that the bulk of the increases are focused on the Survey's core activities, a focus that should sit well with Congress, which has criticized the Administration in recent years for taking USGS in new directions at the expense of core functions.

Although USGS is the sole science-oriented agency within DOI, other Interior agencies, such as the Minerals Management Service (MMS) and the National Park Service, do fund small amounts of R&D. Resource Stewardship at the National Park Service supports a few R&D projects related to the Natural Resources Challenge, a five-year action plan for improving resource management at parks.

Supporting Arguments

With no regulatory or management functions, the USGS is the principal source of independent scientific data on the nation's fresh water, natural hazards, and energy and mineral resources. Research conducted by USGS generates information needed to reduce risks to people from environmental hazards such as earthquakes and floods. It also helps find solutions to challenging environmental problems ranging from drinking water quality to the management of natural resources. The USGS also monitors the nation's supply of water, energy, and mineral resources. USGS research is critical to proper management of the 650 million acres of land managed by the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and Bureau of Land Management, and is increasingly used by state and local planners across the country. The Biological Resources Division is comprised of the research scientists from the DOI natural resource and land management agencies who first formed the National Biological Survey, later re-named the National Biological Service, and eventually became part of USGS in 1994.

Champions and Players

House Appropriations Subcommittee on Interior & Related Agencies	
Ralph Regula (R-OH), Chair	Norm Dicks (D-WA), Ranking Member
Senate Appropriations Subcommittee on Interior & Related Agencies	
Slade Gorton (R-WA), Chair	Robert Byrd (D-WV), Ranking Member
House Resources Committee	
Don Young (R-AK), Chair	George Miller (D-CA), Ranking Member
Senate Energy and Natural Resources Committee	
Frank Murkowski (R-AK), Chair	Jeff Bingaman (D-NM), Ranking Member



Department of Transportation R&D

The FY2001 request would provide \$1.66 billion in R&D funding, a 3.2 percent increase over FY2000. Some key projects:

- **Intelligent Transportation Systems (ITS)** would receive \$338 million, an increase of \$154 million (83%), to support the development of technologies to enhance the safety and efficiency of surface transportation infrastructure.
- **University transportation** research would receive \$27.2 million, up \$3.5 million (14.8%).
- **Next Generation High-Speed Rail** research would decrease \$5.1 million (23%).
- DOT's share of the **Partnership for a New Generation of Vehicles**, a multi-agency program, would go from no funding in FY2000 to \$3.5 million this year.
- The **National Transportation Biomechanics Research Center**, which researches vehicle safety features such as anti-lock braking systems and light- and heavy-vehicle rollover avoidance, would receive \$23.1 million, up 75% over the FY2000 level of \$13.2 million.
- **Aviation** research within the FAA -- in area such as aircraft structures and materials, explosive detection technologies, and other security initiatives -- would increase 18%, to \$184 million.
- **Transit** research, including fuel cells and battery-powered propulsion, hybrid electric buses, and demonstration of bus rapid transit, would increase \$3 million, to \$110 million for FY2001.

Those CVD participants visiting representatives who are members of the House Transportation and Infrastructure Committee or the Senate Commerce, Science, and Transportation Committee, should request support for the full amount of transportation R&D funding requested by the administration and authorized by the Transportation Efficiency Act for the 21st Century (TEA-21) bill (see below).

Background

In 1998, Congress passed and the President signed TEA-21, a landmark transportation bill that authorizes approximately \$214 billion over the next 6 years for highway and transit projects nationwide. It is important to remember that TEA-21 is an authorization bill, **not** an appropriations bill. The amounts authorized by the law must be appropriated by the requisite appropriations subcommittees each year in order for the money to flow to the states. The key issues for 2000 are:

- Whether the transportation authorizing and appropriating committees will agree with the President that \$1.3 billion in unexpected gas tax receipts should be diverted to other transportation areas, such as rail and traffic safety, rather than going to the states for highway projects, as required by the provisions of TEA-21.
- Whether the House and Senate Appropriations Committees will follow TEA-21 authorizations for transportation programs, or whether they will increase or decrease them.

Champions and Players

House Appropriations Subcommittee on Transportation and Related Agencies	
Frank R. Wolf (R-VA), Chair	Martin Olav Sabo (D-MN), Ranking Member
Senate Appropriations Subcommittee on Transportation and Related Agencies	
Richard Shelby (R-AL), Chair	Frank Lautenberg (D-NJ), Ranking Member



National Aeronautics and Space Administration

The President has requested \$14.0 billion for NASA in FY2001, of which AAAS estimates \$10.0 billion would go for R&D (up 2.9 percent from enacted FY2000 levels). The International Space Station requested close to \$2.1 billion, a 9% decrease from last year. The Space Science Enterprise is marked for a 9% increase, or \$2.4 billion, over last year. Life and Microgravity Sciences and applications would receive \$302 million (up 10.1%). The Earth Science Enterprise is down \$37.6 million or 3% from FY2000 for a total of \$1.4 billion. Aero-Space Technology, after years of cuts, would enjoy a 6.1% increase for a total budget of \$1.2 billion, including a \$107 million boost (to \$290 million) for development work on reusable launch vehicles.

With the recent failures of the Mars Climate Orbiter and Mars Polar Lander spacecraft, Congress is taking a very close look at how NASA operates its planetary exploration program. Reports from various review boards are due out in mid-March. Congress is also continuing to keep a close eye on the International Space Station. Congress likes the visibility of NASA in the media and understands—for the most part—that science missions are necessary to generate both public interest and exciting scientific results; human presence in space is not enough. This is reflected in the shifting balance of expenditure within NASA.

Supporting Arguments

NASA's support for basic scientific research has stretched the vistas of imagination, expanding our knowledge of the solar system and the universe -- answering questions and creating new ones. NASA has developed a strong strategic plan that continues to guide the agency in fulfilling its mission. Well-balanced and vigorous civil aeronautics and space programs are critical for advancing science and technology and for improving economic competitiveness. Investments in civil aerospace R&D help to maintain our leadership in the modern world. Support for Earth Science programs has allowed us to improve our understanding of our own planet, including its weather, atmospheric, oceanic and geophysical processes. NASA is one of the most liked Federal agencies by the American public.

Champions and Players

House Science Committee	
James Sensenbrenner (R-WI), Chair	Ralph Hall (D-TX), Ranking Member
Dana Rohrabacher (R-CA), Space Subcmte. Chair	Bart Gordon (D-TN), Space Subcmte. Ranking Member
House Appropriations Subcommittee on VA/HUD & Independent Agencies	
James Walsh (R-NY), Chair	Alan Mollahan (D-WV), Ranking Member
Senate Appropriations Subcommittee on VA/HUD & Independent Agencies	
Christopher Bond (R-MO), Chair	Barbara Mikulski (D-MD)*

* Sen. Mikulski remains one of the strongest voices for NASA and especially the Goddard Space Flight Center, which is the center for all earth-science programs, including ESE.



National Institutes of Health

Congressional support for NIH continues to be strong, as demonstrated by the 14% increase afforded NIH in FY2000. In addition, the continued bipartisan commitment of several leading members of Congress to double NIH support by FY 2003 continues.

For FY2001, the Administration has proposed a 5.6% increase for NIH, considerably more than last year's initial proposed increase of 2.1% (which was drastically increased by Congress). Still, this is a low starting point for budget negotiations, and falls considerably short of the goal of many Members of Congress to double NIH funding within a five-year period. In a February 7th press release, Senator Arlen Specter (R-PA), chairman of the Senate Appropriations Labor-Health & Human Services (LHHS) Subcommittee, announced plans to introduce a budget resolution which would increase NIH funding in FY2001 by \$2.7 billion, the smallest amount necessary to keep funding doubling on track. The rapid increase in support for NIH may now serve as a liability as budget cutters search everywhere for possible savings. Some members of Congress are also skeptical about the ability of NIH to manage large funding increases.

Meanwhile, inconsistent federal support could hinder NIH in its effort to effectively plan its grants portfolio. In the Administration's proposal, the number of research project grants (competitive, investigator-initiated, peer-reviewed grants supporting basic medical research) is estimated to decrease. Some may argue that the Administration's request does not sufficiently provide for inflationary increases for research project grants recipients. The budget proposal provides increases at a rate below the Biomedical Research and Development Price Index of 3.6 percent inflation -- at an average of 2%. This is a cause for concern among many congressional Members who strongly support NIH funding.

Supporting Arguments

NIH-supported basic research is the foundation of our nation's healthcare effort. Such research provides a basis not only for improved health and well-being, but also for economic savings and enhanced global competitiveness. (Examples include billions of dollars in savings from the test of transfusion blood for AIDS, and the positive balance of trade of the pharmaceutical and biotechnology industries.) If the dramatic advances of the last decade are to continue, this research must receive adequate and stable support. It should also be noted that 82% of the research funds for NIH go to its extramural programs which support research at universities and medical schools across the country.

Champions and Players

Senate Appropriations Subcommittee on Labor, Health & Human Services, Education	
Arlen Specter (R-PA), Chair	Tom Harkin (D-IA), Ranking Member
House Appropriations Subcommittee on Labor, Health & Human Services, Education	
John Porter (R-IL), Chair	David Obey (D-WI), Ranking Member

Other champions include Senator Barbara Mikulski (D-MD), in whose state NIH is located, Rep. Connie Morella (R-MD), in whose district NIH is located, and Sen. Connie Mack (R-FL), who co-chairs the Senate Cancer Coalition.



National Science Foundation

For FY2001, the President has requested \$4.57 billion for NSF, a \$675 million or 17.3% increase over FY2000 appropriated levels. The \$675 million increase will be divided between core disciplinary research (\$320 million) and four focused initiatives (\$355 million): information technology research (\$180 million), nanoscale science and engineering (\$69 million), biocomplexity in the environment (\$66 million), and 21st century workforce (\$40 million). An additional \$135 million will be re-allocated to these focused initiatives from the NSF base budget. The Research and Related activities account will increase to \$3.54 million in this year's request.

Supporting Arguments

- Basic research provides the knowledge base needed for the Nation to realize its full scientific and technological potential. NSF-funded basic research contributes to the underpinnings and vitality of the scientific and engineering fields, provides education and training to the Nation's science, mathematics, and engineering students, and supplies the fuel that drives today's technological innovation.
- Scientific discoveries emanating from basic research have had a colossal impact on technology development. Fields such as magnetic resonance, superconductivity, lasers, antibiotics, and transistor action have given rise to many new industries. New ideas and technologies will grow out of current and future research.
- Not only does NSF fund important scientific discovery but also how to educate people to apply these discoveries appropriately – keeping the knowledge continuum growing. Federal support for science and mathematics education helps to ensure a scientifically literate workforce, and well-trained scientists and engineers for the future. NSF's education programs are especially important because they are innovative in approach and designed to have a broad impact on teachers and students alike.
- NSF-supported research is vital to maintaining leadership across the frontiers of scientific knowledge. Prior investments have resulted in unparalleled discoveries and unprecedented scientific strength. This scientific strength is a national resource and must be maintained.

Background Information

This year marks the 50th Anniversary of the Foundation and its support of science research. NSF is the fifth-largest source of research funding in the federal government and is the sole federal agency tasked with maintaining the health of basic research and science education. The Foundation funds research and education in the sciences and engineering through peer-reviewed grants and cooperative agreements to more than 2000 colleges, universities, K-12 schools, businesses, and other research institutions. Approximately 10,000 new grant awards are supported each year and during any given year approximately 20,000 awards support almost 200,000 people. NSF also invests in many large, multi-user, state-of-the-art research facilities that are vital to the progress of research in many areas of science.

Champions and Players

Most members of Congress readily acknowledge that federal support for basic research and education is important, particularly for the programs supported through the NSF. However, no member of Congress is a true champion for the NSF. The lack of a strong advocate for NSF has prevented the agency from receiving substantial increases to its budget over the last several years. This current increase of \$675 million is the largest ever requested for NSF.



APPENDIX

AAAS Preliminary Analysis of R&D in the FY 2001 Budget