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National Technology Initiative

Event date Wednesday, February 19, 1992

Contacts: Steve Skinner, Energy Department, 586-5500.
Steve Olson, Office of Science and Technology Policy,
White House, x2734.

Mat Heyman, NIST Chief of Public Affairs, 301-975-2762

Event site: Oak Ridge National Laboratory

377-4844 (Commerce Dept, Tech Analysis)

See file for details, plus Bob should be calling in from the road.

**Call Steve Skinner if you need event guidance. When I spoke with him this morning, they were still scrambling to put the event together. He did say they would be happy to submit talking points. They should be here by the end of the day.

I have enclosed some quotes on technology. Those circled in blue are the best ones, I think.

Other Technology Quotes:

"We now stand in the vestibule of a vast new technological age."
-- Dwight D. Eisenhower
1959

"A different world cannot be built by indifferent people"
-- Anonymous

From Mat Heyman: The three top points of NTI

- 1) Improve industry awareness of what federal government has to offer in terms of R&D and new policies which will help develop new technologies.
- 2) Raise awareness of Companies working together with other companies and share technological advances.
- 3) Improve feedback and dialogue between the government and the private sector; work together.

**Mat will be faxing additional materials, such as success stories and examples of what this means in real terms, as well as how our economic proposals can be tied in.

(Ferguson/Gershowitz)
February 18, 1992
Draft Two
OAKRIDGE

PRESIDENTIAL REMARKS: KNOXVILLE AUDITORIUM-COLISEUM
WEDNESDAY, FEBRUARY 19, 1992
KNOXVILLE, TENNESSEE
11:45 AM

(Acknowledgments, humor, Tennessee color.)

It's a pleasure to be in Knoxville, for what you have done here is a model for the nation. Knoxville combines in one place the resources of government, the enthusiasm of cutting-edge research and the energy and inventiveness of private enterprise. You are pointing our country toward the next American century.

We stand today at a pivot point in history -- at the end of one era and the beginning of another. In the last year imperial communism died, and as the clouds of the Cold War part, America stands alone, the undisputed leader of the world.

The old era demanded great sacrifices; our country met them proudly. But the new era opens up to us limitless possibilities, fresh challenges of the kind that have always brought out the best in America.

For the short term, of course, our challenge is to fire up the economy. I've put together a short-term plan -- (seven common) sense steps -- to spur investment and create jobs. With inflation down and interest rates at historic lows, my short-term plan offers the stimulus our economy needs and lays the groundwork for a strong recovery.

I've asked Congress to pass my plan by March 20. And here in Knoxville, let me ask them again: Help your country. America can no longer wait. [Placeholder for tax insert.] Pass my plan and get this economy moving again.

With my plan in place, we must look forward, beyond the short-term into the next century. Believe it or not, looking forward has become a more radical notion than it sounds. Even now, in this moment of great triumph for America, we hear from some quarters the dim voice of defeatism, a tinny trumpet sounding retreat. We're told that our future lies in turning away from the world, in isolating our country behind some wall of protection to re-create a simpler, less challenging past.

Don't be fooled by the tough talk and patriotic bluster: protectionism comes from fear -- fear that American workers can't compete -- fear that American ingenuity is spent -- fear that we must turn away from the world because we can no longer lead the world. That's not the future I see for the United States of America.

The America of the future will pull down barriers, not build them up. It will embrace challenges, not cut and run. It will push back the frontiers of knowledge and technology, not pine for an irretrievable past. And because of this, when the America of the future competes, it will win.

This century has taught us many lessons. But above them all hangs an overarching truth: If America is to succeed economically at home, we must lead abroad. Our leadership

ensures markets for American products and jobs for American workers; it gives us room to spread our wings and show the world what we can do. Let us never forget: Our national symbol is the eagle, not the ostrich.

Each generation of Americans makes an implicit compact with the generations that follow: We pledge to our children and grandchildren that their lives will be better than ours -- that their standard of living will be higher, that their opportunities will be greater. Our generation will make good on its pledge only if we continue to lead the world, and as president I hold this promise as a solemn vow.

So for the last three years my administration has been laying the foundation for America's continued leadership in the world. We have approached this pivot point in history -- this moment of unparalleled opportunity -- with a positive strategy to build on the enduring strengths of the American people: our capacity for hard work, our cutting-edge technology, our willingness to take risks.

To continue as the world's economic leader we must excel in two vital areas: education and technology. That's where our future lies. Our strategy targets both.

American science is the best in the world. We've got to make sure that the same is true of American science education. Tomorrow's marketplace will demand workers highly-skilled in math and science. Tennesseans know the importance of that, and I

thank you for lending me your former governor, Lamar Alexander, to help get the message to the rest of the country.

Joining with the nation's governors, Secretary Alexander and I set a series of education goals, and one of the most important was this: By the year 2000, America's students will be first in math and science. Yes, it's an ambitious goal. That's why we've set it.

~~Feb 2, 1990~~ National Education Goals, cited CEHR, 1

The budget I've recently submitted to Congress calls for more than \$2 billion in math and science education programs -- an 18 percent increase this year for programs at the pre-college level. To better train teachers, we plan to double the number of math and science instructors receiving federally-assisted in-depth instruction in their field. That means that this year, almost half the nation's precollege math and science teachers will receive some federally-funded training. CEHR-iv

Report of the FCCset- CEHR iii

CEHR iv

In the old era now ending, many of America's best scientists were engaged in winning the cold war. The new era will free up those priceless talents to concentrate on the technologies of tomorrow -- improving productivity and guaranteeing our longterm prosperity. We will transform the Arsenal of Democracy into the Engine of Economic Growth.

But it will take the right kind of investments -- the kind we've been making for three years. These have been tough decisions. This year, I've asked for a freeze on discretionary domestic spending -- which means that any increases have to be the result of hard thinking about priorities. We've done the

Budget FY-93 Hone-87

hard thinking. And we've made a fundamental decision. Our future economic competitiveness demands that we invest today in our strengths: research and development. I've asked for a record investment in R&D: \$76 billion this year alone.

Budget
FY '93
PANTONE-
88

Let me give you just a few examples of what this means.

This year we're investing \$803 million to assist private enterprise in the development of a high-performance computing system 1000 times more powerful than today's computer. Such a system will forecast droughts and hurricanes, design better aircraft, and unlock the riddle of the genome.

FY '93
Pt-1,88

→ FY '93, Pt-99

We're investing more than \$1 billion in technologies to improve energy efficiency -- nuclear fusion and alternatives to petroleum.

FY '93, Pt-1,89

We're investing almost \$1.5 billion in transportation R&D.

FY '93

To relieve our overburdened highways and airports, we're stimulating research in new transportation technologies such as intelligent vehicle highway systems and high-speed rail.

FY
'93
PHONE-110

We're increasing investment in biotechnology research -- for a total of more than \$4 billion -- so that we continue to lead the world in conquering disease and relieving world hunger. This research can pay dividends undreamed of just a few years ago.

FY '93
Pt-103

One recent development: microorganisms that emit light signals when they encounter pollution in the environment.

→ FY '93, Pt-1, 104

And there's much more: substantial increases for the superconducting supercollider, agricultural research, and the development of advanced materials. We will double the budget for

FY '93, Pt-1, 120

FY '93, Pt-1, 125

Pf 7-90, FY '93

the National Science Foundation -- home to some of our most fantastic technological advances.

And for a generation, when Americans have looked to the future they have looked to the stars. We're intensifying our efforts to explore the Moon and the planets -- a quest that not only lifts our spirits but brings tangible benefits in new technology and economic growth.

Our challenge will be to put these incredible technologies to work for America, to move them out of the laboratory and into the marketplace. We've been busy sweeping away the obstacles that inhibit the transfer of technology from the government to private enterprise. Just over a year ago, I signed a bill that allows private industries to take competitive advantage of government research.

the National Competitiveness Technology Act of 1989 (15 USC 3701)

So far, ~~650~~⁶⁷⁵ such public-private agreements have been reached. In fact, I just witnessed another one out at Oak Ridge this morning. ~~Cools Structural Ceramics Company~~ and Oak Ridge will be perfecting a new ceramic material that's tougher than steel, perfect for making cutting tools. This kind of agreement means jobs: the ~~(cutting-tool) company Hertel~~ has decided to locate one of its manufacturing sites in Oak Ridge, to be near the scientists and facilities there.

We're getting the message out. Our National Technology Initiative brings government officials together with private businesses to let them know what government can offer in new technology.

NTI- remarks by Noel W. A. Schube! 2/12/92 pg 6-7
Hertel company manufacturing tools made
Whisker toughed ceramic
o.r. Nat Lab which invented and perfected whisker toughed ceramic

Cools rel.

But make no mistake: government has no business setting an industrial policy, picking winners and losers and protecting favored industries from market forces. The lightening pace of today's economy is too quick, too vital for the deadening hand of the bureaucrat. We will continue to lead only if we give the marketplace full play. A competitive market cuts fat, encourages efficiency and rewards innovation.

That's why for three years we've tried to encourage private venture capital. America taxes capital gains at a rate higher than any of our world competitors, yet the same pessimists who complain we can't compete have stood in the way of lower capital gains taxes. Let's put an end to that self-defeating nonsense. Congress must lower the capital gains tax to create jobs. The time to lower is now.

Finally, we've asked Congress to make the R&E tax credit a permanent part of the tax code. For private companies, this credit reduces the cost of research and development by as much as 20 percent. American businesses must be able to plan for the future knowing those savings are secure.

Each of these measures I've spoken of this afternoon springs from a vision of what our future should be. The great blessing of our country has always been that we Americans create our own future. This is no less true today than it was in the 19th century, when a vast frontier opened up before us and the Industrial Revolution promised unprecedented prosperity.

In this century, with confidence in themselves and faith in their talents, Americans made good on the dreams of their grandparents. Our grandchildren and their children will do the same for us, if we hold to the same confidence and faith, if we face the future unafraid, if today we bravely lay the foundation for the world they will enjoy tomorrow.

#



City/State: Knoxville, TN
 Event: Oak Ridge Nat'l Lab
 Date: 2/14/92

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File #
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↘ 615-483-1292 home

FAX 456 6218

Guy - water the box
machine. I asked all
to send samples of how
Oak Ridge is helping transfer
technology into the marketplace.

THE WHITE HOUSE
WASHINGTON

February 15, 1992

MEMORANDUM FOR JAY PARMER
SPECIAL ASSISTANT TO THE PRESIDENT AND
DIRECTOR OF PRESIDENTIAL ADVANCE

FROM: ED MURNANE
PEGGY HAZELRIGG

SUBJECT: PRE-ADVANCE TO KNOXVILLE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY AND ADDRESS TO KNOXVILLE COMMUNITY

On Wednesday, February 19, 1992, the President will tour and receive a briefing at the High Flux Isotope Reactor Facility at the Oak Ridge National Laboratory. Following the Visit to Oak Ridge, the President will Address the Knoxville Community at the Knoxville Auditorium-Coliseum.

Oak Ridge National Laboratory

The Oak Ridge National Laboratory -- one of the Department of Energy's major multiprogram laboratories -- focuses its resources on energy research and development. The Laboratory also applies expertise and facilities to other R&D challenges important to DOE and the nation. To meet these challenges, the Laboratory must achieve excellence in its operations related to environmental, safety, and health protection. The Laboratory's missions are Energy Technologies; Basic Research; National Research and Development User Facilities; Education; and Science and Technology Transfer.

The Oak Ridge National Laboratory's annual budget of \$500 million is funded by the Department of Energy (80 percent) and other federal agencies (20 percent). Although Oak Ridge's facilities and land area (58 square miles) are owned by the federal government, the facility is a wholly-owned subsidiary of and operated by Martin Marietta Corporation. Oak Ridge National Laboratory employs 4,500; 1,500 of which are scientists and engineers. The Laboratory celebrates its 50th anniversary next year.

Since it began full power operations in 1966, the High Flux Isotope Reactor at Oak Ridge National Laboratory has been one of the world's most powerful research reactors. One of the primary purposes of the Reactor is the production of ^{252}Cf and other transuranium isotopes for research, industrial, and medical applications.

Address to Knoxville Community

The President's Address to the Knoxville Community is an opportunity for the President to further endorse the recently announced National Technology Initiative and highlight the Oak Ridge National Laboratory as a successful example of the technology transfer effort.

As part of the Administration's technology transfer effort, the Department of Energy has encouraged its contractors and national laboratories to attract industry to their local communities and enter into cooperative research and development projects. The Oak Ridge National Laboratory is an example of federal technology transfer programs designed to provide U.S. industry with the latest technology, increasing their competitiveness in the global market and creating jobs in the United States.

Proposed Scenario

The President arrives McGhee Tyson Air Base and proceeds to Marine One. The President boards Marine One and departs McGhee Tyson Air Base en route Oak Ridge National Laboratory Landing Zone. The President arrives Oak Ridge National Laboratory Landing Zone and proceeds to Motorcade. The President boards Motorcade and departs Landing Zone en route High Flux Isotope Reactor Facility. The President arrives the High Flux Isotope Reactor Facility and is met by: Mr. Alvin W. Trivelpiece, Director, Oak Ridge National Laboratory and TBD Greeters. Following Greetings, The President proceeds to TBD Floor. The President arrives TBD Floor and begins participation in Tour. The President concludes participation in Tour, departs TBD Floor and proceeds to Control Center. The President arrives Control Center and begins participation in Briefing. The President concludes participation in Briefing, departs Control Center and proceeds to Holding Room. The President arrives Holding Room and holds briefly. The President departs Holding Room and proceeds to Motorcade. The President boards Motorcade and departs High Flux Isotope Reactor Facility en route Oak Ridge National Laboratory Landing Zone.

THE WHITE HOUSE

The President arrives Oak Ridge ^{WASHINGTON} National Laboratory Landing Zone and proceeds to Marine One. The President boards Marine One and departs Oak Ridge National Laboratory Landing Zone en route McGhee Tyson Air Base. The President arrives McGhee Tyson Air Base and proceeds to board Motorcade. The President boards Motorcade and departs McGhee Tyson Air Base en route Knoxville Auditorium-Coliseum. The President arrives Knoxville Auditorium-Coliseum and proceeds to Holding Room. The President arrives Holding Room and holds briefly. The President departs Holding Room and proceeds to Auditorium Off-Stage Announcement Area.

The President arrives Auditorium Off-Stage Announcement Area and holds briefly. The President is announced onto Stage and proceeds to Seat. The President is introduced for Remarks by TBD. The President Remarks. (NOTE: A Teleprompter will be used.) The President concludes Remarks, departs Stage, proceeds to Holding Room and holds briefly.

The President departs Holding Room and proceeds to Motorcade. The President boards Motorcade and departs Knoxville Auditorium-Coliseum en route McGhee Tyson Air Base. The President arrives McGhee Tyson Air Base and proceeds to board Air Force One. The President departs Knoxville, Tennessee en route Andrews Air Force Base.

Proposed Backdrop

The backdrop for the President's Briefing at the Reactor will be the Facility's Control Center. The expanded press pool will be located straight on at approximately 20 feet.

The backdrop for the President's Address at the Knoxville Auditorium-Coliseum is TBD. The press platform will be located straight on at approximately 80 feet.

Notes

Attendance for the President's Address is expected to be approximately 1,000, with guests seated theatre style. Tickets for the President's Address will be distributed through various business, civic and community groups in the Knoxville area, including the local Chamber of Commerce.

Access to the site begins the day before the event.

The attire is business suit.

(2) In any case in which the total estimated cost for such planning and design exceeds \$300,000, the Secretary shall notify the Committees on Armed Services and the Committees on Appropriations of the Senate and House of Representatives in writing of the details of such project at least 30 days before any funds are obligated for design services for such project.

(b) **SPECIFIC AUTHORITY REQUIRED.**—In any case in which the total estimated cost for advance planning and construction design in connection with any construction project exceeds \$2,000,000, funds for such design must be specifically authorized by law.

SEC. 3126. AUTHORITY FOR EMERGENCY CONSTRUCTION DESIGN

In addition to the advance planning and construction design authorized by section 3102, the Secretary of Energy may perform planning and design utilizing available funds for any Department of Energy defense activity construction project whenever the Secretary determines that the design must proceed expeditiously in order to meet the needs of national defense or to protect property or human life.

SEC. 3127. FUNDS AVAILABLE FOR ALL NATIONAL SECURITY PROGRAMS OF THE DEPARTMENT OF ENERGY

Subject to the provisions of appropriation Acts and section 3121, amounts appropriated pursuant to this title for management and support activities and for general plant projects are available for use, when necessary, in connection with all national security programs of the Department of Energy.

SEC. 3128. AVAILABILITY OF FUNDS

When so specified in an appropriation Act, amounts appropriated for operating expenses or for plant and capital equipment may remain available until expended.

National
Competitiveness
Technology
Transfer
Act of 1989.
15 USC 3701
note.
15 USC 3701
note.

PART C—TECHNOLOGY TRANSFER

SEC. 3131. SHORT TITLE

This part may be cited as the “National Competitiveness Technology Transfer Act of 1989”.

SEC. 3132. FINDINGS AND PURPOSES

(a) **FINDINGS.**—Congress finds that—

(1) technology advancement is a key component in the growth of the United States industrial economy, and a strong industrial base is an essential element of the security of this country;

(2) there is a need to enhance United States competitiveness in both domestic and international markets;

(3) innovation and the rapid application of commercially valuable technology are assuming a more significant role in near-term marketplace success;

(4) the Federal laboratories and other facilities have outstanding capabilities in a variety of advanced technologies and skilled scientists, engineers, and technicians who could contribute substantially to the posture of United States industry in international competition;

(5) improved opportunities for cooperative research and development agreements between contractor-managers of certain Federal laboratories and the private sector in the United States,

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in writing of the details of
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any case in which the total
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rized by law.

CONSTRUCTION DESIGN

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NATIONAL SECURITY PROGRAMS

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TRANSFER

nal Competitiveness Tech-

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consistent with the program missions at those facilities, particu-
larly the national security functions involved in atomic energy
defense activities, would contribute to our national well-being;
and

(6) more effective cooperation between those laboratories and
the private sector in the United States is required to provide
speed and certainty in the technology transfer process.

(b) PURPOSES.—The purposes of this part are to—

(1) enhance United States national security by promoting
technology transfer between Government-owned, contractor-
operated laboratories and the private sector in the United
States; and

(2) enhance collaboration between universities, the private
sector, and Government-owned, contractor-operated labora-
tories in order to foster the development of technologies in areas
of significant economic potential.

SEC. 3133. AUTHORITY TO ENTER INTO COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS

(a) TECHNOLOGY TRANSFER ACTIVITIES.—Section 12 of the Steven-
son-Wylder Technology Innovation Act of 1980 (15 U.S.C. 3710a) is
amended—

(1) in subsection (a)—

(A) by inserting “, and, to the extent provided in an
agency-approved joint work statement, the director of any
of its Government-owned, contractor-operated laboratories”
after “Government-operated Federal laboratories”;

(B) by striking “for Government-owned” and inserting in
lieu thereof “(in the case of a Government-owned, contrac-
tor-operated laboratory, subject to subsection (c) of this
section) for” in paragraph (2); and

(C) by striking “of Federal employees” in paragraph (2);

(2) in subsection (b)—

(A) by inserting “, and, to the extent provided in an
agency-approved joint work statement, a Government-
owned, contractor-operated laboratory,” after “Govern-
ment-operated Federal laboratory”;

(B) by striking “a Federal” in paragraph (2) and inserting
in lieu thereof “a laboratory”; and

(C) by inserting after paragraph (5) the following:

“A Government-owned, contractor-operated laboratory that enters
into a cooperative research and development agreement under
subsection (a)(1) may use or obligate royalties or other income
accruing to such laboratory under such agreement with respect to
any invention only (i) for payments to inventors; (ii) for the purposes
described in section 14(a)(1)(B) (i), (ii), and (iv); and (iii) for scientific
research and development consistent with the research and develop-
ment mission and objectives of the laboratory.”;

(3) in subsection (c)(3)(A), by striking “employee standards of
conduct” and inserting in lieu thereof “standards of conduct for
its employees”;

(4) in subsection (c)(5)(A), by inserting “presented by the
director of a Government-operated laboratory” after “any such
agreement”;

(5) in subsection (c)(5)(B), by inserting “by the director of a
Government-operated laboratory” after “an agreement pre-
sented”;

INSERT

- #1 - Replace 3rd full paragraph, page 6, starting with "So far..." with following:

In fact, I just witnessed the signing of a Cooperative Research and Development Agreement between Oak Ridge National Laboratory and the Coors Structural Ceramics Company. Together, they are going to attack one of the obstacles to making precision ceramic parts--machining ceramics without destroying their desirable qualities. Oak Ridge, which developed precision machining technology to win the Cold War, and which also houses a world class advanced materials testing facility, will be working with American industry to take the world lead in ceramics.

Why is this important? First, ceramics is a critical technology and the ceramics products market is about to explode. We're behind our foreign competitors in the race to make ceramic parts. This partnership brings together the best we have in this country to make certain we are competitive in this emerging field.

Secondly, and more importantly, this agreement is a symbol of our commitment to win in competitive, high-tech global markets. And that means jobs. Coors Ceramics built a plant in Oak Ridge a little over a year ago precisely to take advantage of the expertise at Oak Ridge National Lab. There are 85 new jobs in Oak Ridge that didn't exist two years ago because of new partnership between a federal laboratory and American industry. And bear in mind this is just one of 25 cooperative agreements at this lab alone.

- #2 - Add to last sentence of last paragraph, page 6:

Oak Ridge National Laboratory is a perfect example of the unparalleled resource that resides in the federal laboratory system, which is comprised of 700 different labs. Yesterday, Oak Ridge was at the forefront of defending the free world. Today we are discussing cutting-edge advanced materials R&D. Tomorrow Oak Ridge will be in the headlines for its premier environmental research, particularly in the area of global climate change. Oak Ridge, and all the national labs, are going to be tremendous partners for American industry.

MERCHANDISING also see **MARKETING; SALESMEN/SELLING; SUPERMARKETS**

our job to make women unhappy with what they have.

B. EARL PUCKETT, president, Allied Stores, obituary in *Newsweek*, Feb. 23, 1976

public doesn't know what it wants. We offer beautiful things that like. Anyone who disagrees with our taste is free to go elsewhere.

WALTER HOVING, chairman, Tiffany & Co., quoted in *Wall Street Journal*, Dec. 24, 1968

t to the American corpse, the American bride is the hottest thing today's merchandising market.

KITTY HANSON, *For Richer, For Poorer*, 1968

ed Until We Open.

SIGN ON BICYCLE SHOP, Szczecin, Poland, 1970

omers Giving Orders Will Be Swiftly Executed.

SIGN ON TAILOR SHOP, Kowloon, Hong Kong, quoted in Leo Rosten, *The 3:10 to Anywhere*, 1976

MIDDLE AGE also see **AGING; OLD AGE**

egins at that precise moment when you realize that all you had right of as preparation was, in fact, fulfillment, while all you had anticipated as fulfillment is likely to turn out as merely more of the

Unitarian Universalist Register-Leader, Mar. 1967

have to pass 40 to know what not to hope for.

WEBSTER SCHOTT, *New York Times*, Sept. 12, 1976

only people who can't enjoy middle age are those who wear themselves out aping the young.

HAL BOYLE'S COLUMN, Aug. 26, 1969

no longer spend your life hurrying around the corner for something which is never there.

REX HARRISON, *Quote*, Sept. 25, 1966

You all of a sudden realize that you are being ruled by people you went to high school with. You all of a sudden catch on that life is nothing *but* high school . . . class officers, cheer-leaders, and all.

KURT VONNEGUT, *Our Time Is Now*, John Birmingham, ed., 1970

A Midlife Crisis is a lot like the Army, only the food is better.

GERALD NACHMAN, *Playing House*, 1978

MIDDLE EAST also see **ISRAEL/ISRAELIS**

If God is dead, he died trying to solve the dilemma of the Middle East.

I. F. STONE, *Polemics and Prophecies*, 1971

Jews and Muslims can live, and have lived, harmoniously together—particularly if there are barbarous and bloodthirsty Christians somewhere near.

C. P. SNOW, speech at New York School of Hebrew Union College—Jewish Institute of Religion, Mar. 31, 1969

The Egyptians are unstable and we're neurotic. It won't be an easy co-existence.

ZEEV SCHIFF, Israeli newsman, quoted in *Newsweek*, Feb. 6, 1978

MINING see **CONSERVATION: MINING**

MODERN TIMES also see **CENTURY: TWENTIETH; CIVILIZATION; DECADES; TECHNOLOGY**

We are living and seeing one of those great turning points in history when a whole era dissolves and disappears.

JACQUES BARZUN, lecture at Columbia University, Jan. 29, 1973

Modern man . . . strides about the globe in scientific splendor, matter in one hand, energy in the other, proclaiming his conquest of the elements. But once back from the campaign, he hasn't the faintest idea of what to do with all this technological plunder.

VAN CLEVE MORRIS, *Existentialism in Education*, 1966

Technology Quotes

It is like the story of Jack who marveled at his unexpected beanstalk only to glimpse, as he neared the top, the ominous form of a disturbed giant.

RICHARD N. GOODWIN, *The American Condition*, 1974

The modern urban-industrial society is based on a series of radical disconnections between body and soul, husband and wife, marriage and community, community and earth. At each of these points of disconnection the collaboration of corporation, government, and experts sets up a profit-making enterprise that results in the further dismemberment and impoverishment of the Creation.

WENDELL BERRY, *The Unsettling of America*, 1977

We may go down in history as an elegant technological society which underwent biological disintegration through lack of economic understanding.

DAVID M. GATES, quoted in *This Week in Public Health*, Sept. 19, 1968

We have not had time to learn inside ourselves the things that have happened to us.

JOHN STEINBECK, *America and Americans*, 1966

At the age of 40 these days, an average man's alarm mechanism is shot.

RUSSELL BAKER, quoted in *Business Week*, Oct. 24, 1964

No one will live all his life in the world into which he was born and no one will die in the world in which he worked in his maturity.

MARGARET MEAD, quoted in *Vital Speeches*, Dec. 15, 1969

We're living in a Babylonian society perhaps more Babylonian than Babylon itself. It's what's called a late sensate period.

MAX LERNER, quoted in *Newsweek*, Nov. 13, 1967

The turbulence of the machine is soothed by the consoling hum of a unified society.

JACQUES ELLUL, *The Technological Society*, 1964

Who can really feel comfortable in this culture now except maybe a few guys who are good at mathematics?

THOMAS HART BENTON, interview in *New York Times*, June 9, 1968

Has anyone noticed that we no longer produce a literature of utopia?

DOUGLAS DAVIS, *Newsweek*, June 14, 1976

MONEY also see POVERTY; RICHES

Money is applause.

JACQUELINE SUSANN

To have money is to have time.

ALBERT CAMUS, *A Happy Death*, 1972

Money is a sixth sense which makes it possible for us to enjoy the other five.

RICHARD NEY, "Day at Night," PBS, June 4, 1974

The fuel that keeps the new people moving faster than the speed of worry is money.

WILFRID SHEED, *The Morning After*, 1971

There is something about making money. You can bitch at it and talk about your ego, but make money and it all becomes easy. It even improves your personality.

JOHN M. KING, quoted in *Forbes*, Aug. 15, 1969

That most versatile of all abstractions. . . . Only the poor appreciate the physicality of cash.

KENNETH BAKER, *New York Times*, Feb. 3, 1974

Nobody is a gentleman when big money is involved.

JOHN LEONARD, *New York Times*, July 6, 1976

I figure if somebody's got a dollar, 40 cents of it is mine.

GUY DRAKE, songwriter and hustler, quoted in *Newsweek*, Apr. 13, 1970

I've got all the money I'll ever need if I die by 4 o'clock.

HENNY YOUNGMAN, quoted on "Tomorrow," NBC-TV, Feb. 22, 1977

Because that's where the money is.

ATTRIBUTED TO WILLIE SUTTON ON WHY HE ROBBED BANKS, THOUGH HE DISCLAIMS IT, *Where the Money Was*, 1976

Compared with the college politician, the real article seems like an amateur.

WOODROW WILSON, quoted in Henry Wilkinson Bragdon, *Wilson: The Academic Years*, 1967

If a university faculty were to unionize and then use the strike to achieve its objectives, it might find that college teachers are not taken as seriously as sanitation workers.

ALBERT H. BOWKER, quoted in *Wall Street Journal*, Dec. 16, 1968

TECHNOLOGY also see MODERN TIMES

Technological society has succeeded in multiplying the opportunities for pleasure, but it has great difficulty in generating joy.

POPE PAUL VI, apostolic exhortation, *Gaudete in Domino*, May 16, 1975

It is . . . the modern version of original sin, tempting us beyond the limits of moral judgment and intelligence.

W. H. FERRY, speech at Dartmouth College, June 1976

The continuing increases in purchasing power and leisure time that have made Americans the envy of working people everywhere have not come from working ever harder—but from working ever smarter.

WILLIAM C. FREUND, *Newsweek*, Jan. 29, 1979

One consequence of postwar technology has been the acceleration of change in our society, so that we seem to produce a new generation about every five years.

ROSS MACDONALD, *New York Times*, Apr. 25, 1971

The characteristic of the exploding technological society is that changes sooner or later *must* take place in a fraction of the time necessary even to assess the situation.

JOHN WILKINSON, *John Wilkinson on the Quantitative Society*, 1964

In guessing the direction of technology it is wise to ask who is in the best position to profit most.

BEN H. BAGDIKIAN, *The Information Machines*, 1971

It would appear that national ambitions and technological progress go hand in hand with the tonic-dominant harmonies of the Sousa march.

YEHUDI MENUHIN, *Theme and Variations*, 1972

If we continue in the direction we are going today, we will make this world uninhabitable—not because we want to, but because we don't care.

ROBERT THEOBOLD, quoted in *New York Times*, Mar. 3, 1968

It was naive of the 19th century optimists to expect paradise from technology—and it is equally naive of the 20th century pessimists to make technology the scapegoat for such old shortcomings as man's blindness, cruelty, immaturity, greed, and sinful pride.

PETER F. DRUCKER, *Technology, Management and Society*, 1970

Just the other day I listened to a young fellow sing a very passionate song about how technology is killing us and all that. But before he started, he bent down and plugged his electric guitar into the wall socket.

PAUL GOODMAN, quoted at American Marketing Association Congress, June 16, 1969

Today technology has a bad name. Young people believe it is irrelevant. If they continue to believe this, we, and particularly they, will soon be irrelevant.

EDWARD TELLER, speech at Conference of Governors, N.Y.C., May 12, 1973

TELEPHONES

The one thing that can interrupt intercourse.

EDMUND CARPENTER, *Oh, What a Blow That Phantom Gave Me!*, 1973

Prolonged adolescence was invented in the 20th century so that there would be somebody to use the phone in the afternoon. . . . Before the telephone, there were no teenagers.

JOHN LEONARD, *New York Times*, Aug. 25, 1976

Instead of belles-lettres we have Ma Bell.

DONAL HENAHAN, *New York Times*, Nov. 6, 1977

In Britain it will connect you to all sorts of people you had no intention of speaking to in the first place.

ROBERT B. SEMPLE, JR., on London's confused phone connections, *New York Times*, Aug. 6, 1976

to produce an income tax return that has any depth to it, any feeling, one must have Lived – and Suffered.

Frank Sullivan (1892-1976)
American humorist, journalist

SEE Franklin on CERTAINTY; Borah on GOVERNMENT; Dickens on TRUTH

What would the world do without tea? How did it exist?

Sydney Smith (1771-1845)
English writer, clergyman

The proper use is to amuse the idle, relax the tedious and dilute the full meals of those who cannot use exercise and will not use abstinence.

Dr Samuel Johnson (1709-1784)

I had known there was no Latin word for what I would have let the vulgar stuff alone.

Hilaire Belloc (1870-1953)
British author

Some oh come ye tea-thirsty restless ones – the kettle boils, bubbles and sings, musically.

Rabindranath Tagore (1861-1941)
Indian author, philosopher

Love and scandal are the best sweeteners of tea.

Henry Fielding (1707-1754)

While there's tea there's hope.

Sir Arthur Pinero (1855-1934)
British actor, playwright, essayist

SEE Holmes on COFFEE

Teachers

A teacher affects eternity.

Henry B. Adams (1838-1918)
American historian

Teaching is the supreme art of the teacher to awaken the child in creative expression and knowledge.

Albert Einstein (1879-1955)

Arrogance, pedantry, and dogmatism are the occupational diseases of those who spend their lives directing the intellects of the young.

Henry S. Canby (1878-1961)
American author, editor

I owe a lot to my teachers and mean to pay them back some day.

Stephen Leacock (1869-1944)
Canadian humorist and economist

Why are we never quite at ease in the presence of a schoolmaster? Because we are conscious that he is not quite at his ease in ours. He is awkward, and out of place in the society of his equals. He comes like Gulliver from among his little people, and he cannot fit the stature of

his understanding to yours.

Charles Lamb (1775-1834)
English essayist, critic

Everybody who is incapable of learning has taken to teaching.

Oscar Wilde (1854-1900)

He who can, does. He who cannot, teaches.

George Bernard Shaw (1856-1950)

I am inclined to think that one's education has been in vain if one fails to learn that most schoolmasters are idiots.

Hesketh Pearson (1887-1964)
British biographer

The vanity of teaching often tempts a man to forget he is a blockhead.

George Savile, Lord Halifax (1633-1695)
English statesman, author

God forgive me for having thought it possible that a schoolmaster could be out and out a rational being.

Sir Walter Scott (1771-1832)

The average schoolmaster is and always must be essentially an ass, for how can one imagine an intelligent man engaging in so puerile an avocation?

H. L. Mencken (1880-1956)
American journalist

He can receive no pleasure from a casual glimpse of Nature, but must catch at it as an object of instruction. . . He cannot relish a beggarman, or a gipsy, for thinking of the suitable improvement. . . A boy is at his board, and in his path, and in all his movements. He is boy-rid, sick of perpetual boy.

Charles Lamb (1775-1834)
English essayist, critic

A teacher is one who, in his youth, admired teachers.

H. L. Mencken (1880-1956)
American journalist

Slaves and schoolboys often love their masters.

George Bernard Shaw (1856-1950)

One looks back with appreciation to the brilliant teachers, but with gratitude to those who touched our human feelings. The curriculum is so much necessary raw material, but warmth is the vital element for the growing plant and for the soul of the child.

Carl Jung (1875-1961)

We loved the doctrine for the teacher's sake.

Daniel Defoe (1661-1731)

A schoolmaster should have an atmosphere of awe, and walk wonderingly, as if he was amazed at being himself.

Walter Bagehot (1826-1877)
English economist, critic

Technology

A teacher should be sparing of his smile.

William Cowper (1731-1800)
English poet

We schoolmasters must temper discretion with deceit.

Evelyn Waugh (1903-1966)

A pure pedantic schoolmaster, sweeping his living from the posteriors of little children.

Ben Jonson (1572-1637)

Well had the boding tremblers learned to trace

The day's disasters in his morning face.

Oliver Goldsmith (1728-1774)

A teacher should have maximal authority and minimal power.

Thomas Szasz (b. 1920)
American psychiatrist

The true teacher defends his pupils against his own personal influence.

A. B. Alcott (1799-1888)
American author, educator, mystic

No bubble is so iridescent or floats longer than that blown by the successful teacher.

Sir William Osler (1849-1919)
Canadian physician

It is when the gods hate a man with uncommon abhorrence that they drive him into the profession of a schoolmaster.

Seneca (c. 5-65)
Roman writer, philosopher, statesman

It were better to perish than to continue schoolmastering.

Thomas Carlyle (1795-1881)
Scottish author

The members of the most responsible, the least advertised, the worst paid, and the most richly rewarded profession in the world.

Ian Hay (1876-1952)
British author

Therefore for the love of God appoint teachers and schoolmasters, you that have the charge of youth; and give the teachers stipends worthy of their pains.

Bishop Hugh Latimer (1485-1555)
churchman, Protestant martyr, schoolmaster

SEE Wells on NATIONALISM; Olivier, Trollope on PUNISHMENT

Technology

Technology is the science of arranging life so that one need not experience it.

anonymous

The drive toward complex technical achievement offers a clue to why the US is good at space gadgetry and bad at slum problems.

J. K. Galbraith (b. 1908)
American economist

NATIONAL GEOGRAPHIC SOCIETY

- Comets are the nearest thing to nothing that anything can be and still be something.
Announcing discovery of a comet visible only by telescope. 31 Mar 55

DAVID R NELSON, Professor of Physics, Harvard

- The main satisfaction we're getting . . . is the intellectual excitement. For me, that's plenty. Isn't that really the driving force of science?
On crystal research. *NY Times* 30 Jul 85

STEPHEN A NESBITT, NASA Public Affairs Officer

- Obviously a major malfunction.
Announcement moments after the space shuttle Challenger exploded, quoted in *NY Times* 29 Jan 86
- The vehicle has exploded.

RICHARD M NIXON, 37th US President

- For one priceless moment in the whole history of man, all of the people on this earth are truly one. One in their pride at what you have done, one in our prayers that you will return safely to earth.
Radio transmission to the first men to walk on the moon 20 Jul 69

J ROBERT OPPENHEIMER

- The open society, the unrestricted access to knowledge, the unplanned and uninhibited association of men for its furtherance—these are what may make a vast, complex, ever growing, ever changing, ever more specialized and expert technological world, nevertheless a world of human community.

Science and the Common Understanding Simon & Schuster 53

- Both the man of science and the man of action live always at the edge of mystery, surrounded by it.
Address at Columbia University 26 Dec 54

- The atomic bomb . . . made the prospect of future war unendurable. It has led us up those last few steps to the mountain pass; and beyond there is a different country.

Quoted by Richard Rhodes *The Making of the Atomic Bomb* Simon & Schuster 87

DR LOUIS ORR, President, Amer Medical Assn

- Science will never be able to reduce the value of a sunset to arithmetic. Nor can it reduce friendship or statesmanship to a formula.

Commencement address at Emory University, Atlanta, 6 Jun 60

HEINZ R PAGELS, Executive Director, NY Academy of Sciences

- The world changed from having the determinism of a clock to having the contingency of a pinball machine.

On quantum theory's break with classical Newtonian physics. *The Cosmic Code* Simon & Schuster 82

- Stars are like animals in the wild. We may see the young but never the actual birth, which is a veiled and secret event.

Perfect Symmetry Simon & Schuster 85

- 12 There was emptiness more profound than the void between the stars, for which there was no here and there and before and after, and yet out of that void the entire plenum of existence sprang forth.

Reflecting on origin of the universe. *Vogue* Jan 86

LINUS C PAULING, 1954 and 1962 Nobel laureate

- 13 I like people. I like animals, too—whales and quail, dinosaurs and dodos. But I like human beings especially, and I am unhappy that the pool of human germ plasm, which determines the nature of the human race, is deteriorating.

From 1959 paper on the effect of radioactive fallout on heredity, recalled on winning 1962 Nobel Peace Prize. *NY Times* 13 Oct 62

JOHN PIKE, Federation of Amer Scientists

- 14 Some agencies have a public affairs office. NASA is a public affairs office that has an agency.

Criticism of statements made by image-conscious NASA officials after explosion of the space shuttle Challenger. *NY Times* 25 Apr 86

WARDELL B POMEROY

- 15 Like Everest, it was there and we conquered it. For the first time, a large body of sex information was gathered, so monumental and so comprehensive that it has not even been approached.

Assessing his work with Alfred C Kinsey. *Dr Kinsey and the Institute for Sex Research* Harper & Row 72

- 16 If this project had been undertaken in Europe or Asia, it might never have attracted any attention or even succeeded, but in America we like to count things.

ib

MICHAEL POTTS, spokesman, Beech Aircraft

- 17 The Wright brothers' design . . . allowed them to survive long enough to learn how to fly.

On the wing formation used in the first successful powered flight. *NY Times* 17 Apr 84

WILBUR L PRITCHARD, President, Satellite Systems Engineering

- 18 NASA put all its eggs in one basket, and the basket fell on the concrete.

On NASA's decision in the mid 1970s to de-emphasize unmanned rockets in favor of the space shuttle. *Time* 24 Mar 86

DAVID M RAUP, Professor of Geophysical Sciences, University of Chicago

- 19 [Extinctions occurred] with clocklike periodicity, every 26 million years.

On computerized study of recorded ages of fossils. *The Nemesis Affair: A Story of the Death of Dinosaurs and the Way of Science* Norton 86, quoted in *International Herald Tribune* 23 Jul 86

RONALD REAGAN, 40th US President

- 20 You on the cutting edge of technology have already made yesterday's impossibilities the commonplace realities of today.

To Nobel laureates and other scientists assembled at the White House 12 Feb 85

SCIENCE

1 They had that special grace, that special spirit that says, "Give me a challenge and I'll meet it with joy."

In a speech made a few hours after the death of seven astronauts in the explosion of the space shuttle Challenger 28 Jan 86

T R REID

2 It was a seminal event of postwar science, one of those rare demonstrations that changes everything.

On the development of the microchip. *The Chip* Simon & Schuster 85, quoted in *NY Times* 11 Feb 85

BERTRAND RUSSELL

3 Science is what you know, philosophy is what you don't know.

Quoted by Alan Wood *Bertrand Russell* Simon & Schuster 58

RICHARD G RUTAN

4 This was the last major event of atmospheric flight. That we did it as private citizens says a lot about freedom in America.

On completing the first nonstop flight around the world on one load of fuel in the experimental craft *Voyager*. *NY Times* 24 Dec 86

5 Time goes by real slow when you're flamed out and going down into the dark—as dark as the inside of a cow.

On engine failure over the Pacific. *Newsweek* 5 Jan 87

6 I flew in combat in Vietnam. I got shot at, I shot back. I got shot down. Compared to this flight, I felt a lot safer in combat.

ib

CARL SAGAN, astronomer, Cornell University

7 To make an apple pie from scratch, you must first invent the universe.

Cosmos PBS TV 23 Nov 80

ROALD Z SAGDEYEV, Soviet astrophysicist

8 I was looking at them as extraterrestrials.

Recalling his first meeting with US scientists. *NY Times* 10 Mar 86

DAVID SARNOFF, Chairman, RCA

9 Freedom is the oxygen without which science cannot breathe.

"Electronics—Today and Tomorrow," in Emily Davie ed *Profile of America* Crowell 54

10 Atoms for peace. Man is still the greatest miracle and the greatest problem on this earth.

First message sent with atomic-powered electricity 27 Jan 54

11 I have learned to have more faith in the scientist than he does in himself.

Recalled on his death. *Newsweek* 27 Dec 71

STUART L SCHREIBER, Associate Professor of Organic Chemistry, Yale

12 It was a flash of eureka.

On 1983 Christmas Eve discovery of periplanon-B, a synthetic aphrodisiac that effectively controls *Periplaneta americana*, the common cockroach. *NY Times* 26 Sep 84

R TUCKER SCULLY, Director, US State Department Office of Oceans and Polar Affairs

13 You don't have three guys holed up there all winter with an American flag for nothing.

In support of ad hoc exploratory missions rather than the establishment of a permanent Arctic research station. *Smithsonian* Nov 84

STUART LUMAN SEATON

14 The presence of humans, in a system containing high-speed electronic computers and high-speed, accurate communications, is quite inhibiting.

To Amer Institute of Engineering. *Time* 17 Feb 58

FREDERICK SEITZ, President, Rockefeller University

15 A good scientist is a person in whom the childhood quality of perennial curiosity lingers on. Once he gets an answer, he has other questions.

Fortune Apr 76

ALAN B SHEPARD JR, US astronaut

16 A-OK full go.

Comment at blastoff from the first American in space 5 May 61

HUGH SIDNEY

17 The Corn Belt is like John Bunyan's idyllic Beulah—or a dark Gehenna.

"Bitter Harvest" *Time* 8 Sep 86

LORD SKELMERSDALE (Roger Bootle-Wilbraham), British Undersecretary of the Environment

18 This is the first time I've actually held a toad. And my sympathy goes very much to the toad.

On opening of tunnel under highway to protect migrating toads during mating season. *NY Times* 14 Mar 87

C P SNOW

19 Technology . . . is a queer thing. It brings you great gifts with one hand, and it stabs you in the back with the other.

NY Times 15 Mar 71

JOHN SPENCER, Professor of Science and Mathematics, Highlands University, Las Vegas NM

20 [The research rat of the future] allows experimentation without manipulation of the real world. This is the cutting edge of modeling technology.

On computer program that simulates a human body's reaction to surgery. *NY Times* 12 Nov 85

ELVIN STACKMAN, President, Amer Assn for the Advancement of Science

21 Science cannot stop while ethics catches up . . . and nobody should expect scientists to do all the thinking for the country.

Life 9 Jan 50

THOMAS P STAFFORD, US astronaut

22 Houston, this is Apollo 10. You can tell the world we have arrived.

On reaching a lunar orbit that brought the spacecraft within nine miles of the moon's surface. *NY Times* 22 May 69

Wisdom, Philosophy & Other Musings

JOHN BETJEMAN

- 1 Now if the harvest is over
And the world cold
Give me the bonus of laughter
As I lose hold.
From *A Nip in the Air* Norton 76, recalled on his death,
Time 28 May 84

STEPHEN BIRMINGHAM

- 2 What is known as success assumes nearly as many
aliases as there are those who seek it.
"Young Men of Manhattan" *Holiday* Mar 61

JIM BISHOP

- 3 It is difficult to live in the present, ridiculous to live
in the future and impossible to live in the past. Nothing
is as far away as one minute ago.
NY Journal-American 7 May 61
- 4 Death is as casual—and often as unexpected—as
birth. It is as difficult to define grief as joy. Each is
finite. Each will fade.
Red Bank NJ Register 13 Aug 73
- 5 Books, I found, had the power to make time stand
still, retreat or fly into the future.
A Bishop's Confession Little, Brown 81

LAWRENCE BIXBY

- 6 Each handicap is like a hurdle in a steeplechase, and
when you ride up to it, if you throw your heart over,
the horse will go along, too.
"Comeback from a Brain Operation" *Harper's* Nov 52

SHIRLEY TEMPLE BLACK

- 7 Make-believe colors the past with innocent distor-
tion, and it swirls ahead of us in a thousand ways—
in science, in politics, in every bold intention. It is
part of our collective lives, entwining our past and
our future. . . . a particularly rewarding aspect of
life itself.
American Weekly 25 May 58

HARRY BLACKSTONE JR

- 8 Nothing I do can't be done by a 10-year-old . . .
with 15 years of practice.
On being a magician. *Newsweek* 16 Oct 78

RONALD BLYTHE

- 9 He longed to be lost but he couldn't bear not to be
found.
On T E Lawrence. *The Age of Illusion* Houghton Mifflin
64
- 10 Death used to announce itself in the thick of life but
now people drag on so long it sometimes seems that
we are reaching the stage when we may have to an-
nounce ourselves to death. . . . It is as though one
needs a special strength to die, and not a final weak-
ness.

The View in Winter Harcourt Brace Jovanovich 79

- 11 The ordinariness of living to be old is too novel a
thing to appreciate.
ib

GEOFFREY BOCCA

- 12 Wit is a treacherous dart. It is perhaps the only
weapon with which it is possible to stab oneself in
one's own back.
*The Woman Who Would Be Queen: A Biography of the
Duchess of Windsor* Rinehart 54

HUMPHREY BOGART

- 13 The whole world is about three drinks behind.
Recalled on his death 14 Jan 57

SISSILA BOK

- 14 Liars share with those they deceive the desire not
to be deceived.
Lying Random House 78
- 15 We are all, in a sense, experts on secrecy. From
earliest childhood we feel its mystery and attraction.
We know both the power it confers and the burden
it imposes. We learn how it can delight, give breath-
ing space and protect.
Secrets Pantheon 83, quoted by Frank Trippett "The
Public Life of Secrecy" *Time* 17 Jan 85

- 16 While all deception requires secrecy, all secrecy is
not meant to deceive.
ib

EDWARD BOND

- 17 The English sent all their bores abroad, and acquired
the Empire as a punishment.
Narrow Road to the Deep North Hill & Wang 68

DANIEL J BOORSTIN, Librarian of Congress

- 18 Technology is so much fun but we can drown in our
technology. The fog of information can drive out
knowledge.
On computerization of libraries. *NY Times* 8 Jul 83
- 19 The greatest obstacle to discovery is not igno-
rance—it is the illusion of knowledge.
Washington Post 29 Jan 84

VICTOR BORGE

- 20 Humor [is] something that thrives between man's
aspirations and his limitations. There is more logic
in humor than in anything else. Because, you see,
humor is truth.
London Times 3 Jan 84

HAL BORLAND

- 21 Knowing trees, I understand the meaning of pa-
tience. Knowing grass, I can appreciate persistence.
Countryman: A Summary of Belief Lippincott 65
- 22 April is a promise that May is bound to keep.
A Promise—April 29, quoted in news summaries 31 Dec
82

RABBI EUGENE B BOROWITZ, Hebrew Union College,
NYC

- 23 The peculiar malaise of our day is air-conditioned
unhappiness, the staleness and stuffiness of ma-
chine-made routine.
Quoted on 1969 poster distributed by Argus Communi-
cations

To starve the poor souls.

Charles Morris (1745–1838) British songwriter. Referring to William Pitt the Younger. *The Faber Book of English History in Verse* (Kenneth Baker)

- 16 The British parliament has no right to tax the Americans . . . Taxation and representation are inseparably united.

Charles Pratt (1714–94) English Lord Chancellor. Speech, House of Lords, Dec 1765

- 17 The taxpayer is someone who works for the federal government but doesn't have to take a civil service examination.

Ronald Reagan (1911–) US politician and president. Attrib.

- 18 It has made more liars out of the American people than Golf.

Will Rogers (1879–1935) US actor and humorist. Referring to income tax. *Saturday Review*, 'A Rogers Thesaurus', 25 Aug 1962

- 19 There is no art which one government sooner learns of another than that of draining money from the pockets of the people.

Adam Smith (1723–90) Scottish economist. *The Wealth of Nations*

- 20 For God's sake, madam, don't say that in England for if you do, they will surely tax it.

Jonathan Swift (1667–1745) Irish-born Anglican priest and writer. Responding to Lady Carteret's admiration for the quality of the air in Ireland. *Lives of the Wits* (H. Pearson)

TEARS

- 1 Life is made up of sobs, sniffles, and smiles, with sniffles predominating.

O. Henry (William Sydney Porter, 1862–1910) US writer. *Gift of the Magi*

- 2 It's my party and I'll cry if I want to.

Herb Weiner US songwriter. Song title

TECHNOLOGY

See also progress, science

- 1 At sixty miles an hour the loudest noise in this new Rolls-Royce comes from the electric clock.

Anonymous Advertising slogan for Rolls-Royce

- 2 Give me a firm place to stand, and I will move the earth.

Archimedes (c. 287–212 BC) Greek mathematician. *On the Lever*

- 3 Man is a tool-using animal.

Thomas Carlyle (1795–1881) Scottish historian and essayist. *Sartor Resartus*, Bk. I, Ch. 5

- 4 Machines from the Maxim gun to the computer, are for the most part means by which a minority can keep free men in subjection.

Kenneth Clark (1903–83) British art historian. *Civilisation*

- 5 Any sufficiently advanced technology is indistinguishable from magic.

Arthur C. Clarke (1917–) British science-fiction writer. *The Lost Worlds of 2001*

- 6 Man is a tool-making animal.

Benjamin Franklin (1706–90) US scientist and statesman. *Life of Johnson* (J. Boswell), 7 Apr 1778

- 7 Our rockets can find Halley's comet and fly to Venus with amazing accuracy, but side by side with these scientific and technical triumphs is an obvious lack of efficiency in using scientific achievements for economic needs, and many Soviet household appliances are of poor quality.

Mikhail Gorbachov (1931–) Soviet statesman. *Perestroika*

- 8 One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man.

Elbert Hubbard (1856–1915) US writer. *Roycroft Dictionary and Book of Epigrams*

- 9 The new electronic interdependence recreates the world in the image of a global village.

Marshall McLuhan (1911–81) Canadian sociologist. *The Gutenberg Galaxy*

- 10 For tribal man space was the uncontrollable mystery. For technological man it is time that occupies the same role.

Marshall McLuhan *The Mechanical Bride*, 'Magic that Changes Mood'

- 11 The machine threatens all achievement.

Rainer Maria Rilke (1875–1926) Austrian poet. *Die Sonette an Orpheus*, II, 10

- 12 The technology of medicine has outrun its sociology.

Henry E. Sigerist (1891–1957) *Medicine and Human Welfare*, Ch. 3

- 13 Pylons, those pillars
Bare like nude giant girls that have no secret.

Stephen Spender (1909–) British poet. *The Pylons*

- 14 No man . . . who has wrestled with

a self-adjusting card table can ever quite be the man he once was.

James Thurber (1894–1961) US humorist. *Let Your Mind Alone*, 'Sex ex Machina'

- 15 Sir, I have tested your machine. It adds new terror to life and makes death a long-felt want.

Herbert Beerbohm Tree (1853–1917) British actor and theater manager. Referring to a gramophone. *Beerbohm Tree* (H. Pearson)

- 16 I see no reason to suppose that these machines will ever force themselves into general use.

Duke of Wellington (1769–1852) British general and statesman. Referring to steam locomotives. *Geoffrey Madan's Notebooks* (J. Gere)

TEETH

- 1 Removing the teeth will cure something, including the foolish belief that removing the teeth will cure everything.

Anonymous

- 2 DENTIST, n. A prestidigitator who, putting metal into your mouth, pulls coins out of your pocket.

Ambrose Bierce (1842–?1914) US writer and journalist. *The Devil's Dictionary*

- 3 Every Tooth in a Man's Head is more valuable than a Diamond.

Miguel de Cervantes (1547–1616) Spanish novelist. *Don Quixote*, Pt. I, Ch. 4

- 4 It is necessary to clean the teeth frequently, more especially after meals, but not on any account with a pin, or the point of a penknife, and it must never be done at table.

St. Jean Baptiste de la Salle (1651–1719) *The Rules of Christian Manners and Civility*, I

- 5 I find that most men would rather have their bellies opened for five hundred dollars than have a tooth pulled for five.

Martin H. Fischer (1879–1962) *Fischerisms* (Howard Fabing and Ray Marr)

- 6 For years I have let dentists ride roughshod over my teeth: I have been sawed, hacked, chopped, whittled, bewitched, bewildered, tattooed, and signed on again; but this is cupid's last stand.

S. J. Perelman (1904–79) US humorous writer. *Crazy Like a Fox*, 'Nothing but the Tooth'

- 7 I'll dispose of my teeth as I see fit, and after they've gone, I'll get along. I started off living on gruel, and by God, I can always go back to it again.

S. J. Perelman *Crazy Like a Fox*, 'Nothing but the Tooth'

- 8 Certain people have false teeth
Robert Rot
broadcaster.
Week, 1977

- 9 He that says
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William Sha
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- 10 The man
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- 11 Sweet this
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- 12 Adam and
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Mark Twain
US writer. *Ch. 4*

- 13 To lose a
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(P. Brandon)

- 5 Nothing to
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Private Lives.

- 6 Dear Mrs

Technology Language

Administration of George Bush, 1990 / Feb. 2

It has no contracts with the United States Government involving classified information.

5. On December 4, 1989, CFIUS made a determination to undertake a formal investigation and so informed the parties to the transaction. CFIUS undertook the investigation in order to assess MAMCO's present and potential production and technological capabilities and the national security implications of CATIC's purchase of MAMCO.

6. During the investigation, CFIUS asked for and received information from MAMCO in addition to that provided in the initial filing. Officials of the Departments of Commerce and Defense, representing CFIUS, visited MAMCO to gather information to assist CFIUS in its assessment of MAMCO's current production and technological capabilities.

7. In its investigation, CFIUS also considered the adequacy of all laws, other than the Exon-Florio provision, to deal with the national security concerns posed by the transaction.

8. Because of the sensitive nature of the evidence in this investigation, CFIUS will be available, on request, to provide the appropriate committees, meeting in closed sessions, with a classified briefing.

George Bush

The White House,
February 1, 1990.

Note: The message was released by the Office of the Press Secretary on February 2.

Statement by Press Secretary Fitzwater on the China National Aero-Technology Import and Export Corporation Divestiture of MAMCO Manufacturing, Incorporated February 2, 1990

The President announced his decision today to order the China National Aero-Technology Import and Export Company (CATIC) to divest its interest in MAMCO, Inc., a company located in Seattle, WA, that machines and fabricates metal parts for aircraft.

The President took this action pursuant to a section of the 1988 Trade Act often referred to as the Exon-Florio provision.

That provision amended the Defense Production Act of 1950 to give the President the power to suspend or prohibit an acquisition of a U.S. company by a foreign party if the President makes certain findings with respect to that acquisition. The President made the requisite findings in this case. Specifically, based on credible confidential information, the President determined that CATIC's continued control of MAMCO might threaten to impair the national security. Moreover, the President determined that no other provision of law provided him with adequate and appropriate authority to protect the national security in this case.

The United States welcomes foreign direct investment in this country; it provides foreign investors fair, equitable, and nondiscriminatory treatment. This administration is committed to maintaining that policy. There are circumstances in which the United States maintains limited exceptions to such treatment. Generally these exceptions are necessary to protect national security. Of those foreign mergers, acquisitions, and takeovers which have been reviewed under the Exon-Florio provision to determine effects on national security, this is the first time the President invoked Exon-Florio authority. The President's action in this case is in response to circumstances of this particular transaction. It does not change our policy and is not a precedent for the future with regard to direct investment in the United States from the People's Republic of China or any other country.

Question-and-Answer Session With High School Students at a Biotechnology Demonstration at the University of Tennessee at Knoxville February 2, 1990

The President. What year of high school are we talking about?

Q. Junior and senior.

The President. Juniors and seniors? Well, let me start before she reads me her Gettysburg Address here and before she unloads on me, too. [Laughter]

Are you all in high school? Are you beginning to get more emphasis on science courses? Everybody? I mean, that's a common thread here. You wouldn't be here if you weren't already taking—what?—chemistry, biology, physics. What else? What other subjects? Math—yes, math would be fundamental. Have most of you made up your mind, when you go to college—going into science or math? You've already determined?

Dr. Monty. That's why they are here. They are those who have been selected because they are interested in science or mathematics.

The President. Okay, you get equal time. Go ahead. [Laughter]

Education Reform

Q. I loved your State of the Union Address on improving education. I was wondering, do you have any plans to get ideas internationally to improve education?

The President. Well, I'm going to kick that one right into the end zone of the Secretary of Education [Lauro F. Cavazos]. But, yes, we have all—he travels a good deal, goes abroad. We have a lot of people in the Department that does that. We're having an international—this is not as much education as dealing with the environment—a big international conference coming up. And we get it all the time—exchanges of ideas.

But I think we've got—we set out there—and I want to give credit to your Governor McWherter and to your former Governor Lamar Alexander—we've gotten great ideas for a national goals program from—in this country—from the Governors who were responding to, maybe, the principal of your high school, for heaven's sake. But I think we now don't need as many of the ideas from abroad as we do to implement these broad goals that are now set in place. Not that we can't learn from others, because some other countries are doing a whale of a job in education. But I think we've got our priorities set.

I still believe that a lot of the emphasis has to be at the local and State level. The Federal Government cannot dictate to your high school the curriculum or exactly what your teachers have to teach. We've learned a lot from those who have been successful

abroad, but now I think we've got the information; we've got to go forward—is about the way I answer that.

Q. I would like to know what plans do you have to fund scholarships for students who excel in math and science?

The President. Well, I'll give that one to him. But we have stepped up that in our budget; we've stepped it up. But go ahead, Larry.

Secretary Cavazos. We certainly have—quite a bit. That's one of the key points in the President's Excellence Act in Education: to identify outstanding students in mathematics and science, and provide scholarships for them for 4 years of college. That's the first step. But actually, it's right down the line. On top of that, we have increased funds for Pell grants, as well as for guaranteed student loans. So, we're certainly looking to that aspect of it and putting major emphasis on math and science.

The President. The first part, Jeanine—we haven't got it through yet. We've made the proposals. I think we've got a good chance in the Congress, but we have not got it passed. I think the Federal Government has a legitimate role there. Just as we do in—you guys are past this stage—but in Head Start. One of the things that—when I first got working on this was back when Lamar Alexander was Governor. He kept talking about “ready to learn.” And as I say, you all are past that, but there's a lot of kids out there that need to be ready to learn when they go to the first grade. So, along with the things that Jeanine was asking about, we think we must do better. And this is one of our national goals in terms of Head Start—getting people ready at the very beginning.

Who else has something they want to say? Yes, Stephanie.

Q. I was wondering if you were planning on starting the younger students in school with math and science, getting them a stronger base before high school and further education.

The President. We're trying to do that. Again, the curriculum must be set by the schools; but the emphasis, the goals of fluency in math and science, if you would, at an early age is out there now. And what the President should do, our Secretary, and

then a Secretary like Secretary Watkins—whose whole success of the Department of Energy relates to—an awful lot relates to science and, thus, math feeding into that—is to exhort. I don't think we can dictate to the school level, the early school levels. We can't do that. But when you set the goals—and the Governors, for the most part, are on board. I think Governor McWherter approves of our broad goals. And all of us have a job of encouraging what you're talking about. So, I think we'll see that result if our national goals—as they move towards implementation, I think we'll see those things come into play.

I have a technical question here. I wonder why it's only the women, only the girls, that ask questions. Now, Daniel, I don't know whether you've got one.

Q. Is the Federal Government increasing and spending for special interest education programs?

The President. Let me ask the Secretary.

Secretary Watkins. Well, the answer is yes. And the President will be presented from his Domestic Policy Council with an entirely new initiative: that we in the Federal Government open our hearts and minds a lot more than we have in the past. For example, we have 23,000 scientists in our national laboratories—two-thirds of the intellectual potential of the Nation in science. And therefore, the reason you see them so involved with you, in Oak Ridge and here in Knoxville, is that we have this kind of capability to bring new motivation and excitement, particularly to minorities and young women, who in many areas of the country have been really denied math and science. And in fact, many are afraid.

And so, this whole program is going to be set up to get us involved—open our facilities to the local school districts—not to set curriculum, as the President said, at all, but to get us involved. His Thousand Points of Light program—that's what we're talking about: getting our scientists to teach in the classroom, to teach teachers, to provide you with opportunities to go to the laboratories and see the excitement of science and be involved in it.

This decade will be the decade of science and research. And the President has opened

and leading the way in the Nation with your speech before the joint session of Congress the other night.

So, this is the excitement. We're very much involved. You'll see much more coming up as this begins to unfold.

The President. I'm sure I would have got a lot better audience for the State of the Union, but I made the mistake in scheduling when Vanderbilt was playing Tennessee in basketball. [Laughter] So, I'm sure all you students watched the State of the Union, but I don't know. [Laughter]

Stanley, what do you got?

Q. I would just basically like to know that, since the population of black male students enrolled in colleges has dropped over the past decade, would that mean greater or lesser chances of us receiving money from the Government?

The President. I think what Dr. Cavazos was talking about will impact heavily in some minority areas that had not had too good a shot. And also, some of that depends on how the output goes not just for black people but white as well—how they do in the elementary schools.

So, as we move toward programs in—I mentioned Head Start. A lot of kids coming out of the background where they haven't really had much dough in the family, or a broken family, or something—those kids really need Head Start more than others. And so, I think if we get the whole elementary thing moving so that the kids—a lot of the kids you're talking about are like you, who have demonstrated an ability and have demonstrated excellence. I think you'll find there will be just more acceptance under existing programs. But I think we have some emphasis here that will benefit minority students, whether it's blacks or Hispanics or whatever.

Secretary Cavazos. There's quite a bit of it. It's there. And of course, as you point out, Mr. President, we're looking at the whole stance, from early childhood right on through the other end of college and on into adult education. And we have to put a special emphasis—you are so correct. The numbers are going down in terms of black males in colleges. We have to turn that

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have to stop and back up to the beginning. So, we will find—dedicating in that direction.

The President. One thing we've done that really isn't directly responsive, but I've long been interested in historically black colleges, and we've stepped up the help for them, their endowment funding, which a lot of the black presidents of these colleges feel is very, very important. I think it's gone way up this year, maybe by 66 percent or something.

So, anyway, that's another—but it's not directly responsive, but it's so—the idea that everybody should be able to get a good education.

Dr. Monty. Mr. President, we probably have time for one or two more questions. Two of those here are outstanding math and science teachers, and they're probably holding back, trying to give the students a chance.

The President. I'd love to hear how you think it's going. I'm on a listening mode here on this trip, so I'd like to know—or if you had any specific suggestions as to how you see our departments interacting.

Q. Mr. President, there's tremendous positive advances taking place. But in education, we sort of get a mixed message sometimes. There's much discussion in many circles about catching up with European countries as far as science and math education is concerned. As a rule, that's related to standardized test scores. So, we're getting, on the one hand, that we need to increase standardized test scores and, then on the other hand, we need to increase problemsolving and creative thinking skills at the same time.

Now, they are certainly compatible to teach at the same time. But as a rule, it takes experience and training to take the subject matter and teach creativity mutually, or at the same time. And I'm wondering if there are any plans for special training that would be related to special programs? But it's a mixed message. And for clarification, particularly for inexperienced teachers, I think it's going to take some kind of a training program.

The President. Special training for teachers? Larry, do you have anything on the Federal side on that?

Secretary Cavazos. Well, in terms of the current budget that we have in front of us, we have about a 62-percent increase in the math and science education area, and it approaches almost \$300 million that we'll be putting in next year in this direction. We're also going to have another program that we've requested money for—to also prepare principals, give them a special education, because, obviously, they're the people involved in the curriculum and the kinds of things that go on a daily basis.

So, this is a partnership. And we really have a commitment to help out in the area of math and science and the preparation of those teachers. And we're also going to include the principals.

The President. Some of the States are doing—go ahead. You were going to say something.

Q. Just as a followup. If there was a direction, should it be toward the problemsolving and creativity—the kind of creativity and creative thinking that it takes to come up with solutions to problems—developing this kind of research? Or should it be in the direction toward the standardized test scores, where basically, it's just the foundational material that—

Secretary Cavazos. I think a lot of that can be worked out as we develop these programs with the people. However, my own instincts toward problemsolving and comprehension—as you recognize, our students can read, but oftentimes when we look at our national tests, they don't comprehend at adequate levels. And I think until we can really comprehend and understand what we're dealing with, all the rest of this will give us no purpose.

The President. Mary, do you want to add something?

Q. Well, I would just follow up to Tom. I, too, am concerned about the quality of teachers that we're going to be getting into science and math. And that has such far-ranging implications for just the quality of the high school, but also for elementary education—getting kids interested in science and math. And I, too, am very concerned about just the quality of teacher that we're going to get into science and math, and encouraging young people to go into

the science- and math-related fields, but also to go into teaching, too.

The President. Again, just so you know where I'm coming from philosophically, I think we can encourage; but I think it's the responsibility of the States and then of the local organizations to actually sign people up and—I just don't want to see our federalizing our elementary, secondary, and higher education. The Federal Government has a distinct role, but I don't want to misrepresent to these kids that I think the Federal Government should undertake all the training for teachers, for example, or set the levels of pay for teachers—I worry—or curriculum. And I think we've got a pretty good balance right now.

Let me say to you kids, because we've got—I know you know a lot about the Government, but you met with—this is Secretary Cavazos, who is the Secretary of Education; Secretary Watkins, who is the Secretary of Energy. But I don't know that you met—we have four Members of Congress here. You guys may be math and scientists, but I'm a political guy, see. So, I've got to—but I hope sometime you will save a little time for the public service kind of things that—but over here is Congressman Quillen, Congressman Duncan, and Congressman Sundquist, and over here, Congressman Lloyd. So, they, too, are along with us today and are very interested. They don't happen to be all from Tennessee, but I wanted to put in a plug for them down the line—and public service as well.

I don't want to undermine all these Oak Ridge scientists here and get away from the subject at hand, but I'm very pleased these Congressmen are with us.

Q. I would like to commend the State for having our school. School of the Sciences made science many times fun. It showed that science is not just a textbook study: it's something that can change the world, literally. And I think it influenced a lot of the kids here who were going to school. I think it made us more interested and got us enthused to go forward in science and not just hold back.

The President. See, here, that's a very important point he's just made, because now, with the encouragement of the State, encouragement of the university, then other States and other communities—we were talking about this coming in in the car

with the two Governors—other States and other communities can see the example here.

This is, I think, a first, actually. At least the summer program that you're talking about. I'm glad that you feel that way because it gives me the thought that if we can just get the message out others on their own will take up this kind of a program, kind of approach, you mean, to science and math.

Dr. Monty. Mr. President, I feel like a school bell. But I've been asked to tell you that it's time for you to move on. These are exceptional students and exceptional teachers, and we're privileged that you would take time, along with the Secretaries, to visit with us.

The President. I'm glad you all came. Thanks. Thanks for taking the time.

Do you all know exactly where you want to go to college and exactly what you want to do? [*Laughter*] No? I never did, either. Really. But anyway, thank you all for your time. I bet we had some other questioners or speakers we did not hear from.

Computers

Q. I'd just like to ask, what role will computers play in the school system in the future?

The President. More and more. And I don't even know how to turn one on—hardly. [*Laughter*] But, no, I can do that. I can write a letter. But, no, I think you're going to see that everybody is going to have to be computer literate. I think that's a given in the nineties, absolute given, for whatever you want to be—liberal arts, science and tech. So, I think you're going to see that just all over.

All right. Thank you. Thanks a lot.

Note: The President spoke at 2:25 p.m. at Carolyn Brown University Center. In his remarks, he referred to Kenneth J. Monty, professor of biochemistry; high school students Jeanine Fulton, Stephanie A. Burriesei, Daniel H. Chang, and Stanley Dean; Mary Boldon, biology teacher at Maryville High School; and Tom Ferguson, biology teacher at Farragut High School. Prior to the demonstration, the President met with university professors and scientists at the center.

Remarks to the Students and Faculty of
the University of Tennessee at
Knoxville

February 2, 1990

Thank you, Lamar Alexander. You all may remember this; but when Lamar Alexander was the Governor, out of all the 50 Governors, he probably did more to take action in the field of education than any other Governor. And now he's bringing his talents to bear at this great university system. I'm very proud of him.

And I'm very proud to be with Governor McWherter. And I noticed the enthusiastic reception to your latest addition to the educational scene—latest support for it. I salute you. I'm very proud of my Secretary of Education, a former university president himself, Dr. Larry Cavazos, who's with us today—doing a superb job. And of course, Admiral Watkins, bringing to the Energy Department as Secretary not only expertise in the nuclear field and certainly, based on his background in the military, military expertise, but a strong commitment to education. And both of them are doing a great job for our country. I'm pleased that Alvin Trivelpiece, the Oak Ridge National Lab Director, is here with us today; also four Members of the United States Congress: Jimmy Quillen and John Duncan, Don Sundquist, Marilyn Lloyd. And I, of course, am very pleased to see another old friend, longstanding, your mayor, Victor Ashe; and, of course, Howard Baker. I don't believe we've had a public servant of his decency and honor in the arena for a long time. He is outstanding—was, still is. And so, Howard, I'm delighted to see you again.

And I'm sorry we were a little late getting in here. But you know how it is on this campus. Even I couldn't find a parking place. [Laughter]

It's great to be back in Tennessee. I'm very proud of this State and this university. And I noticed that Lamar said some of you noticed the T-shirt that I had on while I was jogging down in Texas in December—the Big Orange colors of the Tennessee Volunteers. Well, back in Washington, they debated which move took more guts, invading

Panama or going to Texas wearing a Big Orange T-shirt. [Laughter] I got the shirt in Washington when Pat Summitt came to the Rose Garden last April with Tennessee's Lady Volunteers, the 1989 NCAA national champions. And it was a great day.

And when they came to Washington the Lady Vol's had only one request. Not to see the Oval Office. Not to see the Smithsonian, the Wright brothers' plane. Not even Georgetown at night. What they wanted to see were Millie's new puppies. [Laughter] And that's a fact, too.

Of course, we said yes, But now it's my turn. And as long as I'm at UT, it seems I ought to get to meet Smokey, from what they tell me. [Laughter]

I'm proud of Tennessee and your great sports traditions. But the truth is what makes this university so special says a lot about what makes America so special. It's not the winner's trophy at the end of the quest: it's the quest itself. And in Tennessee, as in America, that means the quest for excellence. At UT, the quest for excellence starts not on the basketball court or the football field but in the classroom. Maybe you heard that at the White House I bragged as much about the Lady Vol's 14 years with a 100-percent graduation rate as I did about that fantastic basketball championship.

Earlier this week, I issued my first formal budget as President, a blueprint for the year ahead. And 2 days ago, I stood in the U.S. Capitol, stood before the American people, and reported to you on the state of the Union. Don't worry. If you missed the speech, you're not going to hear the two words that strike terror in the hearts of every college student: pop quiz. [Laughter] You have an excuse, because our timing was not exactly fortuitous. I understand that while I was orating there before the Congress the Vol's were playing—what was it?—Vanderbilt in basketball, and some of you had your priorities all screwed up. [Laughter] So, I understand that.

But at the heart of the address, though, was a sense of confidence that America today is second to none—and sense of com-

mitment, a plan to keep America second to none in the years ahead. The foundation for our plan, the foundation for our future, is anchored by a cornerstone we call educational excellence. Education really is our most enduring legacy, vital to everything we are and can become. And my budget calls for record funding, reflecting this belief. But as I said Wednesday night, real improvement in our schools is not simply a matter of spending more: it's a matter of asking more—expecting more—of our schools, our teachers, our kids and ourselves.

You in Tennessee know that goals and high expectations work. Five years ago, Governor Lamar Alexander told Tennessee's eighth graders, "If you want to go to State universities, you're going to have to take more math and science." And there was a good deal of grumbling—a little grumpiness about that at first, but today almost all freshmen are meeting those requirements. As a result, admission scores are up; retention rates are up; and best of all, 41 percent more students are taking science and math in the high school than were taking those subjects 5 years ago. You expected more, so you got more.

I believe what worked for Tennessee will work for America. And Wednesday night, I announced America's education goals, goals developed in close cooperation with the Governors of the 50 States. And I thank your Governor for participating so actively in these deliberations.

Part of the answer means getting back to basics. Recently one kid was asked if he knew what the three R's were. He said, "Sure. Reading, writing, and remote control." [Laughter]

Well, just as we're redoubling our efforts to boost education, so we've doubled the three R's as well. We have six goals, "six R's" for education in the nineties.

And the first: readiness. By the year 2000, every child in America will start school ready to learn. And we've called for a record increase, a half-billion dollars, to ensure a fair start through Project Head Start.

And our next goal might be called "search and rescue." We will target America's most at-risk youth and get them the help that they need—they deserve. Our 10-

year goal: to raise America's high school graduation rate to at least 90 percent.

And third, it's time to reestablish excellence. By the new century, American students will leave grades 4, 8, and 12 having demonstrated competency over the world in which they live: the world of math, science, history, and geography.

And we're calling for a new renaissance in science and math, to make America's students first in the world by the year 2000.

And next: reading. A competitive America must be a literate America, where every man and woman possesses the knowledge and skills necessary to succeed in a global economy.

And then last and most fundamental: In every school in America, we've got to create an environment conducive to learning; and that means disciplined schools, that means—and it must mean—drug-free schools. The solution to chaos in our classrooms is no mystery. Franklin had a word for it—not Ben, Aretha Franklin. She calls it: R-E-S-P-E-C-T. Respect. And kids need respect for our wonderful teachers, respect for learning, respect for themselves. And all six goals are important.

And, Lamar, I was thrilled to learn that Tennessee—a major research university and a pillar of the science-rich Oak Ridge Corridor—has already taken the lead in responding to our challenge to use science and technology to boost America's competitiveness. And thanks to Governor McWherter, again, and Norm Augustine, Martin Marietta, and Jim Watkins, the Department of Energy, you will have a new Summer School for Math and Science and a new academy for America's top elementary and high school teachers. And it will be a model for the entire Nation. Unbelievably, it was all put together in a week. And the speed of Tennessee's response proves what we've been saying since I first sent my Educational Excellence package to Congress last spring. The time for study is past; the time for action is now.

You know, building our competitive strength today also means that we need quick congressional action on our other proposals for investing in new capital—intellectual capital. And that includes everything from reforming product liability laws to

doubling the budget of the National Science Foundation. It means a record-high increase in funds for research and development, R&D; new help for R&E, research and experimentation, by making the R&E tax credit permanent; and funds to improve education: the Eisenhower Education Grants for math and science would grow by 70 percent to \$230 million.

In science and technology, the United States is today—and we should take great pride in this, and there are many men in this room and women in this room today who have made a significant contribution to this—the United States today is the undisputed heavyweight champion of the world. We produce more scholarly works, more breakthroughs, more international prizes than any other country.

But like any champion, we cannot rest on our reputation. More than 30 years ago, “Ike,” Dwight Eisenhower, used his State of the Union speech to address a similar challenge. “Our real program,” said Ike, “is not our strength today: it is rather the vital necessity of action today to ensure our strength tomorrow.”

And today I am taking action by appointing the members of the President’s Council of Advisors on Science and Technology. Indeed, my Vice President, Dan Quayle, who’s doing such an outstanding job as Chairman of both the National Space Council and the Competitiveness Council, is swearing in the members of this new Council this afternoon. And it’s comprised of some of the best scientific minds in the country. We’ll meet tomorrow at Camp David to discuss ways to maintain U.S. supremacy in these fields.

One way to do that is by challenging the impossible. And that brings to mind another challenge that will probably mean more to strengthening the educational system and competitive edge than any other single endeavor. And I am talking about space. For in the coming century, first in space will mean first on Earth. And America intends to stay number one.

We need to find ways to do things faster and more efficiently in space. And that’s why NASA [National Aeronautics and Space Administration] and our Space Council have called on America’s great universities and research centers to put their brightest engi-

neers and scientists to work on coming up with bold, innovative ideas—new technologies for a new tomorrow in space.

Tennessee has already made important contributions to the space program. Rhea Seddon, one of America’s first women astronauts, is a graduate of UT’s College of Medicine. And researchers at UT’s Space Institute in Tullahoma are working with NASA to develop advanced space propulsion systems for the next generation of manned and unmanned missions.

In the new century—your century—those new systems may help take Americans back to the Moon and beyond. Our goal: to place Americans on Mars, and to do it within the working lifetimes of scientists and engineers who will be recruited for the effort today. And just as Jefferson sent Lewis and Clark to open the continent, our commitment to the Moon-Mars initiative will indeed open the universe. It’s the opportunity of a lifetime and offers a lifetime of opportunity.

Yet some wonder if America has lost its competitive edge and ask if we must now look overseas for the answer. They point to last week’s launch in Japan—a new satellite sent to orbit the Moon. They forget 26 years ago today, long before some of you were born, America’s Ranger Six landed on the Moon—26 years ago.

The United States is the “defending world champion.” But we have to defend our title day by day, week by week, year in and year out. The Tennessee of Bob Neyland and Johnny Majors, of Wade Houston and Pat Summitt, knows something about defending athletic dynasties. Here it’s done the old-fashioned way, the Tennessee way, the American way. You can play smart, but there are no shortcuts. It takes hard work and grit. It demands the constant renewal of new talent and ideas, always tempered by veteran coaching. And it means sweating harder, reaching higher, and seeing farther than the other guy.

It’s never easy keeping that number one ranking. Pat Summitt said it in 1984, just before bringing the U.S. Women’s Basketball Team to an Olympic Gold Medal. She said, “We’re expected to win. That’s a greater challenge than when you’re expected to finish second.” But she’s right. Pat’s right. We’re going to need as never before

that "can do" attitude that brought our ancestors to America and that brought America to greatness. In World War I, when they asked your own Sgt. York how he captured 132 enemy prisoners and 32 machineguns all by himself, he answered, "I surrounded 'em." [Laughter] And that's what some might expect from a Tennessean. [Laughter] But really, it's that kind of spirit that is going to carry us into the 21st century and beyond.

And as we approach the challenges of tomorrow, in a world increasingly hungry for yesterday's values, I hope that you'll continue to give voice to this State's frontier virtues: hard work; loyalty; love of faith, family, and the Volunteer State.

When we hear America singing, it is often the sound of Tennessee: the bluegrass fiddling in the mountains; the gospel and country sound of Nashville; the jazz, the blues of Memphis. It's the stuff of legend, the spirit of faith and hope. And with spirit like that, America's going to do a Tennessee Waltz all over our competition.

So, thank you for this warm welcome. Thank you for this welcome. And God bless you, and God bless the United States of America. Thank you all very, very much.

Note: The President spoke at 3:25 p.m. in Alumni Memorial Gymnasium. In his remarks, he referred to Norman R. Augustine, chairman and chief executive officer of Martin Marietta Corp.; and Robert R. Neyland, John T. Majors, and Wade Houston, former head football coach, current head football coach, and head coach for men's basketball at the university, respectively. Following his remarks, the President went to Camp David, MD, for the weekend.

Appointment of the Members of the President's Council of Advisors on Science and Technology, and Designation of the Chairman and Vice Chairman

February 2, 1990

The President today announced the appointment of the President's Council of Advisors on Science and Technology (PCAST), comprised of 12 distinguished scientists and

engineers. This panel will provide high-level advice directly to the President on a wide range of important issues concerning science and technology.

PCAST will be the first Presidential scientific advisory group in many years to report directly to the President. Its establishment is a measure of the Bush administration's high esteem for science and a recognition that advances in science and technology contribute in a major way to increased economic competitiveness. It also reflects the President's desire to strengthen Federal science and technology policy, enhance Federal research and development activities, and encourage private sector involvement in research and development.

The United States scientific community leads the world in creating new knowledge. Through PCAST, the President is seeking to provide the best obtainable private sector advice to executive branch decisionmaking in science and technology.

PCAST will be chaired by Dr. D. Allan Bromley, Assistant to the President for Science and Technology. PCAST was established January 19, 1990, by Executive Order 12700. Its members will be sworn in later today by the Vice President at the White House. They include the following individuals:

Norman F. Borlaug, of Texas, is a Nobel laureate and currently leader of the Sasakawa-Global-2000 agricultural program in sub-Saharan Africa, distinguished professor of international agriculture at Texas A&M University, and a senior consultant to CIMMYT. He was director of the wheat research and production program of the International Maize and Wheat Improvement Center, Mexico, from 1964 until his retirement in 1979. Dr. Borlaug's career began in 1935 in the Forest Service, and he subsequently worked as an instructor in plant pathology at the University of Minnesota in 1941, where he received his Ph.D. From 1942 through 1944, he was a microbiologist with E.I. DuPont de Nemours & Co. He also served as research scientist in charge of wheat improvement with the cooperative Mexican agricultural program, Mexican Ministry of Agriculture and the Rockefeller Foundation, 1944-60, and later as associate director of the foundation assigned to the inter-American food crop program, 1960-63.

D. Allan Bromley, Chairman, of Connecticut, is Assistant to the President for Science and Technology and Director of the Office of Sci-



Event Update

OFFICE OF THE SECRETARY

FACSIMILE TRANSMITTAL SHEET

DATE 2/14/92

TO CAROL AARNUS

FAX NUMBER 456-6218

OFFICE NUMBER _____

COMMENTS MORE INFO ON JFWN EVENT - PROPOSED
TALKING POINTS TO FOLLOW SHORTLY

FROM STEVE SKINNER

FAX NUMBER 202-586-0148

OFFICE NUMBER 202-586-5500

NUMBER OF PAGES INCLUDING COVER 6

PROPOSED VISIT TO OAK RIDGE, TENNESSEE

- EVENT: Signing Ceremony of Cooperative Research and Development Agreement between Martin Marietta Energy Systems (DOE contractor operating Oak Ridge National Laboratory) and Coors Ceramics Company.
- SITE: Coors Ceramics Plant in Oak Ridge.
- THEMES:
1. Competitiveness - Advanced Materials Utilization
 2. Job Creation - Plant built within last 2 years, yielding 85 jobs, with plans to expand
 3. Tech Transfer - Plant located in Oak Ridge because of ORNL expertise
 4. Peace Dividend - Marriage of defense and non-defense technologies not possible before

BACKGROUND:

- o Ceramics represent a cutting-edge technology with market applications across the board in industrial manufacturing.
- o According to a joint study conducted by Argonne National Laboratory and the US Advanced Ceramics Association, the potential to the American economy is:
 - 164m ceramic engine parts will be needed in the US by 2000; this number grows to 558m by 2010
 - The value of these parts will expand from more than \$1b in 2000 to more than \$3.6b in 2010
 - Economic impact to US, for the auto parts industry alone, could mean US GNP expanding by \$11b in the year 2000 if American industry leads, or decline by \$26b if foreign industry leads
 - Japan is viewed as the world leader now, and 5 years from now, poised to capture about 40% of the world market; US is seen as poised to capture about 25%
 - Annual savings in petroleum due to use of ceramic engine technology will be more than 11.3m barrels by 2000 (worth \$675m); 65.9m barrels (worth \$5.5b) by 2010
- o DOE R&D has focused on ceramics as a material. Our success leads us now to focusing on the applications of that material--which is where the benefit resides.
- o Issue with ceramic parts is not making them--technology is proven--it is making them cheaply.

- o This CRADA attacks that very problem by marrying the discrete abilities of the parties in an effort to produce ceramic parts cheaply through economies of scale:

Y-12 has cutting-edge, unimaginably precise machining technology developed for production of nuclear bombs. This technology is very expensive, but cost was not as compelling an issue in the Cold War as was victory. Machining can account for 50 - 70% of the cost of ceramic parts.

The High Temperature Materials Laboratory, a \$19m facility employing state of the art equipment for materials characterization and testing, is a world leader in ceramics R&D.

Coors Ceramics is one of the leading American manufacturers of precision ceramic products, doing over \$200m of business per year at 12 different plants around the country.

- o Coors Ceramics Oak Ridge Plant was built in 1990 and employs 85 people, with plans to expand beyond 100 employees.

SOME EXAMPLES OF USES OF ADVANCED CERAMIC MATERIALS

- o flow filters for coal combusters
- o Specialized materials components for Gas-fired furnaces
- o Advanced ceramics demonstrate corrosion and erosion resistance at high temperatures in energy storage and energy conversion technologies
- o Improved Heat Exchanger materials for automotive and other uses.
- o Jet and Gas Turbine Engines for aeronautical, marine and ground transportation purposes
- o Solar Panel Arrays
- o power control devices, thyristors, and vacuum interrupters
- o ice skating blades, sports shoe spikes, baseball bats, and golf clubs
- o Integrated circuits, semiconductors, and hybrid circuits
- o Cutting and grinding heads for machinery

Thus, advanced ceramics play a role in:

- Air, sea and ground transportation
- energy efficient gas, coal, solar, and electric energy systems
- fuel cells, energy storage devices, batteries
- electronics
- power and process control devices
- manufacturing/machining
- recreation

Advanced ceramics offer advantages such as:

- Greater heat/stress resistance than many materials
- Longer life of parts and components
- Lighter weight/greater strength
- Fewer parts and less maintenance
- capabilities not available from metals or other materials

DOE/CE-0323P



US Department of Energy
Office of Transportation Technologies
1991

**TECHNOLOGY
FACT SHEET No. 17.0**

HIGH-TEMPERATURE MATERIALS LABORATORY (HTML)

Program

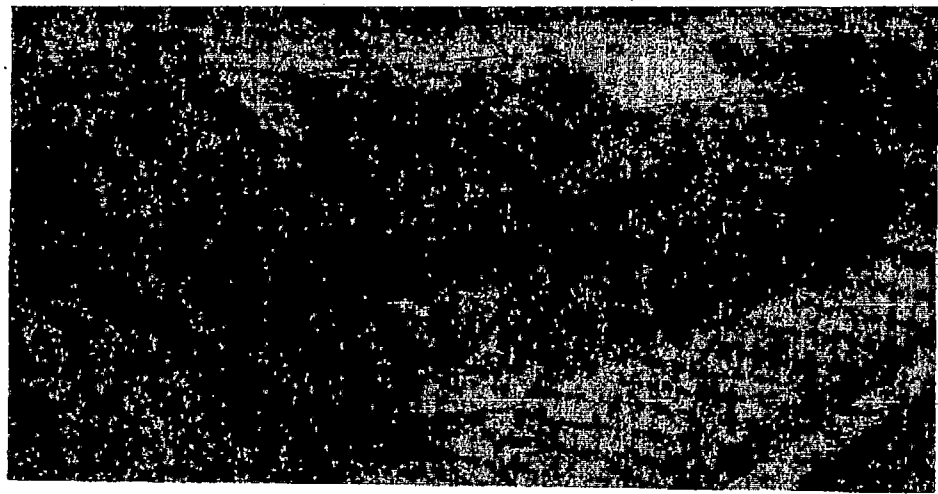
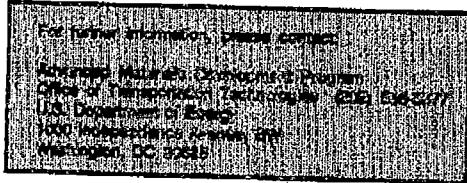
Advanced Materials Development

The High-Temperature Materials Laboratory (HTML) is a state-of-the-art facility that serves as the focal point for high-temperature materials (e.g., ceramics and intermetallic alloys) research at the Oak Ridge National Laboratory (ORNL).

As a major user facility, the HTML provides researchers from industry and the universities access to the extensive array of special materials-research equipment needed to characterize the microstructure and microchemistry of materials and to investigate the effect of these parameters on their physical and mechanical properties. In addition, scientific and technical materials expertise is made available to researchers in industry, universities, and other government agencies.

The HTML supports government and industry efforts in high-temperature materials research and serves as a unique technology-transfer vehicle through its user program. User research that produces open literature publications with an Oak Ridge co-author may be carried out at no charge. Proprietary research may be conducted at the facility under a cost-recovery agreement.

The HTML comprises the following user centers:



HTML Building at Oak Ridge National Laboratory

- 1) Materials Analysis
- 2) High-Temperature X-Ray Diffraction
- 3) Physical Properties
- 4) Mechanical Properties
- 5) Ceramics Specimen Preparation
- 6) Residual Stress Measurements

Objectives

The HTML's specific objectives are to:

- ☐ Make available to researchers from national laboratories, universities, and industry the modern scientific and engineering instrumentation necessary to conduct research in high-temperature materials; and

- ☐ Facilitate research that will assist U.S. industry in meeting the current challenge of foreign competition in the area of high-temperature materials.

Status and Accomplishments

The HTML was inaugurated as a User Facility in July of 1987 with the first User Agreement signed by both an industry and a university that month. A User Advisory Committee was organized to review user proposals, primarily for non-proprietary research in the HTML, and consists of two representatives from industry, one from the university community, one from DOE, and two from Oak Ridge. Through FY 1990 more than 100 industry, university and government institutions have initiated agreements to use the HTML facilities.

Coors Ceramics To Build Plant Near High Temperature Materials Laboratory Signs License for Glostesting

Coors Ceramics Company, one of the nation's largest producers of precision ceramics, has announced plans to build a state-of-the-art ceramic facility near the Oak Ridge National Laboratory (ORNL) in

grams at ORNL as being major factors in the decision to locate in Oak Ridge.

According to Coors, his company plans on being an active participant in the technology transfer programs that are ongoing at the HTML. Coors Ceramics has already signed an agreement to join the User Program of the HTML, a \$19-million facility that provides members of the U.S. industrial and university research communities access to special equipment designed to help solve high-temperature materials problems.

Plant To Be Operational by Spring 1990*

The 52,000-square-foot Coors plant, expected to be operational by late spring 1990, will cost \$22 million and eventually will employ about 100 people. Incorporating expanded operations of the Coors Ceramics plant in Norman, Oklahoma, the Oak Ridge plant will be used for the production of high-precision, complex, advanced ceramic materials. Its product line will include wear tubes, semi-conductor equipment, and R&D products. Woodie Howe, president of the Norman division, will manage operations of both plants from the Oak Ridge facility.



Albert Chesnes, Joe Coors, Jr., and Clyde Hopkins greet reporters at press conference after Coors announcement.

Oak Ridge, Tennessee. During the announcement ceremony on August 18, Joe Coors, Jr., president of Coors Ceramics, cited proximity to the research going on at ORNL in the High Temperature Materials Laboratory (HTML) and to technology transfer opportunities from ceramic pro-

Albert A. Chesnes [Director of the Heat Engine Propulsion Division of the Office of Transportation Systems, which is under Conservation and Renewable Energy (OE) of the U.S. Department of Energy (DOE)]

was present for the ceremony. His technology transfer activities in developing ceramic components for advanced vehicular engines resulted in the HTML facility and its User Program.

According to Chesnes, the HTML's User Program exemplifies effective government/industry cooperation. He said, "This program is the best model in the U.S. — maybe in the whole world. The



Ted A. Nolan, Materials Analysis Group Leader, demonstrates the HTML's Hitachi S-900 Field Emission Scanning Electron Microscope to Joe Coors, Jr.

*Plant was operational October 1990

†Currently employs 85 people

(Ferguson/Gershowitz)
February 18, 1992
Draft One
OAKRIDGE

PRESIDENTIAL REMARKS: KNOXVILLE AUDITORIUM-COLISEUM
WEDNESDAY, FEBRUARY 19, 1992
KNOXVILLE, TENNESSEE
11:45 AM

(Acknowledgments, humor)

It's a pleasure to be in Knoxville, for what you have done here is a model for the nation. Knoxville brings together the resources of government, the enthusiasm of private enterprise and the cutting edge of research. You are pointing our country toward the next American century.

We stand today at a pivot point in history -- at the end of one era and the beginning of another. In the last year imperial communism died, and as the clouds of the Cold War part, America stands alone, the undisputed leader of the world.

The old era demanded great sacrifices; our country met them proudly. But the new era opens up to us limitless possibilities, fresh challenges of the kind that have always brought out the best in America.

For the short term, of course, our challenge is to fire up the economy. I've put together a short-term plan -- seven common sense steps -- to spur investment and create jobs. With inflation down and interest rates at historic lows, my short-term plan offers the stimulus our economy needs and lays the groundwork for a strong recovery.

I've asked Congress to pass my plan by March 20. And here in Knoxville, let me ask them again: Help your country. America can no longer wait. Pass my plan and get this economy moving.

With my plan in place, we must look forward, beyond the short-term into the next century. Believe it or not, looking forward has become a more radical notion than it sounds. Even now, in this moment of great triumph for America, we hear from some quarters the dim voice of defeatism, a tinny trumpet sounding retreat. We're told that our future lies in turning away from the world, in isolating our country behind some wall of protection to re-create a simpler, less challenging past.

Don't be fooled by the tough talk: protectionism comes from fear -- fear that American workers can't compete -- fear that American ingenuity is spent -- fear that we must turn away from the world because we can no longer lead the world.

Well, that's not the future I see for the United States of America.

The America of the future will pull down barriers, not build them up. It will embrace challenges, not cut and run. It will push back the frontiers of knowledge and technology, not pine for an irretrievable past.

And because of this, when the America of the future competes, it will win.

This century -- the first American century -- has taught us many lessons. We know the absolute necessity of military preparedness, and the special obligation a society has to its less fortunate. But above all this century's lessons hangs an overarching truth: If America is to succeed economically at home, we must lead abroad. Our leadership ensures markets for American products and jobs for American workers; it gives us room to spread our wings and show the world what we can do. Let us never forget: Our national symbol is the eagle, not the ostrich.

For the last three years my administration has been laying a groundwork for America's continued leadership in the world. We have approached this pivot point in history -- this moment of unparalleled opportunity -- with a positive strategy to build on the enduring strengths of the American people: our capacity for hard work, our entrepreneurial drive, our willingness to take risks. Our strategy has concentrated on the sort of far-sighted investment that will be paying dividends far into the next century.

The economic leader of the world will excel in two vital areas: education and technology. That's where our future lies. Our strategy targets both.

American science is the best in the world. We've got to make sure that the same is true of our science education. Tomorrow's man and woman will be the ones who are best trained in math and science. Commensurate with the importance of that, and I thank you for lending me your former governor, Lamar Alexander, to help get the message to the rest of the country.

Joining with the nation's governor, Secretary Alexander and I set a goal: By the year 2000, we want America's students to be first in math and science. Yes, it's an ambitious goal. That's why we've set it.

The budget I've recently submitted to Congress calls for more than \$2 billion in extra federal education programs -- an 18 percent increase in the federal share of the pre-college level. To better meet the needs of a growing number of math and science students, we've also established in-depth training programs for our best of the nation's pre-college math and science teachers. We will give some federally-funded training.

In the old days, now called the golden age of American basic scientists, we engaged in winning the world. We've got to free up those priceless talents to concentrate on the technologies of tomorrow -- improving productivity and guaranteeing our longterm prosperity. We will be pouring all our energy into the Engine of Growth.

But it will take a lot of hard thinking to get the kind of results we need. We've been making a lot of decisions. We've got to make sure that our domestic spending is the result of hard thinking, not just hard thinking. And we've got to make sure that our competitiveness is based on the kind of technology that will be the result of hard thinking. We've got to make sure that our economic competitiveness is based on the kind of technology that will be the result of hard thinking.

we've always led the world in research and development. I've asked for a record investment in research and development this year alone.

Let me give you a few examples of what this means.

We're investing in research and development of a high-performance computer that will be 100 times as powerful as today's computer. Such a system will forecast droughts and hurricanes, design better aircraft, and unlock the middle of the genome.

We're investing in technologies to improve energy efficiency -- nuclear fusion and alternatives to petroleum.

To relieve our overburdened highways and airports, we're stimulating research in transportation technologies such as intelligent vehicles and advanced traffic control systems.

We're investing in research and development so that we can produce more energy from coal and relieve water pollution. We're investing in research and development of microorganisms that will help clean up environmental pollution in the environment.

Our challenge will be to get these incredible technological advances out of the laboratory and into the marketplace. We've been busy sweeping away the barriers that inhibit the transfer of technology from the laboratory to the marketplace. Just over a year ago, we passed legislation that will help industries to take advantage of the new technologies.

So far, we've seen a number of technologies that have reached the marketplace. One of the most significant is the development of this morning's technology. This technology is being developed at Oak Ridge and will be particularly useful in the construction of a new generation of steel, perfect for making bridges and other structures. We've learned that one cubic foot of this material can support more than one of its own weight. This technology is being developed by scientists and engineers at Oak Ridge.

The federal government has established a number of Standards and Technology Institutes to help industry and research. These institutes are providing funding in crucial fields such as energy, transportation, and manufacturing. We've provided funding for these institutes to help them develop new technologies.

More importantly, we've established a number of programs to help industry participate in research and development. We've established a number of programs where jobs are created and where those businesses that are helping us to develop new technologies will sharpen their competitive edge.

Make no mistake, we're not just investing in research and development. We're investing in the future of our country. We're investing in the jobs of the future. We're investing in the progress of our country. We're investing in the future of our country. We're investing in the progress of our country. We're investing in the future of our country.

That's why we've established a number of programs to help industry participate in research and development. We've established a number of programs where jobs are created and where those businesses that are helping us to develop new technologies will sharpen their competitive edge.

of our world responsibilities, we can't afford to let our capital goods program become a competitive disadvantage. It's nonsense. We've got to fix it now.

We've also asked Congress to make the new credit a permanent part of the law. Credit reduces the cost of capital goods by as much as 20 percent. American business can't afford to lose that.

Each of these measures comes from a vision of what our country should be in the 21st century. In the 20th century, we were the Industrial Revolution. In the 21st century, we must be the Information Revolution. Our grand challenge is to lay the foundation for the future.

Our priorities are: military and space, energy, education, and investment in infrastructure.

Those fields are the heart of the American economy. We must thank the President and his former government for the leadership in implementing these programs.

We've also seen the importance of especially in the field of math and science. By the year 2000, we must be the world leader in these fields.

Our strategy is to work with the market. We must make sure that at this moment in history, we are not losing ground.

It hasn't been an easy road, but we've made progress.

One of the things we must do is to embrace our own strengths -- our capacity for innovation, our entrepreneurial spirit. Second, we must invest in the future.

I believe that by playing to our strengths, we can overcome our weaknesses.

It's time to stop complaining and start working. We must lower the barriers to entry and lower the cost of doing business.

To take the new credit a permanent part of the law, this program and debt must be as much as 20 percent. American business can't afford to lose that.

We've spoken of this afternoon springs of hope. It's a great blessing that we can make their own future. In the 21st century, we must be the Information Revolution.

In this century, we must be the Information Revolution. Our grand challenge is to lay the foundation for the future. We must thank the President and his former government for the leadership in implementing these programs.

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no one...
I am...
well-prepared... we stand at this great moment

Regulatory Horror Stories

1] RCRA Toxicity Characteristic, CFC Refrigerants, and Asthma Medication: The same CFCs which are used as refrigerants also are used as the propellants in a variety of pharmaceuticals, including the bronchodilators used by millions of asthmatics. FDA approved these chemicals as propellants because they are safe and effective. Because of EPA overregulation, they are also hazardous wastes.

Explanation:

EPA seeks (and will soon require under CAAA) the recycling of CFC refrigerants to prevent them from being vented into the atmosphere where they may ultimately damage the ozone. However, the act of reclaiming these refrigerants transforms them into "solid wastes" under RCRA. The refrigerator repairman thus becomes a "generator" for purposes of RCRA, and has a legal obligation to test this "solid waste" to ensure that it is not hazardous.

To make matters worse, CFC refrigerants contain trace levels of chloroform and carbon tetrachloride -- ingredients in CFC manufacture. Because these trace levels are greater than the thresholds permitted under the "toxicity characteristic" rule promulgated in 2/1990, reclaimed CFCs are classified as hazardous wastes and must be managed in accordance with strict RCRA requirements.

2] USDA Marketing Orders: USDA requires that the label for any product containing meat or poultry be approved prior to use. An office at USDA (with 8 label reviewers) reviews approximately 180,000 labels a year. Their system is so inefficient that a private industry of "label expeditors" has grown up to help usher label applications through the USDA process. There is a huge backlog of applications because whenever USDA changes its rules, all affected labels must be resubmitted and re-approved. No other labeling program (such as FTC or FDA) requires prior approval of labels.

3] Used Lubricating Oil: EPA is about to list used lubricating oil as a hazardous waste unless it is managed in accordance with strict management standards. Once the value of this substance is decimated by EPA, millions of gallons of used lube oil that is currently recycled will be dumped into the trash or down the antion's storm drains and into streams, rivers, lakes and estuaries.

Explanation

EPA's own estimates show these standards will raise the cost of recycling used lube oil by about \$1 per gallon. Since the

current market price of used lube oil in the recycling market is about zero (i.e., collectors will take it away for free), EPA's regs. will cause the market price to plummet to -\$1 per gallon (i.e., collectors will charge \$1 per gallon to take it away).

4] Flooding Balconies Rule: In implementing the Fair Housing Act, HUD initially wanted to require all multi-unit housing with balconies to make these balconies "flush" with the inside floor level (in order to improve wheelchair accessibility). Unfortunately, as any architect or home builder will tell you, doing so could cause water to flood the apartment whenever it rained. As a result of White House review, HUD modified the requirement (to 4 inches).

5] Christopher Columbus Rule: The NRC already protects the American public from Low Level Radioactive Waste Disposal. At an estimated cost of \$2.3 billion, EPA wants to further regulate such waste to prevent no more than 13 cancers cases over a 10,000 year period, the first case not occurring until after 500 years. Thus, if Christopher Columbus had mad this \$2.3 billion investment when he discovered the New World, the first death averted would only just now be occurring.

6] Clean Hard Hat Rule: When OSHA updated its rules on hard hats, it included a new requirement that all hard hats be "disinfected" before exchanging hands. This requirement would have cost some \$60 million a year with no measurable benefits. There was not one documented case of anyone catching anything from an infected hard hat. After White House review, OSHA decided to drop this requirement from the regulation.

7] Happy Animals Rule: USDA has been drafting rules to modify its laboratory animal welfare standards. Such rules must provide, among other things, for the "psychological wellbeing of primates." The original drafts specified exact cage sizes and other details of daily care and feeding. USDA estimated the costs of these rules at \$3 billion. After receiving strong criticism from the scientific community (and after discussions with the White House), USDA has modified the rules and cut about \$1 billion from the costs.

resents the product of a multi-billion dollar investment made in the original research.

Access to the STI knowledge base maintained by Federal agencies has been considerable. Nearly 8 million items were disseminated in 1991 alone. Of those items, almost 6 million went to non-Federal users in the U.S. In addition, access through electronic databases continues to increase dramatically. Researchers gained access to references of over 81 million STI items during searches of on-line data bases provided by Federal agencies in 1991—over 10 million more than just three years earlier. Each item referenced in a search is a potential source of information which the researcher can either order directly from the Federal Government or, as is often done, simply obtain a copy from his or her company, university, or public library.

Advances in information system technology are rapidly changing the way in which STI

is created, stored and disseminated. A world once firmly linked to paper and microfiche has been rapidly shifting to electronic formats. For example, two years ago the Federal Government had never disseminated any STI on CD ROMs, while in 1991 over 1,100 were disseminated. The infrastructure for electronic storage and dissemination of Federal STI will be critical to continuing and enhanced access by Federal and non-Federal users alike. The National Research and Education Network being funded through the High Performance Computing and Communications Initiative will be an essential part of the future STI infrastructure. With such a vast knowledge base being generated and managed by numerous Federal agencies, and with the rapid changes in technology, interagency coordination in STI is critically important. For this reason, the Administration has recently moved to reinvigorate interagency coordination of STI.

STIMULATING INCREASED PRIVATE SECTOR R&D INVESTMENTS

The budget proposes making permanent the research and experimentation tax credit and an 18-month extension of the tax rules governing the allocation of foreign and domestic R&D expenditures.

Industry is the largest supporter of R&D, providing slightly over 50 percent of the total national R&D investment. It also performs much of the R&D funded by the Federal Government. In total, over 70 percent of all R&D is performed by industry.

From the early 1960s through the mid-1980s, total real industrial R&D expenditures increased significantly, mostly in development. Since the mid-1980s, however, the rate of growth in industrial R&D spending has leveled off, dropping from a rate of more than 7 percent average annual percent real growth between 1980-1985 to less than 2 percent between 1985-1991. For 1992, the Industrial Research Institute forecasts that industrial investment in R&D is likely to experience no growth, and will decline as a percentage of revenues for the first time since the mid-1980s. However, this slowdown may be

due to factors other than a simple reduction in funding for R&D. These factors could include greater efficiency in the private R&D process (embodied in a much greater use of concurrent design and engineering), and the shifting of private investment in R&D from products to process technologies.

The Federal Government can stimulate R&D in the private sector directly with increased government R&D spending. The Federal Government can also stimulate R&D in the private sector indirectly through tax incentives. The use of tax credits for R&D has been a net near-term revenue loser to the Treasury. It is anticipated, however, that in the longer-term these losses will be more than offset by the revenues from new products and processes resulting from the private investment stimulated by the credit. However, since only the short-term losses can be estimated (the long-term benefits are simply too diffuse), these incentives are essentially a form of increased Federal R&D spending in areas of greatest potential benefit to

the economy as identified by the private sector.

Tax Credit and Allocation Rules

The Research and Experimentation (R&E) tax credit was originally adopted in 1981 to encourage increased private R&D spending. The credit was never made permanent, but was renewed in 1986, 1988, 1989, 1990, and 1991 (only until Spring, 1992) at a lower rate than originally granted.

Tax credits prior to 1989 reduced the cost of increments to R&D for most qualifying firms by about 6 to 9 percent. In 1989 the incentives provided by the credit were improved. The version of the credit enacted in 1989, and extended in the 1990 Omnibus Budget Reconciliation Act, reduces, for most qualifying firms, the cost of increments to

R&D by 20 percent. Bailey and Lawrence have estimated that this version of the tax credit should increase corporate R&D spending in the 1990s by about 4 percent. Making the credit permanent would help reverse the recent trend toward leveling off of corporate R&D spending.

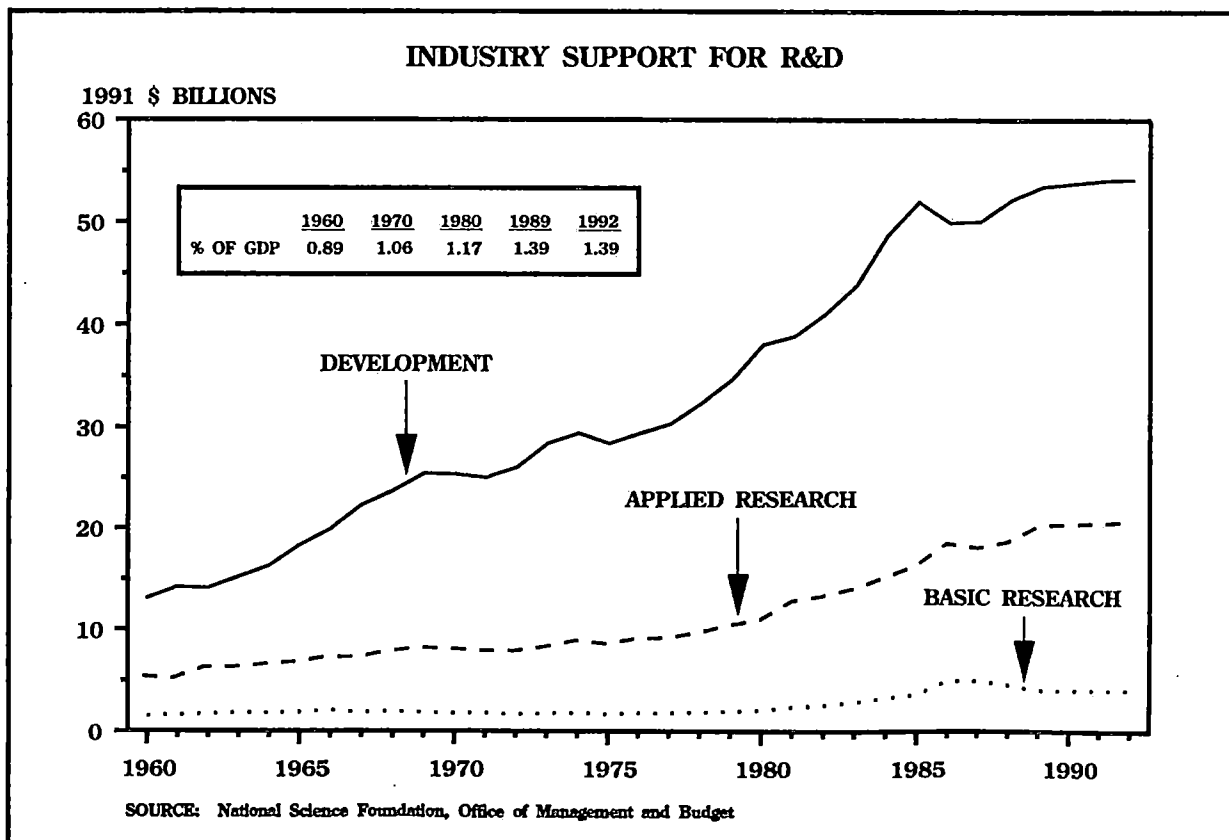
The budget proposes two changes in the tax code designed to provide additional incentives for industry to increase its investment in R&D. The budget proposes to make the 20 percent tax credit permanent. In addition, the budget proposes to extend for 18 months the rules, as extended in the Tax Extension Act of 1991, for the allocation of foreign and domestic R&D expenditures for companies with foreign operations. This proposal would apply to all tax years beginning after the current rules expire on June 30, 1992.

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Event

OFFICE OF THE SECRETARY

FACSIMILE TRANSMITTAL SHEET

DATE 2-14-92

TO Carol Aarbus

FAX NUMBER 456-6218

OFFICE NUMBER _____

COMMENTS _____

FROM Steve Skinner

FAX NUMBER 202-586-0148

OFFICE NUMBER 202-586-5500

NUMBER OF PAGES INCLUDING COVER 4

Proposed Visit to Oak Ridge, Tennessee

SITE: DOE's Oak Ridge National Laboratory (ORNL) and/or Coors Ceramics Company plant in Oak Ridge, Tennessee

EVENT: Attend and participate in Cooperative Research and Development Agreement (CRADA) signing ceremony involving Martin Marietta Energy Systems (DOE contractor operating ORNL) and Coors Ceramic Company (largest U.S. ceramic company--\$200M/yr. business). Tour of ORNL High Temperature Materials Laboratory and local Coors Ceramic Co. plant which produces ceramic materials using advanced technologies developed in cooperation with ORNL.

BACKGROUND: As part of the Administration's technology transfer effort, DOE has encouraged its contractors and national laboratories to attract industry to their local communities and enter into cooperative research and development projects. As part of a \$4 million DOE program, ORNL and DOE's Y-12 Defense Production plant have joined forces to establish a program to develop low cost, lighter-weight, higher-strength ceramics and ceramic matrix composites and improved machining techniques to produce more efficient manufacturing processes. This program is unique in that it uses technology developed at a defense lab to be applied in the commercial sector--"turning swords into plowshares".

Coors Ceramics and Martin Marietta have agreed to enter into the first CRADA under this program to develop these advanced materials and processes to be used at its Oak Ridge and 11 other U.S. ceramic manufacturing plants. This agreement is an example of federal technology transfer programs designed to provide U.S. industry with the latest technology, increasing their competitiveness in the global market and creating jobs in the U.S.

The President recently endorsed the National Technology Initiative which includes a series of conferences designed to spur economic competitiveness by promoting a better understanding of the opportunities for industry to commercialize new technology advances (see attached statement). This event would allow the President to witness first hand what the National Technology Initiative will produce. He will also be able to see how advanced technologies are developed at ORNL and the Y-12 Defense plant and applied in the Coors Ceramics plant.

THE WHITE HOUSE**Office of the Press Secretary
(Manchester, New Hampshire)****For Immediate Release****February 12, 1992****STATEMENT BY THE PRESS SECRETARY**

The President today endorsed a February 12, 1992 conference at the Massachusetts Institute of Technology to launch the "National Technology Initiative."

The President today in New Hampshire said, "Look to the long-term, and we've got work to do ... steps we can take right now to guarantee progress and prosperity into the next American Century. We get there by investing in the technologies of tomorrow, with federal support of R&D at record levels. We need to share the results, get the great ideas generated by public funds out into the private sector, off the drawing board and onto store shelves. Our National Technology Initiative will do just that, at M.I.T., the first regional meeting is underway."

The conference is the first of a series of regional meetings intended to spur U.S. economic competitiveness by promoting a better understanding of the opportunities for industry to commercialize new technology advances. The program will highlight the federal government's investment in advanced technologies, much of which may have commercial potential. It also will stress recent changes in federal policies designed to foster private sector cooperation in commercializing technology.

Secretary of Energy James D. Watkins, Acting Commerce Secretary Rockwell A. Schnabel, Acting Transportation Secretary James B. Busey, and NASA Administrator Richard Truly described the joint initiative as a way to address one of the key challenges facing industry -- the need to translate new technologies into marketplace goods and services.

Encouraging closer cooperation among U.S. companies and better links with federal laboratories is a central element of the initiative.

The MIT conference and subsequent meetings around the country will provide an opportunity for a discussion among government, industry, and universities and increase awareness of federal science and technology programs that can benefit U.S. firms. In recent years, Congress and the Bush administration have taken steps to better enable the private sector to commercialize federally supported research.

-2-

The conference, hosted primarily by the U.S. Departments of Commerce, Energy and Transportation and NASA will offer a forum for government and private sector representatives to discuss their programs -- and share practical techniques for translating government-sponsored research into commercial products and services.

#

From Jeannie & Dan
(used in Wed. speech)

NATIONAL

TECHNOLOGY

INITIATIVE

NATIONAL TECHNOLOGY INITIATIVE

- I. SCOPE & PURPOSE
- II. PROPOSED DATES/LOCATIONS
- III. FEBRUARY 11 & 12 SEMINAR
 - A. PRESS RELEASE
 - B. LETTER TO PARTICIPANTS
 - C. DRAFT AGENDA

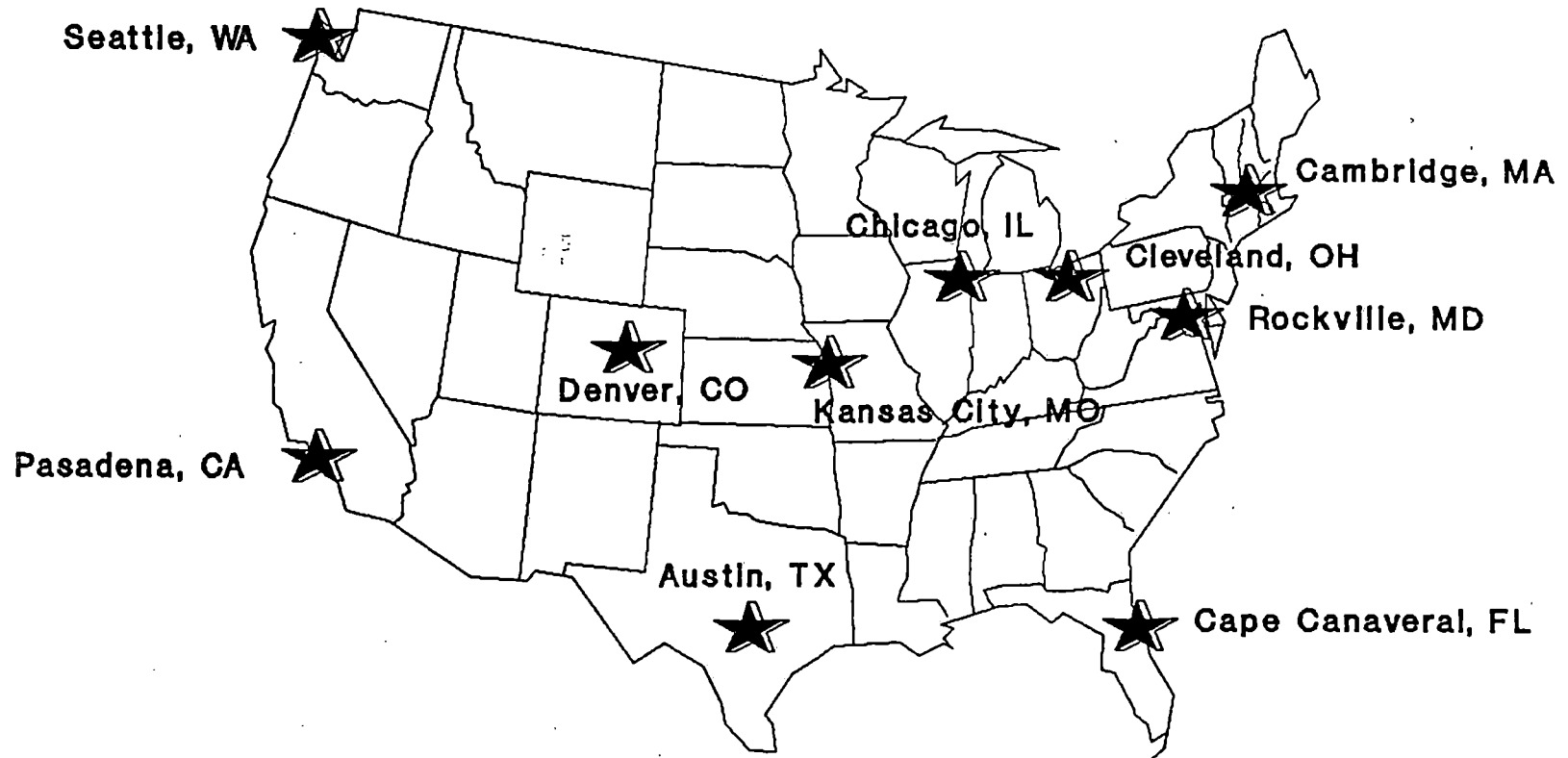
Scope and Purpose

- **Goals: To promote U.S. industry's use of technology to provide:**
 - Higher economic growth rate.
 - Strengthen U.S. competitiveness.
- **Objectives:**
 - Provide for business expansion through technology applications.
 - Create more high value-added jobs for Americans.
 - Promote networks for business partnerships.
 - Increase business confidence.
- **Plan: A series of regional meetings in high-technology cities across the country to promote an exchange of ideas between industry and government on:**
 - Partnerships for R&D and technology transfer.
 - Financing for high-technology enterprises.
 - Manufacturing excellence.

PROPOSED DATES FOR NTI SEMINARS

	February 11 - 12, 1992	Cambridge, MA
Roundtable	February 28, 1992	Atlanta, GA
	March 2 - 3, 1992	Austin, TX
Roundtable	March 11, 1992	California
	March 23 - 24, 1992	Cape Canaveral, FL
	April 7 - 8, 1992	Research Triangle, NC
	April 20 - 21, 1992	Cleveland, OH
	May 13 - 14, 1992	Seattle, WA
	May 28 - 29, 1992	California
	June 10 - 11, 1992	Denver, CO
	June 23 - 26, 1992	Chicago, IL or Kansas City, MO
	Mid-July	Rockville/Beltway

Proposed Locations for the National Technology Initiative



DRAFT: 1/27/92

NATIONAL TECHNOLOGY INITIATIVE

NEWS MEDIA CONTACT:
Joseph Karpinski, 202/586-4940
Mat Heyman (DOC) 301/975-2762

FOR IMMEDIATE RELEASE
January 24, 1992

GOVERNMENT, INDUSTRY TO LAUNCH NATIONAL TECHNOLOGY INITIATIVE ON FEBRUARY 12

Top representatives of four federal agencies will join with industry and academia in a Feb. 12 conference at the Massachusetts Institute of Technology to launch the "National Technology Initiative."

The conference is the first of a series of regional meetings intended to spur U.S. economic competitiveness by promoting a better understanding of the opportunities for industry to commercialize new technology advances. The program will highlight the federal government's investment in advanced technologies, much of which may have commercial potential. It also will stress recent changes in federal policies designed to foster private sector cooperation in commercializing technology.

Secretary of Energy James D. Watkins, Acting Commerce Secretary Rockwell A. Schnabel, Acting Transportation Secretary James B. Busey, and NASA Administrator Richard Truly described the joint initiative as a way to address one of the key challenges facing industry -- the need to translate new technologies into marketplace goods and services.

(MORE)

R-92-014

Encouraging closer cooperation among U.S. companies and better links with federal laboratories is a central element of the initiative.

They said President Bush believes that such cooperation will help to improve the competitiveness of U.S. companies in the global market, leading to increased American jobs and greater economic growth.

The MIT conference and subsequent meetings around the country will provide an opportunity for a discussion among government, industry, and universities and increase awareness of federal science and technology programs that can benefit U.S. firms. In recent years, Congress and the Bush administration have taken steps to better enable the private sector to commercialize federally supported research.

The conference, hosted primarily by the U.S. Departments of Commerce, Energy and Transportation and NASA will offer a forum for government and private sector representatives to discuss their programs -- and share practical techniques for translating government-sponsored research into commercial products and services.

Admiral Watkins, Acting Secretary Schnabel, Acting Secretary Busey, and Admiral Truly, will open the program with remarks at 8:45 a.m., following a welcome by Massachusetts Governor William Weld.

Plenary sessions will focus primarily on financing research and development, contractual and licensing arrangements for government-business research cooperation, and promoting manufacturing excellence.

In addition to those plenary topics, workshops will focus on protection of private ownership of technology in cooperative programs and commercial use of government sponsored environmental and biotechnological research.

Conference registration fee is \$95. Participants may register in advance by contacting Maria Clara Martin, 617/253-0213 (phone) or 617/258-6148 (fax).



The Secretary of Energy
Washington, DC 20585

January 21, 1992

In our roles as United States Secretaries of Commerce and Energy and the Administrator of NASA, we invite you to participate in our first seminar, launching a National Technology Initiative. This seminar will be held at the Massachusetts Institute of Technology in Cambridge, Massachusetts on February 12, from 8:30 a.m. to 5:30 p.m.

The objective of the National Technology Initiative is to address one of the key challenges facing industry -- the need to translate new technologies into marketable goods and services. We intend to use this initiative as a means of creating new partnerships among government, universities and U.S. companies. Through these new arrangements, we can work to bring new technologies to market, to ensure access to capital needed for technological competitiveness and to make manufacturing excellence a national commitment. The President believes that such successful partnerships will help to improve the competitiveness of U.S. companies in the global market, leading to more American jobs and greater economic growth.

To carry out the National Technology Initiative, we will sponsor a series of regional meetings to engage government and business in a dialogue aimed at building new, more productive partnerships in technology development, finance and commercialization. An agenda for the program and a registration form are enclosed.

It is important for all the participants in these meetings -- especially the first one -- to understand that our objective is a candid dialogue between business, university and government research and development leaders. We want to develop the enormous potential that we think can flow from these new partnerships. We must begin by frankly assessing our current situation. The government participants need to spell out their present programs and policies and the business participants need to present their candid assessments about how we can improve our situation. It is time to do what is necessary to ensure a competitive edge for the United States through efficient technology commercialization.

The program at MIT will launch this effort by focusing on three topics:

Commercialization of technology in Federal labs,
universities and the private sector

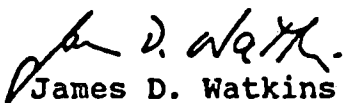
Encouragement of long-term investment and financing for
technology in U.S. companies

Promoting technological excellence in manufacturing in
U.S. industry

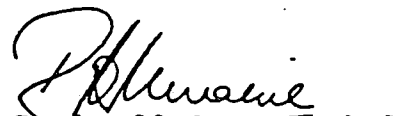
Nationally respected experts in research, manufacturing and finance will participate in a format designed to engage the audience in active dialogue. The emerging technological interests of the New England Region will be reflected in special presentations on commercially promising environmental and biotechnology research underway in the federal laboratories and other government supported institutions.

This first seminar will lay the foundation for what we believe will be a very vital means of addressing the important technological challenges facing our businesses and our nation. We hope you will join us. Please use the enclosed registration form to respond promptly as space is limited.


Sincerely,



James D. Watkins
Secretary of Energy



Rockwell A. Schnabel
Acting Secretary of
Commerce



Richard H. Truly
Administrator, National
Aeronautics and Space
Administration

Enclosures:

Partners In Progress: A Dialogue

Opportunities for Commercialization of Technologies in the New England Region

Objective: To have a candid dialogue between business, university, and government leaders to identify effective ways to translate new technologies into marketable goods and services.

Site: Massachusetts Institute of Technology

Date: Wednesday, February 12, 1992

Format: A series of "town meeting" style discussions among participants from business, universities, and government, with a particular focus on emerging technological interests of the New England region.

AGENDA

7:45 - 8:45 a.m. Continental Breakfast and Registration

8:45 - 9:30 a.m. Welcome and Introduction of Cabinet Members by Governor Weld

Rockwell A. Schnabel, Acting Secretary of Commerce

James D. Watkins, Secretary of Energy

James B. Busey, IV, Acting Secretary of Transportation

Richard H. Truly, NASA Administrator

9:30 - 11:00 a.m. Partnerships for Cooperative R&D

Discussion of mechanisms for forming strategic partnerships, such as: consortia, cooperative research and development agreements (CRADAs), patent licensing, etc.

Moderator: W. Henson Moore, Deputy Secretary of Energy

Panelists: John T. Preston, Director, Technology Licensing Office, MIT
Richard R. John, Director of Volpe National Transportation Systems Center, Department of Transportation
William M. Haney, President, Molten Metal Technology

11:00 - 11:15 a.m. Break

Preliminary Agenda

- 11:15 - 12:30 p.m. Partnerships for Long-term Investment and Financing
- Discussion of public, private and institutional sources of investment capital and corporate financing.*
- Moderator: John Macomber, Chairman, Export-Import Bank of the U.S.
- Panelists: Michael E. Porter, Professor, Harvard Business School
D. Mark Cunningham, Vice President, Alliance Capital Corporation
George Hatsopoulos, President & CEO, Thermo Electron
- 12:30 - 2:00 p.m. Luncheon
- Introduction: Stephen P. Tocco, Secretary of Economic Affairs, Commonwealth of Massachusetts (invited)
- Keynote Speaker: James Vincent, CEO, Biogen Inc.
- 2:00 - 3:15 p.m. Partnerships for Manufacturing Excellence
- Discussion of the successful management of change, assimilation of advanced manufacturing tools and techniques, leveraging of federal capabilities by non-federal organizations, and lessons learned.*
- Moderator: Robert M. White, Under Secretary of Commerce for Technology Administration
- Panelists: Michael Dertouzos, Director, Computer Science Laboratory, MIT
Alvin W. Trivelpiece, Director, Oak Ridge National Laboratory
Robert J. Hermann, Vice President of Science and Technology, United Technologies Corporation
- 3:15 - 3:20 p.m. Plenary Session Wrap-up/Introduction to Workshops
- Admiral James D. Watkins, Secretary of Energy
- 3:20 - 3:30 p.m. Break

3:30 - 5:30 p.m. Concurrent Workshop Series

Conference attendees can attend one workshop from each series.

3:30 - 4:30 p.m. **WORKSHOP SERIES 1**

Workshop 1a - Environmental Technology Partnerships

Practical examination of commercially attractive environmental research underway at Federal laboratories and funded universities.

Moderator: Michael R. Deland, Chairman, Council on Environmental Quality

Panelists: Frank L. Parker, Professor, Vanderbilt University/Clemson University
George W. McKinney, President and CEO, Environmental Quality Corporation
Clyde W. Frank, Deputy Assistant Secretary for Technology Development, Environmental Restoration and Waste Management Program, U.S. Department of Energy

Workshop 1b - Partnerships for Biotechnology

Practical examination of commercially attractive biotechnology research underway at Federal laboratories and funded universities.

Moderator: Bernadine Healy, Director, National Institutes of Health

Panelists: Richard Douglas, VP of Scientific Development, Genzyme Corporation
Timothy B. Anderson, President of Fenwal Division, Baxter Health Care Products
John D. Harding, Life Technologies, Inc.

Workshop 1c - Partnering for Manufacturing Excellence

Practical examination of the issues related to successfully managing change, modifying culture, and measuring success against a business strategy designed to leverage federal research and development and increase utilization of advanced manufacturing capabilities.

Moderator: John G. Mannix, Assistant Administrator for Commercial Programs, NASA

Panelists: Daniel Roos, Professor and Director of Center for Technology Policy & Industrial Development, MIT
John W. Lyons, Director, National Institute of Standards and Technology
Philip W. Cheney, Vice President of Engineering, Raytheon Corp.

Preliminary Agenda

4:30 - 5:30 p.m.

WORKSHOP SERIES 2**Workshop 2a - Protecting Intellectual Property Rights and Technical Data in Technology Commercialization Partnerships**

Practical examination of federal patent policy, licensing procedures, copyright of software and other works, maskworks, proprietary data and trade secret protection, CRADA generated information, and other tools for effective commercialization.

Moderator: Lita Nelsen, Associate Director of Technology Licensing, MIT

Panelists: James P. Dunn, Executive Director for Center for Technology Commercialization
 Jacob N. Erlich, Chief Patent Advisor, Hanscom Patent Prosecution Office, Hanscom Air Force Base
 Gerald E. Lester, Law Group Manager, Digital Equipment Corporation

Workshop 2b - Financing of Partnerships for Technology Commercialization

Practical examination of SBA support for small businesses, State Economic Development Programs, SBIR, venture capital, joint ventures and cost-shared development for commercialization of technology.

Moderator: TBD

Panelists: William Sahlman, Harvard Business School
 Richard Burns, Charles River Ventures
 Sheryl Handler, President and CEO, Thinking Machines Corporation (invited)

Workshop 2c - Federal Technology Transfer Programs

Practical examination of the factors for successfully implementing legislative orders and executive directives pertaining to established public-private partnerships for the transfer of technology from federal laboratories.

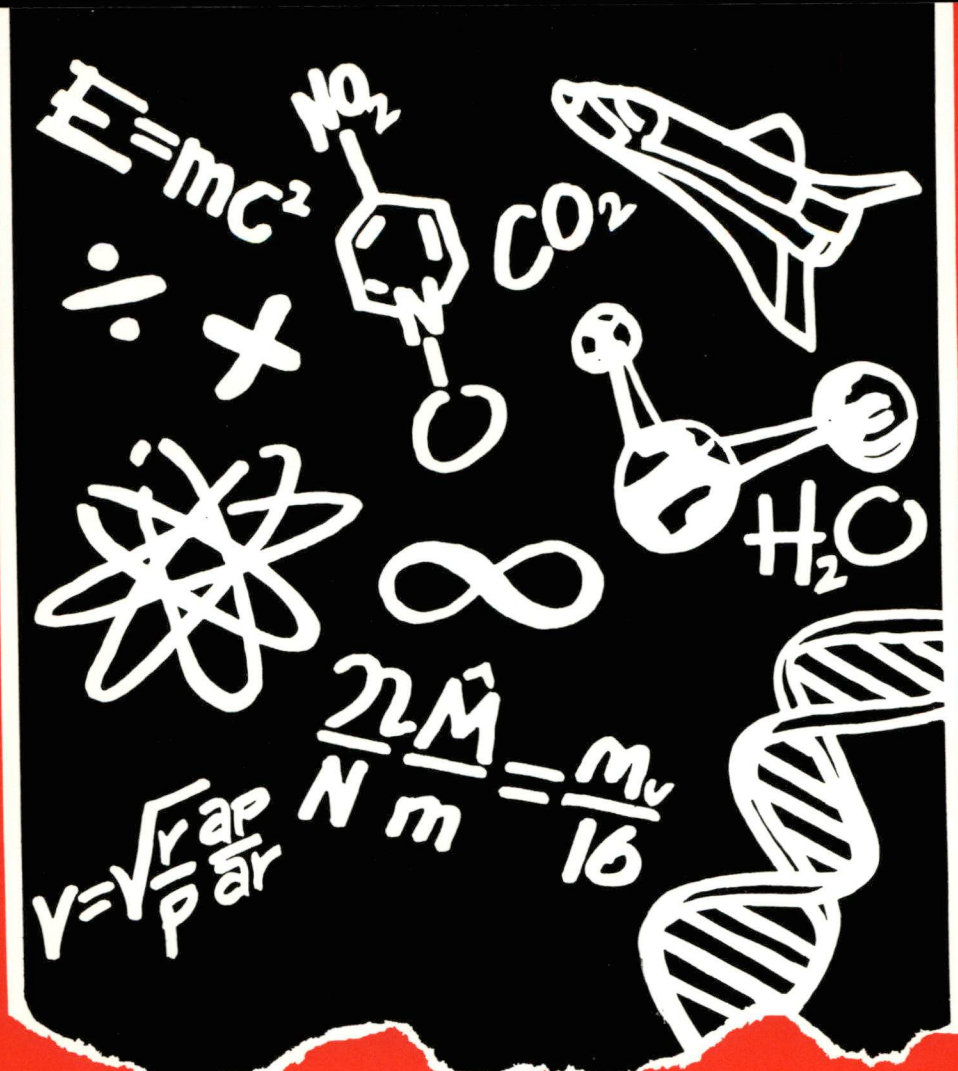
Moderator: Deborah L. Wince-Smith, Assistant Secretary of Commerce for Technology Policy

Panelists: Cherri J. Langenfeld, Director of Technology Utilization, Department of Energy
 Frank Penaranda, Director of Technology Utilization Division, Office of Commercial Programs, NASA
 Reid G. Adler, Director, Office of Technology Transfer, National Institutes of Health

5:30 p.m.

Conference Adjourns

Preliminary Agenda



By the Year 2000
First in The World

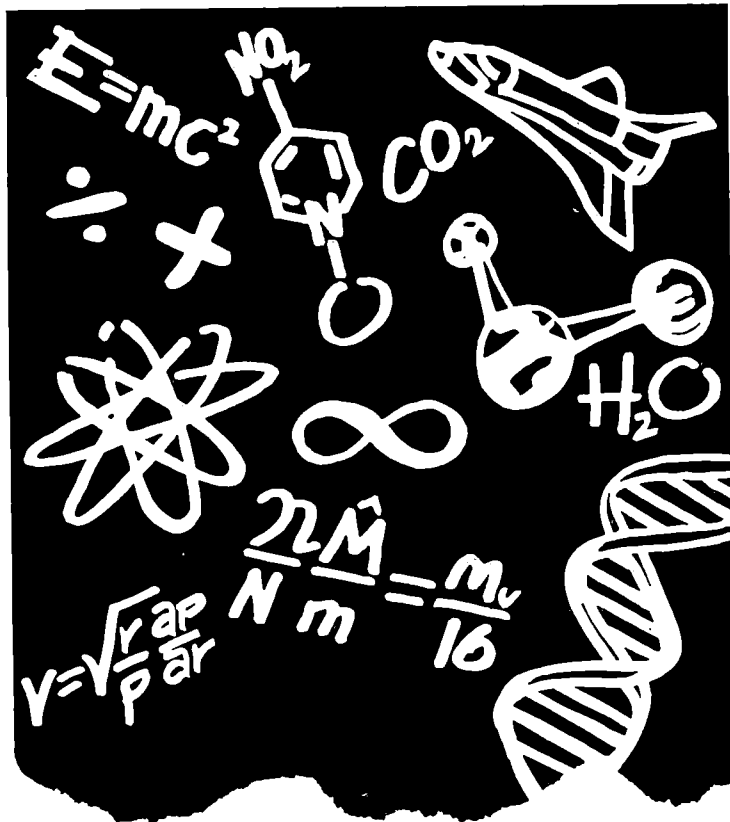
Report of the FCCSET
Committee on Education
and Human Resources

FY 1993

January 1992

BY THE YEAR 2000: FIRST IN THE WORLD

REPORT OF THE FCCSET COMMITTEE ON EDUCATION AND HUMAN RESOURCES



FY 1993
BUDGET SUMMARY

January 1992

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

MEMBERS OF CONGRESS:

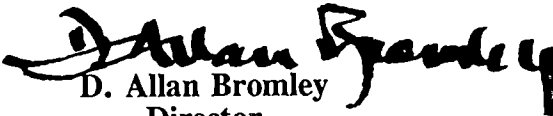
I am pleased to forward with this letter "By the Year 2000: First in the World," a report by the Committee on Education and Human Resources (CEHR) of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), to supplement the President's Fiscal Year 1993 Budget. This report, the second in a series begun in 1991, describes the FY 1993 Presidential Initiative in Mathematics and Science Education.

The CEHR effort is consistent with the President's leadership and commitment in the field of education and supports the goals and objectives of the AMERICA 2000 national education strategy. This report builds on the pioneering work done by the Committee last year, and further develops our understanding of how the Federal Government can contribute to meeting the National Education Goals for mathematics and science education. The emphasis in the program is on precollege education, but strong support is given to efforts to sustain and improve undergraduate and graduate education as well. In FY 1993 we see increased emphasis on public science literacy to strengthen the understanding and knowledge necessary for an informed citizenry.

Through the FCCSET process, and in close cooperation with the Office of Management and Budget, the Committee on Education and Human Resources has achieved a significant increase in the level of interagency coordination in mathematics and science education. The CEHR is also building close ties with the other Presidential Initiatives to ensure that advances, for example, in high performance computing and communications are fully recognized in terms of their potential to improve the delivery of education at all levels.

I want to take this opportunity to salute the superb leadership of Admiral James D. Watkins, who has been Chairman of the Committee on Education and Human Resources since it was established. He and the Co-Vice Chairmen, David Kearns and Luther Williams, have led the coordination and integration of the interagency strategy for this Initiative. They and their interagency committee members, associates, and staff are all to be commended for the excellent work that is manifest in both the Initiative and the report.

In the near future, Admiral Richard H. Truly will succeed Admiral Watkins as Chairman of the Committee on Education and Human Resources. Admiral Truly has already demonstrated an outstanding commitment to the improvement of mathematics and science education in the United States. I am certain that he and the other members of the Committee will continue the tradition begun by Admiral Watkins in advancing the Federal role in making the United States first in the world in mathematics and science achievement.


D. Allan Bromley
Director



The Secretary of Energy
Washington, DC 20585

January 20, 1992

Dr. D. Allan Bromley
Assistant to the President
for Science and Technology
Office of Science and Technology Policy
Old Executive Office Building
Washington, D.C. 20506

Dear Allan:

It is with great pleasure that I submit to you the FY 1993 Budget Summary report of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) Committee on Education and Human Resources (CEHR).

Under the President's leadership, our Nation is engaged in an unprecedented period of education reform. The Committee on Education and Human Resources has the unique opportunity to coordinate the work of Federal agencies in mathematics and science education as part of this effort. This year's report outlines the Committee's accomplishments, describes budget proposals indicative of the President's support for education reform, and our priorities and new initiatives for the future, as well as our commitment to AMERICA 2000.

I take tremendous pride in what this Committee has initiated and accomplished in only eighteen months. Surely, these efforts will assist the Nation in achieving the National Education Goals, and I envision the future of American education bettered by the hard work and dedication of all our Committee and Working Group Members.

Sincerely,

A handwritten signature in cursive script that reads "James D. Watkins". The signature is written in dark ink and is positioned above the printed name and title.

James D. Watkins
Admiral, U.S. Navy (Retired)
Chairman, FCCSET CEHR

Federal Coordinating Council for Science, Engineering, and Technology

Committee on Education and Human Resources

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David T. Kearns, U.S. Department of Education

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Joe Hezir, Office of Management and Budget, Executive Office of the President

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Roberts Jones, U.S. Department of Labor

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Nancy H. Mason, U.S. Department of Commerce

Kate L. Moore, U.S. Department of Transportation

Harry Mussman, U.S. Department of Agriculture

William G. Myers, U.S. Department of Justice

J. Thomas Ratchford, Office of Science and Technology Policy, Executive Office of the President

John E. Schrote, U.S. Department of the Interior

Jack Sommer, U.S. Department of Housing and Urban Development

Barry White, Office of Management and Budget, Executive Office of the President

Executive Secretary

Peggy Dufour, U.S. Department of Energy

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Charles H. Dickens, Executive Secretary

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Charles Dickens
Arthur Sheekey

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Helen McCammon
Bayla F. White

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Frank Owens
National Aeronautics and Space Administration

Undergraduate

Ted Berlincourt
Janet Johnston
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Jay Moskowitz
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Office of Science and Technology Policy

Charles Dickens

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LIST OF COMMON ACRONYMS

ADAMHA	Alcohol, Drug Abuse, and Mental Health Administration
CEHR	Committee on Education and Human Resources
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOJ	U.S. Department of Justice
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
ED	U.S. Department of Education
EPA	U.S. Environmental Protection Agency
FCCSET	Federal Coordinating Council for Science, Engineering, and Technology
HHS	U.S. Department of Health and Human Services
HUD	U.S. Department of Housing and Urban Development
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
OMB	Office of Management and Budget
OPD	Office of Policy Development
OSTP	Office of Science and Technology Policy
SI	Smithsonian Institution
USDA	U.S. Department of Agriculture
VA	U.S. Department of Veterans Affairs

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EXECUTIVE SUMMARY



THE CONTINUING CHALLENGE

For decades, commissions, committees and task forces have called for the improvement of American mathematics and science education. Citing challenges to U.S. economic strength and well-being from increasing international competition, they have brought to our attention the awareness that while America's scientific enterprise is currently the best in the world, American science education is not.

While it is true that many American children receive an excellent education, it is also true that far too many do not. Evidence of this can be seen in:

- Poor American student performance relative to their peers in other countries;
- Inadequate college and university preparation and lack of current scientific knowledge and effective pedagogical techniques among too many American teachers;
- Insufficient numbers of students pursuing the education and training necessary for critical scientific and technical jobs;
- Continued underrepresentation of women, minorities and persons with disabilities in science courses and careers; and
- Low levels of science literacy among the American public.

THE FEDERAL ROLE

The Federal Government is both a user and patron of a large portion of America's scientific and technical workforce and, as such, has both short-term and long-term interest in the successful preparation of that workforce. Education in the United States is a partnership that includes: parents; educators; Federal, State and local governments; business and industry; professional associations; community-based organizations; and volunteers from all walks of life. Approximately 94% of precollege funding comes from States and local communities. However, with its 6%, the Federal Government can play a leadership role by mobilizing national support for reform, establishing national goals, initiating model reform efforts and bringing to bear the great scientific and technical resources managed by Federal agencies. In mathematics, science and technology education, the Federal Coordinating Council for Science, Engineering, and Technology's Committee on Education and Human Resources (CEHR) provides the essential coordination between Federal agencies to carry out this work.

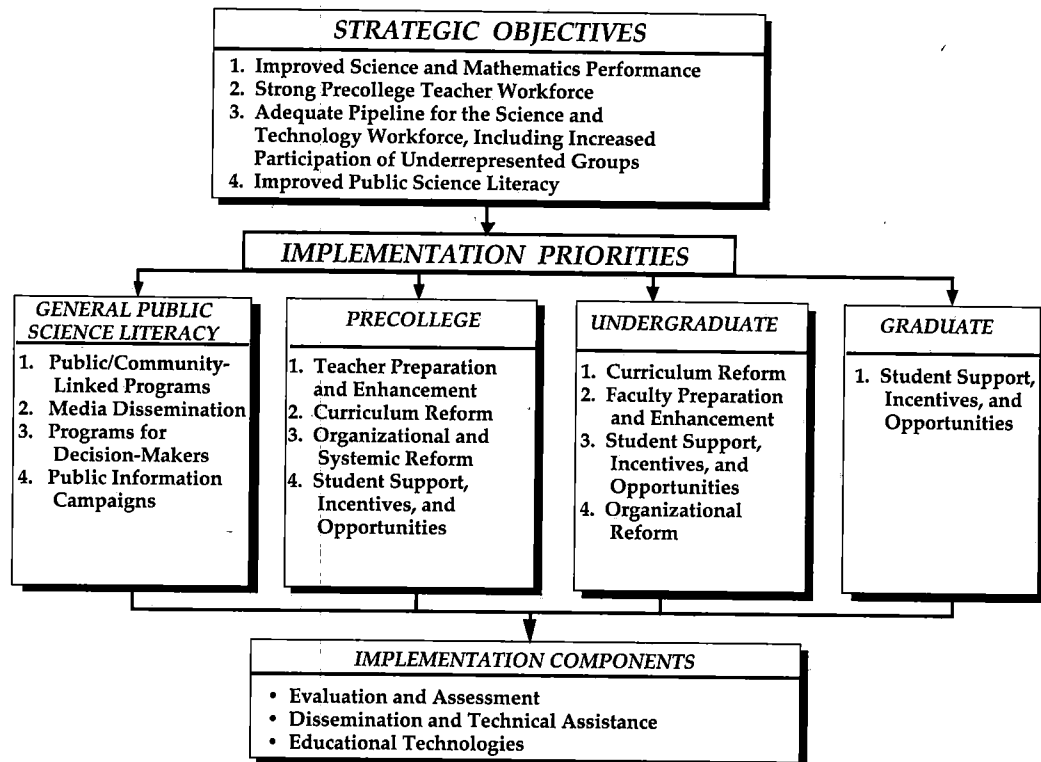
AMERICA 2000

In April 1991, President Bush announced a comprehensive national strategy for achieving the six National Education Goals, including the improvement of mathematics, science and technology education. Entitled "AMERICA 2000," the strategy identifies four tracks for accomplishing national education reform:

- making better and more accountable schools for today's students;
- creating a new generation of American schools for tomorrow's students;
- becoming a "nation of students;" and
- making communities places where learning can happen.

Because the focal point of AMERICA 2000 is the National Education Goals, and because CEHR priorities are based on those goals as they relate to mathematics, science and technology, the Committee has a well-established programmatic and budgetary framework [Figure I] to help further the goals and objectives of AMERICA 2000.

Figure I:
FY 1993 Federal Math/Science Education Priority Framework



The Committee also recognizes that experiences from precollege through graduate education are interdependent. CEHR recognizes its responsibilities in higher education as well, as reflected in its priorities shown above.

FY 1993 BUDGET SUMMARY

The President's FY 1993 budget proposes the investment of \$2.1 billion in mathematics, science, technology, and science literacy education programs. This is an increase of \$138 million (or 7%) over the FY 92 enacted levels for the programs and a \$626 million (or 43%) increase over FY 90 enacted levels [Figure II].

Figure II:
FY 1990-1993 Growth by Education Level (dollars in millions)

	FY 1990	FY 1991	FY 1992	FY 1993	Increase FY 90-93	% Increase FY 90-93
Grand Totals	\$ 1466.07	\$ 1712.70	\$ 1954.74	\$ 2092.23	\$ 626.16	43%
Precollege	343.66	514.65	650.71	767.95	424.28	123%
Undergraduate	383.95	413.90	444.25	480.77	96.82	25%
Graduate	738.46	784.15	768.88	750.20	11.74	2%
Science Literacy	N/A	N/A	90.89	93.32		

The FY 1993 increases are consistent with the priorities established by CEHR to achieve the mathematics- and science-related National Education Goals through AMERICA 2000. They are distributed as follows:

Precollege: \$768 million, 37% of the CEHR budget.
 Increase over FY 1992: \$117 million (+18%)
 Increase over FY 1990: \$424 million (+123%)

Undergraduate: \$481 million, 23% of the CEHR budget.
 Increase over FY 1992: \$37 million (+8%)
 Increase over FY 1990: \$97 million (+25%)

Graduate: \$750 million, 36% of the CEHR budget.

Increase over FY 1992: -\$19 million (-2%)

Increase over FY 1990: \$12 million (+2%)

Public Science Literacy: \$93 million, 5% of the CEHR budget.

Increase over FY 1992: \$2 million (3%)¹

NEW INITIATIVES

For FY 1993, there are three major new initiatives in mathematics and science education that build on the concept of increased utilization of Federal government assets:

Mathematics and Science Teacher Enhancement. The most important near-term action to improve mathematics and science education is to enhance the content knowledge, pedagogic skills, and enthusiasm of teachers already in the workforce. The President's budget proposes an expanded program for the training of these teachers, a part of which includes the use of Federal laboratory personnel and facilities. The initiative builds significantly on existing programs and will ultimately provide in-depth, up-to-date training for all of America's precollege mathematics and science teachers. As an initial step, this budget proposes to double the number of teachers receiving Federal assistance for high-intensity training in FY 1993 to roughly 45,000. In addition, the initiative supports shorter-term training opportunities for approximately 725,000 teachers. Thus, this initiative will reach almost half of the Nation's precollege math and science teachers. The initiative will also have the objective of preparing teachers to teach mathematics and science curricula that are tied to world class standards, when those standards are in place.

This initiative will involve the complementary efforts of three Federal agencies. The National Science Foundation (NSF) will award merit-based grants to university investigators to operate regional teacher training programs. The U.S. Department of Education (ED) will support model projects in selected school districts designed to employ secondary school math and science teachers to train elementary and middle school teachers in those districts. ED will also modify its Eisenhower State Grant program to increase the number of teachers receiving intensive training. The U.S. Department of Energy (DOE) will lead an interagency effort to implement teacher training and research programs based at Federal laboratories, in collaboration with universities, State and local educational agencies, businesses and industry.

Educational Technologies. A major objective of the AMERICA 2000 strategy is to establish national electronic networks that link all American schools with other sites where learning occurs. In support

¹New budget category; comparative data only available for FY 1992.

of this objective, the Administration proposes to accelerate implementation of classroom educational technology programs.

Mathematics and science teaching is ideally suited for the use of electronic dissemination technologies. Through technology, outstanding scientists can be brought into thousands of classrooms at once and students can interact in real-time with astronauts on National Aeronautics and Space Administration (NASA) missions, for example. By linking researchers, educators, and students, in this way, current information in science and technology can be shared in a timely manner, providing an invaluable supplement to standard curricula. Federal agencies, including U.S. Department of Defense (DOD), NASA, DOE, and NSF, are presently engaged in two major activities in this area: (1) the use of long-distance electronic communication technologies (e.g., satellite broadcasting, fiber optics and computer networks) that provide technical training and disseminate scientific and technical information developed to support agency programs and missions; (2) both ED, through its STAR Schools Program, and NSF support distance learning programs, with emphasis on rural school systems that have limited access to educational resources.

In 1992, CEHR will hold a major conference to review the merits of existing and proposed educational technologies. Those technologies demonstrating the most promise for revolutionizing classroom instruction will be selected for support under special, fast-track demonstration programs.

Computers and Scientific Equipment. Studies have shown that student performance in mathematics and science is enhanced by access to and experience with computers and various scientific equipment. Yet, in times of tight budgets, investment in these types of equipment is often deferred. This initiative proposes a new effort to make available Federal excess and surplus personal computers and scientific equipment to local school systems. In future years, the amount of excess personal computers and related equipment is expected to rise due to the turnover of current Federal assets.

CEHR ACCOMPLISHMENTS

In its first eighteen months, the Committee on Education and Human Resources has achieved several of its goals. In preparation for the previous year's budget submission, CEHR:

- Prepared the first comprehensive Federal budget crosscut of mathematics, science and technology education programs at the precollege, undergraduate and graduate levels;
- Published the first inventory of mathematics, science and technology programs in 16 Federal agencies.

In preparation for the FY 1993 budget submission, CEHR:

- Established programmatic and budgetary priorities for the continuation of existing programs and the initiation of new ones;
- Reviewed the math and science education programs of every agency for merit, impact, cost, and alliances with other Federal agencies or the private sector; during this process, information was exchanged on agency objectives, as well as the characteristics of major science and mathematics education activities;
- Added the new science literacy category to the program inventory in order to better emphasize and coordinate programs that reach a broader public;
- Convened four program-based task forces to draft government-wide program priorities and milestones for precollege, undergraduate, graduate and science literacy education levels; and
- Encouraged member agencies to assist with the implementation of AMERICA 2000 reform efforts at the State and local levels.

In the coming year, the Committee will begin the development of a multi-year Strategic Plan, will convene Task Forces on Technical Training and Federal Schools, and will conduct national meetings on educational technologies and effective science literacy education strategies.

THE PURPOSE OF THE REPORT

In the balance of this report, the Committee will:

- Summarize the President's FY 1993 budget request for mathematics, science and technology education in support of AMERICA 2000;
- Provide budget highlights by agency;
- Provide background on the Committee and its role in implementing the AMERICA 2000 education strategy; and
- Outline the Committee's future course of work.

INTRODUCTION: AMERICA 2000 AND CEHR

AMERICA 2000: THE NATIONAL EDUCATION STRATEGY

Our country has a fundamental stake in the educational abilities and accomplishments of its youth and in the workforce preparedness and scientific literacy of its adults. As a result of the President's Education Summit with the Governors in 1989, the adoption of the National Education Goals in 1990, and the President's launching of AMERICA 2000 in 1991, the Federal Government has begun to contribute greatly as a catalyst and coordinator of educational reform, both in terms of policy discussions and funding of reform, e.g., NSF's Statewide Systemic Initiative. CEHR's work is to coordinate these Federal efforts as they apply to the established goal of being first in the world in mathematics and science student achievement and to foster a greater understanding of mathematics and science throughout the Nation.

Three National Education Goals specifically target achievement, competency, and literacy in



President Bush presenting AMERICA 2000 to the U.S. Chamber of Commerce, January 14, 1992.

the sciences and mathematics. These are Goals 3, 4, and 5, as shown in Figure 1. The four tracks of AMERICA 2000, the strategy designed to achieve the National Education Goals, are cited in Figure 2. The CEHR strategic framework (Figure 3) was designed to address The National Education Goals along all four tracks of AMERICA 2000.

Figure 1: The National Education Goals

By the Year 2000:

1. All children in America will start school ready to learn.
 2. The high school graduation rate will increase to at least 90 percent.
 3. *American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.*
 4. *U.S. students will be first in the world in science and mathematics achievement.*
 5. *Every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.*
 6. Every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning.
-

**Figure 2:
AMERICA 2000:
The National Education Strategy**

The AMERICA 2000 strategy has four tracks that will be pursued simultaneously:

- Track 1 **For today's students**, we must radically improve today's schools by making all 110,000 of them better and more accountable for results.
- Track 2 **For tomorrow's students**, we must invent new schools to meet the demands of a new century with a New Generation of American Schools, bringing at least 535 of them into existence by 1996 and thousands by decade's end.
- Track 3 **For those of us already out of school and in the workforce**, we must keep learning if we are to live and work successfully in today's world. A "Nation at Risk" must become a "Nation of Students."
- Track 4 **For schools to succeed**, we must look beyond our classrooms to our communities and families. Schools will never be much better than the commitment of their communities. Each of our communities must become a place where learning can happen.
-

Further information about AMERICA 2000 and copies of the AMERICA 2000 brochure can be obtained by contacting the U.S. Department of Education AMERICA 2000 Hotline, 1-800-USA-LEARN (1-800-872-5327). In the Washington, D.C. area, the number is 202-401-2000.

CEHR MISSION AND ACCOMPLISHMENTS

The White House Office of Science and Technology Policy (OSTP), through the Federal Coordinating Council for Science, Engineering,



Secretary Lamar Alexander speaking with students during an AMERICA 2000 event.

and Technology, established the Committee on Education and Human Resources as a direct result of the 1989 Education Summit. The Committee is tasked to develop a Federal strategy for science, mathematics, engineering and technical education that will ensure U.S. world leadership in science and technology; ensure the Nation's access to a highly trained workforce; and increase the scientific literacy of our citizens.

The Committee is chartered to develop and update a long-range Federal strategy for scientific and technical education in the U.S.; to identify and define planning priorities that will lead to effective use of Federal resources for meeting related goals and objectives; to review and evaluate existing programs; and to improve planning, coordination, and communication among member agencies.

The Committee began working in May 1990, and in January 1991 produced *By the Year 2000: First In the World*, which included both the first Federal crosscut budget in mathematics and science education as well as the first descriptive listing of programs administered by sixteen participating agencies.

CEHR's 1991 Accomplishments

This budget submission represents the second integrated and comprehensive plan for science, mathematics, engineering, and technology education. For FY 1993, the base for the CEHR budget was broadened to include the Smithsonian Institution. Throughout the past year, two other agencies, the U.S. Department of Labor (DOL) and the U.S. Department of Housing and Urban Development (HUD), contributed to the development of the Federal program plan although their own science and mathematics education activities are not presented as part of this budget.²

Over the past year, the Committee has made significant progress in developing broad-based expertise and understanding of science education programs across Federal agencies; in working out common program guidelines that will strengthen agency programs and facilitate evaluation of the



overall Federal science and mathematics education effort; in identifying collaborative programs that will capitalize on agency strengths; and in developing innovative strategies for strengthening the Federal role in education.

During 1991, major CEHR accomplishments included:

- **Extensive review of Federal agency programs:** A review was held of the math and science education programs of every agency for merit, impact, cost, and alliances with other Federal agencies or the private sector. Information on agency objectives, as well as the characteristics of major science and mathematics education activities, was exchanged.

²FCCSET CEHR classifies Federal education programs into three categories that reflect their degree of focus on science, mathematics, engineering, and technology education (see "Definitions" in the Appendix). The budget includes only "Category 1" programs—those legislated by Congress for science, mathematics, engineering, and technology education or expressly managed by agencies as an education-related activity. Over the past year, four agencies (DOL, HUD, DOT, and VA) reviewed their education programs and determined that they fell outside the Category 1 definition.

- **Establishment of four CEHR Task Forces:** Precollege, undergraduate, graduate, and science literacy task forces met to develop program guidelines and strategies that will guide CEHR program development in the future as well as the FY 1993 budget process. Task Force leaders were: NASA for precollege, DOD for undergraduate, the U.S. Department of Agriculture (USDA) for graduate, and the U.S. Department of Health and Human Services (HHS) for public science literacy. Reports by the Task Forces detailed Federal program activities, refined objectives and priorities, established milestones, and identified future issues.



"Weather & Me" Program from Smithsonian Institution's National Science Resource Center.

- **Expansion of the CEHR program base to include public science literacy:** The Task Force on Public Science Literacy developed an operating definition for activities designed to improve the public understanding of science and technology; defined a set of program categories for use in the budget process; established a baseline inventory of Federal programs; and developed milestones and recommendations for future activity.
- **Development of the FY 1993 budget submission:** Under the leadership of NSF, the strategic framework was reviewed and updated; the program inventory was recalculated to establish a new base, and inventory definitions were revised and strengthened; Federal planning priorities were developed to guide budget development; four interagency program groups were convened to address special cross-agency issues that undergird the entire structure (evaluation, dissemination, educational technologies, and minority program activities); and recommendations for joint strategies in critical areas were developed.

The most important achievement of CEHR over the past year has been the maturing of the interagency process through which the application of the CEHR education framework in setting agency priorities and guiding program development has occurred. The most notable examples were HHS, which ran a three-day conference structured around the CEHR strategy to set its own education agenda, particularly in the area of science literacy; and NASA, which is developing a program totally compatible with the CEHR strategy.

CEHR ROLE IN AMERICA 2000

To implement the mathematics and science components of AMERICA 2000 requires a coherent Federal strategy, one that addresses the entire educational continuum. The CEHR education strategy therefore examines the pre-college, undergraduate, and graduate education levels, and science literacy. These four components build and rely on one another and cannot be developed in isolation. The strategy is predicated on the need to maintain the integrity and strength of programs in each area since all play a critical role in making American students first in the world in science and mathematics achievement.

Each component offers unique challenges and requires that attention be focused on different priorities so as to effect appropriate changes in the system. Throughout all levels and priorities, the strategy places emphasis on increasing the participation of groups underrepresented in the sciences and mathematics.

CEHR has considered each priority through both budget and programmatic lenses. Thus, the proposed strategy consists of recommendations for funding increases that track areas of most critical need, that provide for expansion of activities under effective existing programs, and that create, where appropriate, new programs to address deficiencies. The strategy includes suggestions for changes that will increase the impact of programs without additional cost to the taxpayers. One example of this is ED's proposed requirement that 25 percent of Eisenhower State funds go toward intensive teacher training rather than funding short term workshops exclusively.



Students at Coleman Elementary, DOE's AMERICA 2000 adopted school, seal their agreement with Secretary of Energy, James D. Watkins.

BENEFITS OF A COORDINATED FEDERAL STRATEGY

There are many advantages to establishing and maintaining a coordinated Federal strategy for improving mathematics and science education.

An Integrated Federal Response

The challenges addressed by the National Education Goals cut across the missions of many Federal agencies, and so should the solutions. The CEHR strategy enables member agencies and other policy makers to take a global view of the entire Federal response to mathematics and science achievement and to revise priorities or emphases in their own agencies in a manner resulting in a coordinated Federal effort to meet the National Education Goals.



In Summer Science Institutes at Federal laboratories, teachers work with scientists to develop curriculum materials on environmental sciences, electricity and magnetism, chemistry, biology, and physics.

Baseline Information on Federal Activities

In February 1991, CEHR made available to the public a government-wide inventory that, for the first time, listed all Federal mathematics, science and engineering education programs and activities across agencies. In addition, the inventory included previously unavailable information for policy makers about mathematics and science education activities at levels below the traditional agency budget line items, as well as including volunteer and outreach activities. Such inventories will serve as valuable guides for teachers, parents, school administrators and others on the front lines of educational reform who would like access to Federal expertise and resources.

Reducing Overlap and Filling Gaps

With expanded information about education missions and programs of Federal agencies, the

President, the Congress, and Federal agencies can take action to reduce overlap and fill gaps. Executive and Legislative Branch policy makers are becoming more aware of promising programs and activities, including those that have not been highly visible in the past because they fall below the budget line-item level.

More Effective Use of Resources

Shared knowledge about the range and purposes of Federal programs can result in more effective use of Federal resources. Because many programs in the inventory are cooperative ventures with other government and private sector entities, CEHR collaboration can open up new avenues for cost sharing and greater leveraging of Federal funds.

More Access to Federal Scientific Equipment and Facilities

Federal laboratories and other scientific facilities can become centers for student and teacher learning outside the classroom, offering hands-on opportunities and exposure not available in traditional school settings. Surplus equipment from Federal facilities can be made more available to the precollege educational system. More on this may be found in the "New Initiatives" section, on page 16.

Replication of Successful Programs

Greater cooperation among Federal agencies will open new channels for disseminating information about exemplary programs and will expand opportunities for replicating successful programs.

Interagency Networks

Through its work, CEHR has established a network of mathematics and science education professionals across all Federal agencies who can serve as valuable sources of information and

coordination. Participation in CEHR will enable member agencies to evaluate their efforts against the unified Federal strategy. Opportunities are also increased for cooperative interagency efforts and joint funding of projects.

Better Evaluation and Dissemination

The inventory of Federal programs identified by CEHR has been uniformly reviewed by the Committee, which will help ensure that funds are spent appropriately and effectively. The most successful programs can then be disseminated through the interagency network to the public.



Metro D.C. teachers participating in the ADAMHA "Summer in the Lab" program.

Greater Public Support

A coordinated interagency budget and a comprehensive program inventory provide valuable information to the public about Federal programs, facilities, expertise and resources for mathematics and science education. Greater public awareness and access to Federal resources can translate into

increased public commitment and community action.

Coordination with the States and Public Sector

By coordinating its own efforts in mathematics and science education, the Federal government can provide State and local governments and the private sector with easier and greater access to Federal programs and other resources, such as personnel, educational materials, facilities and equipment. By working together in this way, national progress toward achieving the National Education Goals by the year 2000 can be made most rapidly.

A Stronger Teaching Force

Within precollege education, CEHR has placed first priority on enhancing the skills of teachers. Through innovative CEHR programs, and by utilizing resources such as Federal laboratories, teachers will gain greater exposure to cutting-edge science, update their knowledge, and become better prepared to educate students. More students in the science pipeline will form a larger pool of future mathematics and science teachers. The teaching force can also be expanded by offering encouragement and incentives for mid-career professionals from science and technical disciplines to enter teaching through innovative programs in alternative certification. In addition, Federal scientific and technical experts can assist teachers by serving as classroom resource persons.

Better Educated Students

Through the CEHR action strategy, Federal resources will be better utilized to motivate students to stay in the mathematics, science and engineering pipeline. CEHR coordination will increase student exposure to the latest scientific

and technical developments through hands-on activities that link curriculum with the real world of science and through contact with Federal experts and facilities. Targeted Federal programs will help students complete high school with competency in mathematics and science and encourage them to enter college to receive further education in these subjects.

A More Scientifically Literate Public

Increased coordination will better enable Federal agencies to provide science and technology information to the public and increase public understanding. A more scientifically literate population will be better prepared to make well-informed decisions on scientific and technical issues confronting themselves and the Nation.

FUTURE CEHR ACTIVITIES

The future activities of CEHR will combine ongoing programs that reflect the planning accomplished during the past year and the new initiatives described above. Last year's work will manifest itself in new programs designed by the four task forces, and those programs will represent both the efforts of individual agencies and the interagency collaborations that the FCCSET process fosters.

Over the next year, CEHR will establish a Strategic Planning Working Group, to be chaired by ED, and Task Forces on Federal Schools, chaired by the U.S. Department of the Interior (DOI), and on Technical Education, to be chaired by DOL.

Strategic Planning Working Group. This Working Group will fully integrate the work of CEHR with the AMERICA 2000 education strategy. The Working Group will also lay out a

multi-year strategic plan for CEHR that will address each education level.

Task Force on Technical Education. National Education Goal #5 and Track 3 of AMERICA 2000 refer to the need for students and adults alike to be prepared for productive employment and possess the knowledge and skills needed to compete in a global economy. Over the next year, DOL will take lead responsibility for expanding the program inventory to include technical education. This program area will be a difficult one to address. The Committee has to determine relevant fields and occupations that qualify as technical training under CEHR; decide on minimal skill levels and activities appropriate for consideration; identify a range of program activities that depict Federal involvement in this area; and develop a baseline.

Task Force on Federal Schools. DOI will lead the CEHR agencies in an examination of how the Federal government is teaching mathematics and science in the school systems that it operates, including the Bureau of Indian Affairs school system and the Department of Defense Dependents Schools system.

National Conference on Educational Technologies. CEHR will sponsor a national conference on educational technologies, described more fully in the "New Initiatives" section on page 15.

New Program Directory. In 1992, the Committee will begin work on a State-by-State directory of all Federal programs in mathematics, science and technology education, to provide better information on Federal programs available at the local and national level to parents, teachers and administrators.

CEHR FY 1993 BUDGET SUMMARY

FY 1993 BUDGET REQUEST

The President's FY 1993 budget proposes the investment of \$2.1 billion in mathematics, science, engineering, technology, and science literacy education programs, along priority lines indicated in Figure 3. This represents an increase of \$138 million or 7% over the FY 1992 enacted levels for these programs (Figure 4: FY 1992-93 Growth by Education Level), and a \$626 million, or 43% increase over their FY 1990 enacted levels (Figure 10).

The FY 1993 request is distributed by education level as shown in Figure 5: \$768 million for precollege (37% of the total request), \$481 million for undergraduate (23%), \$750 million for graduate (36%), and \$93 million for science literacy (4%).

For FY 1992-93, in accordance with the policy guidance provided by the National Education Goals and AMERICA 2000, the single largest requested increase is in the precollege area

**Figure 3:
FY 1993 Federal Math/Science Education Priority Framework**



Figure 4:
FY 1992-1993 Growth by Education Level (dollars in millions)

	<u>FY 1992</u>	<u>FY 1993</u>	<u>Increase FY 92-93</u>	<u>% Increase FY 92-93</u>
Grand Totals	\$ 1954.74	\$ 2092.23	\$ 137.50	7%
Precollege	650.71	767.95	117.23	18%
Undergraduate	444.25	480.77	36.52	8%
Graduate	768.88	750.20	-18.68	-2%
Science Literacy	90.89	93.32	2.43	3%

(+18%), followed by undergraduate (+8%) and science literacy (+3%), followed by a decrease in graduate (-2%) education, due to add-ons in the FY 1992 budget that are not requested again in FY 1993.

(Figure 24) and FY 1992 (Figure 25) can be found in the Appendix.

Figure 6: FY 1993 Budget Request by Agency and Major Program Area and Figures 7 and 8: FY 1992-1993 Growth, show the President's FY 1993 request for CEHR programs in detail by agency, educational level and major program area. Complete budget matrices for FY 1993

Figure 5:
FY 1993 Request by Education Level

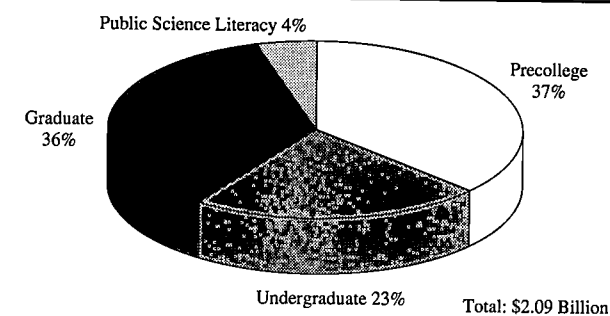


Figure 7:
FY 1992-1993 Growth by Agency (dollars in millions)

	<u>FY 1992</u>	<u>FY 1993</u>	<u>Increase</u>	<u>% Increase</u>
TOTAL	\$1954.74	\$2,092.23	\$137.50	7.03%
USDA	20.36	22.65	2.29	11.26%
DOC	3.51	3.68	.18	4.99%
DOD	415.97	415.97	0.00	0.00%
ED	293.83	392.53	98.70	33.59%
DOE	108.56	113.21	4.65	4.28%
DHHS	411.94	416.45	4.51	1.09%
DOI	82.73	88.43	5.70	6.89%
SI	9.96	10.04	.08	0.84%
NSF	521.80	537.20	15.40	2.95%
NASA	77.79	82.27	4.48	5.76%
EPA	8.30	9.80	1.50	18.07%

CEHR FY 1993 Budget Request by Agency and Major Program Area

MAJOR CATEGORIES	Total Request	USDA	DOC	DOD	ED	DOE	HHS	DOI	SI	NSF	NASA	EPA
GRAND TOTAL	2092.23	22.65	3.68	415.97	392.53	113.21	416.45	88.43	10.04	537.20	82.27	9.80
Precollege Total	767.95	0.72		4.97	371.20	32.39	21.84	25.30	0.63	286.20	16.70	8.00
Teacher Preparation/Enhancement	436.51			0.63	286.50	16.84	5.19	2.00	0.33	114.80	7.92	2.30
Curriculum Development	91.58				2.70	4.51	2.54	6.90	0.22	67.70	5.00	2.01
Comprehensive/Organizational Reform	104.05				20.00	3.58	4.14			74.00	0.29	2.04
Student Incentives	68.08	0.72		4.34	20.00	6.55	9.97	14.71		11.00	0.58	0.21
Program Evaluation and Studies, and Dissemination	58.74				42.00	0.57		0.15	0.08	13.80	0.70	1.44
Other	8.99					0.34		1.54		4.90	2.22	
Undergraduate Total	480.77	13.50		176.20	21.00	56.87	25.00	8.72		146.30	32.38	0.80
Faculty Preparation/Enhancement	49.22					11.52	0.08	1.82		30.80	5.00	
Curriculum Development	97.71			38.90		3.22	0.16	1.03		52.90	1.50	
Comprehensive/Organizational Reform	90.44	13.50		6.80	6.00		22.52	0.43		28.80	12.39	
Student Incentives	190.05			100.50	15.00	25.05	2.24	5.33		28.80	12.33	0.80
Other, includes education technologies, program evaluation and dissemination	53.35			30.00		17.08		0.11		5.00	1.16	
Graduate Total	750.20	8.43	3.68	234.80		19.62	364.01	11.07	0.50	73.90	33.19	1.00
Predoctoral Fellowships	99.54		0.30	16.70		8.21	5.64	0.10	0.09	52.40	15.30	0.80
Predoctoral Traineeships	160.81	4.00		3.90		0.55	128.99	10.42		8.40	4.35	0.20
Postdoctoral Fellowships	98.70		3.38	10.50		6.43	51.23	0.55	0.41	13.10	13.10	
Postdoctoral Traineeships	155.62	4.43				0.50	150.69					
Other	235.53			203.70		3.93	27.46				0.44	
Public Science Literacy Total	93.32				0.33	4.34	5.60	43.34	8.91	30.80		
Education Programs for Decision Makers	5.10					0.35		3.35		1.40		
Media Dissemination	22.09					1.13	1.21	3.25		16.50		
Public/Community-Linked Dissemination	59.50					1.34	3.23	33.12	8.91	12.90		
Public Information Campaigns	6.33				0.33	1.42	0.96	3.62				
Public Science Literacy Evaluation	0.30					0.10	0.20					

Figure 6:
FY 1993 Budget Request by Agency and Major Program Area

Figure 8:
FY 1992-1993 Growth by Program Element (dollars in millions)

Major Categories/Elements	FY 1992 Baseline	FY 1993 Total Request	Change	Percent Change
Grand Total	\$ 1,954.74	\$ 2,092.23	\$ 137.49	7%
Precollege	\$ 650.71	\$ 767.95	\$ 117.24	18%
Precollege Teacher Preparation and Enhancement	382.56	436.51	53.95	14%
Precollege Curriculum and Materials Development	83.35	91.58	8.23	10%
A. Precollege Instructional Materials Development	61.65	65.87	4.22	7%
B. Precollege Educational Technologies	21.71	25.71	4.00	18%
Precollege Student Incentives and Opportunities	46.48	68.08	21.60	46%
A. Precollege Direct Student Support	27.80	63.46	35.66	128%
B. Bridging to Postsecondary	18.68	4.62	-14.06	-75%
Precollege Organizational Reform	60.34	72.65	12.31	20%
Precollege Comprehensive or Multifaceted Programs	27.35	31.40	4.05	15%
Precollege Dissemination and Technical Assistance	17.63	17.84	0.21	1%
Precollege Program Evaluation and Studies	24.10	40.90	16.80	70%
A. Precollege Evaluation and Assessment	11.10	10.90	-0.20	-2%
B. Precollege Data Collection and Studies				
C. Precollege National Standards and Testing	13.00	30.00	17.00	131%
Precollege Other Total	8.89	8.99	0.10	1%
Undergraduate	\$ 444.25	\$ 480.77	\$ 36.52	8%
Undergraduate Program Evaluation and Studies	3.60	3.90	0.30	8%
A. Undergraduate Evaluation and Assessment	3.60	3.90	0.30	8%
B. Undergraduate Data Collection and Studies				
Undergraduate Educational Technology	31.00	31.00	0.00	0%
Undergraduate Dissemination and Technical Assistance				
Faculty Preparation and Enhancement	36.66	49.22	12.56	34%
Undergraduate Curriculum and Materials Enhancement	103.45	97.71	-5.74	-6%
A. Undergraduate Course and Curriculum	80.28	74.59	-5.69	-7%
B. Undergraduate Laboratory Equipment	23.17	23.12	-0.05	0%
Undergraduate Student Incentives and Opportunities	168.55	190.05	21.50	13%
A. Undergraduate Financial Assistance	131.63	134.65	3.02	2%
B. Undergraduate Research Experiences and Coops	36.67	50.05	13.38	36%
C. Bridging to Four Year or Graduate School	0.25	5.35	5.10	2040%
Undergraduate Organizational and Operational Reform	25.90	32.40	6.50	25%
Undergraduate Comprehensive or Multifaceted Programs	56.30	58.04	1.74	3%
Undergraduate Other Total	18.80	18.46	-0.34	-2%

Figure 8:
FY 1992-1993 Growth by Program Element (continued)

Major Categories/Elements	FY 1992 Baseline	FY 1993 Total Request	Change	Percent Change
Graduate	\$ 768.88	\$ 750.20	\$ -18.68	-2%
Predoctoral Fellowships	99.77	99.54	-0.23	0%
Predoctoral Traineeships	180.28	160.81	-19.47	-11%
Postdoctoral Fellowships	98.79	98.70	-0.09	0%
Postdoctoral Traineeships	154.79	155.62	0.83	1%
Graduate Program Evaluation and Studies	0.10	0.10	0.00	0%
A. Graduate Evaluation and Assessment	0.10	0.10	0.00	0%
B. Graduate Data Collection and Studies				
Graduate Other Total	235.16	235.43	0.27	0%
Public Science Literacy	\$ 90.89	\$ 93.32	\$ 2.43	3%
Education Programs for Decision Makers	1.74	5.10	3.36	193%
Media Dissemination	21.73	22.09	0.36	2%
Public or Community Linked Dissemination	56.90	59.50	2.60	5%
Public Information Campaigns	6.95	6.33	-0.62	-9%
Public Science Literacy Program Evaluation and Studies	3.57	0.30	-3.27	-92%
A. Public Science Literacy Evaluation and Assessment	3.57	0.30	-3.27	-92%
B. Public Science Literacy Data Collection and Studies				
Public Science Literacy Other Total				

Footnote:

Undergraduate programs, separated by two- and four-year levels, can be found in the Appendix as *Figure 26*.

FY 1990-93 GROWTH

The FY 1993 request marks the third year of significant increases for Federal programs in mathematics, science, engineering, and technology education. As shown in Figures 9-11, the multi-agency growth over the three year period, FY 1990-1993, has been a substantial \$626 million, a 43% increase. The most notable increase has been in the precollege area (+123%), in conformance with Presidential support for the National Education Goals and AMERICA 2000.

Figure 10:
FY 1990-1993 Growth by Education Level

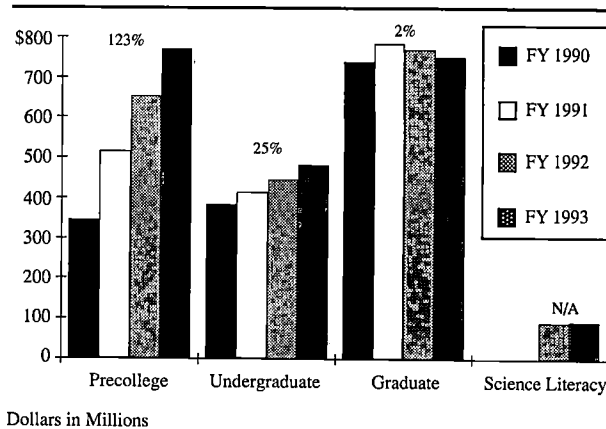


Figure 9:
FY 1990-1993 Growth by Education Level (dollars in millions)

	FY 1990	FY 1991	FY 1992	FY 1993	Increase FY 90-93	% Increase FY 90-93
Grand Totals	\$ 1466.07	\$ 1712.70	\$ 1954.74	\$ 2092.23	\$ 626.16	43%
Precollege	343.66	514.65	650.71	767.95	424.28	123%
Undergraduate	383.95	413.90	444.25	480.77	96.82	25%
Graduate	738.46	784.15	768.88	750.20	11.74	2%
Science Literacy	N/A	N/A	90.89	93.32		

Figure 11:
FY 1990-1993 Growth by Agency (dollars in millions)

	FY 1990	FY 1991	FY 1992	FY 1993	Increase FY 90-93	% Increase FY 90-93
Total Request	\$ 1466.08	\$ 1715.70	\$ 1954.74	\$ 2092.23	\$ 626.15	43%
USDA	19.60	19.95	20.36	22.65	3.05	16%
DOC (1)	7.31	7.26	3.51	3.68	-3.63	-50%
DOD	416.04	416.04	415.97	415.97	-0.07	
ED	162.90	235.00	293.83	392.53	229.63	141%
DOE	42.04	64.14	108.56	113.21	71.17	169%
DHHS	435.42	486.33	411.94	416.45	-18.97	-4%
DOI	27.14	40.58	82.73	88.43	61.29	226%
SI	N/A	N/A	9.96	10.04	N/A	N/A
NSF	277.78	371.66	521.80	537.20	259.42	93%
NASA	50.91	68.15	77.79	82.27	31.36	62%
EPA	1.00	6.59	8.30	9.80	8.80	880%

(1) All years contain core NOAA and NIST postdoctoral program funding. FY 1990 - 91 figures also contain miscellaneous discretionary funding which may become available in FY 1992.

NEW INITIATIVES

For FY 1993, there are three major new initiatives in mathematics and science education that build on the concept of increased utilization of Federal government assets:

Mathematics and Science Teacher Enhancement. The most important near-term action to improve mathematics and science education is to enhance the content knowledge and enthusiasm of the teachers. The President's budget proposes an improved program for the training of these teachers, a part of which includes the use of Federal laboratory personnel and facilities. The initiative will ultimately provide in-depth, up-to-date training for all of America's precollege mathematics and science teachers. As an initial step, this budget proposes to double the number of teachers receiving Federal assistance for high-intensity training in FY 1993 to roughly 45,000. In addition, the initiative supports shorter-term training opportunities to approximately 725,000 teachers. Thus, this initiative will reach almost half of the

Nation's precollege math and science teachers. The initiative will also have the objective of preparing teachers to teach mathematics and science curricula that are tied to world class standards, when those standards are in place.

This initiative will involve the complementary efforts of three Federal agencies. NSF will award merit-based grants to university investigators to operate regional teacher training programs. ED will support model projects in selected school districts designed to employ secondary school math and science teachers to train elementary and middle school teachers in those districts. ED will also modify its Eisenhower State Grant Program to increase the number of teachers receiving intensive training. DOE will lead an interagency effort to implement teacher training and research programs based at Federal laboratories, in collaboration with universities, State and local educational agencies, and corporations.

Educational Technologies. A major objective of the AMERICA 2000 strategy is to establish national electronic networks that link all

**Figure 12:
Mathematics and Science Teachers Trained
(in thousands)**

	1989	1990	1991	1992	1993
Intensive ¹	11	14	20	23	45
Short-term ²	550	530	690	746	725
Total Teacher-days	770	800	1084	1206	1627

¹ Intensive training is defined as 20 or more days.
² Short-term training includes a variety of activities, including attendance at seminars of one-day or less duration. These activities are primarily supported through the ED's Eisenhower program.

American schools and other sites where learning occurs. In support of this objective, the Administration proposes to focus attention to accelerate implementation of educational technology programs in classrooms.

Math and science teaching is ideally suited for the use of electronic dissemination technologies. By linking researchers, educators, and students, current information in science and technology can be shared in a timely manner, providing an invaluable supplement to standard curricula. Federal agencies, including DOD, NASA, DOE, and NSF, are presently engaged in two major activities in this area: (1) the use of long-distance electronic communication technologies (e.g., satellite broadcasting, fiber optics and computer networks) that provide technical training and disseminate scientific and technical information developed to support agency programs and mission; (2) both ED, through its STAR Schools Program, and NSF support distance learning programs, with emphasis on rural school systems that have limited access to educational resources.

In 1992, CEHR will hold a major conference to review the merits of existing and proposed educational technologies. Those technologies demonstrating the most promise for revolutionizing classroom instruction will be selected for support under special fast-track demonstration programs.

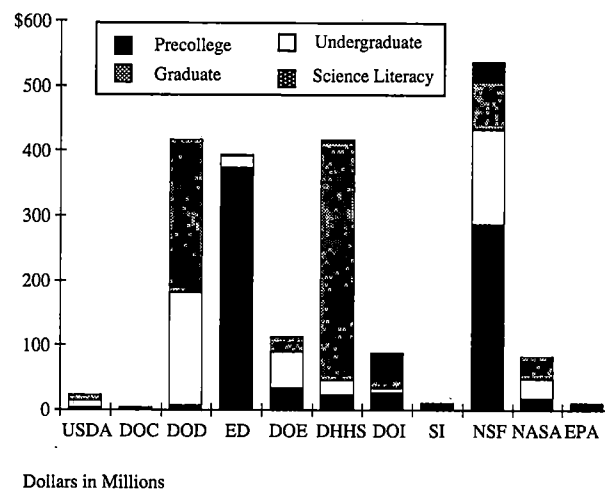
Computers and Scientific Equipment. Studies have shown that student performance in mathematics and science is enhanced by access to and experience with computers and various scientific equipment. Yet, in times of tight budgets, investment in these types of equipment is often deferred. The budget proposes a new

effort to make available excess Federal personal computers and equipment to local school systems. In future years, the amount of excess personal computers and related equipment is expected to rise due to the turnover of current Federal assets.

AGENCY ROLES

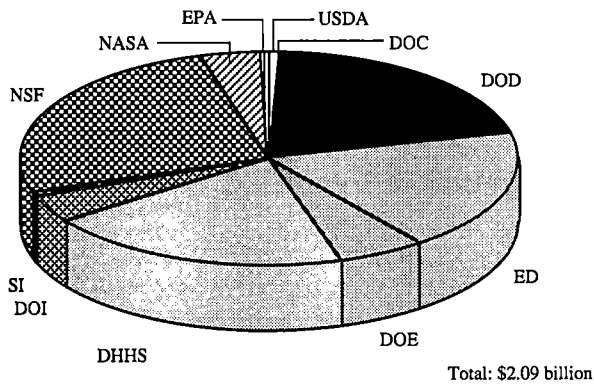
The roles that CEHR agencies play in mathematics and science education vary by their size, mission, and educational level emphasis. Figure 13 indicates total spending by agency, while Figure 14 shows a comparison by overall budget size.

**Figure 13:
FY 1993 Agency Roles —
Requests by Education Level**



Agency roles vary significantly, as shown in Figure 13. NSF and ED, for example, represent 44% of the total FY 1993 funding request. While ED focuses on the precollege arena, NSF covers higher education as well. HHS and DOD

Figure 14:
FY 1993 Budget Request by Agency



represent a combined 40% of total funding—both are heavily focused on graduate education, and DOD provides the single highest level of funding for undergraduate education. Mission agencies make unique contributions in subject areas related to their science and technology mission. Figure 15 shows FY 1993 budget highlights by agency.

Figure 15:
Budget Highlights by Agency

National Science Foundation: In FY 1993, through budget increments and reprogramming, NSF will aggressively pursue its strategy for systemic reform by forging alliances and partnerships among all major players in the education system. NSF programs will support exemplary projects for reform of State precollege educational delivery systems; school system- or district-wide teacher enhancement activities; and teacher preparation collaboratives that link schools of education and disciplinary departments within universities. In addition, NSF will intensify efforts to increase the quality and quantity of science, mathematics and engineering

education of minority students through systemic approaches that promise to affect permanent change in the delivery of education at both the precollege and undergraduate levels.

Department of Education: For FY 1993, ED is proposing a \$36 million teacher enhancement program conducted by expert math/science secondary school teachers who will provide intensive inservice training to all elementary and middle school teachers in a district. Additionally, two new math and science bilingual education competition grant programs are proposed to: (1) provide bilingual instruction focusing on mathematics and science to limited English proficient students and (2) provide bilingual education teacher training with a particular emphasis on math and science.

Department of Energy: In FY 1993, DOE will sponsor the Second Annual National Science Bowl for high school students involving 32 teams selected from regional competitions involving more than 12,000 students. Other activities include expanded support for rural-urban partnerships with DOE laboratories, like that of the Oak Ridge National Laboratory and the Oak Ridge School District, and expanded alliances between DOE laboratories/facilities and minority colleges and universities to encourage students to pursue careers in environmental sciences and waste management. DOE will also lead a new interagency teacher enhancement initiative that utilizes Federal laboratories.

Department of Defense: DOD's efforts to ensure the Nation's future supply of trained scientists and engineers are supported through its graduate and post-doctoral grant programs. Undergraduate programs are available to

improve education performance and teaching methods for skill training programs for DOD personnel.

Department of Commerce: DOC has expanded the number of fellows participating in its National Institute of Standards and Technology/ National Research Council Postdoctoral Research Associateships Program from 25 to 30.

National Aeronautics and Space

Administration: In FY 1993, NASA will complete the implementation of the National Space Grant College and Fellowship Program encompassing 50 state consortia of colleges, universities, nonprofit organizations, industry and state and local governments, a total of approximately 350 institutions. A significant component of this program is educational outreach at the precollege level, emphasizing CEHR priorities. In 1993, NASA will implement the primary phase of the National Scholars Program, as well as expand its teacher enhancement programs. From a management perspective, NASA will also implement its long range Education Strategic Plan.

Department of Interior: In FY 1993, over 3 million teachers and students will be reached through the National Park Service's "Parks as Classrooms" program which builds science activities around park resources. 2,000 teachers will participate in U.S. Geological Survey (USGS) Joint Education Initiative, or "JeDI," workshops during FY 1993. These workshops will teach them how to use CD-ROM technology to improve their science classes in high schools. 100 college professors will improve their teaching skills during short term USGS faculty preparation programs. Over 500 students will

work as summer interns for the U.S. Fish and Wildlife Service during FY 1993 improving their science skills and becoming exposed to science and its principles through fish and wildlife issues.

Department of Health and Human Services : In FY 1993, HHS will extend its efforts to improve public understanding of the life sciences by expanding its speakers bureau, developing exhibits, and supporting national media programs on a variety of biomedical research issues. HHS will continue to encourage and support direct involvement of its scientists in precollege classrooms and with precollege teachers in a variety of settings. For 1993, as part of its new Science Teaching Enhancement Award Program, HHS will implement a Pre-Service Teacher Training Program targeted at future K-12 teachers.

Environmental Protection Agency: In FY 1993, EPA will provide \$ 4.1 million in grants to post-secondary institutions to operate an environmental training and education program as well as grants to support local, State and non-profit environmental education. The EPA Office of Environmental Education (OEE) is developing a clearinghouse of information on environmental education materials which will eventually include information from all Federal agencies. An internship program for college students and fellowship program for in-service teachers to improve training of environmental professionals will be established.

Department of Agriculture: With its commitment to advance minority participation, USDA has more than doubled the funding for the 1890 Institution Teaching and Research Capacity

Building Grants Program since it was launched in FY 1990. USDA has expanded its Graduate Fellowship Grants Program to reduce shortages of scientific expertise and is stimulating curricula revitalization and faculty development through its Higher Education Challenge Grants Program.

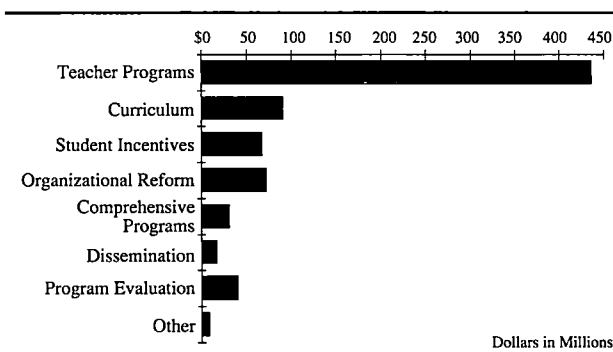
Smithsonian Institution: As part of its ongoing commitment to education, the SI intends in FY 1993 to strengthen and expand its programs in education, especially at the precollege level. Major efforts include: 1) Leadership Institutes (National Science Resource Center), which prepare educators from across the country to spearhead efforts to improve elementary science education in their school districts; 2) Project Star (Smithsonian Astrophysical Observatory), which develops innovative high school teaching materials in astronomy and trains master teachers to implement courses based on the materials; and 3) Education Outreach (National Air and Space Museum), which develops and disseminates materials to assist teachers, especially in fostering school children's interest in science.

PRECOLLEGE PROGRAMS

The education level that receives the highest priority in the overall CEHR strategy is precollege. Formal elementary and secondary education provides the basic skills upon which future knowledge is predicated. For many individuals, it represents the entire sum of school experience. If we are to enhance significantly the learning and productive capabilities of our citizens, substantial investments, as well as institutional and policy changes must be made at this level. Recognizing this, the President's

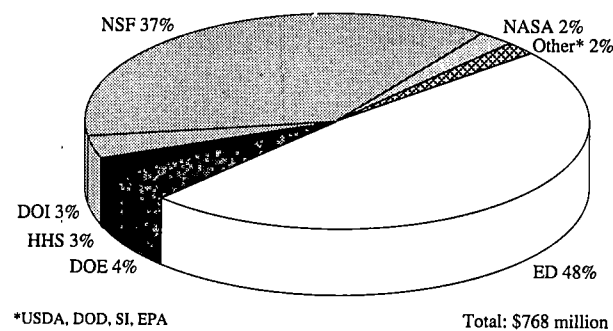
FY 1993 budget includes a total request of \$768 million for precollege mathematics and science education programs, more than one-third of the CEHR total request. This represents a \$117 million or 18% increase over FY 1992, and a \$424 million or 123% increase over FY 1990. The CEHR strategy at the precollege level is

**Figure 16:
Precollege Program Elements**



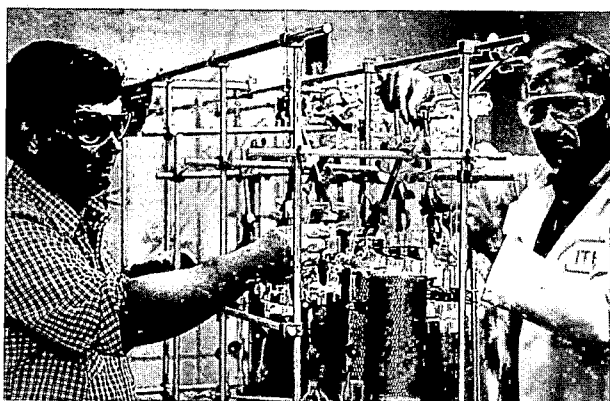
structured around four program elements. In descending order of priority, these are: teacher preparation and enhancement, curriculum reform, organizational reform, and student incentives and opportunities. The first three program areas, especially, are interrelated. To be successful in any one area, progress and change must exhibit requisite complementary changes in the others. Within program areas, agency roles vary considerably. For example, ED provides nearly two-thirds the support for teacher enhancement, mainly through the Eisenhower State Grants program; NSF is the dominant player in both curriculum and organization reform, 74% and 98% respectively. Mission agencies (HHS, DOE, NASA, DOD and DOI) support nearly 60% of student incentive activities.

**Figure 17:
Precollege Budget by Agency**



AMERICA 2000 proposes the development of national standards for what students should know and what they should be able to do. Standards will help link Federal efforts with each other, ensuring that all are working toward the goal of making American students first in the world in mathematics and science achievement by the year 2000.

Standards for achievement at the precollege level in mathematics have been established by the National Council of Teachers of Mathematics



Dr. William E. Bechtold (left) of the ITRI Staff and Mr. Jack K. Witles, STEP Teacher at Portales High School, Portales, New Mexico.

(NCTM); they are currently being developed in science by the National Academy of Sciences (NAS). To measure student performance relative to these standards, AMERICA 2000 proposes the development of a new voluntary set of American Achievement Tests. When the appropriate standards and tests are in place, they will help guide both the content and method of teaching in Federally supported programs, as well as define expected performance levels for students.

Teacher Preparation and Enhancement. If America is to become first in the world in mathematics and science achievement by the year 2000, our teachers must be able to deliver a world class education to their students. Those whose prior training in mathematics and science is out of date must have an opportunity to update their knowledge; and those whose preservice education was inadequate will require intensive retraining. To ensure that our teachers have the capability to deliver this world class education, the CEHR strategy has the following objectives:

- Tying Federal teacher training efforts to world class standards as established in mathematics by NCTM and in science by NAS, and certified by the National Education Goals Panel.
- Improving the quality of, and increasing the intensity, of teacher training experiences. Research indicates that longer and more intensive experiences are more likely to have a significant effect on a teacher's subsequent instruction and ability.
- Doubling the number of teachers receiving intensive training between 1992 and 1993.

To accomplish these objectives, the President is proposing to expand or modify existing programs and to undertake several new initiatives.

- Teacher enhancement activities within the National Science Foundation will continue to provide intensive, multi-year training to individual teachers. Emphasis will be placed on creating master teachers who return to their schools to mentor colleagues, broadly improving teacher competence, student outcomes, and the learning environment. State- and district-wide enhancement efforts are also being pursued. In FY 1993, NSF will support the intensive training of nearly 25,000 teachers. Also in FY 1993, NSF will begin development of teacher preparation collaboratives that will combine the expertise of schools of education and disciplinary departments within universities.
- The Department of Education will hold a \$36 million competition, under Eisenhower National Programs, which will support model projects, operating within a whole school district, that employ experienced and expert secondary school teachers of math and science to train elementary and middle school teachers in an integrated mathematics and science curriculum. Approximately 7,200 teachers would receive intensive training in 1993.
- ED will also require the higher education portion of the Eisenhower State Grants program to be used for intensive teacher training activities of 20 days or more. This would allow 12,400 teachers to receive intensive training in 1993.
- A new interagency initiative will expand the use of the vast resources of the Federal labora-



Summer institute for Chicago science and mathematics teachers at Fermi National Accelerator Laboratory.

tory system, exposing teachers to cutting-edge science in specific content areas and showing them how to incorporate what they have learned into the classroom. In FY 1993, 1,800 teachers would receive intensive training.

With the new initiatives and the expansion or modification of current programs, the Federal Government will provide intensive training of at least four weeks to approximately 45,100 teachers in 1993, up from 23,400 in 1992.

Provisions are also being made to ensure that new cadres of teachers enter the workforce

properly prepared. In CEHR, both ED and NSF will play lead roles in the preparation of teachers by working with universities to improve pre-service training programs. However, mission agencies will also have a role; for example, HHS plans to establish a program targeted at providing opportunities for future K-12 science teachers in the Nation's leading biomedical and behavioral research laboratories. Over time, all preservice programs will be linked to inservice training activities. ED will also encourage States to reform certification requirements so that the requirements relate to world class standards as they are developed. The President's AMERICA 2000 strategy addresses this issue by proposing legislation to support States to encourage more qualified individuals to enter the teaching profession by expanding alternative routes to teacher certification.

Curriculum Reform. Teaching that significantly improves student performance depends on the availability of quality curricula. New standards for science and mathematics, new technologies, and recent research findings on teaching and learning need to be incorporated into curricula in an ongoing process. In order to ensure that the curricula at the local level reflect new standards, the ED, through its Eisenhower National Programs, is sponsoring the development of State curriculum frameworks that will guide district curricula.

NSF is supporting development of new instructional materials that will meet national standards in science and mathematics and permit the delivery of curricula within various State frameworks. NSF is also providing for development and implementation of new technology tools in instruction; for the development of new assessment instruments and



Parents and children learn computer basics together in a program sponsored by Brookhaven National Laboratory.

new ways of reporting student learning; and for the evaluation and dissemination of NSF-funded materials.

The CEHR strategy supports development and dissemination of high-quality, comprehensive, and integrated curriculum models that span the precollege continuum. The strategy calls for evaluation and support of major national curriculum projects such as National Council of Teachers of Mathematics and Mathematical Sciences Education Board's implementation of the mathematics standards, the American Association for the Advancement of Science's *Project 2061*, and the National Science Teacher Association's *Scope, Sequence, and Coordination* project. In addition, there must be evaluation, and widespread dissemination of

existing high quality curricula materials, and when necessary, development of new curricula.

To promote both efficiency and effectiveness of the Federal investment in curricula projects, the CEHR strategy calls for an integration of mission agency resources with those of NSF and ED. Subject-specific instructional materials produced by mission agencies can be very effective in augmenting basic curricula. These materials will be developed in conjunction with education and disciplinary experts designing general science and mathematics curriculum. They will be evaluated to ensure accuracy of underlying scientific and mathematical principles, as well as relevance and utility for classroom instruction. As an example, HHS is developing exhibits for schools and libraries that will provide precise illustrative information on the biological basis of drug abuse.



Children participate in astronaut training activities while at NASA Marshall Discovery Lab in Huntsville, Alabama.

Federal teacher training activities must integrate the standards-related curricula into their programs. This will allow increasing numbers of teachers to gain excellent and up-to-date content knowledge. NSF presently integrates NSF-developed curricula into its teacher enhancement

program, while ED's new Eisenhower National Programs initiative will use curricula related to world class standards and tied to State and local curriculum frameworks.

Organizational and Systemic Reform. The education system must be responsive to the attempts being made to improve the teacher workforce and curricula. Retraining individual teachers or introducing new textbooks will have little impact if the educational system is not prepared to absorb these improvements on a broad scale basis. The Federal government is now taking a more active role in catalyzing organizational and systemic reform by promoting the adoption of new standards and by helping State and local officials implement the strategies that they propose to improve the delivery of science and mathematics education. The CEHR strategy calls for a substantial increase in support for organizational and systemic reform activities that address all aspects of education.

Federal support for State and local reform activities will primarily be carried out through the efforts of NSF and ED. At NSF, support will continue for the Statewide Systemic Initiative Program that engages entire State structures (legislative, education, industry, etc.) in catalyzing reform for science and mathematics education. By 1994, reform activities in 30-34 States will be supported under this program. ED is supporting the creation of New American Schools, which reflect one of the AMERICA 2000 tracks.

There is a role in reform for all agencies, however. To effect significant, permanent change, all major Federal programs in a particular State should be brought to bear in support of the reforms in a coordinated fashion.



No matter how young, children enjoy exploring their world through hands-on science.

Sharing of expertise and building effective communications linkages within and among these States will accelerate the pace of improvement.

Student Incentives. Interest in science and mathematics must be captured at a young age and sustained throughout the precollege years to ensure a sufficient pool of scientists and science teachers. This interest is also critical to ensuring a scientifically literate public. Federal resources, including laboratories, national parks, and museums, can provide student experiences that enhance classroom curricula. The mission agencies play a critical role in this area. Topics such as space, health, nuclear energy, global warming, and the environment immediately capture and stimulate students' imaginations.

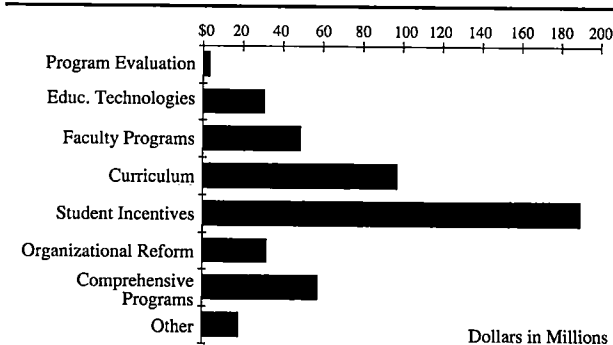
Programs supported in these areas will be designed in conjunction with teachers and administrators so as to relate them to classroom curricula. All agencies' teacher preparation and enhancement programs will include information on how the teacher can utilize resources in the community to provide valuable student enrichment experiences.

Program Evaluation, Studies, and Dissemination. To ensure accountability and program effectiveness, NSF has initiated a comprehensive evaluation of all its major education and human resource programs to be conducted over a five-year cycle. As part of the CEHR strategy, NSF will coordinate the evaluation of corresponding initiatives in other Federal agencies.

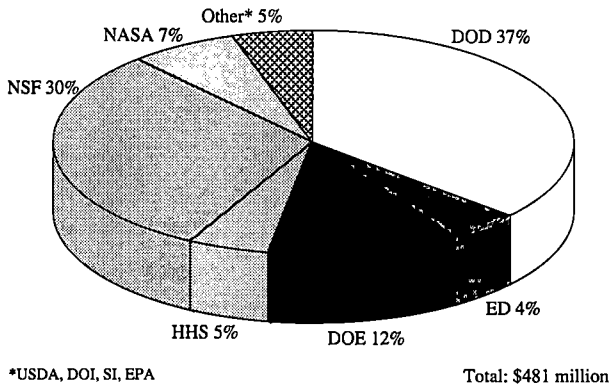
UNDERGRADUATE PROGRAMS

The total requested for undergraduate programs in FY 1993 is \$481 million, representing an increase of \$37 million (+8%) over FY 1992, and \$97 million (+25%) over FY 1990 levels. This represents 23% of the total CEHR request. Figure 18 indicates the relative spending on undergraduate program elements, and Figure 19 shows undergraduate spending by agency.

**Figure 18:
Undergraduate Program Elements**



**Figure 19:
Undergraduate Budget by Agency**



opportunities for students (Figure 18). DOD and NSF represent nearly two-thirds of all funding in this program area: DOD is the major contributor to direct student support through its Reserve Officer Training Corps (ROTC) Program; NSF provides the majority of support for curriculum, faculty development, and operational reform. While USDA funding is modest, a major proportion of its education resources go to these activities.

Two-year colleges continue to represent a concern for CEHR. Nearly one-half of all college

Undergraduate education develops the next generation of scientists and engineers; provides valuable training for precollege science and mathematics teachers; and generally improves the literacy of non-majors in issues and principles related to science and technology. A primary concern at this level, similar to that with precollege, is that of stimulating interest and increasing the retention of students in these fields. Retention is an especially serious problem for underrepresented minorities at this education level.

The CEHR strategy places this education level second to precollege as a focal point for improvement. Undergraduate science, mathematics, and engineering education consists of four program elements, in descending order of priority: curriculum reform, faculty preparation and enhancement, organizational reform, and student incentives and opportunities. As at the precollege level, these four program areas are interrelated and must be developed in concert. In the FY 1993 request, the single largest component (almost 40%) of the undergraduate request provides financial and research



At the University of Illinois, students explore ways of learning calculus through interactive computer software. Computers individualize instruction by allowing students to master material at their own speed. Undergraduate curriculum projects at NSF integrate changes in course content and teaching methods with innovative applications of new technologies.

students (including a significant number of minorities) take their introductory college mathematics and science classes at these institutions. These institutions are critical to the

production of highly qualified technicians for the changing workforce and they often have unique needs and require different programmatic approaches than those used for four-year institutions. Direct support for two-year colleges continues to remain at roughly 3% of the undergraduate total. However, increasing emphasis is being placed on involving these institutions in existing programs and encouraging consortia between these institutions and four-year colleges and universities.

Curriculum Reform. In the scientific world, which is characterized by nothing less than a knowledge explosion, theories are constantly changing, knowledge bases evolving, and new discoveries are being made that, taken in combination, can relegate even recently published textbooks to obsolescence. Undergraduate curricula are seriously outdated, failing to give



Northeast Missouri State University strengthened its biology curriculum and laboratory facilities with support from the NSF Instructional Laboratory Improvement Program. Above, students join their professor in exploring techniques to determine the chemical composition of fungi which play a critical role in the decomposition of organic matter and its subsequent recycling.

students access to current information in their fields. Moreover, reform of the precollege curricula requires revision of lower-division courses to ensure an appropriate interface of the two education levels.

The CEHR strategy places heavy emphasis on improvement of courses at the introductory level. Introductory courses are gateways for advanced study in science, mathematics, and engineering, as well as the principal source of instruction in scientific and technical fields for precollege science and mathematics teachers. Interesting and accessible courses at the lower division are also instrumental in improving the science literacy of non-technical majors. CEHR also recommends that programs foster the development of educational technology whenever possible so that new advances in science and mathematics can be disseminated quickly and effectively to all students.

Courses can be made more effective by incorporating subject-specific materials produced by the mission agencies. The mission agencies, NSF and ED will work together in the development of curricula that capitalize on the respective strengths of each agency.

Faculty Preparation and Enhancement.

Good faculty inspire students, both increasing their performance and maintaining their interest in science, mathematics, and engineering disciplines. Additional efforts are needed to ensure that undergraduate faculty have contemporary content knowledge and can apply the most effective pedagogical techniques. Faculty preparation and enhancement will benefit from the formation of closer ties between the research and education components of universities. Both these outcomes should be encouraged and would benefit from organizational reform efforts.

Organizational and Systemic Reform.

Organizational and systemic reform programs are intended to address problems in the structure and management of undergraduate programs. Similar to precollege efforts in this area, the level and permanence of improvement requires support of the underlying educational system. The CEHR strategy for undergraduate education calls for the establishment of programs that integrate research and teaching. This will involve a restructuring and integration of the traditionally separate schools of education and schools of mathematics, science, and engineering. Federal agencies with strong ties to science, mathematics, and engineering departments at colleges and universities (e.g. NSF and the various mission agencies) will work together with ED, which is more closely linked to schools of education. These collaborations will encourage approaches that draw upon both types of knowledge.

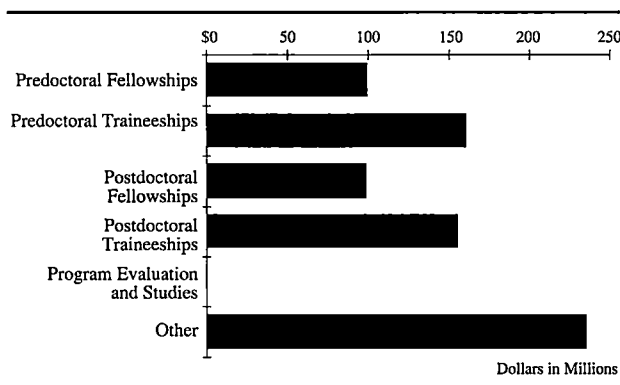
Linkages should exist not only among the schools within a college or university, but also between high schools and colleges, two-year and four-year colleges, and undergraduate and graduate institutions. "Bridging" efforts will be developed that smooth the progression of students between these various institutions. These articulation efforts ensure that programs build upon each other and facilitate the retention of students in the pipeline. These consortia-type programs are believed instrumental in improving the retention of minorities in science, mathematics, and engineering fields and form the basis for a new class of NSF programs in this area. Similar programs are in existence in DOE (classified as research co-ops) with its National Laboratories forming the cornerstone of several alliances.

Student Support and Incentives. At the undergraduate level, a large share of the Federal government's funding for science, mathematics, and engineering education goes to direct support for students. A significant number of programs are geared toward increasing the representation of certain groups underrepresented in these fields (e.g., minorities and women). The Undergraduate Task Force recommended expanding student support opportunities for underrepresented groups.

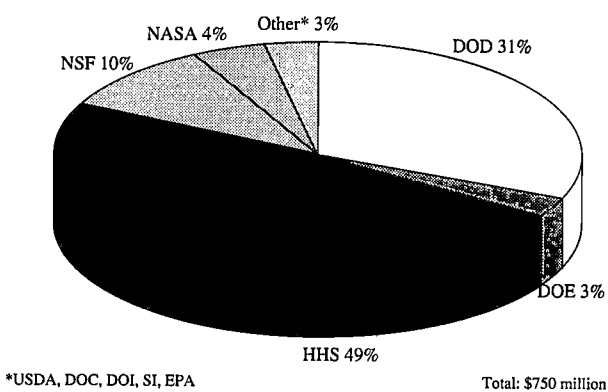
GRADUATE EDUCATION

For graduate education programs, the total requested for FY 1993 is \$750 million, which represents 36% of the CEHR budget. This level is a \$19 million, a 2% decrease from FY 1992 due to an add-on in the FY 1992 budget, and a \$12 million (+2%) increase over FY 1990. In Figure 20, funding for graduate program elements is illustrated, and in Figure 21, agency spending can be seen.

**Figure 20:
Graduate Program Elements**



**Figure 21:
Graduate Budget by Agency**



*USDA, DOC, DOI, SI, EPA

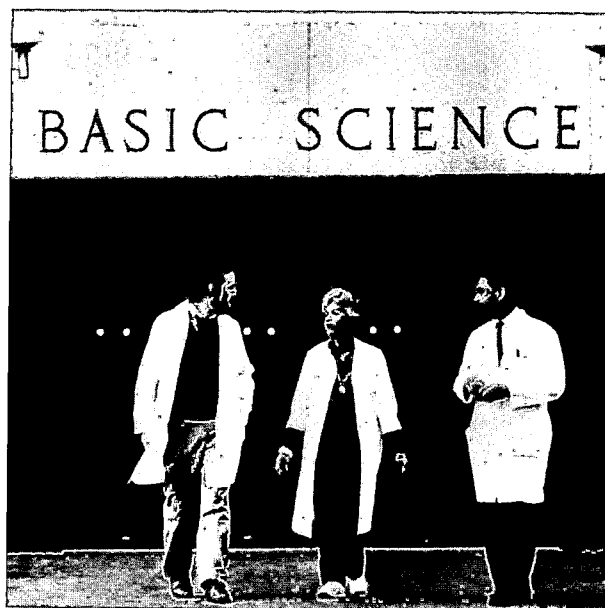
Total: \$750 million

The United States is considered the world leader in graduate education, with students coming from all over the world to study and conduct graduate level research on American campuses.



HBCU graduate student in Environmental Science working at Los Alamos National Laboratory.

From the U.S. perspective, outstanding graduate programs are necessary for maintaining the cadre of scientists, mathematicians, and engineers that keep our Nation economically competitive. Federal fellowships, internships, and traineeships offered to both pre- and post-doctoral students serve a crucial role in developing future experts in these fields. Although graduate education is, in many ways, the least problematic of the three formal education levels, strong Federal support for student incentives must continue. At this education level, mission agencies play an appropriate and critical role in maintaining the supply of technical experts in the various disciplines specific to their programs. Much of the education resources of these agencies are focused on graduate education. In the FY 1993 request, nearly four-fifths of the graduate funding comes from HHS and DOD.



Much of the research that NIH supports is conducted at universities, medical schools, hospitals, and other research institutions throughout the United States and abroad. This picture was taken at the Georgetown University School of Medicine—an NIH extramural research grant site.

Student Incentives and Opportunities.

Virtually all Federal graduate programs, pre- and postdoctoral, offer financial support and student research opportunities. NSF programs broadly address all fields of science, mathematics and engineering in support of its legislative mandate to maintain the health of the science and engineering enterprise; mission agencies concentrate their resources on disciplines critical to their particular areas of operation. All agencies will continue to evaluate the needs of specific disciplines and expand or redirect their programs as required.

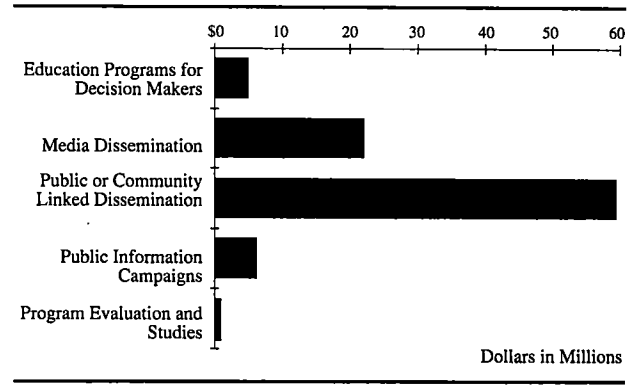
PUBLIC SCIENCE LITERACY

Public science literacy is a new budget category for FY 1993, with a request of \$93 million, representing 4% of the CEHR budget. Some of the programs represented in this category were included in last year's budget, mostly under precollege programs. Other agency programs are new for this year, and some have significant increases. FY 1992 was recalculated to provide a new base in order to give valid FY 1992-93 comparisons. The FY 1992-93 increase for this program area is \$2 million, or 3% over FY 1992.



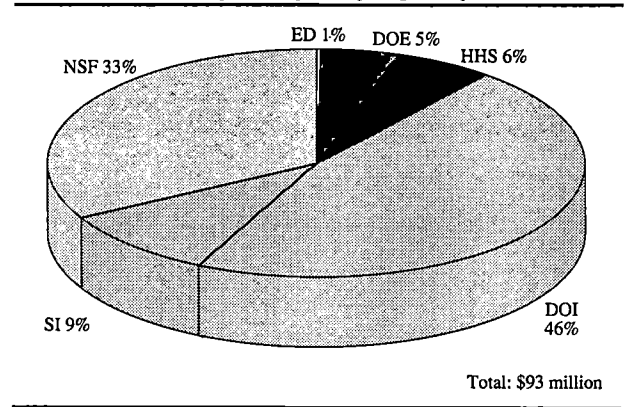
Hands-on activities at the American Museum of Science and Energy in Oak Ridge, Tennessee.

**Figure 22:
Science Literacy Budget by Agency**



Public science literacy has long been an overlooked component of science and mathematics education. However, adoption of both the National Education Goal for adult literacy and AMERICA 2000, which has life-long learning as one of its basic tenets, heralds increased interest in learning outside the formal education system. Scientific literacy is important for many reasons: it provides a basis on which to make informed decisions across an increasingly complex array of scientific issues (e.g., the environment, health, defense, and energy); it is critical for increasing the productivity of workers in an increasingly

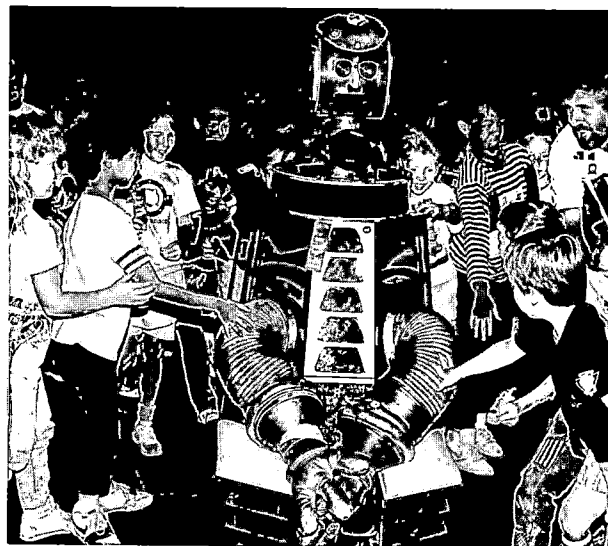
**Figure 23:
Science Literacy Budget by Agency**



technological society; and it leads parents to demonstrate a more positive attitude about science and mathematics to their children.

Much of CEHR's effort in science literacy has been focused on establishing a workable definition and identifying a baseline of programs and activities. The Task Force on Public Understanding of Science defined science literacy as a knowledge of the basic principles underlying scientific processes and concepts. It includes an awareness of scientific ways of thinking; an understanding of the relationship of science, mathematics, and technology to society; and the ability to use that knowledge to make informed decisions. Critical to future development of this area would be studies that assess the state of science literacy so as to define directions for future program development.

The current Federal strategy for improved public science literacy includes four components, in descending order of priority: (1) public and community-linked programs, (2) media dissemination, (3) programs for decision-makers, and (4) public information campaigns. In FY 1993, 64% of the public science literacy budget supports high-impact public and community-linked programs and media dissemination (Figure 22). DOI and NSF, combined, represent almost 80% of the funding for public science literacy (Figure 23). DOI, with its extensive park and refuge programs, represents over one-half of the reported support for public and community-linked programs; support of media programs by NSF represents nearly 70% of funding in that category.



Foobie D. Robot is part of a museum anti-drug program that stresses to children that their bodies are "million dollar machines," and that they are responsible for their personal health.

Public and Community-Linked Programs.

Activities include museum and library exhibits, science centers and youth programs; a sample of the programs in this component is the National Park and Refuge programs that include Ranger talks and guided walks, interpretive displays and films. All these programs thrust science education into daily life and promote better understanding of the importance of science and scientific research to the individual. The CEHR strategy calls for increased emphasis on these programs. Coordination of these efforts with teacher or student enhancement programs would allow outside activities to reinforce what is being taught in the classroom. Mission agencies, in particular, will continue and expand the community outreach efforts centered around their regional laboratories.



Hands-on Biology Programs...nature at first hand.

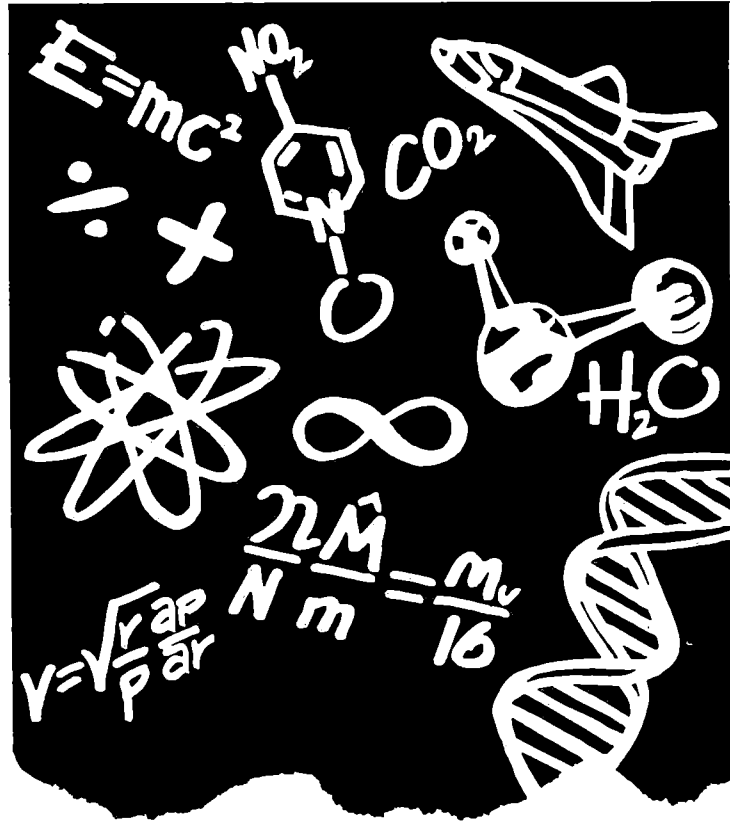
Media Dissemination. Media play a very important role in our technology-based society. Television, radio, and the press provide a cost-efficient, effective way of providing scientific information and related societal issues to millions of people. CEHR has set the goal of doubling the number of media programs by the year 2000. Care must be taken, however, that only the best products are put forward. In particular, programs must disseminate only accurate information; encourage development of instructional materials that capitalize on the media presentations; and place more emphasis on the scientific principles underlying issues that are

discussed. All agencies can be involved in these programs.

Programs for Decision-Makers. These programs are designed to educate government, educational, corporate, and media decision-makers about scientific concepts, principles, and issues so that they can make informed professional decisions and aggressively support and promote policies and programs that will move the Nation toward achieving the education goals for the year 2000. Major activities would include workshops and task forces of media and government representatives and active involvement of Cabinet-level agency officials.

Public Information Campaigns. Information campaigns included in the CEHR program are those that specifically provide explanations of scientific processes. If campaigns simply encourage a change in public behavior without an explanation of the science that is involved, they are not considered science literacy. The CEHR strategy encourages agencies to increase the number of public information campaigns and individual information sources that promote science education components and directs agencies to include in their programs, as appropriate, the science behind the issues.

APPENDIX



**FCCSET CEHR Charter
FY 1993 Budget Request
FY 1992 Enacted Budget
FY 1992-1993 Undergraduate Growth
Definitions
Agency Contacts**

CHARTER

COMMITTEE ON EDUCATION AND HUMAN RESOURCES of the Federal Coordinating Council for Science, Engineering and Technology

The Committee on Education and Human Resources (CEHR) is hereby established by action of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET).

The Committee serves as a part of the internal deliberative process of the FCCSET, which provides overall guidance and direction. The Council shall serve as the forum for developing consensus and resolving issues raised in the committee process.

Purpose

The purpose of the Committee on Education and Human Resources is to address issues critical to the provision of the best possible mathematics, science, and engineering education and technical training; to enable this generation of American students to become well informed, scientifically literate citizens; to ensure the Nation of an adequate, well-trained scientific and technical workforce; and to enable the Nation to retain its world leadership position in science and technology. In carrying out its activities, the Committee will be guided by the National Education Goals and the AMERICA 2000 National Education Strategy.

Functions

Reporting to and under the direction of the Chairman of FCCSET, the Committee on Education and Human Resources will:

- o review Federal research and development and support programs directed at improving education, training, and human resources development in mathematics, science, engineering, and technology;**
- o improve planning, coordination, and communication among Federal agencies engaged in education and human resources development;**
- o address specific programmatic and operational issues and problems regarding education and human resources that affect two or more Federal agencies;**

- o identify and define education, training, and human resources development priorities, in particular those pertaining to the Federal workforce, scientific and technological literacy, and the fields of mathematics, science, and engineering;
- o identify Federal resources, including scientific expertise, facilities, equipment, and programs that can be utilized to achieve the National Education Goals and the AMERICA 2000 National Education Strategy and to improve scientific and technical education and training;
- o develop and update long-range plans for the overall Federal effort in science, mathematics, engineering, and technology education, particularly with respect to the accomplishment of the National Education Goals and the AMERICA 2000 National Education Strategy; and
- o provide reviews, analyses, advice, and recommendations to the Chairman of FCCSET on Federal policies and programs concerned with education and human resources development, particularly with respect to the accomplishment of the National Education Goals and the AMERICA 2000 National Education Strategy.

Structure

The Committee Chairman and Vice Chairmen are appointed by the Chairman of FCCSET, the Vice Chairmen being from agencies other than that of the Chairman. The Executive Secretary is designated by the Committee Chairman. Additional staff and funding assistance, consistent with the terms of this charter, are the responsibility of the Committee Chairman.

The Committee Chairman will hold no fewer than four meetings of the Committee a year and will approve agendas. Minutes of meetings will be prepared by the Committee Executive Secretary and distributed to all members of the Committee and to the Assistant Director of OSTP responsible for FCCSET.

The Committee Chairman will meet bimonthly with the FCCSET Chairman and the chairmen of other committees to evaluate progress, discuss policy coordination, receive instructions from the FCCSET, and report on ongoing activities.

The Committee Chairman will recommend action on major activities to the FCCSET Chairman for approval.

The following departments and agencies are represented on this Committee at the Assistant Secretary level or above:

**Department of Defense
Department of Justice
Department of the Interior
Department of Agriculture
Department of Commerce
Department of Labor
Department of Health and Human Services
Department of Housing and Urban Development
Department of Transportation
Department of Energy
Department of Education
Department of Veterans Affairs
Office of Management and Budget
Office of Science and Technology Policy
National Aeronautics and Space Administration
Environmental Protection Agency
National Science Foundation
The Smithsonian Institution**

The Committee may establish such Subcommittees and Working Groups as are necessary to carry out its functions. The Committee Chairman will appoint the chairmen of all Subcommittees and Working Groups after consultation with the Committee and approval by the FCCSET Chairman. Chairmen of CEHR Subcommittees and Working Groups will arrange assistance from their own agencies or from other agencies represented on the Subcommittees or Working Groups.

Membership on Subcommittees and Working Groups is not restricted to Committee members, but all members must be full-time Federal employees.

Charters and Statements of Roles and Objectives (SROs) will be recommended for approval to the FCCSET Chairman for all Subcommittees and Working Groups, respectively. The Charters and SROs will identify the issues to be addressed and specify the desired products and delivery times to the Committee. Charters will be distinguished from SROs by scope and by duration, with Charters developed around broad issues, renewable from year to year, and SROs focussed on more short-term issues and subject to dissolution at any time.

Private Sector Interface

The Committee will recommend to the Chairman of the FCCSET the nature of private sector advice needed to accomplish its mission. The Chairman of the FCCSET will take necessary steps to ensure appropriate interactions between the President's Council of Advisors on Science and Technology (PCAST) and the FCCSET Committee. The Committee may also interact with and receive ad hoc advice from various private sector groups as consistent with the Federal Advisory Committee Act.

Compensation

All members are full-time Federal employees who are allowed reimbursement for travel expenses by their agencies plus per diem or subsistence while serving away from their duty stations and in accordance with standard government travel regulations.

Documentation

Agendas and records of actions of Committee meetings are prepared and disseminated to members by the Executive Secretary. Records of actions are submitted to members for approval. Complete records of all Committee activities, including those of Subcommittees and Working Groups, are maintained in the office of the Chairman.

The Committee prepares a report for the Chairman of the FCCSET not later than 60 days after the end of each fiscal year. The report contains, as a minimum, the Committee's functions; a list of members; a list of Subcommittees and Working Groups; a review of all Subcommittees and Working Groups that have discharged their responsibilities and are recommended by the Committee to be brought to closure; and brief highlights of the previous year.

The Committee will produce a Report on Mathematics, Science, and Engineering Education for FCCSET to supplement the President's Budget Submission to the Congress. The Committee Chairman will present the report to the FCCSET for approval. The report will comprise integrated, coordinated, and comprehensive plans, programs, and budgets, with supporting rationale, for Federal efforts on this subject.

In preparing this report, the Committee will work with FCCSET and OSTP to assist OMB in reviewing current and proposed funding levels for selected science, engineering, and technology education issues affecting more than one agency. Such reviews will be undertaken consistent with general guidelines established by OMB and will supplement, rather than supplant, the traditional Executive Branch budget formulation process. Final budget decisions will continue to be made in the context of individual agency requests to OMB and ultimately to the President.

Figure 24:
CEHR FY 1993 Budget Matrix

FCCSET CEHR FY 1993 Budget Request												
		22-Jan-92	2:49 AM									
Major Categories/Elements	FY 1993 Total Request	USDA	DOC	DOD	ED	DOE	DHHS	DOI	SI	NSF	NASA	EPA
Grand Total	2,092.23	22.65	3.68	415.97	392.53	113.21	416.45	88.43	10.04	537.20	82.27	9.80
Precollege	767.95	0.72		4.97	371.20	32.39	21.84	25.30	0.63	286.20	16.70	8.00
Precollege Teacher Preparation and Enhancement	436.51			0.63	286.50	16.84	5.19	2.00	0.33	114.80	7.92	2.30
Precollege Curriculum and Materials Development	91.58				2.70	4.51	2.54	6.90	0.22	67.70	5.00	2.01
A. Precollege Instructional Materials Development	65.87				2.70	4.51	2.54	6.85	0.22	43.70	4.50	0.85
B. Precollege Educational Technologies	25.71								0.05	24.00	0.50	1.16
Precollege Student Incentives and Opportunities	68.08	0.72		4.34	20.00	6.55	9.97	14.71		11.00	0.58	0.21
A. Precollege Direct Student Support	63.46	0.50			20.00	6.55	9.97	14.71		11.00	0.58	0.15
B. Bridging to Postsecondary	4.62	0.22		4.34								0.06
Precollege Organizational Reform	72.65						1.65			71.00		
Precollege Comprehensive or Multifaceted Programs	31.40				20.00	3.58	2.49			3.00	0.29	2.04
Precollege Dissemination and Technical Assistance	17.84				12.00	0.12			0.08	3.50	0.70	1.44
Precollege Program Evaluation and Studies	40.90				30.00	0.45			0.15	10.30		
A. Precollege Evaluation and Assessment	10.90					0.45			0.15	10.30		
B. Precollege Data Collection and Studies												
C. Precollege National Standards and Testing	30.00				30.00							
Precollege Other Total	8.99					0.34		1.54		4.90	2.22	
Undergraduate	480.77	13.50		176.20	21.00	56.87	25.00	8.72		146.30	32.38	0.80
Undergraduate Program Evaluation and Studies	3.90					0.10				3.80		
A. Undergraduate Evaluation and Assessment	3.90					0.10				3.80		
B. Undergraduate Data Collection and Studies												
Undergraduate Educational Technology	31.00			30.00						1.00		
Undergraduate Dissemination and Technical Assistance												
Two Year Total	12.42					1.08	1.43	0.10		8.30	1.51	
Two Year Faculty Preparation and Enhancement	4.02							0.02		3.00	1.00	
Two Year Curriculum and Materials Enhancement	2.60									2.60		
A. Two Year Course and Curriculum	0.30									0.30		
B. Two Year Laboratory Equipment	2.30									2.30		
Two Year Student Incentives and Opportunities	1.67					1.08		0.08			0.51	
A. Two Year Financial Assistance	1.08					1.08					0.51	
B. Two Year Research Experiences and Coops	0.51										0.51	
C. Bridging to Four Year Institution	0.08							0.08				
Two Year Organizational and Operational Reform	2.70									2.70		
Two Year Comprehensive or Multifaceted Programs	1.43						1.43					
Two Year Dissemination and Technical Assistance												
Two Year Other Total												
Four Year Total	433.45	13.50		146.20	21.00	55.69	23.57	8.62		133.20	30.87	0.80
Four Year Faculty Preparation and Enhancement	45.20					11.52	0.08	1.80		27.80	4.00	
Four Year Curriculum and Materials Enhancement	95.11			38.90		3.22	0.16	1.03		50.30	1.50	
A. Four Year Course and Curriculum	74.29			38.90		3.16	0.10	1.03		29.60	1.50	
B. Four Year Laboratory Equipment	20.82					0.06	0.06			20.70		
Four Year Student Incentives and Opportunities	188.38			100.50	15.00	23.97	2.24	5.25		28.80	11.82	0.80
A. Four Year Financial Assistance	133.57			100.50	15.00	11.97				5.30		0.80
B. Four Year Research Experiences and Coops	49.54					12.00	2.01	5.23		23.50	6.80	
C. Bridging to Graduate School	5.27						0.23	0.02			5.02	
Four Year Organizational and Operational Reform	29.70			6.80						22.90		
Four Year Comprehensive or Multifaceted Programs	56.61	13.50			6.00		21.09	0.43		3.20	12.39	
Four Year Dissemination and Technical Assistance												
Four Year Other Total	18.46					16.98		0.11		0.20	1.17	

Figure 24:
CEHR FY 1993 Budget Matrix (continued)

FCCSET CEHR FY 1993 Budget Request						22-Jan-92	2:49 AM					
Major Categories/Elements	FY 1993											
	Total Request	USDA	DOC	DOD	ED	DOE	DHHS	DOI	SI	NSF	NASA	EPA
Graduate	750.20	8.43	3.68	234.80		19.62	364.01	11.07	0.50	73.90	33.19	1.00
Predoctoral Fellowships	99.54		0.30	16.70		8.21	5.64	0.10	0.09	52.40	15.30	0.80
Predoctoral Traineeships	160.81	4.00		3.90		0.55	128.99	10.42		8.40	4.35	0.20
Postdoctoral Fellowships	98.70		3.38	10.50		6.43	51.23	0.55	0.41	13.10	13.10	
Postdoctoral Traineeships	155.62	4.43				0.50	150.69					
Graduate Program Evaluation and Studies	0.10					0.10						
A. Graduate Evaluation and Assessment	0.10											
B. Graduate Data Collection and Studies												
Graduate Other Total	235.43			203.70		3.83	27.46				0.44	
Public Science Literacy	93.32				0.33	4.34	5.60	43.34	8.91	30.80		
Education Programs for Decision Makers	5.10					0.35		3.35		1.40		
Media Dissemination	22.09					1.13	1.21	3.25		16.50		
Public or Community Linked Dissemination	59.50					1.34	3.23	33.12	8.91	12.90		
Public Information Campaigns	6.33				0.33	1.42	0.96	3.62				
Public Science Literacy Program Evaluation and Studies	0.30					0.10	0.20					
A. Public Science Literacy Evaluation and Assessment	0.30					0.10	0.20					
B. Public Science Literacy Data Collection and Studies												
Public Science Literacy Other Total												

Figure 25:
CEHR FY 1992 Enacted Budget

Major Categories/Elements	FCCSET CEHR FY 1992 Budget Rebaselined						22-Jan-92	2:51 AM					
	FY 1992 Baseline	USDA	DOC	DOD	ED	DOE (1)	DHHS	DOI	SI	NSF	NASA	EPA	
Grand Total	1,954.74	20.36	3.51	415.97	293.83	108.56	411.94	82.73	9.96	521.80	77.79	8.30	
Precollege	650.71	0.71		4.97	283.00	22.95	20.17	21.67	0.55	276.20	14.00	6.50	
Precollege Teacher Preparation and Enhancement	382.56			0.63	240.00	7.07	4.88	2.06	0.25	120.80	5.87	1.00	
Precollege Curriculum and Materials Development	83.35				2.00	4.66	2.18	4.08	0.22	63.70	4.50	2.01	
A. Precollege Instructional Materials Development	61.65				2.00	4.66	2.18	4.03	0.22	43.70	4.01	0.85	
B. Precollege Educational Technologies	21.71							0.05		20.00	0.50	1.16	
Precollege Student Incentives and Opportunities	46.48	0.71		4.34		6.55	9.27	13.85		11.00	0.55	0.21	
A. Precollege Direct Student Support	27.80	0.50				6.55	9.27			11.00	0.33	0.15	
B. Bridging to Postsecondary	18.68	0.21		4.34				13.85			0.22	0.06	
Precollege Organizational Reform	60.34						1.34			59.00			
Precollege Comprehensive or Multifaceted Programs	27.35				16.00	3.54	2.49			3.00	0.28	2.04	
Precollege Dissemination and Technical Assistance	17.63				12.00	0.12			0.08	3.50	0.69	1.24	
Precollege Program Evaluation and Studies	24.10				13.00	0.45		0.15		10.50			
A. Precollege Evaluation and Assessment	11.10					0.45		0.15		10.50			
B. Precollege Data Collection and Studies													
C. Precollege National Standards and Testing	13.00				13.00								
Precollege Other Total	8.89					0.56		1.53		4.70	2.10		
Undergraduate	444.25	11.75		176.20	10.50	55.47	24.72	9.08		122.20	33.53	0.80	
Undergraduate Program Evaluation and Studies	3.60					0.10				3.50			
A. Undergraduate Evaluation and Assessment	3.60					0.10				3.50			
B. Undergraduate Data Collection and Studies													
Undergraduate Educational Technologies	31.00			30.00						1.00			
Undergraduate Dissemination and Technical Assistance													
Two Year Total	12.11					1.95	1.43	0.10		6.90	1.73		
Two Year Faculty Preparation and Enhancement	3.57							0.02		2.30	1.25		
Two Year Curriculum and Materials Enhancement	2.60									2.60			
A. Two Year Course and Curriculum	0.30									0.30			
B. Two Year Laboratory Equipment	2.30									2.30			
Two Year Student Incentives and Opportunities	2.51					1.95		0.08			0.48		
A. Two Year Financial Assistance	2.43					1.95					0.48		
B. Two Year Research Experiences and Coops	0.08							0.08					
C. Bridging to Four Year Institution													
Two Year Organizational and Operational Reform	2.00									2.00			
Two Year Comprehensive or Multifaceted Programs	1.43						1.43						
Two Year Dissemination and Technical Assistance													
Two Year Other Total													
Four Year Total	397.55	11.75		146.20	10.50	53.43	23.29	8.98		110.80	31.80	0.80	
Four Year Faculty Preparation and Enhancement	33.09					4.89	0.08	1.82		22.30	4.00		
Four Year Curriculum and Materials Enhancement	100.85			38.90		12.81	0.16	1.12		46.20	1.66		
A. Four Year Course and Curriculum	79.98			38.90		12.70	0.10	1.12		25.50	1.66		
B. Four Year Laboratory Equipment	20.87					0.11	0.06			20.70			
Four Year Student Incentives and Opportunities	166.04			100.50	4.50	18.85	2.24	5.50		22.40	11.25	0.80	
A. Four Year Financial Assistance	129.20			100.50	4.50	6.85				5.30	11.25	0.80	
B. Four Year Research Experiences and Coops	36.59					12.00	2.01	5.48		17.10			
C. Bridging to Graduate School	0.25						0.23	0.02					
Four Year Organizational and Operational Reform	23.90			6.80						17.10			
Four Year Comprehensive or Multifaceted Programs	54.87	11.75			6.00		20.81	0.43		2.60	13.28		
Four Year Dissemination and Technical Assistance													
Four Year Other Total	18.80					16.88		0.11		0.20	1.61		

Figure 25:
CEHR FY 1992 Enacted Budget (continued)

Major Categories/Elements	FCCSET CEHR FY 1992 Budget Rebaselined					22-Jan-92	2:51 AM					
	FY 1992 Baseline	USDA	DOC	DOD	ED	DOE (1)	DHHS	DOI	SI	NSF	NASA	EPA
Graduate	768.88	7.90	3.51	234.80		24.84	362.26	11.22	0.50	92.60	30.26	1.00
Predocctoral Fellowships	99.77		0.30	16.70		10.93	5.30	0.25	0.09	52.40	13.80	
Predocctoral Traineeships	180.28	3.50		3.90		0.70	128.96	10.42		28.60	3.40	0.80
Postdoctoral Fellowships	98.79		3.21	10.50		8.93	50.75	0.55	0.41	11.60	12.64	0.20
Postdoctoral Traineeships	154.79	4.40				0.60	149.79					
Graduate Program Evaluation and Studies	0.10					0.10						
A. Graduate Evaluation and Assessment	0.10					0.10						
B. Graduate Data Collection and Studies												
Graduate Other Total	235.16			203.70		3.58	27.46				0.42	
Public Science Literacy	90.89				0.33	5.31	4.79	40.76	8.91	30.80		
Education Programs for Decision Makers	1.74					0.34				1.40		
Media Dissemination	21.73					1.13	0.90	3.20		16.50		
Public or Community Linked Dissemination	56.90					1.34	3.23	30.52	8.91	12.90		
Public Information Campaigns	6.95				0.33	2.40	0.65	3.57				
Public Science Literacy Program Evaluation and Studies	3.57					0.10		3.47				
A. Public Science Literacy Evaluation and Assessment	3.57					0.10		3.47				
B. Public Science Literacy Data Collection and Studies												
Public Science Literacy Other Total												

¹ Does not include a one-time \$4.5 million reprogramming.

**Figure 26:
FY 1992-1993 Undergraduate Growth**

	FY 1992	FY 1993		
	Baseline	Request	Change	% Change
Undergraduate	444.25	480.77	36.52	8%
Undergraduate Program Evaluation and Studies	3.6	3.9	0.3	8%
A. Undergraduate Evaluation and Assessment	3.6	3.9	0.3	8%
B. Undergraduate Data Collection and Studies				
Undergraduate Educational Technology	31	31		
Undergraduate Dissemination and Technical Assistance				
Two Year Total	12.11	12.42	0.31	3%
Two Year Faculty Preparation and Enhancement	3.57	4.02	0.45	13%
Two Year Curriculum and Materials Enhancement	2.6	2.6		
A. Two Year Course and Curriculum	0.3	0.3		
B. Two Year Laboratory Equipment	2.3	2.3		
Two Year Student Incentives and Opportunities	2.51	1.67	-0.84	-33%
A. Two Year Financial Assistance	2.43	1.08	-1.35	-55%
B. Two Year Research Experiences and Coops	0.08	0.51	0.43	538%
C. Bridging to Four Year Institution		0.08	0.08	0
Two Year Organizational and Operational Reform	2	2.7	0.7	35%
Two Year Comprehensive or Multifaceted Programs	1.43	1.43		
Two Year Dissemination and Technical Assistance				
Two Year Other Total				
Four Year Total	397.55	433.45	35.9	9%
Four Year Faculty Preparation and Enhancement	33.09	45.2	12.11	37%
Four Year Curriculum and Materials Enhancement	100.85	95.11	-5.74	-6%
A. Four Year Course and Curriculum	79.98	74.29	-5.69	-7%
B. Four Year Laboratory Equipment	20.87	20.82	-0.05	
Four Year Student Incentives and Opportunities	166.04	188.38	22.34	13%
A. Four Year Financial Assistance	129.2	133.57	4.37	3%
B. Four Year Research Experiences and Coops	36.59	49.54	12.95	35%
C. Bridging to Graduate School	0.25	5.27	5.01	1981%
Four Year Organizational and Operational Reform	23.9	29.7	5.8	24%
Four Year Comprehensive or Multifaceted Programs	54.87	56.61	1.74	3%
Four Year Dissemination and Technical Assistance				
Four Year Other Total	18.8	18.46	-0.34	-2%

DEFINITIONS

Precollege: Science and mathematics education programs directed at students below the postsecondary level (i.e., preschool and kindergarten, as well as elementary, middle and high school). Pre- and in-service training for precollege teachers are included here even if such training is received at colleges and universities.

Undergraduate: Science, mathematics, engineering and technology programs directed at students below the baccalaureate level but beyond secondary school. Relevant institutions include two-year (both for terminal as well as preparation for baccalaureate degrees), four-year colleges, and comprehensive and graduate institutions offering baccalaureate degrees.

Graduate: Science, mathematics, engineering, and technology programs directed at students beyond the baccalaureate level.

Teacher: Precollege educator.

Faculty: Postsecondary educator.

Public Understanding of Science and Technology [Science Literacy]: Programs specifically focused on increasing public understanding and knowledge of science and its impact on society. These programs educate audiences of all ages about the principles underlying scientific methods and processes. Programs geared to changing behaviors (i.e., public information, consumer education, health promotion and disease prevention) without offering specific and detailed information on the science behind the recommended changes, are not included.

Underrepresented Groups: Underrepresented groups include ethnic minorities (e.g., American Indians, Alaskan Natives, Blacks [not of Hispanic origin], Hispanics [Mexicans, Puerto Ricans, Cubans, and Central or South Americans], Pacific Islanders); females; persons with disabilities; those with limited English proficiency; and the economically disadvantaged.

Teacher and Faculty Preparation: Program targeted on pre-service preparation (disciplinary and pedagogical) for instruction in science, mathematics, engineering, and/or technology. Activities include development and evaluation of innovative approaches to teacher preparation and research on factors affecting the recruitment and preparation of teachers. Not included are programs that are purely pedagogical in nature or that replicate courses normally available through graduate departments. Pre-service programs designed for teachers are categorized as "precollege."

Teacher and Faculty Enhancement: Continuing education, in-service programs that update skills, as well as enrich and strengthen the theoretical and practical basis for classroom and laboratory instruction. Programs can include both content and pedagogy, but do not primarily enhance research ability, are not *purely* pedagogical in nature, and do not replicate courses normally available in graduate departments. In-service programs designed for teachers are categorized as "precollege."

Curriculum Reform, R&D in Teaching & Learning: Programs leading to development and/or implementation of:

- new or improved courses, curricula, laboratory experiences, instructional materials (e.g., print, computer software, video materials), and delivery mechanisms. This category includes support of national projects such as AAAS "Project 2061," NCTM Standards, NSTA "Scope Sequence and Coordination"; and the NAS Mathematical Sciences Education Board;
- educational technologies (e.g., computers and software, interactive computer-videodisc systems, CD-ROM (compact disc, read only memory), satellites, cables, fiber optics, audio and video recording, television, and radio) that can significantly increase the efficiency and effectiveness of instruction at all levels. Applications include distance learning, innovative educational systems, intelligent tutors, authoring systems, problem-solving tools, "microworlds", and expert systems;
- research in teaching and learning to identify significant factors affecting how children learn; how to best meet the learning needs of underrepresented groups; and how to effectively transmit knowledge to children at all grade levels.

Organization and Systemic Reform: Programs designed to make systemic changes in education systems with the dual objective of increasing the number of students studying science, mathematics, engineering, and technology and improving the quality of instruction received. Reform programs generally affect all aspects of an educational system including teachers,

curricula, and administrative practices and generally involve collaborative partnerships among members of the science and engineering enterprise (e.g., legislative and education officials, schools, higher education institutions, the research establishment, business and industry, professional organizations, community groups). Organization and operational reform applies to both precollege and postsecondary levels; systemic reform is applicable primarily at the precollege level.

Comprehensive Programs: Programs specifically designed to address simultaneously multiple program areas (e.g., curriculum/materials development, teacher/faculty enhancement, community involvement).

Student Support, Incentives, and Opportunities: Programs providing direct student financial assistance (e.g., fellowships, traineeships, scholarships) and/or research experiences (e.g., research and teaching assistantships, enrichment experiences, and cooperative work-study) or facilitating the transition (bridging) from one education level to another (e.g., high school to undergraduate, two-year to four-year colleges, undergraduate to the workplace, undergraduate to graduate). Bridging programs are categorized in the education level of origin. Programs designed specifically to support training of future science, mathematics, engineering, and technology educators are categorized under teacher or faculty preparation/enhancement.

Program Evaluation and Assessment: Programs and activities designed to generate data and analyses that provide information on the operation of an agency's education programs.

Relevant activities include development of databases for monitoring project performance and related evaluation and assessment studies that indicate the effectiveness of projects and/or entire programs in meeting stated goals and objectives.

Data Collection and Studies: Programs and activities designed to provide data and analytic studies—aggregate in nature—that describe the environment in which education programs operate, broadly supporting policy development.

National Standards and Testing: Support of activities specifically related to development of national curriculum standards and a nationwide examination system for science and mathematics.

Dissemination and Technical Assistance:

Programs and activities that encourage the widespread dissemination, exchange and use of knowledge, materials, and practices to improve science, mathematics, engineering and technology education. Includes support for activities and programs that provide technical assistance to educators that encourages adoptions and utilization of the products of education programs.

Other: Includes activities not appropriate for categorization under program elements. An example of such activities would be awards to schools, students or teachers/faculty for demonstrated excellence in scientific and technical fields.

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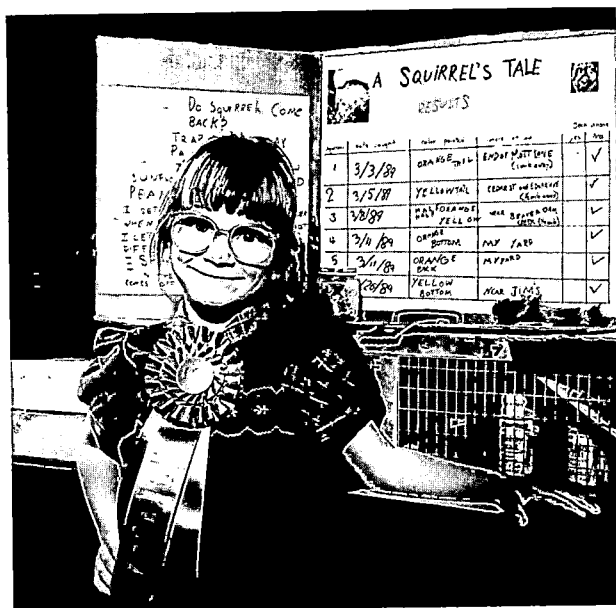
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Kindergartner Corey Sack won first prize in the Brookhaven National Laboratory Elementary School Science Fair. Her entry, "A Squirrel's Tale," documented her observations of squirrel behavior.

