The Nation’s Research Agenda at a Crossroads

Dr. G. Wayne Clough
President, Georgia Institute of Technology

Chancellor’s Distinguished Lectureship Series
Louisiana State University
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“We’ve come through a period of finally understanding the nature and magnitude of humanity’s transformation of the Earth. Having realized it, can we become clever enough at a big scale to be able to maintain the rates of progress?”

Dr. William C. Clark
Biologist, Harvard University
“Imagine a future of relentless storms and floods; islands and heavily inhabited coastal regions inundated by rising sea levels; fertile soils rendered barren by drought and the desert’s advance; mass migrations of environmental refugees; and armed conflicts over water and other precious natural resources.”

Kofi Annan
United Nations Secretary General
*Time*, Aug 26, 2002
Georgia Tech civil engineers took a portable high-tech damage survey system they developed for earthquakes to Ground Zero after the September 11 attacks, providing immediately usable information in the recovery effort and mapping heavy debris for removal from the site.
In 1946 physicists at Harvard and Stanford discovered and explored the phenomenon of nuclear magnetic resonance in the course of studying the spin characteristics of basic matter. This discovery was the basis for magnetic resonance imaging (MRI), which has revolutionized diagnostic medicine.
“The heritage of the past is the seed that brings forth the harvest of all the future.”

Nikita Krushchev

National Archives plaque
Richard Feynman

Eddie Bauer
“Nano-Care” Chinos

PPG Industries self-cleaning windows

GM Safari

Courtesy of the Archives, California Institute of Technology
Compound annual R&D growth rate in R&D expenditures (1985-1998)

U.S. Competitiveness 2001 Council on Competitiveness
Federal R&D investment by budget function

NSF Science & Engineering Indicators 2002
Change in federal research funding (FY 1993-1999)

Trends in Federal Support of Research and Graduate Education
National Research Council
“It has proved impossible to predict reliably which areas of science will ultimately contribute to important new technologies.”

Science, Technology and the Federal Government: National Goals for a New Era

COSEPUP
U.S. engineering enrollment

Full- and part-time students

Undergraduate

Graduate

NSF Science & Engineering Indicators 2002
Bachelor’s degrees awarded at U.S. universities

NSF Science & Engineering Indicators 2002
U.S. science & engineering doctorates

- Noncitizens
- U.S. citizens, white men
- U.S. citizens, white women
- U.S. citizens, minority men and women

NSF Science & Engineering Indicators 2002
“With a drop in support for certain disciplines comes a drop-off in students and faculty entering those fields. We have seen this happening; the number of engineering, physical and environmental science degrees has been falling since the early 1990s.”

Assessing the U.S. R&D Investment
President’s Council of Advisors on Science and Technology
U.S. science & engineering doctorates

Number

12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0

1980 1983 1985 1987 1989 1991 1993 1995 1997 1999

Noncitizens

U.S. citizens, white men

U.S. citizens, white women

U.S. citizens, minority men and women

NSF Science & Engineering Indicators 2002
Doctorates in natural sciences & engineering

NOTE: Europe includes France, Germany, and the United Kingdom. Asia includes China, India, Japan, South Korea, and Taiwan.

NSF Science & Engineering Indicators 2002
Doctoral students in science & engineering with plans to remain in the U.S.

NSF Science & Engineering Indicators 2002
By the end of 2004, one of every 10 jobs at U.S. computer-related companies will have moved to emerging markets where costs are lower.

Gartner Inc.

By 2015, 3.3 million white-collar jobs paying $136 billion in wages will have moved from the United States to lower cost countries, with the software and computer industry leading the exodus.

Forrester Research Inc.
In India, white-collar service and IT jobs from overseas are expected to employ 4 million people, generate $57 billion in revenues, and account for 7% of the gross domestic product by 2008.

Joint study, McKinsey & Co and Indian software association Nasscom
“The biggest danger to U.S. workers isn’t overseas competition. It’s that we worry too much about other countries climbing up the ladder and not enough about finding the next higher rung for ourselves.”

Michael Mandel
Chief Economist, Business Week
Aug 28, 2003 issue
At the crossroads: Concerns

- Imbalance in the federal research portfolio
  - Fundamental research versus development and application
  - Engineering and the physical sciences versus health and the life sciences
- Decline in interest in science and engineering on the part of U.S. students
- Flow of high-end technology jobs overseas
Beyond the crossroads

⇒ Rebalance the federal portfolio, increasing research in engineering and the physical sciences.

⇒ Encourage U.S. students to pursue science and engineering:
  → Support for scholarships and fellowships
  → Innovative curricula and degree programs

⇒ Recognize that innovation is the key to maintaining a strong U.S. economy in the face of global competition.