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February 22, 1995

John H. Gibbons
Assistant to the President for
Science & Technology
Office of Science Technology Policy
Old Executive Office Building
17th St. & Pennsylvania Ave., NW
Washington, DC 20500

Dear Jack:

The Council has just released its assessment of the President's FY 1996 Budget. I thought you would be interested in our analysis since it is supportive of the direction the Administration is taking.

Please let me know if you have any comments.

Best regards,



Daniel F. Burton, Jr.
President

\Enclosure

cc: Lionel Johns

B-6-95
STATEMENT ON R & D
Policy & Competitiveness
is enclosed.

JHG

AD's

APD

TU

HG

Schneider
Gillman

FOR IMMEDIATE RELEASE
February 14, 1995

CONTACT: Brenda Siler or
David Goldston at
(202) 682-4292

**COUNCIL ON COMPETITIVENESS GIVES ITS ASSESSMENT OF
THE PRESIDENT'S FY 1996 BUDGET**

WASHINGTON -- The President's plan to minimally increase the amount of dollars that would be allocated for basic research and programs in which industry and government work together to achieve national goals positively supports R&D says the Council on Competitiveness as it reviewed the Administration's budget. With deficit reduction a primary goal, the Council recognizes the commitment by the Administration to make investments that ensures the nation's long-range economic health.

Based on the Council's assessment of FY 1996, civilian research would continue to increase, while military research declines; basic and applied research would continue to grow, while spending on development drops.

"The value of basic research aimed at ensuring industrial competitiveness, and research on dual-use technologies remain central themes," says Dan Burton, Council president. "The Council has long endorsed these budgeting trends."

The Council acknowledges that although the President's budget approach is consistent with the recent past, because of the changes in the make up of the Congress, the budget submission sets the stage for a significant debate over the direction of federal R&D policy.

The Council went on to say that even if the President's budget were approved intact, more would need to be done to improve the climate for R&D in the United States.

"Any successful R&D policy would have to address not only spending, but tax and regulatory reform as well," said Burton. "The Council believes the President should move

Budget Assessment/Add One

swiftly to recommend the elimination of regulations that unnecessarily encumber R&D and investment in new technology and the enactment of tax reforms and incentives that stimulate private R&D."

The Council highlights these specific aspects of FY 1996:

*The Council continues to endorse shifting R&D funds toward civilian R&D to ensure the competitiveness of the American economy.

*The Council endorses the emphasis on basic research, which is necessary to maintain both the long-range viability of American industry and the strength of research and training in America's universities.

*The Council supports the priority given to programs that emphasize the creation of research partnerships and achievement of strategic objectives.

*The Council continues to believe that ^{ANY} my successful R&D policy must include regulatory and tax reforms that promote private sector investments in R&D, as well as continuing federal investments in R&D.

The Council on Competitiveness is a private-sector coalition of chief executive from leading businesses, organized labor and higher education whose goal is to improve the ability of U.S. industry and its workers to compete in world markets in a way that builds a rising standard of living at home.

Editor's Note: A complete copy of the Council's *Competitiveness Assessment of the President's FY 1996 R&D Budget* is attached.

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*A Competitiveness Assessment
of the President's
FY 1996 R&D Budget*

*Council
on
Competitiveness*

February 1995

HIGHLIGHTS

- Federal spending for R&D would remain relatively flat at \$73 billion in FY 1996, but the share of the R&D budget devoted to civilian and dual-use technology would increase to 51 percent. **The Council supports this shift and continues to endorse returning to an R&D budget more evenly balanced between civilian and defense R&D to ensure the competitiveness of the American economy.**
- Funding for basic research would increase by 3.5 percent, while applied research would grow by less than 1 percent and development would decline by almost 1 percent. **The Council endorses this emphasis on basic research, which is necessary to maintain both the long-range viability of American industry and the strength of research and training in America's universities.**
- Funding would increase substantially for programs that encourage government, industry and academia to work together on research of direct relevance to the economy. **The Council supports the priority given to programs that emphasize the creation of research partnerships and the achievement of strategic objectives.**
- The budget does not include an R&D tax credit or any other tax incentives to promote R&D. **The Council continues to believe that any successful R&D policy must include regulatory and tax reforms that promote private sector investments in R&D, as well as continuing federal investments in R&D.**

SELECTED AGENCY R&D BUDGETS

The Administration would continue to increase R&D funding for key technology agencies and programs in FY 1996 (see table 3).

TABLE 3

	FY93 Actual	FY95 Estimated	FY96 Proposed	% Change FY95-96
Agency R&D (Budget Authority, \$ millions)				
NIST	279	784	938	19.6%
NSF Research and Related Activities	2,046	2,280	2,454	7.6%
NIH Biomedical Research	10,326	11,321	11,789	4.1%
Department of Energy	6,896	6,637	7,125	7.4%
NASA	8,873	9,455	9,517	0.7%

The Administration remains committed to R&D programs at the National Institute of Standards and Technology (NIST), proposing a \$154 million, or 20 percent, increase over last year's levels. The new funding would benefit both extramural activities at NIST, such as the ATP and the Manufacturing Extension Partnership (MEP), and intramural research. NIST's core laboratory programs would receive substantial increases: electronics and electrical engineering, up 27 percent to \$45.1 million; computer systems, up 26 percent to \$46.7 million; building and fire research, up 48 percent to \$19.5 million; and applied mathematics and scientific computing, up 51 percent to \$32.3 million; among others.

The National Science Foundation's (NSF) budget for Research and Related Activities would reach nearly \$2.5 billion in FY 1996, up 7.6 percent from this year. Although NSF accounts for only 3 percent of total Federal R&D spending, it provides nearly one-half of all federal support for non-medical basic research performed by colleges and universities and roughly 30 percent of total Federal support for science, mathematics, engineering and technology education.

NSF support for equipment and facilities grants, on the other hand, would drop to \$100 million in FY 1996 from \$118 million. The budget of the agency's Education and Human Resources directorate, which focuses primarily on pre-college education, would also be cut, falling to \$599 million from almost \$606 million.

Biomedical research funded by the National Institutes of Health would increase by 4 percent in FY 1995 to reach \$11.8 billion. The new budget authority would fund growth in basic biomedical research as well as targeted increases for HIV/AIDS-related research, women's health research, minority initiatives, high performance computing, environmental cancer research and gene therapy.

After no growth last year, Department of Energy (DOE) funding of R&D would climb again with a proposed 7.4 percent increase to \$7.1 billion in FY 1996. Approximately \$100

INDUSTRY-GOVERNMENT PARTNERSHIPS

The FY 1996 budget reaffirms the Clinton Administration's commitment to building stronger links to the private sector through cooperative technology programs with industry (see table 4).

TABLE 4

	FY93 Actual	FY95 Estimate	FY96 Proposed	% Change FY95-96
Budget Authority (\$ in millions)				
Advanced Technology Program (ATP)	68	431	491	14%
Technology Reinvestment Project (TRP)	472	443	500	13%
Manufacturing Extension Partnership (MEP)	18	91	147	62%
Technology Transfer Investment	NA	1,611	1,768	10%

After record growth last year, the Advanced Technology Program (ATP) would grow 14 percent to reach \$491 million in FY 1996. The \$60 million in new budget authority is expected to support one general competition and one new focused competition. To date the program has run focused competitions for research on manufacturing composite structures, component-based software, computer-integrated manufacturing for electronics, information infrastructure for health care and tools for DNA diagnostics. The Administration has stated that it intends to expand the ATP budget to \$750 million by FY 1997, but the current rate of growth does not seem to be keeping pace with this goal.

NIST's Manufacturing Extension Partnership (MEP) would grow by more than 60 percent to \$147 million in FY 1996. The program provides information and assistance to small- and medium-sized manufacturers. New funding would be used to start 10 new centers and to take over funding for 22 centers originally supported by the TRP. With 44 centers in 32 states already in place, the Administration is well on its way to achieving its goal of 100 centers by FY 1998.

The inter-agency Technology Reinvestment Project (TRP) administered by the Advanced Research Projects Agency (ARPA) would grow from \$443 million to \$500 million in FY 1996. The program is a key element of the Administration's effort to promote the development of dual use technologies.

Investment in technology transfer by federal agencies would reach \$1.8 billion in FY 1996, a 10 percent increase over FY 1995 levels. The number of cooperative research and development agreements (CRADAs) between industry and the federal labs would also increase from 6,093 to 6,816. The total cash and non-cash value of the CRADA investments, including both public and private sources, is expected to reach \$5.8 billion in FY 1996.

$$\div 2 = 2.9 \text{ B. each}$$

ABOUT THE COUNCIL

Founded in 1986, the Council on Competitiveness is a nonprofit, nonpartisan organization of chief executives from business, higher education and organized labor who have joined together to pursue a single overriding goal: to improve the ability of American companies and workers to compete in world markets while building a rising standard of living at home.

To build consensus within the public and private sectors on the actions needed to help Americans compete, the Council pursues a three-part agenda: increase public awareness of the breadth and severity of America's economic problems; mobilize the political will required to set the United States on a positive economic course; and assist in the development of specific public policies and private-sector initiatives. To that end, the Council focuses on issues in the areas of fiscal policy, science and technology, international economics and trade, and human resources.

The Council is governed by an executive committee and draws on the resources of its national affiliates — over forty trade associations, professional societies and research organizations — to help analyze issues and develop consensus. The Council is privately supported through contributions from its members, foundations and other granting institutions.



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STATEMENT ON R&D POLICY AND COMPETITIVENESS

As the 104th Congress begins its historic work, efforts to promote research and development (R&D) should be high on the agenda.

In fashioning R&D policy, the Congress should keep in mind three fundamental principles.

First, science and technology are key to the nation's economic growth. Economists attribute the unprecedented productivity growth of the United States during the post-World War II period to its strength in research and development -- a conclusion borne out by the continuing global competitiveness of such American industries as telecommunications, computers, financial services, pharmaceuticals, chemicals, textiles, aerospace and agriculture. No program to improve the standard of living and quality of life of the American people can succeed without ensuring the nation's continued leadership in science and technology.

Second, the government has a central role to play in ensuring that the United States maintains that leadership. This principle has long been a subject of bipartisan agreement. The federal government has contributed to the nation's success in science and technology in numerous ways since World War II. It has financed about half the nation's research, supporting work in universities, corporations and government laboratories. It has promoted science education, university facilities and advanced telecommunications, putting in place the

groundwork for a thriving R&D enterprise. And it has spearheaded work to accomplish national missions, such as exploring space, improving health and maintaining national security, that, in turn, have sparked industrial innovation and increased productivity.

Third, government, industry and academia must work together in an active partnership for science and technology to move forward. Merely continuing 50-year-old R&D policies will not be enough to succeed in an era of global competition. In recent years, Republican and Democratic administrations, working with the Congress, have begun to frame a joint R&D policy for the post-Cold War world based on this notion of cooperation. We need to build on that foundation.

To promote cooperation, government must help create a tax and regulatory environment in which R&D can flourish. The new Congress should ensure that tax laws help increase the availability of long-term, patient capital; that regulations stimulate rather than stifle the R&D efforts of industry and universities; and that intellectual property receives adequate protection.

Government must also see that its own R&D dollars are spent in a way that enhances the long-term competitiveness of the United States. At a time when both federal and corporate budgets are under stress, this is more important than ever. The new Congress should support programs that provide incentives for private partners to pool their R&D capital and expertise to invest in long-term and riskier projects.

The private sector must continue to do its part as well. Industry has begun to focus its R&D on improving manufacturing and market performance. Universities are revamping their curricula and research programs to improve the nation's productivity. These efforts must be sustained and strengthened.

The new willingness of government, industry and academia to work together has already born fruit. The 1994 Critical Technologies Update recently published by the Council on Competitiveness showed that the United States has begun to regain its edge in a wide range of technologies. But a Council survey also found that most American business, labor and academic leaders believe that the nation's greatest competitiveness challenges still lie ahead.

The need to respond to this continuing challenge -- some might say "threat" -- must guide Congressional action in the first 100 days, and beyond. No new agenda, no new program, no new policy will succeed over the long term if it undercuts the ability of the United States to innovate and compete. We urge the Congress to move swiftly to eliminate regulations that unnecessarily encumber R&D and investment in new technology; to enact tax reforms and incentives that stimulate private R&D; and to continue to support federal R&D investment that enhances the nation's competitiveness and encourages cooperation among the government, industry and academia. We stand ready to work with the Congress to develop a comprehensive R&D strategy that includes all three of these elements.

Signatories to Statement on R&D Policy and Competitiveness

Ernest Mario
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John R. Stafford
Chairman, President and
Chief Executive Officer
American Home Product Corporation

Richard C. Notebaert
Chairman and Chief Executive Officer
Ameritech Corporation

Joel Marvil
Chairman and Chief Executive Officer
Ames Rubber Corporation

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Chairman of the Board and Chief
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Analog Devices, Inc.

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Convex Computer Corporation

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Corning Incorporated

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Henry B. Schacht
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Alan Magazine
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Health Industry Manufacturers Association

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President and Chief Executive Officer
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Peter Likins
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National Center for
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William Ferguson
Chairman and Chief Executive Officer
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Charles M. Pigott
Chairman and Chief Executive Officer
PACCAR Inc

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Pacific Telesis Group

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Chairman and CEO
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The Procter & Gamble Company

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W.R. Timken, Jr.
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The Timken Company

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President and Chief Executive Officer
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As of January 17, 1995

FAX TRANSMITTAL

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January 5, 1995

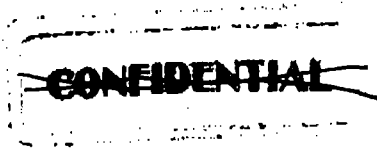
TO: Skip Johns

FAX: 456-6023

FROM: Dan Burton

OF PAGES: 4 (including cover page)

RE: Statement on R&D Policy and Competitiveness



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To promote cooperation, government must help create a tax and regulatory environment in which R&D can flourish. The new Congress should ensure that tax laws help increase the availability of long-term, patient capital; that regulations stimulate rather than stifle the R&D efforts of industry and universities; and that intellectual property receives adequate protection.

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Council on Competitiveness

AGENDA

ANNUAL MEETING

November 15-16, 1994

The Ritz-Carlton Hotel
2100 Massachusetts Avenue, N.W.
Washington, D.C.
(202) 293-2100

Tuesday, November 15, 1994

6:30 p.m. - 7:30 p.m. Reception
 Ballroom Foyer

7:30 p.m. DINNER
 Ballroom

Panel: "Competitiveness and the 1994 Election Results"

Moderator: Christopher Matthews,
 San Francisco Examiner

Charles Cook, Cook Political Report
Frank Luntz, Luntz Research Companies

Wednesday, November 16, 1994

7:30 a.m. - 8:30 a.m. BREAKFAST
 Ballroom
 Speaker: Stanley Greenberg, Greenberg Research

8:30 a.m. - 8:45 a.m. Chairman's Update
 Paul Allaire

8:45 a.m. - 9:00 a.m. BREAK

- over -

Wednesday, November 16, 1994 (Cont.)

9:00 a.m. - 10:00 a.m. The Honorable John Deutch
Deputy Secretary of Defense

10:00 a.m. - 11:15 a.m. Panel: "1994 Competitiveness Assessment"

Moderator: Steve Pearlstein
The Washington Post

Thomas Everhart, President
California Institute of Technology

Jack Sheinkman, President
Amalgamated Clothing & Textile Workers Union,
AFL-CIO, CLC

William Steere, Chairman and CEO
Pfizer Inc

William Reinsch, Undersecretary of Commerce
for Export Controls

11:15 a.m. - 12:15 p.m. The Honorable Leon Panetta
White House Chief of Staff

12:15 p.m. - 12:30 p.m. Closing Remarks and Adjournment
Paul Allaire

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LESSONS FROM THE BATTLEFIELD

By Dr. Frank I. Luntz

Every election cycle has its share of *lessons*, but this year the rules of engagement have fundamentally changed. A tidal wave of anger has swept out dozens of incumbents who failed to heed its warnings, and swept in the Republican Party with its commitment for bold, dramatic change.

With the events of yesterday still fresh, I offer the following as a guide to the New Politics, which history will record as having been born on November 8, 1994.

1. *No incumbent is safe anymore.* A (modern) record of Democratic incumbents went down this time, including such so-called "safe" veterans as Dan Rostenkowski (IL), Jim Sasser (TN), Jack Brooks (TX) and House Speaker Tom Foley (we think). But newly-elected representatives had best keep an eye on the rear-view mirror. The winds of change will not die so quickly.
2. *Bringing home the bacon does not bring home the votes.* "Pork barrel politics" was killed last night. Federally subsidized roads, bridges and buildings no longer assuage an angry national electorate. Just ask the four individuals mentioned above, and dozens of others. The voters have awakened to the shell game: send a cake to Washington and you get crumbs in return.
3. *Being one of US is better than being one of THEM.* By running Congress for most of their lifetimes, the Democrats became **THEM**, the symbol of what was wrong with Washington. Sure, Republicans did capitalize on the anti-Washington mood, but in their style and message they became *one of us*. In marginal seats it would have been better to be a used car salesman than an incumbent Democrat.
4. *A "checkered shirt" beats an Armani suit.* The folksy, checkered shirts of Fred Thompson (TN) and Mike DeWine (OH) was much preferred to the stuff-shirted image of their opponents. When Republicans dress down, and when they listen and serve as the voice of the people, they win.
5. *Concerns about morality have displaced pocketbook issues.* Whether measured by polling data or paid advertising space, politicians of all stripes were talking values and virtues first, crime second, and economic concerns a distant third.

(Thanks to a strategic blunder committed by DCCC head Vic Fazio in attacking religious conservatives, the Republican Party has successfully united social and economic conservatives under one umbrella.)

6. **Traditional ideological labels are dying.** While Americans have clearly embraced conservative principles over their liberal alternatives, they hate labels or being labeled themselves. They want to pick from a buffet of options and solutions which respond to changing priorities rather than from a pre-set ideological menu.
7. **Partisanship is a loser.** Voters may currently prefer Republicans over Democrats, but a growing percentage would rather cast stones than ballots for either. Running as a Democrat was a serious vote drag, and running away from president Clinton was virtually impossible for those who had super-glued themselves to him early on. Republicans were merely the natural beneficiaries.
8. **Anger has replaced fear as the premier political emotion.** Over the past ten years, politicians were most successful when they relied on fear to motivate voters. From Social Security (a Democratic scare tactic) to Willie Horton (a Republican ploy), these scare tactics worked. But the politicians have cried “wolf” too often. Yesterday, the electorate was more interested in **punishing** the Democrats in power than **protecting** themselves from the Republicans and their policies.
9. **Voters want to believe again.** *Ideas* moved the Republicans from minority to majority status, but it could not have happened without the angry public mood. The public is demanding a bold, forward-looking agenda, and they expect it to come from the Republicans in Congress rather than the President. If the GOP delivers, a long-term majority will be theirs.
10. **The Republican “Contract with America” is the most significant story of 1994.** The Contract was not some campaign gimmick. With its non-partisan tone and issue specificity, the Contract has redefined the way national campaigns are run, and it will soon redefine the way Congress itself runs. This document is for real because the commitment to fulfilling the Contract is for real. The public will learn this on January 4, 1994.

* * * * *

For months, pundits and prognosticators called this election a referendum on the first two years of the Clinton presidency. But it was so much more than that. It was a referendum on 40 years of single party control of the one American institution which has promised the most and delivered the least. Last night was a public scream to change the entire way Washington does business.

Two years ago today, pundits were writing the obituary of the GOP. Today, it is Washington that appears on the obituary columns. This year, voters threw out the players, and drafted a "new" Congress to change the way the game is played. If they fumble once or twice, they will be forgiven. But if they sit on the sidelines and refuse to play, the American people will make sure the new Members don't make the next cut.

Last night, voters gave the Republicans a mandate and sent them a message: listen, learn and lead. Now do it.

DINNER PANEL MODERATOR BIO

CHRISTOPHER MATTHEWS

Christopher Matthews is Washington Bureau Chief for the San Francisco Examiner and evening news anchor for the new NBC cable network *America's Talking*. He is also a nationally syndicated columnist for Tribune Media Services and political commentator on ABC's *Good Morning America*. Matthews wrote the best-selling book Hardball, a primer on the world of inside politics that has become assigned reading at universities throughout the country.

He honed his political skills through a long career as aide to Senator Edmund Muskie, speechwriter for President Jimmy Carter and, from 1981 through 1986, as Spokesman for Speaker of the House Thomas "Tip" O'Neill, Jr. Matthews has been a frequent book reviewer for The New York Times, The Washington Post, The Boston Globe, and The Los Angeles Times. He contributed for several years to The New Republic and is currently completing a book on the politics of the Cold War. He is a graduate of Holy Cross and studied economics at the University of North Carolina graduate school.

DINNER PANELIST BIOS

CHARLES COOK

Charles Cook is Editor of The Cook Political Report and President of Cook & Company, a Washington-based political analysis firm. The Cook Political Report analyzes American politics, particularly elections for the U.S. Senate and House and President, for almost 500 subscribing corporations, trade associations, labor unions, as well as foreign governments and government agencies.

Widely recognized as one of the nation's leading authorities on U.S. politics and elections, Mr. Cook has appeared on the ABC, CBS, CNN and NBC evening news, ABC's "Good Morning America", "Nightline" and "This Week With David Brinkley, on NBC's "Today Show" and "Meet the Press", and served in 1990 and 1992 as a consultant to CBS News for their election night coverage.

In a poll by the Kamber-O'Leary Report, Mr. Cook was ranked as one of the top six "Best Political Pundits". Mr. Cook is a graduate of Georgetown University.

DR. FRANK LUNTZ

Dr. Frank Luntz is President of The Luntz Research Companies, Inc, a leading survey research firm. Prior to forming Luntz Research, he was president of the survey research and consulting firm Luntz Weber Research. Dr. Luntz played a key role in formulating the Republican Party's "Contract With America". Some of his clients include the Presidential campaign of Ross Perot, the Reform Party of Canada, the Governor of Puerto Rico, The British Broadcasting Company, and The New York Post. The Washington Post honored him with their "Crystal Ball" award for being the most accurate pundit in 1992. Business Week pronounced him one of "Campaign 1992's Top Research Minds", and Campaigns and Elections named him one of the "50 Rising Stars" of his profession.

Dr. Luntz has been a guest on *Nightline*, *Crossfire*, *Inside Politics*, *McNeil Lehrer*, and *The Today Show*. He is an Adjunct Assistant Professor at the University of Pennsylvania, where he received his B.A. in history and political science. He received his Doctorate in Politics from Oxford University in 1987. In 1993, he was named a Fellow at Harvard University's Institute of Politics, the second youngest individual ever to receive this honor.

BREAKFAST SPEAKER BIO

STANLEY GREENBERG

Stanley Greenberg is Chairman and Chief Executive Officer of Greenberg Research, Inc., a national survey and polling firm working to advance public issues and political campaigns. He founded the company in 1980 after a decade of teaching in political science at Yale University. He was pollster and senior advisor to Bill Clinton's presidential campaign, and is now pollster to the President and advisor to the Democratic National Committee. He also served as polling and strategic advisor for the presidential campaign of Nelson Mandela.

Greenberg has also advised the political campaigns of Senators Chris Dodd, Joe Lieberman, and Jeff Bingaman, Governor Jim Florio and gubernatorial candidate, Andy Young, and former Vice-President Walter Mondale. Clients of Greenberg Research have included the National Education Association, World Policy Institute, Center for National Policy, Union of Concerned Scientists, Sierra Club, Common Cause, and Public Citizen.

He has published numerous works, including *Middle Class Dreams: The Power of the New American Majority* (forthcoming), "The Politics of American Identity", and *Politics and Poverty*. He was educated at Miami University and Harvard University where he received his Ph.D. in government in 1971.

MORNING SPEAKER BIO

THE HONORABLE JOHN DEUTCH

The Honorable John M. Deutch was sworn in as Deputy Secretary of Defense in March, 1994. He previously served as the Under Secretary of Defense from April 1993 until his confirmation this year. Dr. Deutch has held many positions in the federal government, including Acting Assistant Secretary and Under Secretary for the Department of Energy, where he received the Secretary's Distinguished Service Medal and the Department's Distinguished Service Medal. He has also been a member of the White House Science Council, and the President's Commission on Strategic Forces.

He became a member of the faculty of the Massachusetts Institute of Technology in 1970, and has since served as an associate professor and professor of chemistry, chairman of the Department of Chemistry, dean of science, provost and Institute Professor. He has been a trustee of the Urban Institute, a member and Chair of the National Science Foundation Advisory Panel for Chemistry, a trustee of Wellesley College, and a member of the Trilateral Commission.

A graduate of Amherst College with a B.A. in history and economics, he earned both a B.S. in chemical engineering and a Ph.D. in physical chemistry from M.I.T. He holds honorary doctoral degrees from Amherst College and the University of Lowell.

MORNING PANEL MODERATOR

STEVE PEARLSTEIN

Steve Pearlstein is the economy reporter on the financial news staff for The Washington Post. He joined The Post in 1988 as deputy editor on the financial news staff after working for three years as a senior editor at Inc. magazine. From 1982-1985, Pearlstein was editor, publisher, and founder of monthly opinion journal, The Boston Observer. He also worked as a writer, on-air reporter, and acting manager for the Ten O'Clock news on Boston's public television station from 1979-1981.

From 1976-1978, Pearlstein served as the administrative assistant to Senator John Durkin and later to Congressman Michael J. Harrington (D-Mass). In the early 1970s, he worked as a reporter in New Hampshire for the Concord Monitor and the Foster's Daily Democrat. He earned his B.A. from Trinity College in Connecticut in 1973.

MORNING PANELIST BIOS

THOMAS EVERHART

Thomas Everhart is President of the California Institute of Technology and Professor of Electrical Engineering and Applied Physics. Prior to this, he served as Chancellor of the University of Illinois at Urbana-Champaign, and Dean of the College of Engineering at Cornell University.

He has been active in the Council on Competitiveness since 1987, joining the Executive Committee in 1989 and serving as Vice-Chairman since 1990. He also serves on the Board of Directors at Hewlett-Packard, General Motors, KCET, and Reveo, Inc. He has won numerous awards and honors, including the Professional Achievement Award from UCLA, the ASEE Centennial Medallion, and honorary doctorates from Illinois Wesleyan and Pepperdine Universities.

JACK SHEINKMAN

Jack Sheinkman is President of the Amalgamated Clothing and Textile Workers Union, after having served as secretary-treasurer and co-chief executive officer of the union and as a vice president. He is also Chairman of the Boards of the Amalgamated Bank of New York and the Amalgamated Life Insurance Company.

He is a vice president of the AFL-CIO and its Industrial Union Department and chairman of its Executive Council's Committee on Benefit Funds. He also serves as vice president of the International Textile, Garment and Leather Workers' Federation, and is a member of the President's Advisory Committee for Trade Policy and Negotiations.

WILLIAM STEERE

William Steere is the Chairman and CEO of Pfizer, Inc. He has been a member of the Pfizer Board of Directors since 1987. He began his career with Pfizer in 1959 as a medical service representative, rising through the ranks to become president of Pfizer Pharmaceutical Group in 1986. He was elected President and CEO in February 1991 and chairman in March 1992.

He is a member of the board of directors and executive committee of the Pharmaceutical Manufacturers Association. He is also on numerous other boards, including the Council on Competitiveness, the New York University Medical Center, the Federal Reserve Bank of New York, and The Business Roundtable.

WILLIAM REINSCH

Bill Reinsch currently serves as Under Secretary for Export Administration in the U.S. Department of Commerce. He is charged with enforcing the export control policies of the U.S. government. From 1991 through 1993, Mr. Reinsch was a senior Legislative Assistant to Senator John D. Rockefeller IV, responsible for the Senator's work on trade, international economic policy, foreign affairs, and defense.

In addition, Mr. Reinsch has served as an adjunct associate professor at the University of Maryland University College Graduate School of Management and Technology.

SPEAKER BIO

THE HONORABLE LEON PANETTA

Leon Panetta was appointed by President Bill Clinton to be his Chief of Staff in July 1994. Prior to that appointment, Panetta served as Director of the Office of Management and Budget, beginning in January 1993. He played a major role in the development of the President's economic plan, which has produced three consecutive years of deficit reduction. From 1977 to 1993, Panetta was a United States Representative from California's 16th (now 17th) Congressional District. He served eight full terms and had begun serving his ninth when he became OMB Director. He was Chairman of the House Committee on the Budget from 1979-1985.

Panetta began his career in Washington as a legislative assistant to U.S. Senator Thomas H. Kuchel of California, the Senate Minority Whip. In 1969, he became special assistant to the Secretary of Health, Education, and Welfare and then Director of the U.S. Office for Civil Rights, where he was responsible for enforcement of school desegregation orders. In 1970, he went to New York City to serve as Executive Assistant to the Mayor. He returned to California in 1971 to practice law in the Monterey firm of Panetta, Thompson and Panetta until he was elected to Congress in 1976.

Panetta is the author of Bring Us Together, an account of his service as Director of the Office for Civil Rights. He has received numerous awards and honors, including, most recently, the Peter Burnett Award for Distinguished Public Service in 1993. Panetta received both his B.A. and J.D. from the University of Santa Clara.

Council on Competitiveness
Annual Meeting
November 15-16, 1994
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Former CEO, Hewlett-Packard Company

GENE ZEISZLER

Industrial Base Manager

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S/b

Consolidated
Comments sent

—

CRITICAL TECHNOLOGIES SURVEY 1994

An Update of *Gaining New Ground: Technology Priorities for America's Future*



RESPONDENT INFORMATION

(all information will be kept confidential)

Name WHITE HOUSE OFFICE OF SCIENCE AND TECH. POLICY.

Title _____

Department _____

Company/Organization _____

City/State/Zip _____

Phone 202-456-6046 Fax 202-456-6023 e-mail _____

Please check the industry sector most closely associated with your work, or more specifically the sector in which you are knowledgeable in both the critical technologies and relevant markets:

- | | |
|--|---|
| ☒ Aerospace | ☒ Electronic Components & Equipment |
| ☐ Chemical and Allied Products | ☐ Machine Tools & Robotics |
| ☒ Computers and Software | ☐ Motor Vehicles |
| ☐ Construction | ☒ Telecommunications |
| ☐ Drugs and Pharmaceuticals | ☐ Other _____ |

SURVEY INSTRUCTIONS

The critical technologies list included in *Gaining New Ground: Technology Priorities for America's Future* will serve as the basis for this survey. It was divided into five categories: 1) materials and associated processing technologies, 2) engineering and production technologies, 3) electronic components, 4) information technologies, and 5) powertrain and propulsion technologies.

Please complete the following for *ONLY* those technologies with which you are familiar:

INDICATE ... the U.S. competitive position compared to the rest of the world by placing a check in the box most closely describing status of technologies that are *incorporated in products or processes in the marketplace*. A shaded box shows the 1991 competitive position as published in *Gaining New Ground*. If you are unsure of the status of a specific technology, leave it blank. Category definitions are provided on the following page.

DELETE ... any technologies on each list that are no longer critical to the future competitiveness of your industry sector.

ADD ... any new technologies that have become critical during the past few years in the "NEW TECHNOLOGIES" section. Indicate the U.S. competitive position as previously described.

(Continued on back...)

DEFINITIONS

STRONG	U.S. industry is in a <u>LEADING WORLD POSITION</u> and is not in danger of losing this position in the next five years.
COMPETITIVE	U.S. industry is <u>ROUGHLY EVEN WITH WORLD-BEST</u> . This category includes technologies where the United States is leading, but it is uncertain whether the leadership will be sustained over the next five years, and technologies where different countries lead in different niches.
WEAK	U.S. industry is <u>BEHIND</u> in technology or <u>LIKELY TO FALL BEHIND</u> in the next five years. Changes are needed if the United States is to remain in the businesses related to this technology.
LOSING BADLY OR LOST	U.S. industry is <u>NO LONGER A FACTOR</u> or is not likely to have a presence in the next five years. It will take considerable effort or a major change in technology for the United States to become competitive.

SAMPLE RESPONSE

MATERIALS AND ASSOCIATED PROCESSING TECHNOLOGIES				
TECHNOLOGY	U.S. POSITION			
	Strong	Competitive	Weak	Losing Badly or Lost
Materials Processing:				
Catalysts	☒	☒	☐	☐
Chemical Synthesis	☐	☒	☐	☐
Membranes	☐	☒	☒	☐
Net Shape Forming	☐	☒	☒	☐
Precision Coating	☐	☐	☒	☐
Process Control	☐	☒	☐	☐
Environmental Technologies:				
Emissions Reduction	☒	☐	☐	☐
Recycling/Waste Processing	☒	☐	☐	☐ del
NEW TECHNOLOGIES (please add any new technologies that are not included in the above list and should be):				
<u>Fuel Cells (Environmental)</u>	☐	☒	☐	☐
COMMENTS:				
<u>Fuel cells will...</u>				

Please return your completed survey to the Council on Competitiveness at the address provided below by May 6, 1994. If you have any questions, contact Amy Petri at (202) 785-3990, or via e-mail at 71722.1120@compuserve.com. We will send you a copy of the final critical technologies list as soon as it is completed. Thank you!

★ ★ ★

COUNCIL ON COMPETITIVENESS
900 17th Street, NW • Suite 1050
Washington, DC 20006
(202) 785-3990 • (202) 785-3998 Fax

MATERIALS AND ASSOCIATED PROCESSING TECHNOLOGIES

TECHNOLOGY

U.S. POSITION

Strong

Competitive

Weak

Losing Badly
or Lost

Advanced Structural Materials:

Advanced Metals

☐
☐
☒
☐

Metal Matrix Composites

☐
☒
☐
☐

Polymers

☐
☒
☐
☐

Polymer Matrix Composites

☐
☒
☐
☐

Structural Ceramics

☐
☐
☐
☒

Electronic & Photonic Materials:

Display Materials

☐
☐
☐
☒

Electronic Ceramics

☐
☐
☒
☒

Electronic Packaging Materials

☐
☐
☒
☒

Gallium Arsenide

☐
☐
☒
☒

Magnetic Materials

☐
☒
☐
☐

Optical Materials

☐
☒
☐
☐

Photoresists

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Silicon

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☐
☒
☒

Superconductors

☐
☒
☐
☐

Biotechnologies:

Bioactive/Biocompatible Materials

☒
☐
☐
☐

Bioprocessing

☒
☐
☐
☐

Drug Discovery Techniques

☒
☐
☐
☐

Genetic Engineering

☒
☐
☐
☐

Materials Processing:

Catalysts

☐
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Chemical Synthesis

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Membranes

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Net Shape Forming

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Precision Coating

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Process Control

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Environmental Technologies:

Emissions Reduction

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Recycling/Waste Processing

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NEW TECHNOLOGIES (please add any new technologies that are not included in the above list and should be):

BIO POLYMERS

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BIO SENSORS

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BIO REMEDIATION

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COMMENTS:

ENGINEERING AND PRODUCTION TECHNOLOGIES

TECHNOLOGY

U.S. POSITION

Strong

Competitive

Weak

Losing Badly
or Lost

Design & Engineering Tools:

Computer-Aided Engineering

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Human Factors Engineering

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Leading-Edge Scientific Instruments

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Measurement Techniques

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Structural Techniques

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Systems Engineering

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Commercialization & Production Systems:

Computer-Integrated Manufacturing

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Design for Manufacturing

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Design of Manufacturing Processes

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Flexible Manufacturing

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Integration of Research, Design & Mgmt.

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Total Quality Management

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Process Equipment:

Advanced Welding

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High-Speed Machining

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IC Fabrication and Test Equipment

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Joining and Fastening Technologies

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Precision Bearings

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Precision Machining and Forming

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Robotics and Automated Equipment

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NEW TECHNOLOGIES (please add any new technologies that are not included in the above list and should be):

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COMMENTS:

ELECTRONIC COMPONENTS

TECHNOLOGY

U.S. POSITION

	Strong	Competitive	Weak	Losing Badly or Lost
Microelectronics:				
Logic Chips	☐	☒	☐	☐
Memory Chips	☐	☐	☒	☐
Microprocessors	☒	☐	☐	☐
Submicron Technology	☐	☒	☐	☐
Electronic Controls:				
Actuators	☐	☐	☐	☐
Sensors	☐	☐	☐	☐
Optoelectronic Components:				
Laser Devices	☐	☐	☐	☐
Photonics	☐	☐	☐	☐
Electronic Packaging & Interconnections:				
Multichip Packaging Systems	☐	☐	☒	☐
Printed Circuit Board Technology	☐	☐	☒	☐
Displays:				
Electroluminescent	☐	☐	☐	☐
Liquid Crystal	☐	☐	☐	☒
Plasma and Vacuum Fluorescent	☐	☐	☒	☐
Hardcopy Technology:				
Electro Photography	☐	☐	☐	☐
Electrostatic	☐	☐	☐	☐
Information Storage:				
Magnetic Information Storage	☐	☒	☐	☐
Optical Information Storage	☐	☐	☐	☐

NEW TECHNOLOGIES (please add any new technologies that are not included in the above list and should be):

FIELD PROGRAMMABLE LOGIC

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COMMENTS:

LOGIC CHIPS IS AN OUTDATED TAXONOMY, REPLACE WITH F. P. LOGIC

INFORMATION TECHNOLOGIES

TECHNOLOGY

U.S. POSITION

Strong

Competitive

Weak

Losing Badly
or Lost

Software:

Applications Software
Artificial Intelligence
Computer Modeling and Simulation
~~Expert Systems~~
High-Level Software Languages
Software Engineering

☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐

Computers:

Hardware Integration
Neural Networks
Operating Systems
Processor Architecture

☐	☒	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐

Human Interface & Visualization Technologies:

Animation and Full Motion Video
Graphics Hardware and Software
Handwriting and Speech Recognition
Natural Language
Optical Character Recognition

☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐

Database Systems:

Data Representation
Retrieval and Update
Semantic Modeling and Interpretation

☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐

Networks & Communications:

Broadband Switching
Digital Infrastructure
Fiber Optic Systems
Multiplexing

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☒	☒	☐	☐
☒	☒	☐	☐
☐	☒	☐	☐

Portable Telecom Equipment & Systems:

Digital Signal Processing
Spectrum Technologies
Transmitters and Receivers

☒	☒	☐	☐
☐	☒	☒	☐
☒	☒	☐	☐

NEW TECHNOLOGIES (please add any new technologies that are not included in the above list and should be):

KNOWLEDGE BASED SYSTEMS
FUZZY LOGIC SYSTEMS
VIRTUAL ENVIRONMENT SIMULATION
DISTRIBUTED INTERACTIVE SIM.
TELECOMM. SATELLITES
ENCRYPTION

☒	☐	☐	☐
☒	☐	☐	☐
☒	☐	☐	☐
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☒	☐	☐	☐

COMMENTS:

REPLACE EXPERT SYSTEMS WITH KNOWLEDGE BASED SYSTEMS WHICH INCLUDES EXPERT SYSTEMS, CASE BASED REASONING, NEURAL NETS, GENETIC ALGORITHMS, ETC.

POWERTRAIN AND PROPULSION TECHNOLOGIES

TECHNOLOGY

U.S. POSITION

Strong

Competitive

Weak

Losing Badly
or Lost

Powertrain:

Alternative Fuel Engines

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Electric Motors and Drives

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☐

Electrical Storage Technologies

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High Fuel Economy/Power Density Engines

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Low Emission Engines

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Propulsion:

Airbreathing Propulsion

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Rocket Propulsion

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NEW TECHNOLOGIES

(please add any new technologies that are not included in the above list and should be):

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COMMENTS:



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Council on Competitiveness

Date Rec'd 4/15/94

ACTION to _____
INFO to Johns-Fell
Nelson

AAAS COLLOQUIUM ON SCIENCE AND TECHNOLOGY POLICY Gillman April 6-8, 1994 - Washington, DC

New Relationships in Science and Technology
by

Erich Bloch

Distinguished Fellow, Council on Competitiveness
Washington D.C.

Scharf-GHG
Schwartzentat
Nelson
Roque
Clements

1. Introduction

One occasionally can only wonder about the many changes the Science and Technology community has been experiencing of late. The list is without limit. To name a few:

- downsizing in industry,
- a difficult labor market for new graduates and experienced professionals.
- an increasing number of consortia, cooperation among industry, academia and government laboratories and even among fierce competitors,
- NII and clean car initiatives,
- freezing of overhead in universities.

You can make your own list.

One needs to ask if these are random and unconnected events.

Hardly.

Or are these the results of a "process of creative destruction" along Schumpeter's lines of insight?

Maybe - at least in part.

Or is it the next phase in the development of the country's Science and Technology system, or the emergence of a new paradigm for that system?

I would suggest that this is indeed the case. I will come back to this point at the end of this talk after exploring some of the changes and forces that fuel these developments.

2. Policy Environment.

First I want to say something about the policy environment we need to contend with.

Since the demise of the Soviet Union we have moved from an environment where *Containment and Confrontation* had the priority focus, to one where the *Global Economy and the country's Economic Competitiveness* underlies our actions and policies.

We should not deceive ourselves in thinking that containment was only affecting our defense posture. Indeed it pervaded our lives more profoundly than we realized or were willing to acknowledge. Certainly, our foreign policy, trade and investment policies over the last 40 years have been instruments of this overarching policy.

And so has been the country's science policy. Military preparedness was one of the rationales that Vanevar Bush identified as the *raison d'être* for the government to support basic research and a vigorous science and technology base.

We are seeing now the shift - and many times a painful shift - from this past policy to the new one of Global Economy and National Economic Competitiveness. While these terms might sound contradictory, we need to realize they are not. Let me discuss each one.

The global economy does not necessarily imply free markets, but much more the emergence of new areas that are both generators and consumers for innovative products and services. China, India, and the Pacific Rim are becoming increasingly viable players, not to speak of Korea, Taiwan and others.

Those that would like to see a global economy free of national restrictions and assume an environment where national origin of enterprises is immaterial or where science and technology become a free good, accessible to all, will be as disappointed as those after World War II, that postulated a "One World" concept.

This does not mean that we will not make progress lowering some barriers to free trade. Both NAFTA and the GATT Uruguay Round are promising developments.

But it also means that we not only have to contend with competition for products or services, but also for research and technology that at one time were of domestic origin. Two examples should make this point:

- Borland 800 number
- Bangalor Software Plateau of the world.

National economic competitiveness, on the other hand, is "the degree to which a nation can, under free and fair market condition, produce goods and services that will meet the test of international markets while maintaining or expanding the real income of its citizens."

This definition of economic competitiveness, which the Council on Competitiveness has been advocating, is a far cry from the simplistic definition one encounters. Many times, the focus is only on trade imports or at best trade balances. It is also a more encompassing definition than equating competitiveness with productivity. Neither of these definitions recognize sufficiently that investment in R&D, in an educated workforce, and in a world-class technical infrastructure of institutions and facilities affect the future well-being, be it of individuals, companies or nations.

If we are doing well by the Council's definition we have a starting point for our society to build an economy and for our industry to generate products and services for its own use and for demands in the global market and thereby obtain higher employment and an improved standard of living at home.

3. Focus on Economic Competitiveness.

Why the focus on economic competitiveness? Some of the numbers tell the story.

- o Our trade deficit is increasing, despite the low dollar. In 1993, we had the biggest trade deficit ever with Japan, namely \$59 Billion. Many blame the Japanese recession for this state of affairs. The truth might be more connected to the content of our trade, than the externalities mentioned.

- o Cars, trucks, computers and semiconductors make up \$46 billion or over 50% of Japanese exports to the U.S. On the other hand fish, tobacco, corn, lumber and aircraft make up the majority of Japan's imports from the U.S.

- o Or consider our capital investment of 12% of our GNP, compared to 20% by Japan or 15% by Germany.

But more is at stake. To be competitive, a workforce that can absorb and internalize the many changes that will descend on us at an increasing rate is indispensable. Both our K-12 attainment and our vocational training do not prepare our students for the task ahead.

One of our other shortcomings is bridging the gap between science and technology attainments, and translating these attainments into successes in the marketplace. Reducing the risk of market failures is an area where government and industry jointly need to work together.

How are all these considerations influencing the policies and relationships between government, industry and academia?

4. Government Policy.

The starting point for the Clinton Administration's policy is that "technology is the engine of economic growth". This requires, if not mandates, world leadership in science, mathematics and engineering and the mobilization and prioritization of the vast R&D resources of the federal government amounting to \$75 billion yearly.

It also requires the mobilization and use of the laboratories, people and facilities of the government in a more coherent way than was the case before. The goals for these expenditures need to be relevant to the aspirations and needs of the country and its important social objectives, such as providing modern infrastructures, like NII, health, education, transportation and the environment.

These priorities favor therefore the civilian part of the R&D budget, with a commensurate reduction of defense R&D. There is also the need to work cooperatively with the private sector, collaborate on some programs and generally have a closer involvement in each others activities. Input from the private sector to the policy process of the government and its deliberations is an important ingredient to the success of these activities.

This calls for a far different atmosphere than the one we had been used to in the past: arms-length, even adversarial, relationships give way to collaboration, consortia and coordination. It reflects itself not only in budget considerations, but requires new organizations and organizational relationships.

5. Academia.

The major expansion the university system experienced over the last 40 years was an outgrowth of the confrontation and containment policy of the free nations.

Containment was predicated on achieving and maintaining an overwhelming superiority of science and technology to counteract the superior position in numbers our adversaries could muster.

In this shielded environment, forces were set in motion, such as excessive growth that eventually - and the eventually is now - need to be ameliorated. To name a few:

- with the monetary constraints the country is facing, the size of the academic research system and the cost of maintaining it are no longer feasible;
- we neglected the educational mission of the universities in favor of research;
- we also neglected the appropriateness of the higher education curriculum and of adjusting the role of the academic degree to the changing needs of their holders.

Beyond these excesses there is the question of the structure of academia's research component. The development and inventions and insights that mostly came out of academic institutions and their practitioners are transforming the way research is done: it is driven by computational and information rich tools and techniques. This new common base provides the capability of communication to bridge geographic and institutional boundaries. It also provides access to equipment from one's desktop that required much effort to access in the past. In turn, this will change departmental and institutional relationships or even lower barriers that in the past had been taken for granted.

Last, but not least, the changes in government and industry require a different positioning of academia than in the past: the triangular relationship of industry, government and academia needs to arrive at a new equilibrium position.

Does all this add up to a crisis in academia, as is often contended? Not at all, but neither is it without pain and displacement.

6. Industry.

Shifts in the commercial sector's view of R&D are in many ways a bell weather for changes in government and academic R&D.

The general downsizing or rationalizing of enterprises caused in part by a swollen bureaucracy and the loss of strategic direction in many of our enterprises are the basis for many changes, affecting R&D.

While the current industrial downsizing is due to complacency and inaction at the right moment, there are other reasons for rethinking industrial R&D relationships.

One important contributor is the reduced profitability of many companies. This will impact how much and what kind of R&D can be afforded by industry in the future. Any significant reduction will impact basic research first. In this regard it is interesting to note that American industry spends over 60% of its profits on R&D, compared to 13% in 1950.

The general requirement for shorter time to market and decreased product life cycles is another important change that affects the R&D enterprise.

The increasing cost of doing research and the increased complexity of research leads naturally to the establishments of consortia, alliances, and cooperative efforts.

The renewed focus on manufacturing, quality management and customer satisfaction are lessons learned the hard way and belatedly, but will have a major effect on the enterprise and its future profitability.

7. A New Paradigm.

I stated at the outset that I would want to return to the question of the next phase of the country's science and technology system.

To compare the past with the future, let me discuss some of the important differences. I want to acknowledge, however, that a black and white comparison oversimplifies greatly and brushes over the variety and the continuum between these theoretical endpoints. Nevertheless the trend is toward the future policy agenda (See attached Table).

Organizing Principle. Containment vs. Economic Competition, respectively, are the driving principles on which our policies are based.

The effects of this change are profound and affect S&T content, relationships and organizations.

Research Priority. Priority for civilian technology is not only because of the change in the geopolitical environment, but also because today it is civilian technology and its application in commercial products that precursus its use in defense.

Timetable. With much of the focus on competitiveness, time to market, rapid obsolescence and the accelerating pace of development affect the time horizon of research.

Research Focus. The Bush Administration made technology policy a concern of government policy, side by side with science policy. The new Administration added strategic R&D to that of basic research as a highly-visible concern.

Innovation Model. Much attention has focused on the subject of the progression from basic concept and innovation in fundamental research to the progression to a product in the marketplace. That this is not a sequential process has been realized for a long time, but tradition and organizational separation have been constraining influences on the dynamic interactions between stages of development and have profoundly influenced our policies. The more conscious awareness of the real interactions between applications and fundamental understanding, as well as the demands of the marketplace and the general acceleration of development bring broad changes to our policies as well.

R&D Budget. More and more of the federal budget in the R&D arena will be interagency driven and program oriented, reducing redundancy and taking more of a systems approach to initiatives, rather than project orientation.

Government Labs. Government laboratories that absorb a third of the federal R&D budget are most likely to be affected greatly in mission and activity.

Practitioner. By no means would I want to assert that the individual investigator is becoming an endangered specie; but side by side teams, centers, consortia will occupy great importance in the conduct of R&D in industry, academia and the government.

8. Conclusions.

The massive changes that are occurring and the trends we can foresee require a rethinking of the expectations and the responsibilities of the three major participants in the U.S. R&D enterprise.

For the reasons I mentioned, we have irreversibly crossed the line from the world that Vannevar Bush foresaw to one that is more interconnected and interdependent. The involvement and interdependence of academia, government and industry in R&D will only increase. New demarcation lines will have to be drawn and new relationships established and above all, new priorities will have to be recognized. The old adage, "If you don't like this year's budget, wait until next year," will no longer work - if it ever did.

There is no doubt that industry will depend more heavily on academia for basic and fundamental research, as it turns more dynamically to the market and curtails its investments in research. It is also the case that the government laboratories will be increasingly tasked and judged with not only supporting national programs but helping industry in its goal to gain and maintain its superiority in technology. This means, that for everybody, the question of relevancy of research will be ever more important as will be metrics of accomplishments.

These changes in policy and relationships will not occur overnight. Neither will they occur without much experimentation, successes and disappointments. But the pressure for them to develop will be enormous and visible. It will require new policies, new organizations, maybe even new institutions. How to move in that direction is a concern we all need to have. The Council on Competitiveness is starting a major program, "Re-inventing R&D", to shed light on this broad topic.

These are difficult times. The future will be stressful for the R&D community; but it will also provide a new experience, a new beginning, and a new challenge.

NATIONAL POLICY TRENDS

	<i>PAST</i>	<i>FUTURE</i>
ORGANIZING PRINCIPLE	Containment	Economic Competition
RESEARCH PRIORITY	Defense Technology	Civilian Technology
TIME TABLE	Long Term	Shorter Term
RESEARCH FOCUS	Science Basic Research	Science & Technology Basic and Strategic R&D
INNOVATION MODEL	Sequential	Overlapping / Concurrent
R&D BUDGET	Single Agency Driven Project Orientation	Interagency Driven Program Orientation
GOVERNMENT LABS	Agency / Mission Focus	National Goals Focus
PRACTITIONER	Individual Researcher	Team / Center / Consortia

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Council on Competitiveness

August 11, 1993

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Dear Skip:

Thank you for meeting with the Council on Competitiveness's Ad Hoc Committee on Materials on July 9th. Please find enclosed the comments of the group, based primarily on the discussions during and after that meeting.

Our main conclusion is that although we support bringing the materials initiative under the umbrella of the advanced manufacturing initiative, we urge caution to ensure that the benefits of AMPP process are not lost, and are in fact, expanded. It is particularly important to maintain some of the structure of the AMPP under the framework of the manufacturing initiative.

We look forward to continuing to work with you on this important subject.

Sincerely,



Erich Bloch
Distinguished Fellow and
Chairman, Ad Hoc Materials
Advisory Committee

cc: Jack Gibbons w/enclosure

Enclosure

Council on Competitiveness
Ad Hoc Committee on Materials
Comments on the Advanced Materials and Processing Program
August 1993

Introduction

This report comments on the Advanced Materials and Processing Initiative (AMPP), the Federal government's interagency program in materials science and technology. This initiative coordinates materials R&D across ten Federal agencies and seeks to strengthen the areas that are the highest priority.

The Council on Competitiveness has strongly supported this initiative. Advances in materials and processing are vital for the country, driving improvements in products and processes in virtually all sectors of the nation's economy. Bringing the diverse R&D activities across the Federal government into a more coherent program is an important task and the Council commends those in the government who have been working towards this goal.

The Council on Competitiveness's ad hoc group of materials experts, drawn from the Council's diverse membership as well as from other organizations, has met several times over the last two years to review and comment on the program. The following comments and recommendations for the program are based on its latest review.

Progress in the AMPP

In the last year, the AMPP has made several significant accomplishments and made several significant changes, in part responding to our previous recommendations. It has:

- Created and published an inventory of materials research in the Federal government. This provides significantly better information on materials R&D in the Federal government than was available before and makes the Federal materials R&D more available to groups in the private sector.
- Stimulated intra- and interagency cooperation in the Federal government in materials R&D. Federal laboratories, such as NIST, have more intralab materials programs and have developed better cooperation with other laboratories. Multiagency planning has also advanced in specific areas, such as materials for infrastructure and construction; metal casting; structural ceramics; and electronic packaging.
- Built constructive links to the private sector in specific areas, such as materials for infrastructure and construction.
- Prepared a second cross agency budget for materials R&D, to be published this summer, which will identify programs that support materials research that were not included in the program last year. Some of these programs, such as

SEMATECH and the Advanced Technology Program in NIST, are among the programs that the private sector believes are most valuable.

Much credit for these accomplishments must go to the FCCSET groups, especially the Committee on Materials (COMAT), and their leaders, as well as OSTP and OMB.

In many other areas, however, the AMPP has not yet achieved its potential:

- Much greater interaction with the private sector is needed. Although there has been informal interaction with the private sector at the policy level and in specific technical areas, there needs to be much greater interaction across a broad range of technology specific areas.
- The AMPP has not had a major effect on the total materials R&D budget. New money is not necessarily needed, but there needs to be a greater effort to set priorities and shift existing funds to the higher priority areas.
- It has not yet made sufficiently effective links between R&D and the commercial application of materials technologies.
- Metrics to measure the success of the AMPP, although evolving, are still limited and primitive.

In summary, the AMPP has shown significant progress, but its work is not finished.

Proposed Changes

The Administration is proposing to combine the AMPP with the Advanced Manufacturing Program. Data collection for materials would be integrated with the data collection for manufacturing. The Administration also intends to concentrate increases in the program on new thrust areas that are Administration priorities, such as "clean cars", information and traditional public infrastructure, semiconductors, and the environment. In this new arrangement the COMAT, which managed the AMPP, would be expected to continue.

Views and Recommendations

We believe there are many potential advantages in the new approach. As we previously recommended, it is important to link materials R&D with the development of improved products and processes. By linking the materials initiative with the manufacturing initiative, and by focusing this work on thrust areas, the new approach should strengthen the link between materials and its applications. It also makes sense to link materials to the manufacturing initiative because in many areas of manufacturing -- such as semiconductors -- materials technology and processing are difficult to separate from the totality of the manufacturing effort. A critical part of manufacturing is controlling the structure and properties of the products produced. This aspect of manufacturing, which is part of materials processing, takes place at atomic and microscopic scales, and has often been

underemphasized. Combining the manufacturing and materials initiative should help bring focus to this area.

Focusing on thrust areas should help strengthen political support for Federal materials R&D by linking the R&D to politically tangible goals. It is also consistent with the reality that in most agencies materials R&D is conducted in support of a specific mission or within a specific program.

Although the committee generally supports this new approach, it has several concerns:

(1) It is important to ensure that basic and generic materials R&D not directly connected to manufacturing or the thrust areas is not ignored. There is a risk that the integration of the materials initiative with the manufacturing initiative and the focus on thrust areas will lead to neglect of some R&D and education activities that underlie our long term competitiveness. Not all of the important areas of materials R&D -- especially fundamental research and education -- will naturally fall under the thrust areas or under manufacturing. Materials are critical technologies for many sectors of the economy other than manufacturing. To help prevent a weakening of these key areas, it is essential that: (a) the thrust areas incorporate a portfolio of long-, mid-, and short-term R&D; (b) "manufacturing" be defined broadly, so that materials for construction and health care, for example, are not neglected; and (c) a focus on education and training for materials can be enhanced through either the manufacturing initiative or the initiative on education and training.

(2) **It is necessary to continue to improve and not destroy the intra- and interagency linkages in materials R&D and to continue to make Federal materials R&D more available and better connected to the private sector.** As noted above, the AMPP has improved linkages within government and with the private sector, but this work is in its infancy and should not be lost. The work of COMAT should continue with equal effort, materials R&D budget data should continue to be collected, and links to the private sector should continue to be expanded. As part of this, it is also necessary for the private sector to become better organized to provide the appropriate input and we will continue to work with the Administration to help define the private sector's priorities and to review and monitor the program.

We believe that it would be desirable to keep the materials activities in the AMPP as a clearly identified element of the broad manufacturing initiative for several reasons:

- It would help retain the significant progress already made and continue the unfinished work.
- It would help maintain the visibility and attention paid to materials science and engineering as a significant enabling activity deserving Federal leadership and support. This would also help maintain the support and the involvement of the materials community in the manufacturing initiative.

Maintaining a recognizable focus on materials within the manufacturing initiative is especially important in the near term, as it is not yet clear how well materials and biotechnology will fit under a broad manufacturing initiative. To integrate materials effectively with manufacturing, it is important to maintain a structure that will allow work in materials to continue.

(3) The thrust areas must be chosen and defined carefully, and should be based on in depth consultation with the private sector. One the one hand, the thrust areas should be sufficiently broad so as to address important problems, capture broad political support, and support a significant amount of generic technology. On the other hand, the thrust areas should be defined narrowly enough so that it is possible to achieve measurable results. The areas should also be chosen to improve the country's competitiveness and create jobs, and should be evaluated on these output parameters. Some of the thrust areas, such as "clean cars" may have been too narrowly defined (although it is difficult to know without better information) and therefore do not support a sufficiently broad range of generic material technologies.

We are concerned that there has been little private sector input to the thrust areas. We also believe that it is also important to better define the industry-government roles in these thrust areas. Although there are numerous examples of successful Federal technology projects, there have been many failures (such as synfuels or breeder reactors) due in part to poor connection to the commercial markets and the lack of broad participation by the private sector.

(4) **The government should promote the commercialization of new materials by serving as the test-market for new materials systems and their application.** We encourage the government to work jointly with the private sector to become a more venturesome customer. There are significant opportunities for the government to play a greater role in this area, especially in the building and highway construction arena, where industry, academia and the public sector all can contribute to the timely commercialization of high performance construction materials.

The Council through this Ad Hoc Committee will continue to work to monitor this activity, and we want to thank FCCSET, OMB and OSTP for the opportunity for this productive dialogue.

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Council on Competitiveness

January 19, 1993

Dr. J. Thomas Ratchford
Office of Science & Technology Policy
The White House
Old Executive Office Building
Room 494
Washington D.C. 20025

Dear Tom:

Government subsidies -- how to define, limit, and even prohibit them -- have been the focus of extensive international negotiations over the last three decades. The R&D provisions of the GATT Subsidies Code have recently been the focus of extensive domestic negotiations, among U.S. industry and government. Limiting trade-distorting subsidies while preserving essential government-funded R&D programs is an extremely complex and controversial task.

Because of strong interest in this issue, the Council on Competitiveness is putting together an advisory group of leading government and academic specialists, as well as industry executives, to assess the implications of any changes to the R&D provisions of the GATT Subsidies Code.

This discussion is part of a larger project that the Council is conducting on Trade, Technology, and Investment. The Council is uniquely qualified to conduct this project. It has established itself as a major player in the national technology policy debate and has a close working relationship with senior executives in a wide array of U.S. technology intensive industries, as well as with policymakers in the federal government. Eric Garfinkel, former Assistant Secretary of Commerce for Import Administration and current Senior Fellow at the Council, is chairing this project.

Because of your in-depth knowledge of the subsidies issue, I would like to invite you to participate in this case study. Our meeting will be held on February 2, from 10:00 AM to 2:00 PM at the offices of the Council on Competitiveness in Washington D.C. (900 17th St., NW, Suite 1050). Lunch will be served during the meeting.

900 17TH Street, NW • Suite 1050 • Washington, DC 20006
(202) 785-3990 • FAX (202) 785-3998

This should be an extremely stimulating discussion, and I hope that you will be able to join us. I would appreciate it if you would let Council Associate Mark Mahaney know at your earliest convenience whether you will be able to participate.

Sincerely,

A handwritten signature in black ink, appearing to read 'D. Burton', with a stylized flourish at the end.

Daniel F. Burton, Jr.
Executive Vice President

Council on Competitiveness

Trade, Technology & Investment Project

Meeting on R&D Portions of GATT Subsidies Code

Tuesday, February 2, 1993, 10:00 - 2:00

Invited Participants

Industry:

1. Lisa Barry (Boeing)
2. Judge Morris (NAM)
3. Phyllis Jones (IBM)
4. Mary Lou Lackey (Motorola)
5. Laird Patterson (Bethlehem)
6. Chuck Larson (IRI)

Executive Branch:

1. Tim Reif (USTR)
2. Harry Broadman (USTR)
3. Deborah Wince Smith (DOC)
4. Mark Lieberman (formerly DOC)
5. Tom Ratchford (OSTP)
6. Ron Lorentzen (DOC)
7. Jon Paugh (DOC)
8. Robert Simon (DOE)
9. Trivel Piece (Oak Ridge National Lab)

Legislative Branch:

1. Loretta Dunn (Senate Commerce)
2. Marsha Miller (Senate Finance)
3. Ed McGaffigan (Sen. Bingaman)
4. Carolyn Wagner (House S&T)
5. Kevin Dempsey (Sen. Danforth)
6. Bill Reinsch (Sen. Rockefeller)
7. Bruce Wilson (House Ways & Means)

AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET
NEW YORK, N.Y. 10024-5192
769-5752

OFFICE OF THE CHAIRMAN

January 7, 1993

40 Wall St., Room 4201
New York, New York 10005

Dear Tom:

This confirms our telephone conversation. I'm delighted that as soon as you are free to do so you will become a member of the Library Committee of the Museum. Your wisdom and experience will make you a valuable member, and I am sure you will enjoy the association. Indeed, I'm especially pleased that you and I will then once again have an official affiliation.

Henry G. Walter Jr., a vice chairman of the board of trustees of this Museum, serves as chairman of the committee, and he is revitalizing it effectively. The Committee will probably meet three or four times a year. Hank Walter will be writing you also expressing his pleasure.

The Library, which we believe to be the greatest natural history collection in this country and second in the world only to the collection of the British Natural History Museum, includes more than 400,000 volumes plus some 800,000 photographs.

I'm enclosing a copy of the just-issued annual report of the Museum which I think you'll find interesting to look through.

Hank Walter will be informing you of the date of the next meeting of the Committee. A trustees dinner (black tie) will take place on February 2 in celebration of the completion of the new eight-story, \$12 million library building in the Museum complex. You will receive a formal invitation in due course. I hope that you and Joanne will find it convenient to attend the dinner which surely will be a very pleasant occasion and will give both of you an opportunity to meet committee members, other Museum trustees, and invited Friends of the Museum and of the Library.

With warm regards,

Sincerely,



William T. Golden

Dr. J. Thomas Ratchford
8804 Fircrest Place
Alexandria, Virginia 22308

[Dictated by Mr. Golden; signed
and mailed in his absence.]

William T. Golden
 Chairman of the Board of Trustees
 and
George D. Langdon, Jr.
 President
 of the
American Museum of Natural History
 request the pleasure of your company at the
Winter Trustees Dinner
 to celebrate the opening of
The New Library Building
Tuesday, February 2, 1993

Cocktails 6:45 p.m.
The Library
Program 7:30 p.m.
Hall of Birds of the World

Dinner 8:00 p.m.
Hall of Northwest Coast Indians
Black Tie
R.S.V.P.

The program for this evening will feature
presentations by
Nina J. Rees
Director of the Library
 " "
The American Museum of Natural History Library:
"A Necessary Adjunct"
 and
Nils Elmhage
Curator, Department of Invertebrates
 " "
Mass Extinction, Evolution, and the Biodiversity Crisis

Please enter the Museum from 7th Street between
Extinctus Avenue and Corbitt Park West
or from the Museum Shopping Lot, across from
8th Street which will be shown throughout the evening

*Office of the President
American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024-5192*

COUNCIL FOR EXCELLENCE IN GOVERNMENT

1620 L Street, N.W.
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January 14, 1993

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Dr. J. Thomas Ratchford
Associate Director, International Affairs
Office of Science and Technology Policy
Old Executive Office Building
Washington, DC 20500

Dear Tom:

It was good speaking to you today. As I mentioned, the Council for Excellence would like to invite you to meet with the Council's 1992-93 class of Science and Technology Fellows on February 4, 1992. We would like to meet in the afternoon and have some flexibility about the time. The meeting will take place at the offices of the Carnegie Commission on Science and Technology at 1620 L Street.

This is the first year of the Council's Science and Technology Fellows Program, which is being supported by a grant from the Carnegie Corporation and tuitions from government agencies. The Fellows are outstanding mid-level government executives who have been nominated by their agencies to participate in our Fellows program. The Fellows continue in their government positions, while spending approximately one day a month in seminars at the Council, meeting with distinguished present and former government science executives. I've enclosed some background materials on the Fellows program, as well as a list of the Fellows selected for the inaugural year of the science and technology program. This is the fourth year of our Executive Branch Fellows program.

The objective of the Science and Technology Fellows program is to assist government scientists to make the transition from bench scientists to government senior executives. We also hope to broaden their understanding of the role S&T executives play in government, the issues they handle, and the environment in which they operate. The Council's Prune Book: The 60 Toughest Science and Technology Jobs in Washington serves as the "text" for the program. As you know, you are profiled in the book.

As I mentioned on the phone, we would like to pair you with either Dr. Bromley or Dr. Henderson for an informal panel discussion. Among the topics we would like to discuss are:

- Your own career and how you made the transition to a science policy executive;
- The major issues you see ahead for government science and technology executives;
- The major accomplishments of the Office of Science and Technology Policy over the past four years;
- How the senior management -- you, Dr. Bromley, and your colleagues -- worked together as a team to dramatically revitalize the Office of Science and Technology.

2400 N Street
Carnegie Endow. for Int'l. Peace

G5-14

As you can see, these are very broad topics that will lend themselves to a wide-ranging discussion. After your opening remarks, we will then turn to the Fellows for their questions and a discussion period.

If you have any questions, please feel free to give me a call. I do hope that you will be able to join us on February 4. I look forward to seeing you.

Sincerely,



Mark A. Abramson
President

**COUNCIL FOR
EXCELLENCE IN
GOVERNMENT**

1992 Excellence in Government Fellows: Science and Technology Program

The Program

This Excellence in Government Fellows program is tailored to the developmental needs of mid-level managers in the Federal science and technology (S&T) community. It is designed to enhance the leadership skills of scientists and engineers throughout government. It is offered by the Council for Excellence in Government as a follow on to its new publication, *The Prune Book: The 60 Toughest Science and Technology Jobs in Washington*.

The 1992 program, which begins in September 1992 and continues through September 1993, consists of a series of interactions with successful leaders from major corporate and government organizations. While continuing to serve in their current jobs, the Fellows are brought together with top executives of business and government to explore the challenges confronting managers in the science and technology establishment.

The content of the Fellows program, coupled with the professional relationships established during the fellowship year, yield the following benefits to the Fellows and their agencies:

- broadened perspective on effective organizational performance in research and development organizations;
- increased understanding of the role S&T executives play in government, the issues they handle, and the environment in which they operate;
- strengthened commitment to personal responsibility for career planning and management; and
- creation of a cohort of talented S&T managers from different departments and agencies who will collaborate for years to come.

Eligibility

Agencies may nominate individuals who:

- are at the GS-14 level or equivalent in the military or other pay systems;
- have current or recent managerial experience;
- have demonstrated high achievement and leadership potential;
- are committed to a career in public service; and
- are based in the Washington, D.C. commuting area.

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THE BROOKINGS INSTITUTION

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TELEPHONE: 202/797-6000 FAX: 202/797-6004

Center for Public Policy Education

January 26, 1993

The Honorable J. Thomas Ratchford
Consultant
Office of Science and Technology Policy
Executive Office of the President
Old Executive Office Building
Seventeenth and Pennsylvania Avenue, N.W.
Room 494
Washington, D.C. 20500

Dear Tom:

We are delighted to confirm that you will speak to a group of senior government executives in a Brookings Conference on Issues in Science and Technology Policy, in colonial Williamsburg, Virginia.

You will speak on Monday, February 15 during the luncheon session. Lunch begins at 12:00 noon and your talk begins at 1:00 p.m. on "The Role of the White House Science Office."

Our usual format, as you know is for speakers to talk for about 30 minutes and spend the remainder of their time responding to questions from the participants.

If you have any questions please call me on (202) 797-6167 or my meeting planner, Jessica Masten, on (202) 797-6282. I look forward to seeing you and to a stimulating and rewarding discussion.

Sincerely yours,

Bruce L.R. Smith
Senior Staff

Conference for Government Managers

On

ISSUES IN SCIENCE AND TECHNOLOGY POLICY

February 14-19, 1993
Williamsburg, Virginia

AGENDA

Sunday
February 14, 1993

4:45 Room DE Colonial Williamsburg Lodge	Registration and Welcome ❖ <i>Bruce L.R. Smith, Jessica Masten</i> <i>The Brookings Institution</i>
5:00	The International Environmental Challenge ❖ <i>E. Donald Elliott, Yale University</i>
6:15 Tidewater Room	Reception
6:45 Tidewater Room	Dinner Technology and U.S. Competitiveness ❖ <i>Alan Wm. Wolff, Dewey, Ballantine, Bushby,</i> <i>Palmer & Wood</i>
8:45	Recess

Monday February 15, 1993

- 7:30
Colonial Williamsburg
Lodge Breakfast Individually
- 9:00
Room DE **The Clinton Administration and the Post-War Consensus
in American Science and Technology Policy**
❖ *Bruce L.R. Smith*
- 10:15 Break
- 10:30
Room DE **The State of the Universities**
❖ *L. Vaughn Blankenship, University of Illinois at Chicago*
- 11:45 Group Photo
- 12:00
Room C **Lunch Session: The Role of the White House Science Office**
❖ *J. Thomas Ratchford, Office of Science and Technology
Policy, Executive Office of the President*
- 2:00
Room DE **Science, Law, and Democracy**
❖ *David M. O'Brien, University of Virginia*
- 3:15 Coffee Break
- 3:30
Room DE **The New Environmental Agenda**
❖ *William E. Cooper, Michigan State University*
- 4:45 Recess
- 6:00
Tidewater Room Reception - sponsored by Colonial Williamsburg Foundation
- 6:30
Tidewater Room Dinner
- 7:45 Colonial Music at Bruton Parish Church
-

Tuesday
February 16, 1993

7:30 Colonial Williamsburg Lodge	Breakfast Individually
9:00 Room DE	Science and the Press ❖ <i>Daniel S. Greenberg, <u>Science and Government Report</u></i>
10:15	Coffee Break
10:30 Room DE	Technology Issues Facing the Congress ❖ <i>John Alic, Office of Technology Assessment</i>
12:00 Room C	Lunch
2:00 Room DE	Environmental Issues in the Chesapeake Bay Region ❖ <i>Robert J. Huggett, College of William and Mary</i>
3:15	Coffee Break
3:30 Room DE	Technology and the Workforce ❖ <i>Gus Tyler, International Ladies' Garment Workers' Union</i>
5:00	Recess
6:30	Colonial Dinner at Christiana Campbell's Tavern

Wednesday February 17, 1993

7:30 Breakfast Individually
Colonial Williamsburg
Lodge

9:00 **The Future of the U.S. Space Program**
Room DE ❖ *Kenneth S. Pederson, Georgetown University*

10:45 Coffee Break and Recess

12:00 Lunch
Room C

1:30 Bus leaves for Gloucester Point

2:00 **Field Trip to the Virginia Institute of Marine Sciences**
❖ Hosted By: *Robert J. Huggett*

Affiliated with The College of William and Mary, the Virginia Institute of Marine Sciences (VIMS) is an internationally-recognized research, educational and public service institution. Its work spans a variety of professional fields (from basic research to natural resource management) and encompasses a diversity of disciplines including biological, chemical, geological and physical oceanography; wetlands ecology; fisheries science; and marine resource management.

4:00 Bus returns to Williamsburg Lodge

Free Evening

Thursday February 18, 1993

7:30 Colonial Williamsburg Lodge	Breakfast Individually
9:00 Room DE	Technology, Costs, and Quality in Health Care ❖ <i>The Honorable Martin H. Gerry, LBJ School</i>
10:30	Coffee Break
10:45 Room DE	Technology Transfer and the Future of the Federal Labs ❖ <i>Lee W. Rivers, National Technology Transfer Center</i>
12:00 Room C	Luncheon Session: Technology Policy and Critical Technologies ❖ <i>Christopher T. Hill, The Rand Corporation</i>
2:00 Room DE	Technology and Defense Policymaking ❖ <i>The Honorable Lawrence J. Korb, The Brookings Institution</i>
3:15	Coffee Break
3:30 Room DE	Trade and Technology Issues ❖ <i>The Honorable Bill Frenzel, The Brookings Institution</i>
5:00	Recess
6:00 Tidewater Room	Reception
6:30 Tidewater Room	Dinner & Colonial Entertainment
8:00	Adjourn for the Day

Friday
February 19, 1993

7:30 Breakfast Individually
Colonial Williamsburg
Lodge

8:45 **Ethics and Misconduct in Science: Issues for the 1990s**
Room DE ❖ *Marcel E.C. LaFollette, George Washington University*

10:00 **Technology and the Economy**
Room DE ❖ *The Honorable Sidney L. Jones, Adjunct Faculty Member,
Center for Public Policy Education,
The Brookings Institution*

11:15 **Review and Evaluation**
Room DE

11:45 Program Adjournment

Lunch Individually or Boxed Lunches available

Conference for Government Managers

On

ISSUES IN SCIENCE AND TECHNOLOGY POLICY

Williamsburg, Virginia
February 14-19, 1993

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***A COMPETITIVE ASSESSMENT
OF THE PRESIDENT'S FY 1995
FEDERAL R&D BUDGET***

***CONTINUING INVESTMENT FOR
ECONOMIC GROWTH AND COMPETITIVENESS***

***Council
on
Competitiveness***

February 1993

THE PROGRESS CONTINUES

The FY 1994 budget marked the beginning of the Clinton Administration's investment agenda and a restructuring of the country's vast science and technology enterprise to improve its contribution to economic growth. The Council, as one of the main contributors to President Clinton's science and technology policy during the campaign and throughout the first year of the Administration, is pleased with the progress made to-date, the content of the new FY 1995 budget, and the priorities that are implied.

The underlying theme of the FY 1995 budget is deficit reduction tempered with investment in both people and know how, which has characterized the Administration's policy focus during the past year. In contrast to the Cold War years, where the fallout from investments in defense, space and basic research were of serendepitous benefit to civilian technology, today civilian technology itself is the target for direct investment.

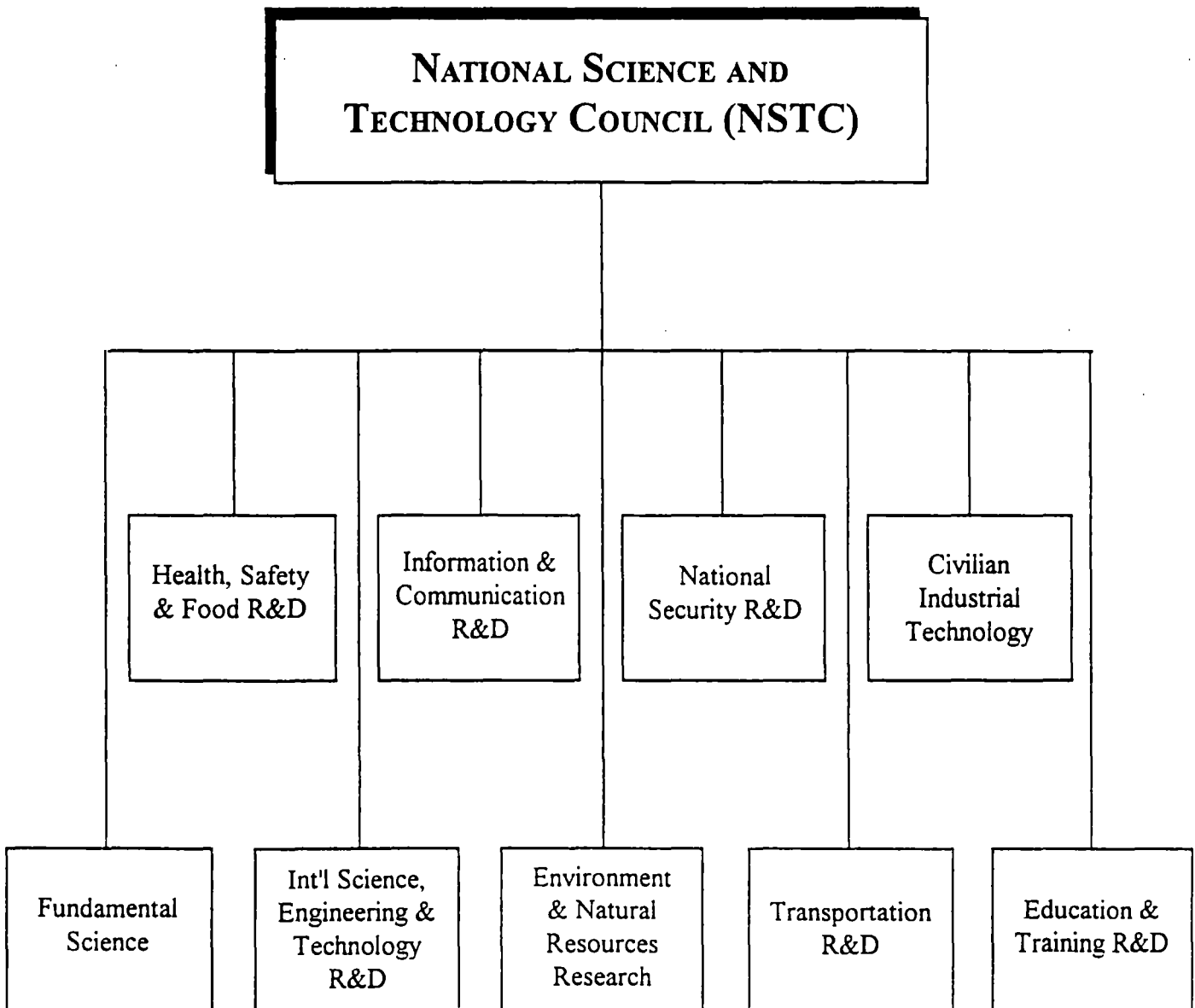
Highlights and an overview of the President's FY 1995 budget submission, including its implications for national technology policy and U.S. competitiveness, are provided below.

HIGHLIGHTS

- Federal spending for R&D, including facilities, will reach \$73 billion in FY 1995, a 3 percent increase over FY 1994. This is highly respectable considering the declining nature of discretionary spending and the proposed terminations and reductions in many other areas. The defense share of Federal R&D will remain at 53 percent, versus 47 percent for civilian and dual-use initiatives. The Council has recommended keeping Federal R&D at least constant while balancing defense and civilian/dual-use R&D.
- The FY 1995 budget aggressively promotes civilian technology programs while reaffirming the nation's commitment to basic science. The Council advocates this balanced approach to regaining a U.S. lead in science and technology and promoting continued economic growth.
- Critical technology initiatives that target national goals, such as improved information and transportation infrastructure, healthcare and environmental protection, are a cornerstone of the FY 1995 budget. These initiatives symbolize the Administration's commitment to identifying and following through with national technology priorities that will benefit both industry and society.
- Industry-government partnerships are a key element of the FY 1995 budget and the Administration's broader technology strategy. The Council urges its membership, as well as the private sector as a whole, to continue to provide input to the Federal government on civilian technology priorities and participate in cooperative national technology efforts.

- The Administration has pledged to improve coordination and management within the federal government through the newly created National Science and Technology Council (NSTC) and its nine oversight committees (see figure 1). The President's Committee of Advisors on Science and Technology (PCAST) has also been reinstituted to serve as the primary channel for private sector advice to the NSTC. The Council applauds the Administration's goals, however, neither the NSTC nor PCAST are yet in place and the approach the NSTC will use to assure timely private sector input into the various committees is unclear.

FIGURE 1



AN OVERVIEW OF THE FEDERAL R&D BUDGET

The President's FY 1995 budget proposes a 4 percent increase in the Federal R&D budget over FY 1994 levels (see table 1). The majority of the new funding – \$2.2 billion or 87 percent – will support applied research and development. Approximately \$1.4 billion of this new budget authority is allocated to defense.

Federal support for basic research will increase to \$322 million in FY 1995. R&D support for university researchers is also slated to grow 4% to \$12.2 billion. This is an important element of the Administration's commitment to retaining U.S. preeminence in fundamental science. However, due to the tight budget climate the Administration is freezing university overhead at FY 1994 levels.

TABLE 1

	FY93 Actual	FY94 Enacted	FY95 Proposed	% Change FY94-95
(\$ in millions)				
Total R&D (without facilities)	69,750	68,484	71,029	4%
Basic Research	13,362	13,790	14,112	2%
Applied & Development	56,388	54,693	56,917	4%
Total R&D (with facilities)	72,478	71,073	73,045	3%

Despite increases in major civilian technology programs, the ratio of defense to civilian R&D remains unchanged at 56 versus 44 percent (see table 2). If defense dual-use technology programs are separated from pure defense, such as the Technology Reinvestment Project (TRP), Sematech, and funding for high performance computers and communications, the civilian share of the R&D budget rises to 47 versus 53 percent for defense. This civilian-defense ratio still falls 3 percentage points, or slightly more than \$2 billion, short of the President's target of a fifty-fifty split by 1998, which the Council has advocated strongly.

TABLE 2

	FY93 Actual	FY94 Enacted	FY95 Proposed
Civilian share of R&D (without-dual use)	41%	44%	44%
Defense Share of R&D	59%	56%	56%
Civilian Share of R&D (with dual-use)	43%	47%	46%
Defense Share of R&D	57%	53%	53%

SELECTED AGENCY BUDGETS

The Administration began to increase funding for key technology agencies and programs last year and continued the trend in this year's budget submission (see table 3). The Department of Commerce is a clear beneficiary of new budget authority in FY 1995, with a proposed increase of \$600 million, or 17 percent. The majority of the new funding targets expansion of civilian technology programs within the National Institute of Standards and Technology (NIST) and the National Telecommunications Information Administration (NTIA). The budget for the Office of the Undersecretary for Technology, which oversees civilian technology programs within Commerce, will also grow to \$12 million, a 100 percent increase over FY 1994.

TABLE 3

	FY93 Actual	FY94 Enacted	FY95 Proposed	FY97 Projected	% Change FY94-95
(\$ in billions)					
Commerce	3.2	3.6	4.2	4.7	17%
National Institutes of Health	10.3	11.0	11.5	12.5	5%
NASA	14.3	14.5	14.3	14.5	-1%
Energy	19.3	18.6	18.0	18.3	-3%
National Science Foundation	2.7	3.0	3.2	3.3	6%

The National Science Foundation's (NSF) budget will reach \$3.2 billion in FY 1995, an increase of \$182 million, or 6 percent, over FY 1994. NSF's "research and related activities" will increase by more than 8 percent while funding for "academic research infrastructure" will decrease from \$100 to \$55 million.

Department of Energy (DOE) R&D funding will remain flat at slightly over \$6 billion, however, its support for cooperative research and development agreements (CRADAs) will rise 5 percent to \$275 million in FY 1995. The overall budget of DOE will decrease by 3 percent.

The National Aeronautic and Space Administration's (NASA) budget will also decrease in FY 1995 to \$14.3 billion from \$14.5 billion last year. However, NASA's year old New Technology Investments (NTI) program will grow 60 percent to \$67 million, and its support of aeronautics research will increase 21 percent to \$347 million.

If projected agency budgets for FY 1997 are taken into account, Commerce and NIH can expect continued growth throughout the Clinton Administration. However, NSF's budget is only expected to rise another 3 percent between FY 1995 and FY 1997. This slower rate of growth falls short of inflation and does not keep pace with the Council's recommended timeframe for significantly increasing funding NSF.

INDUSTRY-GOVERNMENT PARTNERSHIPS

The Clinton Administration came to office committed to building stronger links to the private sector. Last year's budget submission began the process by expanding cooperative technology programs with industry and the FY 1995 budget request has continued the trend (see table 4).

TABLE 4

	FY93 Actual	FY94 Enacted	FY95 Proposed	% Change FY94-95
(\$ in millions)				
Advanced Technology Program (ATP)	68	200	451	128%
Technology Reinvestment Project (TRP)	472	554	625	13%
Manufacturing Extension Partnership (MEP)	18	30	61	103%
Technology Transfer	384	551	865	57%

The Advanced Technology Program (ATP) within NIST will more than double to \$451 million in FY 1995, keeping pace with the Council's recommendation for significant expansion of the program. A substantial portion of the new budget authority will support projects in strategic program areas currently being defined in cooperation with industry. ATP's budget is expected to reach \$1.4 billion by FY 1997.

The interagency Technology Reinvestment Project (TRP) administered by the Advanced Research Projects Agency (ARPA) will grow from \$554 million to \$625 million in FY 1995. The program, which is a cornerstone of the Administration's strategy for commercial-military technology integration, has spurred significant interest from the private sector. Last year's submissions drew over \$2 billion worth of proposals from a wide variety of industrial sectors.

NIST's Manufacturing Extension Partnership (MEP) continues to be the focal point for activities geared towards building a national network to assist small and medium sized businesses. The program's budget will double to \$61 million in FY 1995.

Technology transfer budgets of the Federal agencies will reach \$865 million in FY 1995, a 57 percent increase over FY 1994 levels. The number of cooperative research and development agreements (CRADAs) between industry and the federal labs will also increase from 2,758 to 3,211. The total cash and non-cash value of the CRADA investments, including both public and private sources, is estimated at \$1.5 billion.

TECHNOLOGY FOR NATIONAL GOALS

The Administration's budget submission reflects a strong commitment to advanced technology initiatives that support infrastructure development and other national technology goals, such as environmental protection and world class manufacturing (see table 5).

TABLE 5

FY93 FY94 FY95 % Change
Actual Enacted Proposed FY94-95

(\$ millions)

National Information Infrastructure (NII)	780	964	1,272	32%
Manufacturing Technologies	NA	1,841	2,000	9%
"Clean Car" (Energy only)	107	141	175	24%
Intelligent Vehicle Highway System (IVHS)	155	214	289	35%
U.S. Global Change Research Program	1,338	1,446	1,794	24%

The newly created National Science and Technology Council's (NSTC) Committee on Civilian Industrial Technology will manage a \$2 billion cross-agency program to develop advanced manufacturing technologies with broad applications. This is up \$159 million, or 9 percent, from FY 1994. Defense, Energy, Commerce, NASA, and NSF will be the primary performers of the research.

Funding for development of a national information infrastructure (NII) will increase 32 percent in FY 1995 to almost \$1.3 billion. This includes \$1.2 billion for the cross-agency high performance computing and communications (HPCC) initiative which will be overseen by the NSTC Committee on Information and Communications. Also included are \$100 million for the National Telecommunications and Information Administration's (NTIA) grant program to connect schools, clinics, hospitals, libraries and other non-profit entities to the NII and a one-time allocation of \$18 million to promote electronic dissemination of data generated by the Federal government.

Technology driver programs designed to improve the U.S. transportation system are also slated for increases in FY 1995. Key programs include the next generation high-speed rail, the intelligent vehicle highway system, and the "Clean Car" initiative – an industry-government partnership to improve fuel economy and enhance the competitiveness of the U.S. automobile industry.

The Administration is targeting improved knowledge of our planet's climate through the U.S. Global Change Research Program (USGCRP), which will reach \$1.8 billion in FY 1995, an increase of 24 percent over FY 1994. The technologies developed under the USGCRP are expected to help balance economic growth with improve energy efficiency and environmental protection.

INVESTING IN PEOPLE

"Putting people first" is another key component of the Administration's investment agenda. Today's job market is characterized by stiff global competition and rapid advances in technology, requiring a highly skilled, flexible workforce. The FY 1995 budget supports increased funding for programs to improve the U.S. education system, help students plan for and manage the school to work transition, and promote continued workforce training and retraining (see table 6).

TABLE 6

	FY93 Actual	FY94 Enacted	FY95 Proposed	% Change FY94-FY95
(\$ millions)				
Goals 2000	-	105	700	567%
School to Work (Education & Labor)	-	100	300	200%
Dislocated Worker Assistance	651	1,118	1,465	31%
One-Stop Career Shopping	-	50	250	400%
Employment Service	895	918	918	0%

Increased funding for the Administration's *Goals 2000: Educate America Act* will target nationwide education reform and establish a National Education Goals Panel to monitor progress. The legislation also provides Federal support for the establishment of national skill standards. The program is expected to grow to \$700 million in FY 1995, a 567 percent increase over last year. The Council's Human Resources Committee has been promoting passage of the legislation in Congress.

The School to Work Opportunities Act, passed by both houses of Congress, aims to help states develop and implement strategies for preparing students for the workplace. The \$300 million requested for FY 1995 – a threefold increase over last year – is divided between the Department of Education and the Department of Labor. This legislation was also supported by the Council.

Dislocated worker assistance will grow 31 percent to nearly \$1.5 billion in FY 1995. The initiative is designed to facilitate the transition of experienced workers to new jobs and will be implemented in conjunction with \$918 million employment service budget and a \$250 million program to support development a "one-stop career shopping" network.

CONGRESS AND THE FY 1995 BUDGET

The Council strongly supports the President's FY 1995 budget submission but expects a tough road ahead as the budget moves to Congress for approval. With the tight budget caps put in place last year, discretionary spending is not increasing and funding for R&D and other investments must be paid for with cuts in other programs. President Clinton has made some tough choices regarding program terminations and reductions to pay for his investment agenda, however, past Administrations have unsuccessfully targeted many of the same programs that Clinton is proposing to eliminate or reduce in FY 1995.

The committee structure in Congress presents another problem. Many different authorization and appropriations committees have jurisdiction over Federal science and technology programs and initiatives, interfering with passage of a coherent R&D strategy. In addition, the various committees are often forced to make trade-offs between R&D and other societal programs within their domain. These trade-offs have sometimes resulted in a lower R&D appropriation than requested by the Administration.

The Administration is advancing proposals for biennial budgeting and a capital budget to improve the budget process and to allow the government to separate operational expenses from capital investments that can be depreciated over their useful life, as is the practice in industry. In the meantime, it will take continued effort by both the Administration and the private sector to pass a Federal budget that balances deficit reduction and with key national investment programs.

NEXT STEPS FOR THE COUNCIL

The President's FY 1995 budget proposal is an important step to accomplishing the technology strategy the Council has been advocating. The Council will therefore:

- support passage of the Administration's proposed budget in Congress;
- act as an advocate for implementation of the NSTC and other proposed organizational changes to improve management of Federal science and technology programs;
- promote effective management of Federal investment programs, including the development of metrics to gauge their success;
- assure that our members voices are well represented through formal and informal channels to the Administration;
- continue to actively assess progress and identify areas in need of increased action.

■ Export Controls

The Clinton Administration announced on March 30th a significant new liberalization of U.S. export controls. Virtually all controls on exports of telecommunications equipment and computers to China and the states of the former Soviet Union will be eliminated as of April 4th, opening markets worth roughly \$150 billion over ten years. Specifically, the announcement liberalizes exports of almost all telecommunications equipment as well as computers with a performance capacity of up to 1,000 million theoretical operations per second (MTOps).

The Administration also established a new general licensing process that will allow U.S. exporters to ship — without prior approval by the U.S. government — most low-level, dual-use items to civilian end-users in formerly proscribed destinations. According to the Commerce Department, the new export license liberalization will eliminate 35 percent of the individual validated licenses previously required for proscribed destinations. A strict licensing policy will be continued, however, for very sensitive items such as chemical weapons precursors, supercomputers, and sensitive electronic equipment with significant military applications. Further, those countries determined by the State Department to support terrorism — Cuba, Iran, Iraq, Libya, North Korea, and Syria — will remain off-limits to U.S. telecommunications equipment and computer exporters.

The initial reaction of the U.S. business community to the Administration's announcement was very positive. AT&T officials, for example, described the decision as a "blockbuster announcement...exactly what we've been looking for." The new policy is very much in line with the recommendations of the Council on Competitiveness' recent report, *Economic Security: The Dollar\$ and Sense of U.S. Foreign Policy*.

Also, members of COCOM (the Coordinating Committee on Multilateral Export Controls) have agreed to maintain existing export control lists as the basis for national controls after the official dissolution of COCOM on March 31, 1994.

■ Competitiveness Act Passes

S. 4, the National Competitiveness Act of 1993, passed the Senate on March 16th by a vote of 59-to-40. After extended floor debate, the overall authorization for the bill was reduced from \$2.8 to \$1.9 billion. The bill will now go to conference with the House version, H.R. 820, which was approved last May. The reductions in budget authorization will be apportioned in conference.

S. 4 authorizes funding for the Commerce Department and the National Science Foundation to stimulate the development and commercialization of new technologies. Specifically, the bill provides funding for the Advanced Technology Program, the Manufacturing Extension Partnership, and high-performance computing and NII demonstration projects.

A provision in the bill to establish a venture capital program for high-technology industries narrowly survived a Republican move to eliminate it. Existing differences between the Senate and the House version of this provision will have to be reconciled in conference. Also due to be debated in conference is the "Manton Amendment" in H.R. 820, which places strict conditions on U.S. and foreign firm participation in Advanced Technology Program projects.

■ Reemployment Act of 1994

President Clinton unveiled the Reemployment Act of 1994 on March 9th, promising to streamline the nation's unemployment system while providing increased job-search services and training to the jobless. The Administration's bill, H.R. 4050, was introduced to the House of Representatives on March 16th by Reps. Dan Rostenkowski (D-IL) and William Ford (D-MI). The Senate version will likely be introduced soon.

The legislation, prospects for which are uncertain, is projected to cost more than \$13 billion over 5 years. Among other provisions, the legislation will:

- Make eligible for a comprehensive range of unemployment services all permanently laid-off and long-term unemployed workers;

- Consolidate all Labor Department dislocated worker programs now available at the state and local levels;
- Establish one-stop career centers to give workers and employers information on and access to a full array of employment assistance programs and services; and
- Allow permanently laid-off workers extensions of their unemployment benefits to enable them to take and complete long-term training programs.

According to the Labor Department, the number of workers who are permanently laid off is increasing, rising from an average of 1.8 million a year in the late 1980s to more than 2 million in recent years.

■ Budget Cuts

The Senate passed the Administration's \$1.5 trillion FY1995 budget on March 27th, but only after a surprise amendment to the Senate Budget Resolution cut federal discretionary spending by \$26 billion over the next five years. A mid-April conference committee will seek to reconcile the Senate and House budget authorization levels.

The amendment was sponsored by Sens. James Exon (D-NE) and Charles Grassley (R-IA) and would require across-the-board discretionary spending cuts, with all savings going to deficit reduction. The White House is expected to argue that the \$26 billion cuts will severely impact defense spending and national security. The Administration is also expected to strongly support the House budget version in the conference committee. Although the House's budget authorization is \$3.1 billion below the President's request, it does not contain the Senate's further \$26 billion reduction.

The Senate also adopted by voice vote a bipartisan resolution calling for entitlement spending caps beginning in 1996.

■ U.S.-Asia Trade

With the June 3rd decision on most-favored nation (MFN) trading status for China approaching, Administration officials have begun signaling that the U.S. will consider a selective — as opposed to a full — withdrawal of Beijing's MFN status if human rights conditions are not met. Secretary of State Warren Christopher announced on March 18th that a selective MFN withdrawal may target only China's state-owned enterprises.

MFN withdrawal would result in significantly higher tariffs on Chinese imports and could lead to retaliatory tariffs by Beijing. According to Administration officials, one advantage of a selective withdrawal of MFN status would be to reduce the action's

impact on American businesses. In Congress, both Senate Minority Leader Robert Dole (R-KS) and House Majority Leader Richard Gephardt (D-MO) have predicted that China would be able to win renewal of its MFN status.

Meanwhile, Japan announced on March 29th a new package of market-opening measures designed to break the bilateral trade impasse with the U.S. The Japanese proposal promised an extension of income tax cuts, an overhaul of government procurement rules, and the deregulation of large industries such as telecommunications and financial services. U.S. officials dismissed the proposals, however, as inadequate.

U.S.-Japan trade relations have been in a stalemate, and bilateral Framework negotiations have been suspended, since the February 11th Clinton-Hosakawa summit. Tokyo continues to refuse to set numerical goals for opening its markets — a major trade goal of the Clinton Administration.

Also on March 29th, the Honda and Mazda car companies announced plans to increase their purchases of U.S. auto parts, both in Japan and at their production facilities in the United States. Toyota, Nissan, and Mitsubishi had already unveiled similar plans. As a sign of the growing size of Japanese auto plants in the U.S., the number of cars manufactured by Japanese companies in the U.S. will this year for the first time exceed Japanese auto exports to the U.S.

*Editor: Mark S. Mahaney
Council Associate*

KEY RECOMMENDATIONS

1. IN ORDER TO ENHANCE U.S. COMPETITIVENESS, THE PRESIDENT SHOULD ACT IMMEDIATELY TO MAKE TECHNOLOGICAL LEADERSHIP A NATIONAL PRIORITY.

The President should announce his intention to increase dramatically the share of federal R&D expenditures that support critical generic technologies and present a five-year implementation plan in his FY1993 budget. He should direct the Office of Science and Technology Policy to work with industry to set priorities in critical generic technologies, to translate these into specific action plans and to implement these programs. In addition, he should further strengthen key technology agencies, such as the National Institute of Standards and Technology, the Defense Advanced Research Projects Agency, the National Institutes of Health and the National Science Foundation.

2. THE FEDERAL AND STATE GOVERNMENTS SHOULD DEVELOP POLICIES AND IMPLEMENT PROGRAMS TO ASSURE THAT AMERICA HAS A WORLD-CLASS TECHNOLOGY INFRASTRUCTURE. The federal government should assess the nation's technology infrastructure needs, benchmark what foreign governments are doing and develop strategies, programs and implementation plans to make sure that the United States has world-class research facilities and equipment and an adequate supply of skilled scientists and engineers.

3. U.S. INDUSTRY SHOULD ESTABLISH MORE EFFECTIVE TECHNOLOGY NETWORKS TO HELP IT COMPETE IN THE INTERNATIONAL MARKETPLACE. U.S. industry associations, professional societies, R&D consortia, universities and research institutes should all make a major commitment to promote technology collaboration and to diffuse technology and information that promote America's technological competitiveness.

4. U.S. FIRMS SHOULD SET A GOAL TO MEET AND SURPASS THE BEST COMMERCIALIZATION PRACTICES OF THEIR COMPETITORS. The U.S. private sector should match the

President's goal to increase dramatically the percentage of R&D expenditures that support critical generic technologies. In order to build on successful commercialization practices, U.S. firms should benchmark their competitors; set appropriate goals and allocate the necessary resources; motivate, train and empower their employees to take responsibility for achieving these goals; and develop the external relationships necessary to accelerate the commercialization process.

5. WHILE KEEPING THEIR BASIC RESEARCH PROGRAMS STRONG, UNIVERSITIES SHOULD DEVELOP CLOSER TIES TO INDUSTRY SO THAT EDUCATION AND RESEARCH PROGRAMS CONTRIBUTE MORE EFFECTIVELY TO THE REAL TECHNOLOGY NEEDS OF THE MANUFACTURING AND SERVICE SECTORS.

Universities should increase their focus on the manufacture, use and commercialization of technology, but in the process should not jeopardize their basic research programs.

The report is the result of a two-year effort guided by a blue-ribbon group of top technology experts from industry, universities and labor around the country. The analysis differs from previous studies since it focuses on the needs of a broad spectrum of U.S. industry rather than on the individual needs of particular sectors. Because the technologies identified cut across different industries and drive national productivity and economic growth, they reflect the broader national interest, rather than the special interests of individual firms or industries.

The Council on Competitiveness is a private, non-profit, non-partisan organization of chief executives from business, higher education and organized labor who have joined together to improve the ability of American companies and workers to compete in world markets. The price of the full report is \$20. Copies can be obtained by contacting the Council.

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GAINING NEW GROUND:

TECHNOLOGY PRIORITIES FOR AMERICA'S FUTURE

H I G H L I G H T S

Gaining New Ground is a major new report from the Council on Competitiveness that identifies critical generic technologies driving the American economy and explains what the nation must do to strengthen its leadership in them. The report represents the first-ever U.S. private-sector consensus on U.S. priorities in technology. The critical technologies cut across nine major sectors of the economy, which together account for over \$1 trillion of sales. It describes where the United States is ahead, where it is behind and, more important, what U.S. government, labor, industry and universities can do to improve America's performance. The report reflects the strong conviction of leading American private-sector executives that unless the nation acts immediately to promote its position in critical generic technologies, U.S. technological competitiveness will erode further, with disastrous consequences for American jobs, economic growth and national security.

KEY FINDINGS

■ **THERE IS A BROAD DOMESTIC AND INTERNATIONAL CONSENSUS ABOUT THE CRITICAL GENERIC TECHNOLOGIES DRIVING ECONOMIC GROWTH AND COMPETITIVENESS.**

The U.S. government, the Japanese Ministry of International Trade and Industry, and the European Community have all identified similar critical technologies. Given this consensus, it is time to move beyond making lists. We must begin implementing programs to strengthen U.S. leadership in critical technologies.

■ **THE U.S. POSITION IN MANY CRITICAL TECHNOLOGIES IS SLIPPING AND, IN SOME CASES, HAS BEEN LOST ALTOGETHER. FUTURE TRENDS ARE NOT ENCOURAGING.**

America pioneered such technologies as numerically controlled machine tools, robotics, optoelectronics, semiconductors and memories only to lose leadership in them to foreign competitors.

Moreover, in many critical technologies, ranging from leading-edge scientific equipment to precision bearings, trends are running against U.S. industry.

■ **JAPAN, EUROPE AND OTHER FOREIGN GOVERNMENTS ARE SYSTEMATICALLY PURSUING LEADERSHIP IN CRITICAL TECHNOLOGIES.**

The most successful efforts combine funding with extensive public-private collaboration.

■ **U.S. PUBLIC POLICY DOES NOT ADEQUATELY SUPPORT AMERICAN LEADERSHIP IN CRITICAL TECHNOLOGIES, AND U.S. NATIONAL PRIORITIES DO NOT SUFFICIENTLY ADDRESS ISSUES RELATED TO THE ROLE OF TECHNOLOGY IN U.S. COMPETITIVENESS.**

Government R&D programs need to be reinforced by policies that encourage sharing of the costs and results of precompetitive research and

(continued on next page)

that stimulate private-sector investment in proprietary R&D and commercialization.

■ **MOST OF THE TECHNOLOGIES THAT WILL DRIVE ECONOMIC GROWTH OVER THE NEXT DECADE ALREADY EXIST, AND INDUSTRY NEEDS TO IMPROVE ITS ABILITY TO CONVERT THEM INTO MARKETABLE PRODUCTS AND SERVICES.**

Many of America's competitiveness problems stem from industry's failure to commercialize technology. Effective commercialization depends on management systems that promote the development and application of technology, strong education and training programs, and world-class commercialization systems.

■ **AMERICA'S RESEARCH UNIVERSITIES CONSTITUTE A GREAT NATIONAL ASSET, BUT THEIR FOCUS ON TECHNOLOGY AND COMPETITIVENESS IS LIMITED.**
U.S. universities produce first-rate scientists and engineers and conduct pioneering research, but their focus on preparing graduates for the needs of industry has been inadequate.

The tables below list the critical generic technologies driving U.S. industrial competitiveness. The technologies are divided into five major categories. Each technology is ranked according to whether the United States is strong, competitive, weak, or losing badly or lost.

(continued on next page)

MATERIALS AND ASSOCIATED PROCESSING TECHNOLOGIES	ENGINEERING AND PRODUCTION TECHNOLOGIES	ELECTRONIC COMPONENTS	INFORMATION TECHNOLOGIES	POWERTRAIN AND PROPULSION TECHNOLOGIES
ADVANCED STRUCTURAL MATERIALS <i>Competitive</i> in Metal Matrix Composites, Polymers, Polymer Matrix Composites <i>Weak</i> in Advanced Metals <i>Losing badly or lost</i> in Structural Ceramics ELECTRONIC AND PHOTONIC MATERIALS <i>Competitive</i> in Magnetic Materials, Optical Materials, Photoresists, Superconductors <i>Losing badly or lost</i> in Display Materials, Electronic Ceramics, Electronic Packaging Materials, Gallium Arsenide, Silicon BIOTECHNOLOGIES <i>Strong</i> in Bioactive/Biocompatible Materials, Bioprocessing, Drug Discovery Techniques, Genetic Engineering MATERIALS PROCESSING <i>Competitive</i> in Catalysts, Chemical Synthesis, Net Shape Forming, Process Controls <i>Weak</i> in Membranes, Precision Coating ENVIRONMENTAL TECHNOLOGIES <i>Strong</i> in Emissions Reduction, Recycling/Waste Processing	DESIGN AND ENGINEERING TOOLS <i>Strong</i> in Computer-Aided Engineering, Systems Engineering <i>Competitive</i> in Human Factors Engineering, Measurement Techniques, Structural Dynamics <i>Weak</i> in Leading-Edge Scientific Instruments COMMERCIALIZATION AND PRODUCTION SYSTEMS <i>Competitive</i> in Computer-Integrated Manufacturing <i>Weak</i> in Design for Manufacturing, Design of Manufacturing Processes, Flexible Manufacturing, Integration of Research, Design and Manufacturing, Total Quality Management PROCESS EQUIPMENT <i>Competitive</i> in Advanced Welding, Joining and Fastening Technologies <i>Weak</i> in High-Speed Machining, Precision Bearings, Precision Machining and Forming <i>Losing badly or lost</i> in Integrated Circuit Fabrication and Test Equipment, Robotics and Automated Equipment	MICROELECTRONICS <i>Strong</i> in Microprocessors <i>Competitive</i> in Logic Chips, Submicron Technology <i>Losing badly or lost</i> in Memory Chips ELECTRONIC CONTROLS <i>Competitive</i> in Sensors <i>Weak</i> in Actuators OPTOELECTRONIC COMPONENTS <i>Weak</i> in Laser Devices, Photonics ELECTRONIC PACKAGING AND INTERCONNECTIONS <i>Losing badly or lost</i> in Multichip Packaging Systems, Printed Circuit Board Technology DISPLAYS <i>Losing badly or lost</i> in Electroluminescent, Liquid Crystal, Plasma and Vacuum Fluorescent HARDCOPY TECHNOLOGY <i>Weak</i> in Electro Photography, Electrostatic INFORMATION STORAGE <i>Strong</i> in Magnetic Information Storage <i>Losing badly or lost</i> in Optical Information Storage	SOFTWARE <i>Strong</i> in Applications Software, Artificial Intelligence, Computer Modeling and Simulation, Expert Systems, High-Level Software Languages, Software Engineering COMPUTERS <i>Strong</i> in Neural Networks, Operating Systems, Processor Architecture <i>Competitive</i> in Hardware Integration HUMAN INTERFACE AND VISUALIZATION TECHNOLOGIES <i>Strong</i> in Animation and Full Motion Video, Graphics Hardware and Software, Handwriting and Speech Recognition, Natural Language, Optical Character Recognition DATABASE SYSTEMS <i>Strong</i> in Data Representation, Retrieval and Update, Semantic Modeling and Interpretation NETWORKS AND COMMUNICATIONS <i>Competitive</i> in Broadband Switching, Digital Infrastructure, Fiber Optic Systems, Multiplexing PORTABLE TELECOMMUNICATIONS EQUIPMENT AND SYSTEMS <i>Strong</i> in Transmitters and Receivers <i>Competitive</i> in Digital Signal Processing, Spectrum Technologies	POWERTRAIN <i>Strong</i> in Low Emission Engines <i>Competitive</i> in Alternative Fuel Engines, Electric Motors and Drives, Electrical Storage Technologies <i>Weak</i> in High Fuel Economy/Power Density Engines PROPULSION <i>Strong</i> in Airbreathing Propulsion, Rocket Propulsion
Source: Council on Competitiveness	Source: Council on Competitiveness	Source: Council on Competitiveness	Source: Council on Competitiveness	Source: Council on Competitiveness

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Education Secretary Riley On School, Work and High Expectations

A comprehensive plan for American education that starts with high standards is the key to preparing children for a globally competitive world, according to U.S. Education Secretary Richard Riley.

"There's no place in the economy now for people who have a watered-down education," Riley told *Challenges* in a recent interview. "Everybody has to work and try to get that message out."

For the federal government, Riley said, that means pushing for legislation like reauthorization of the Elementary and Secondary Education Act. The legislation includes providing federal funds to the highest-poverty schools, making schools safer and bringing the information highway into schools.

Another legislative concern is the School-to-Work Opportunities Act, which would help create high school apprenticeship-type programs for the many students who don't pursue college.

The administration's efforts

paid off with the passage of Goals 2000, which provides states with objectives for their academic standards.

Along with setting policy, Riley said, the federal government also has a responsibility to help people understand the importance of life-long learning. Research has shown, Riley pointed out, that the higher the education level of a population is, the lower the



Education Secretary Richard Riley

unemployment and the higher the earning potential.

"It's important," he said, "for us to say that education does matter, that it is connected to quality of life."

All of these issues, the secretary explained, are wrapped up in the Clinton administration's fundamental view that

every child can learn and that the single-shot approaches of the 1980s were not enough.

War Games for Global Market Competition

Recently, a group of American industry representatives got together with some U.S. government officials and played war.

Not with tanks and bomber jets, but with economic strategies and market projections. It was just a game, called Prosperity Games, based on the defense War Games, but the activity had a very real objective: Improve industry-government cooperation to boost American competitiveness.

Unlike a policy conference, where generally people listen to speakers, Prosperity Games are interactive, focused and highly charged, explained game director Pace VanDevender of Sandia National Laboratories.

Unlike governmental agencies that play out similar what-if economic scenarios internally, these games bring in all sides: industry, government, national laboratories, and those in the advisory community, such as universities.

"It's a learning tool," VanDevender said.

Through Prosperity Games, industry leaders are brought together, giving them the open-

"Not that the one-shots were bad. They just didn't help the
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ing for relationships that might lead to joint, long-term strategies.

Meanwhile, VanDevender said, "The government walks out with an innovative understanding of industry concerns, so that they can go back and construct policy better.

"And the labs and the universities walk away with a better understanding of their customers in both industry and government."

Working for Solutions

The project was hatched last summer, after VanDevender took a new Sandia title: national industrial alliances director. He spent a lot of time talking to people on all sides of the competitiveness issue to find out what Sandia could do to help.

"We realized that we didn't have a solution," he said of the lab, "but we could provide a forum for people to work toward solutions."

A chat with a Defense Department technology development official — who, incidentally, had just returned from two weeks with the Navy reserve — provided the idea. Prosperity Games were born.

'An Outstanding Activity'

The first game, in January,
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GAINING NEW GROUND:

TECHNOLOGY PRIORITIES FOR AMERICA'S FUTURE

H I G H L I G H T S

Gaining New Ground is a major new report from the Council on Competitiveness that identifies critical generic technologies driving the American economy and explains what the nation must do to strengthen its leadership in them. The report represents the first-ever U.S. private-sector consensus on U.S. priorities in technology. The critical technologies cut across nine major sectors of the economy, which together account for over \$1 trillion of sales. It describes where the United States is ahead, where it is behind and, more important, what U.S. government, labor, industry and universities can do to improve America's performance. The report reflects the strong conviction of leading American private-sector executives that unless the nation acts immediately to promote its position in critical generic technologies, U.S. technological competitiveness will erode further, with disastrous consequences for American jobs, economic growth and national security.

KEY FINDINGS

■ **THERE IS A BROAD DOMESTIC AND INTERNATIONAL CONSENSUS ABOUT THE CRITICAL GENERIC TECHNOLOGIES DRIVING ECONOMIC GROWTH AND COMPETITIVENESS.**

The U.S. government, the Japanese Ministry of International Trade and Industry, and the European Community have all identified similar critical technologies. Given this consensus, it is time to move beyond making lists. We must begin implementing programs to strengthen U.S. leadership in critical technologies.

■ **THE U.S. POSITION IN MANY CRITICAL TECHNOLOGIES IS SLIPPING AND, IN SOME CASES, HAS BEEN LOST ALTOGETHER. FUTURE TRENDS ARE NOT ENCOURAGING.**

America pioneered such technologies as numerically controlled machine tools, robotics, optoelectronics, semiconductors and memories only to lose leadership in them to foreign competitors.

Moreover, in many critical technologies, ranging from leading-edge scientific equipment to precision bearings, trends are running against U.S. industry.

■ **JAPAN, EUROPE AND OTHER FOREIGN GOVERNMENTS ARE SYSTEMATICALLY PURSUING LEADERSHIP IN CRITICAL TECHNOLOGIES.**

The most successful efforts combine funding with extensive public-private collaboration.

■ **U.S. PUBLIC POLICY DOES NOT ADEQUATELY SUPPORT AMERICAN LEADERSHIP IN CRITICAL TECHNOLOGIES, AND U.S. NATIONAL PRIORITIES DO NOT SUFFICIENTLY ADDRESS ISSUES RELATED TO THE ROLE OF TECHNOLOGY IN U.S. COMPETITIVENESS.**

Government R&D programs need to be reinforced by policies that encourage sharing of the costs and results of precompetitive research and

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