

Eric Walker Distinguished Lecture

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

National Conference on the Advancement
of Research

December 3, 2002

Eric A. Walker


- President, Penn State University, 1956-1970
- Chairman, National Science Board 1966-1968
- NAE founding member; president, 1966-1970
- Presidential Citation, 1970



“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
New York Times, Aug 20, 2002



“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



Logging tropical rain forests brings disease-bearing mosquitoes that live high in the forest canopy down to the ground and into contact with humans.

Global climate dynamics can affect outbreaks of infectious diseases. Warmer, wetter weather is associated with large increases in rodents, which carry diseases like plague, Lyme disease, and hantavirus pulmonary syndrome. Global warming could increase the incidence of such diseases.

Georgia Tech civil engineers developed a portable high-tech damage survey system for use after earthquakes. A National Science Foundation grant sent them to Ground Zero after September 11, 2001, to provide immediately usable information in the recovery effort and to map heavy debris for removal from the site.

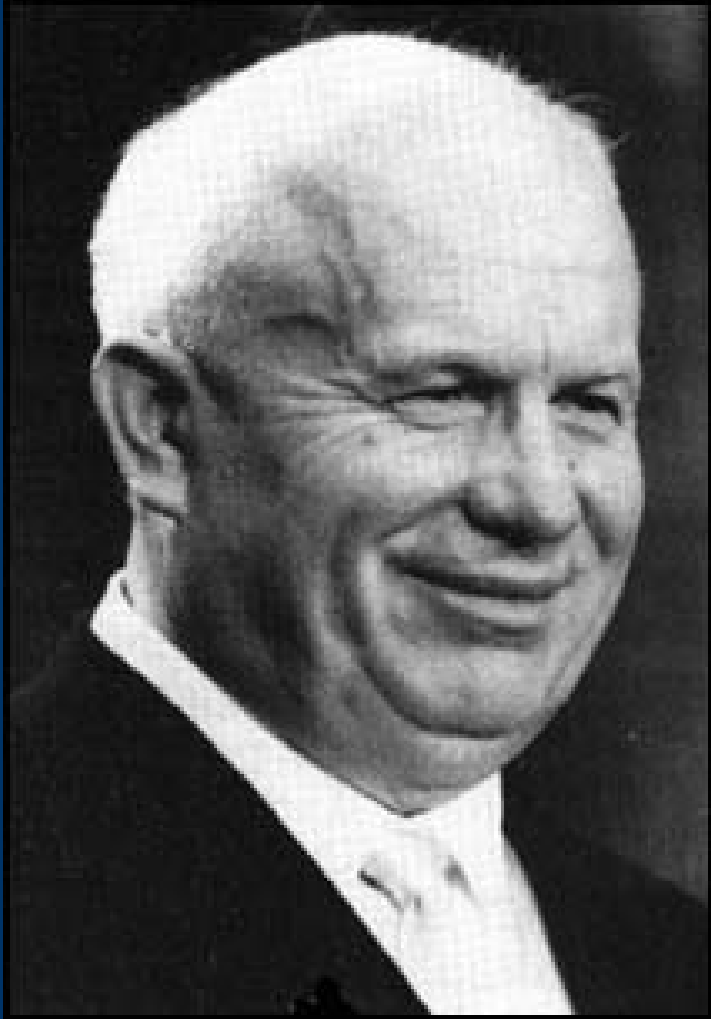


Software developed by astronomers to sort out the crowded regions of the sky where literally millions of stars appear in images, is being adapted to use with mammograms, screening out background “clutter” so that it is easier to identify micro-calcifications that can be forerunners of cancerous tumors.



Comet Ikeyi-Seki

NSF Nifty Fifty



Nikita Krushchev

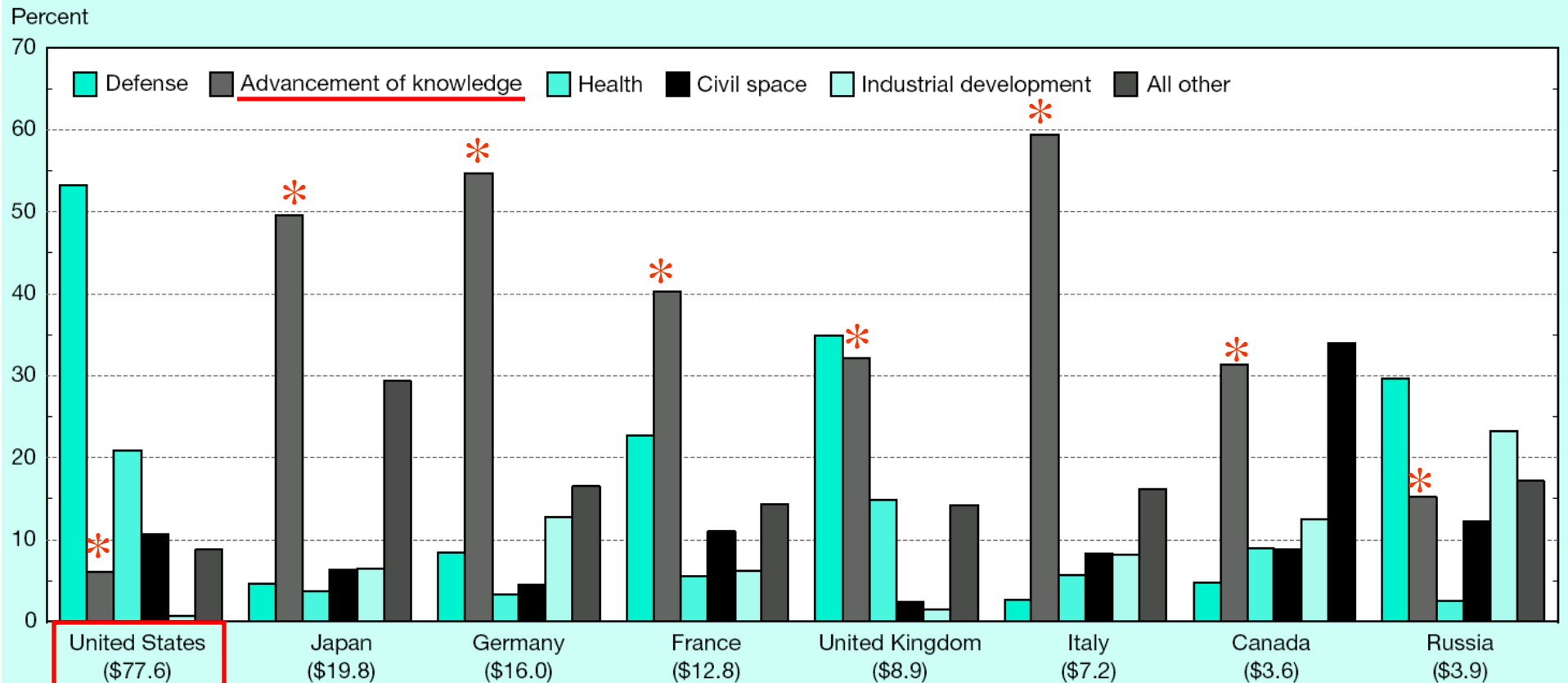
“The heritage of the past is the seed that brings forth the harvest of all the future.”

National Archives plaque

“For investigators who do such fundamental research, primarily in universities, the original motivation is... to discover and to understand natural processes. Nevertheless, this motivation – the enlarging of human knowledge – in the end brings advances and applications that cannot be made in any other way.”

Experiments in International Benchmarking of U.S. Research Fields
National Academies' Committee on Science, Engineering and Public Policy

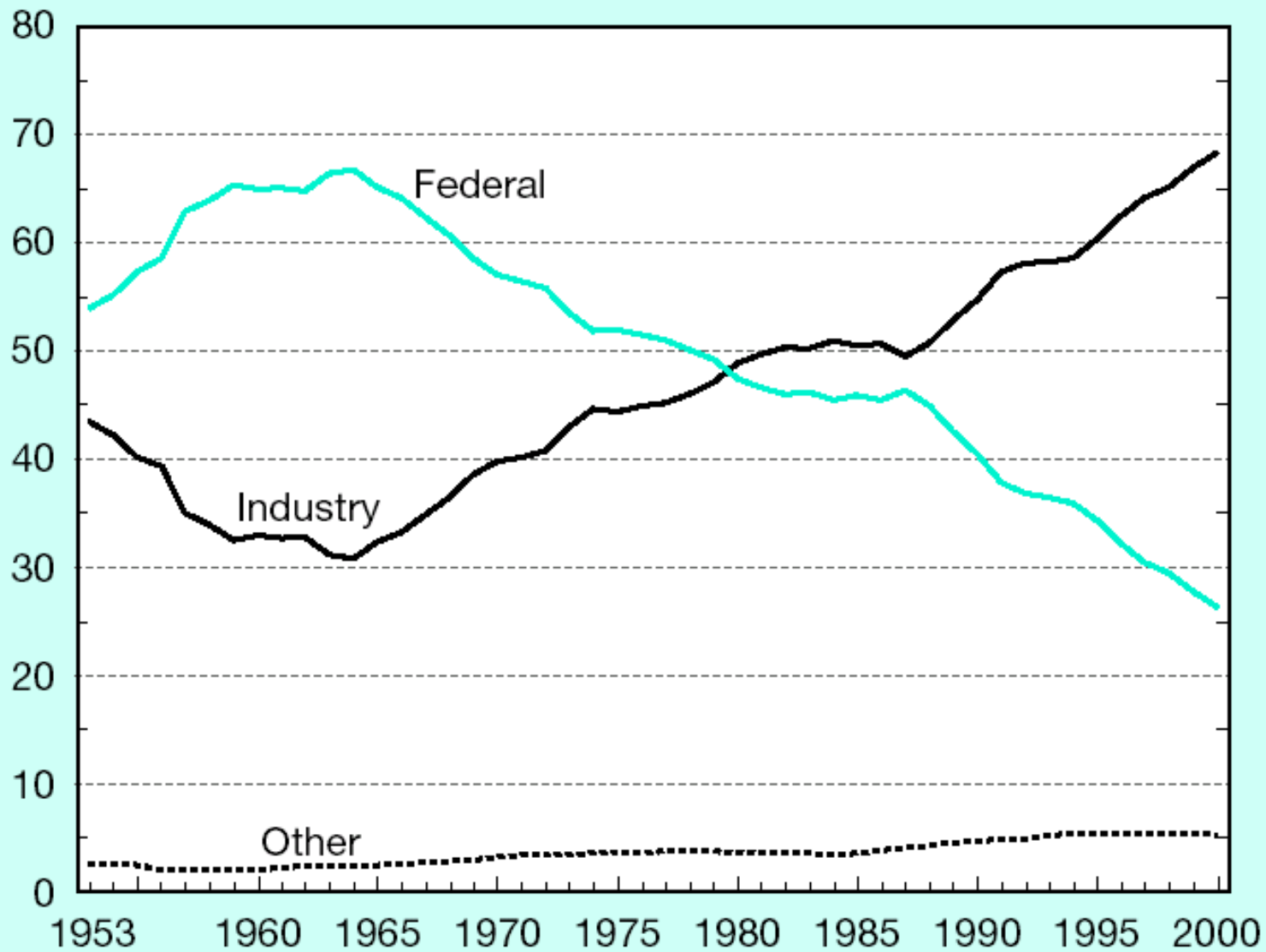
Federal R&D by type of expenditure in G-8 nations



NSF Science & Engineering Indicators 2002

Source of U.S. research funding

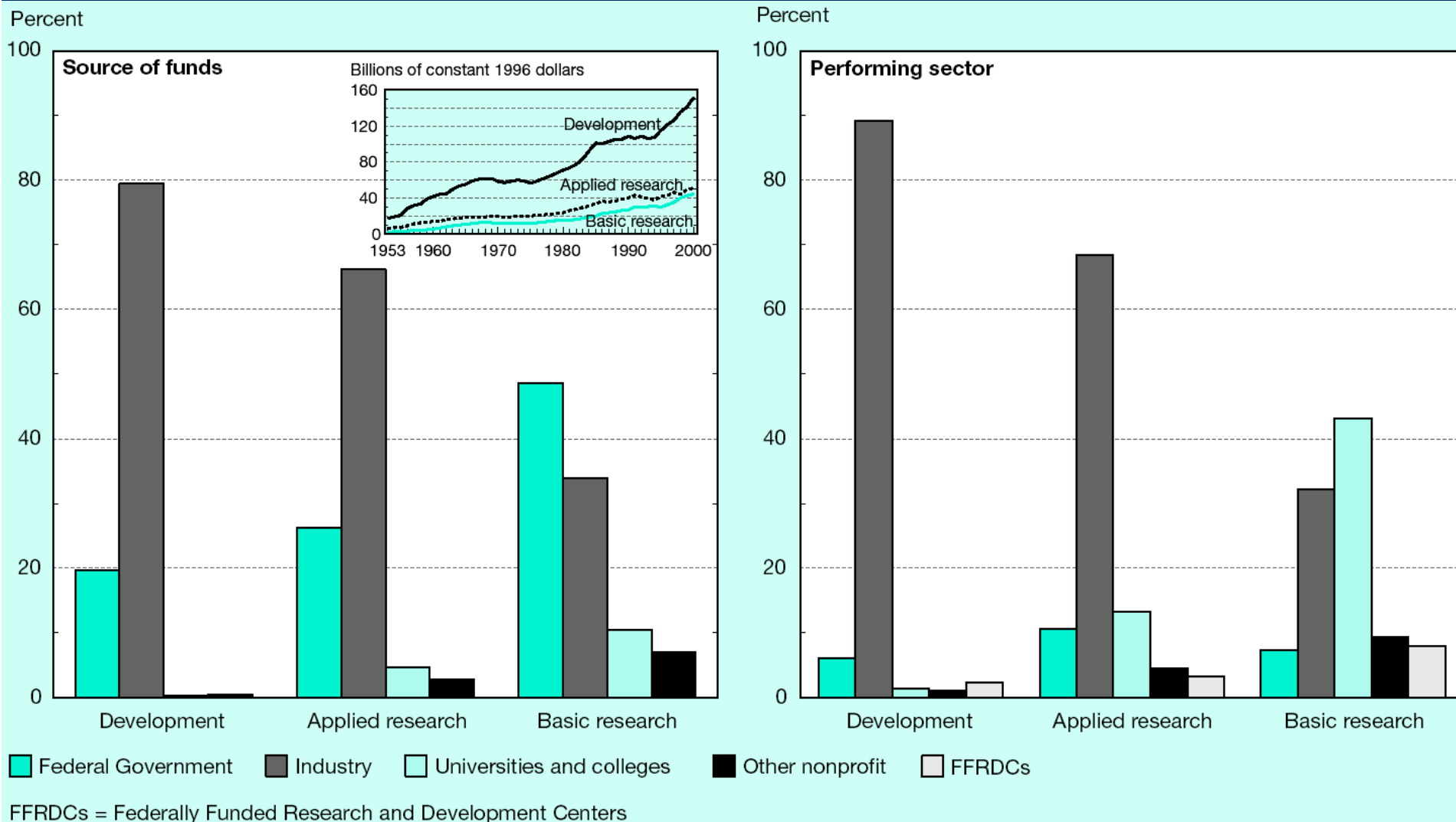
Percent of total R&D funding



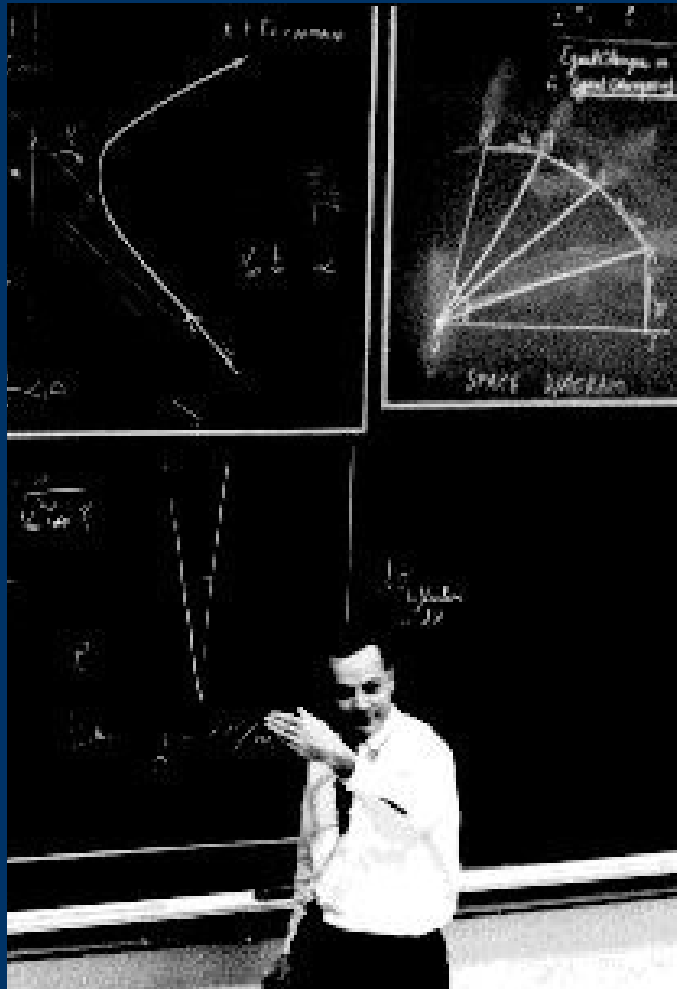
NSF Science & Engineering Indicators, 2002

National R&D: Source, performer, type

FY 2000



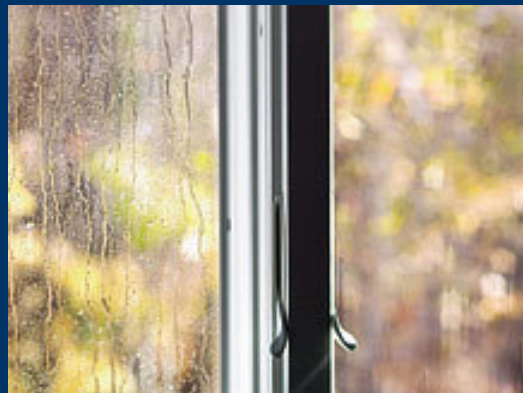
Richard Feynman



Courtesy of the Archives, California
Institute of Technology

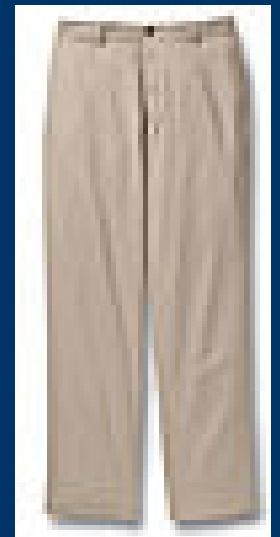


GM Safari



PPG Industries self-
cleaning windows

Eddie Bauer
“Nano-Care” Chinos



“It is seldom possible to predict the outcomes of basic research or to know which fields of research will ultimately contribute to important new ideas or technologies... Retrospective studies consistently describe the power of research to produce breakthroughs years and even decades after the work has been performed.”

Experiments in National Benchmarking of U.S. Research Fields
Committee on Science, Engineering and Public Policy

COSEPUP National Goals

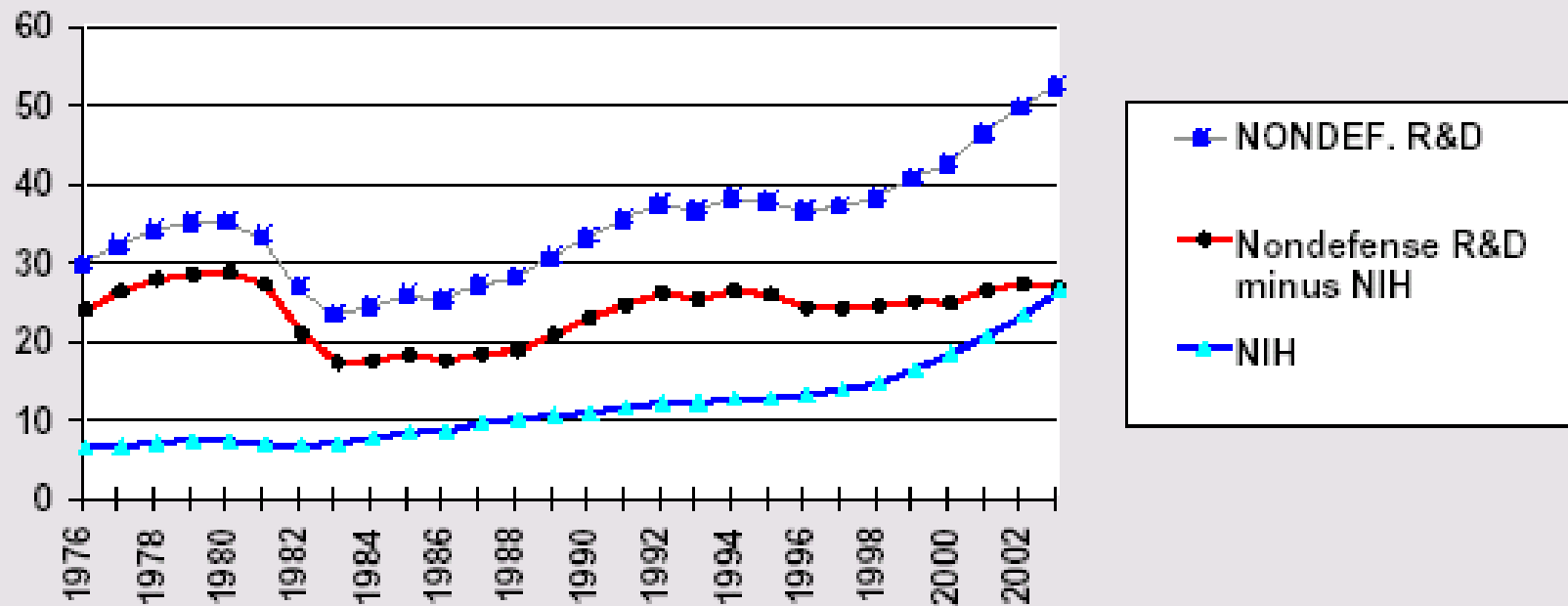
- The United States should be among the world leaders in all major areas of science.
 - The United States should maintain clear leadership in some major areas of science.
-

Long-term National Goal

Discover new knowledge with wide-ranging applications that will emerge along the way.

Selected Trends in Nondefense R&D, FY 1976-2003

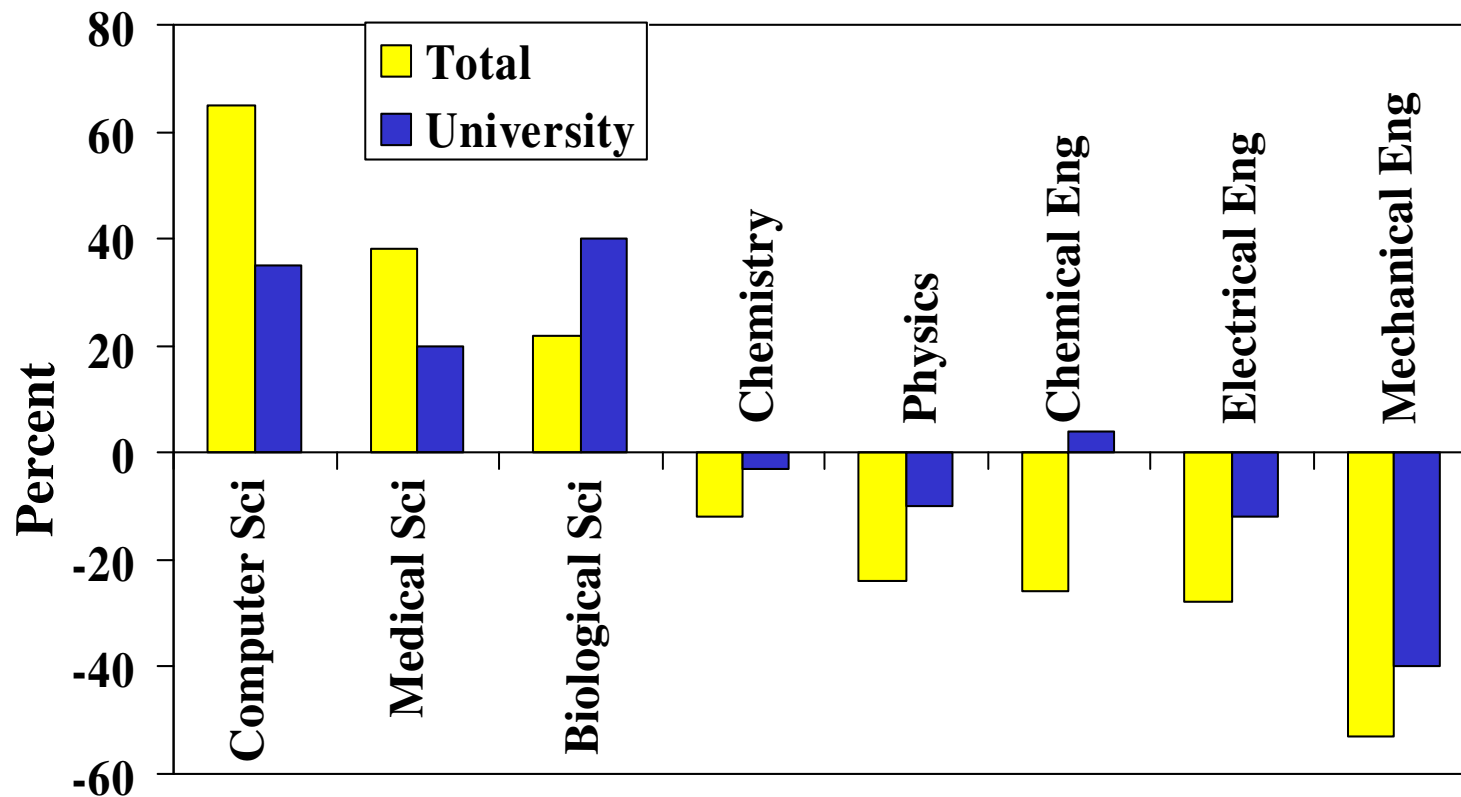
in billions of constant FY 2002 dollars



Source: AAAS analyses of R&D in *AAAS Reports VIII-XXVII*. FY 2003 figures are President's request; FY 2002 figures are latest estimates.

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Change in federal research funding FY 1993-1999



National Research Council: Trends in Federal Support of Research and Graduate Education

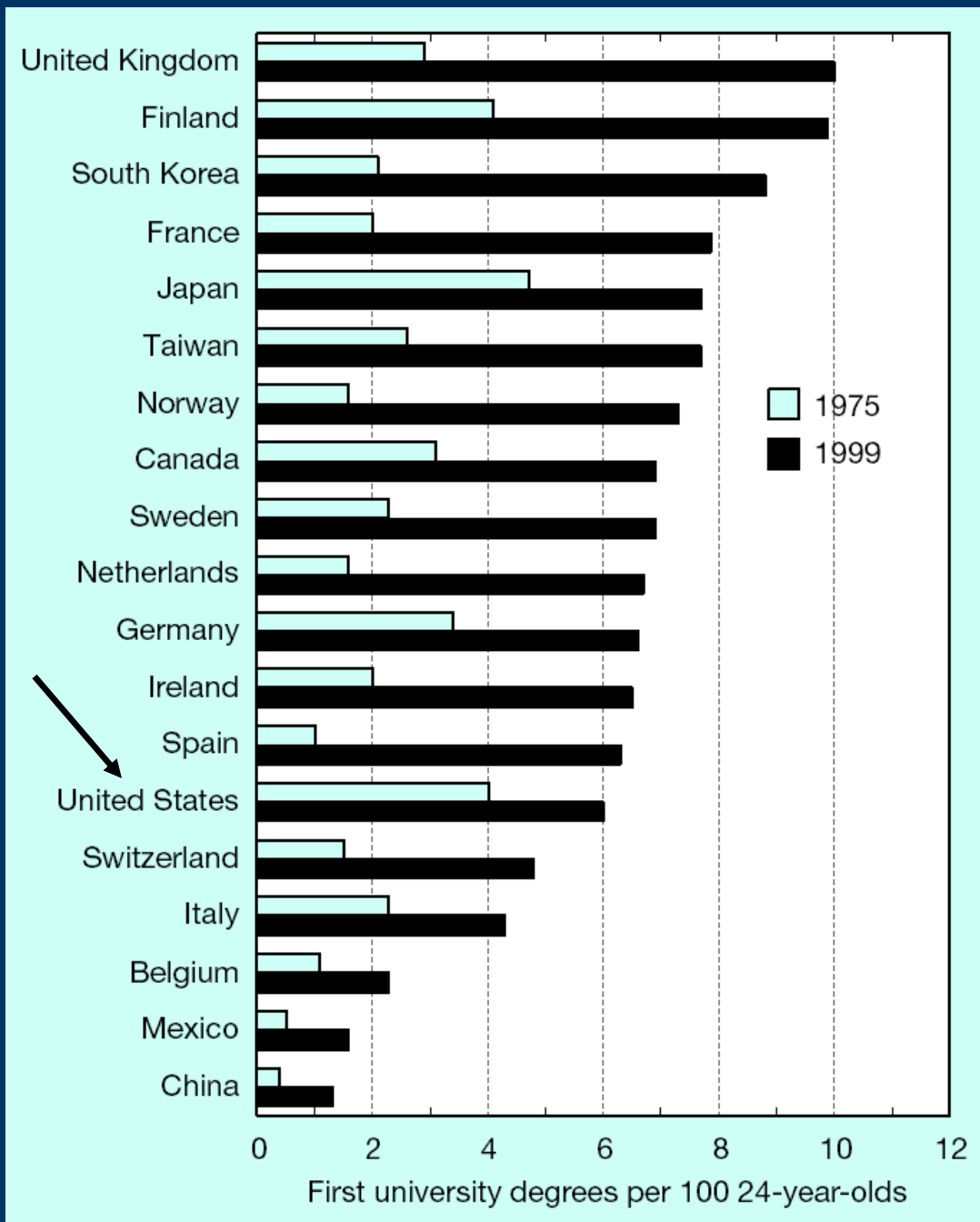


“It has proved impossible to predict reliably which areas of science will ultimately contribute to important new technologies.”

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

First university degrees in science and engineering per 100 24-year-olds

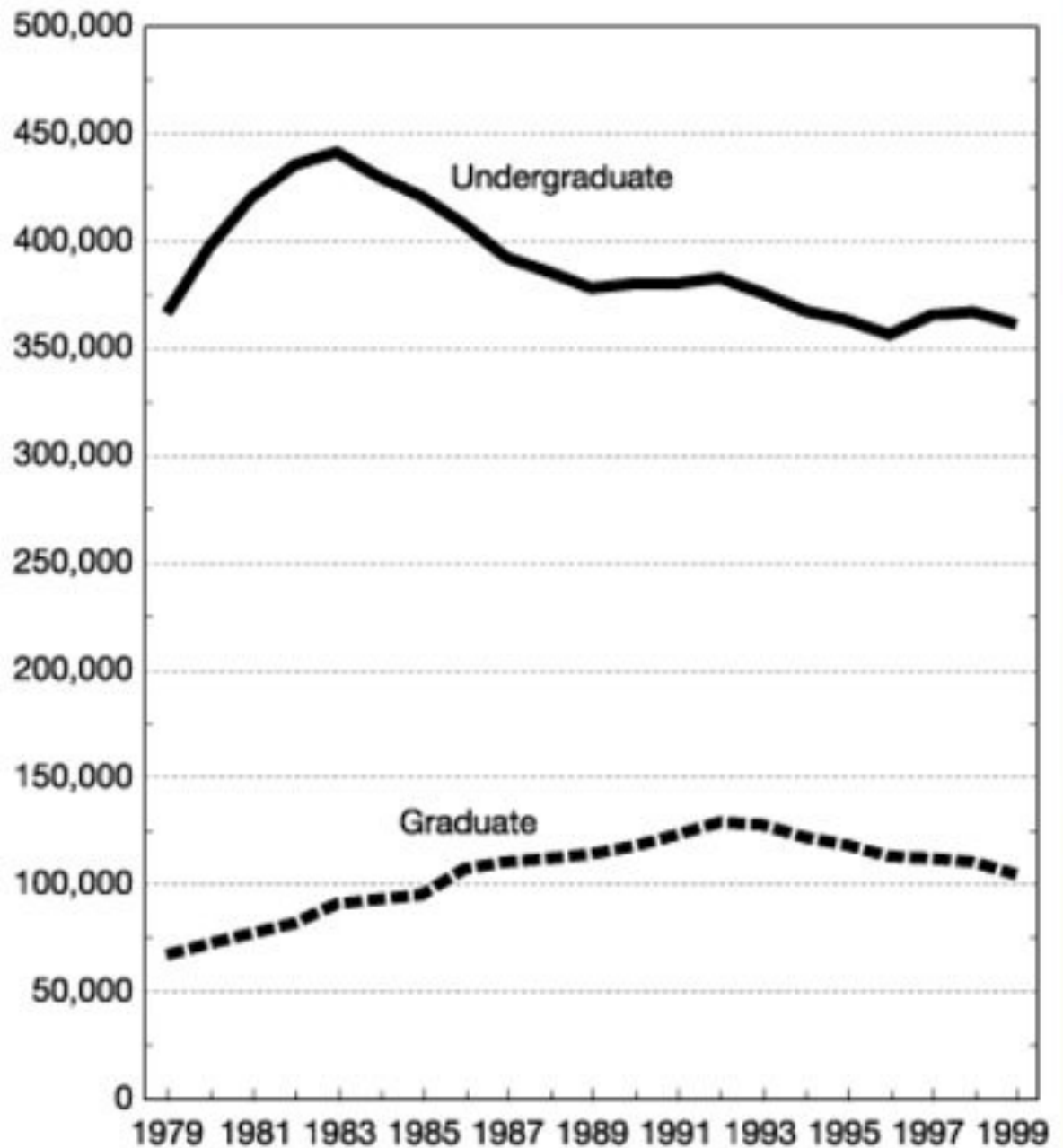
NSF Science & Engineering Indicators 2002



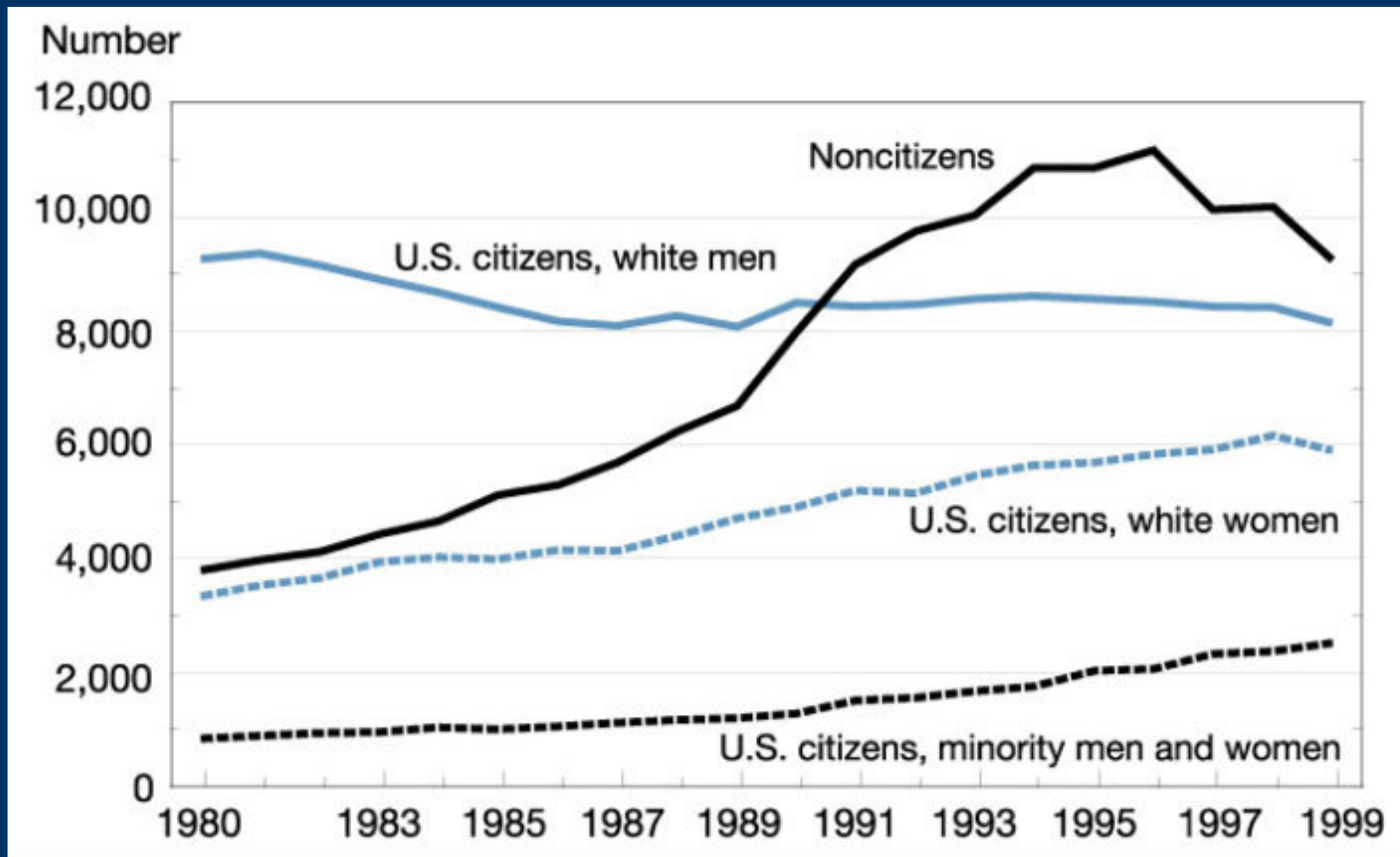
U.S. engineering enrollment

NSF Science &
Engineering Indicators
2002

Full- and part-time students

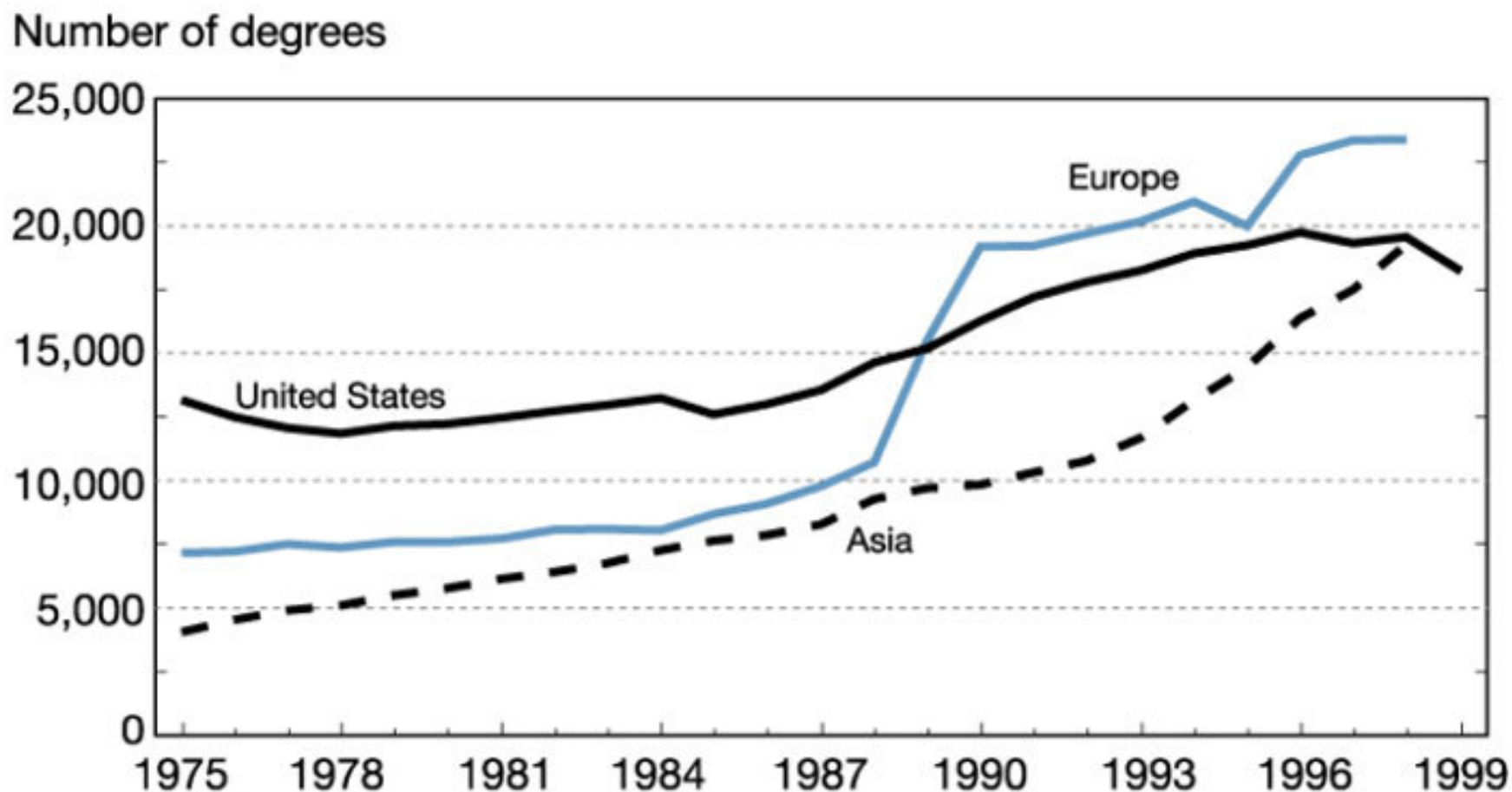


U.S. Science & engineering doctorates



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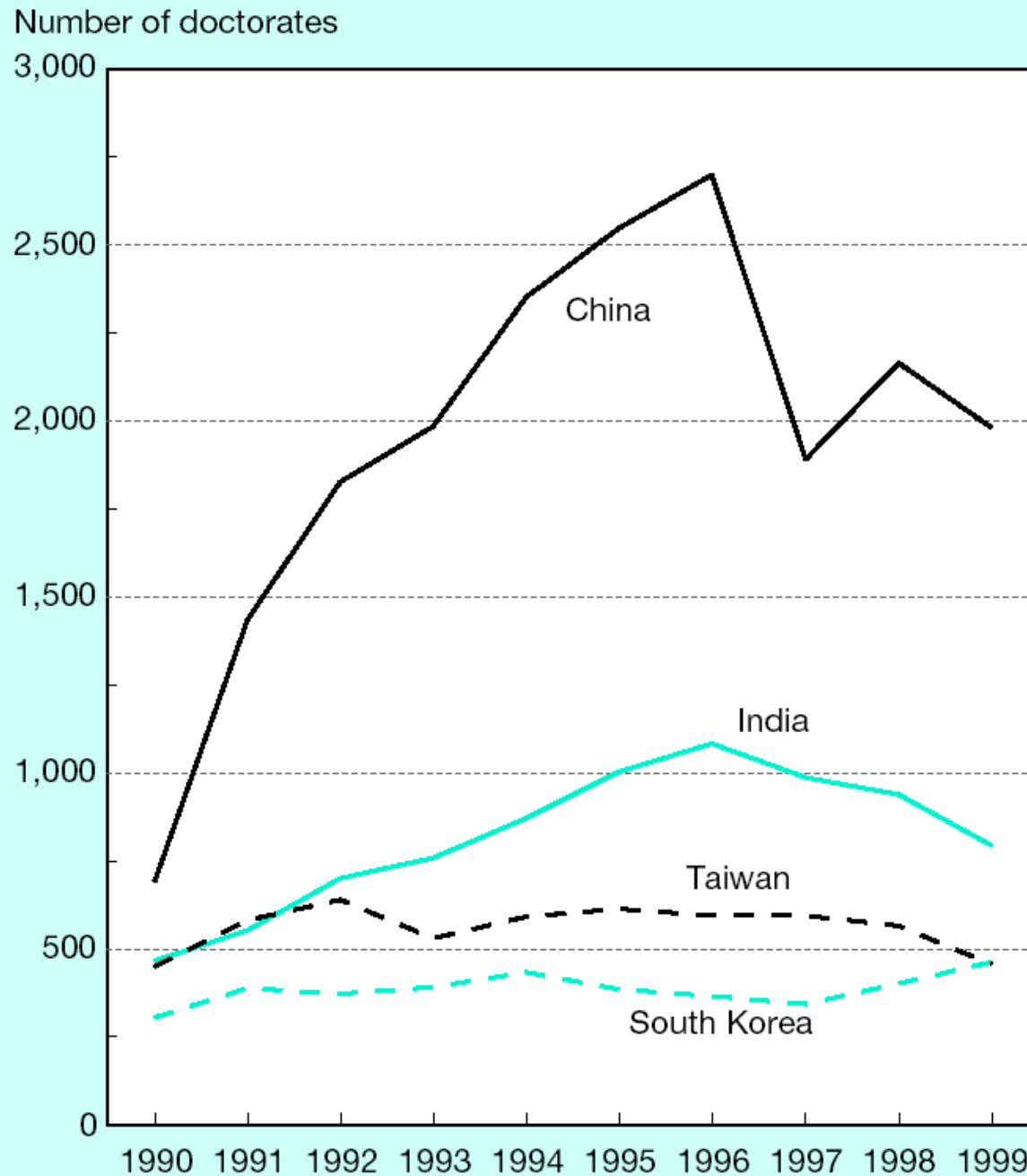
Doctorates in natural sciences & engineering



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

Doctoral students in science & engineering with plans to remain in the U.S.

NSF Science & Engineering Indicators 2002



“Trends in federal obligations for university research directly affect graduate enrollment because research funding supports graduate research assistantships. Moreover, trends in federal obligations for university-based research also indirectly affect graduate enrollment by shaping the job market in given research fields.”

Trends in Federal Support of Research and Graduate Education
National Research Council

“The open society, the unrestricted access to knowledge, the unplanned and uninhibited association of men [and women] 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.”

J. Robert Oppenheimer
Science and the Common Understanding
1954

