

The Case for Increasing Federal R&D Spending in the Physical Sciences, Engineering, and Mathematics

Prepared by

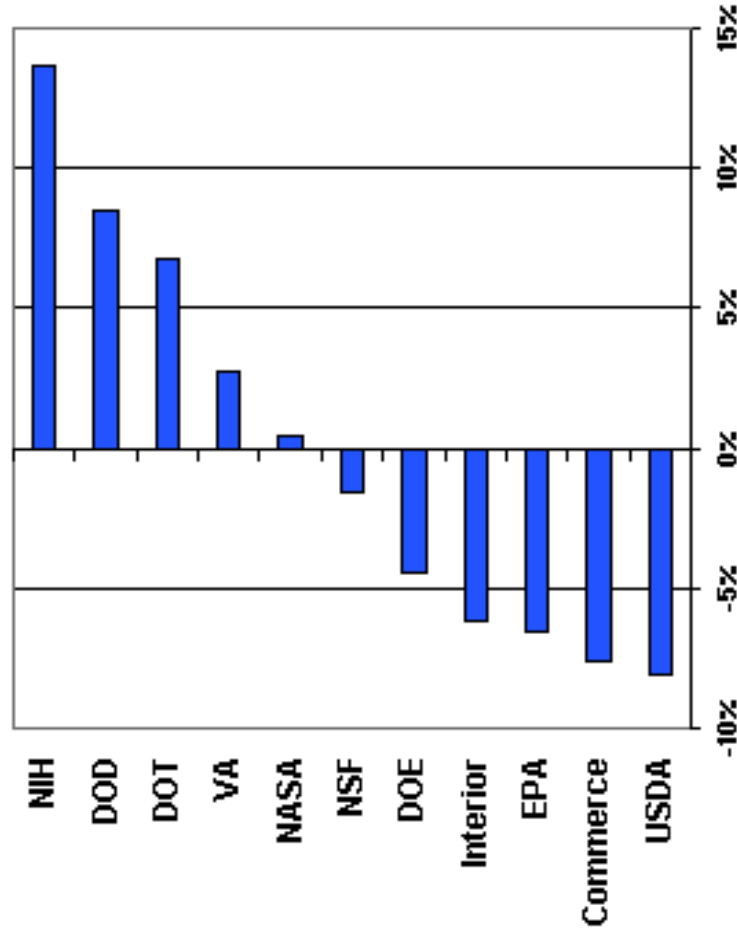
ASTRA

The Alliance for Science & Technology
Research in America



**How is R&D Funding Doing
This Year (FY2002)?**

FY 2002 R&D Request Percent Change from FY 2001



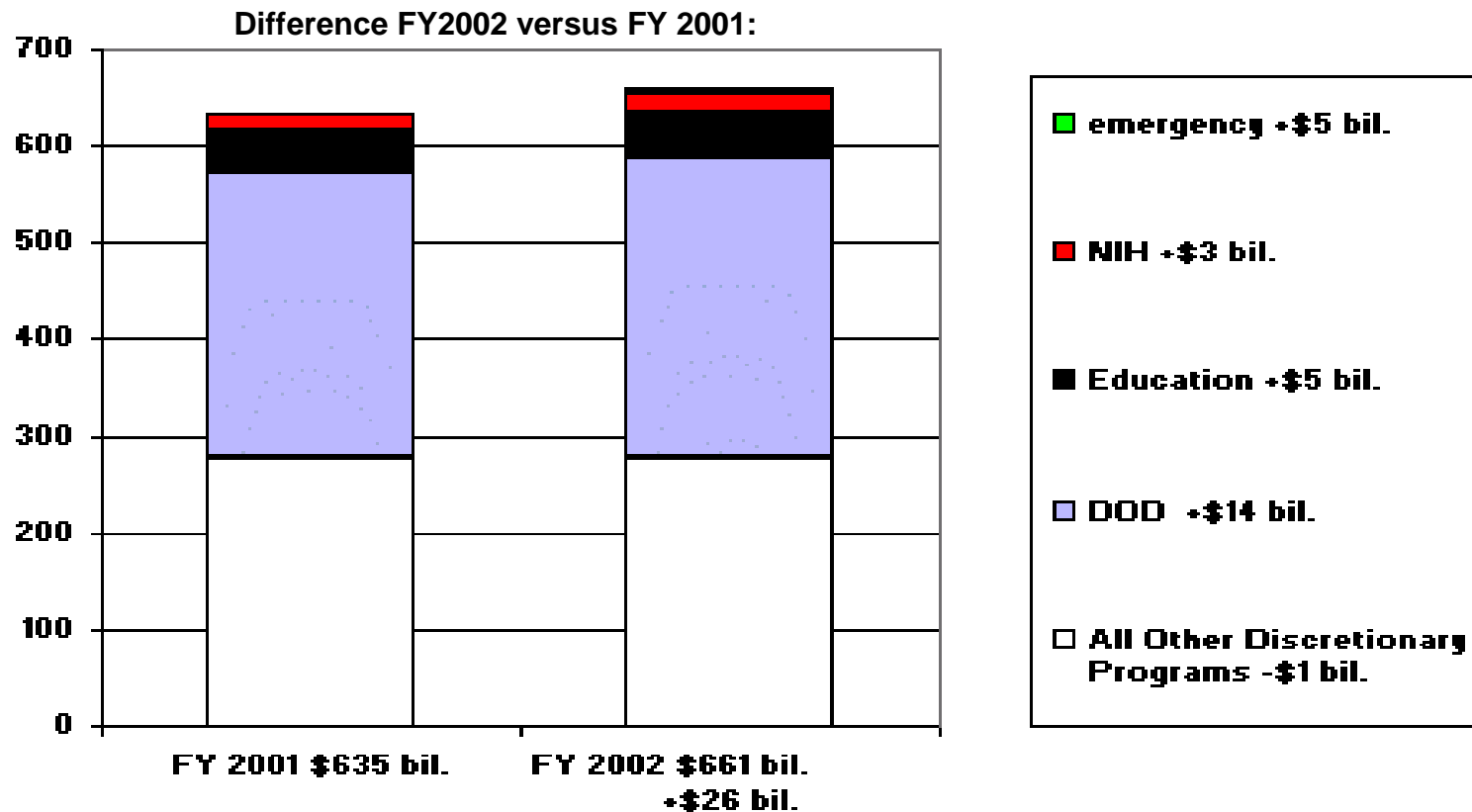
Source: AAAS, based on OMB R&D Budget Data and agency estimates for FY 2002.
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ADVANCEMENT OF SCIENCE

Discretionary Spending


FY 2001 to FY 2002, in billions of dollars



Source: Budget of the U.S. Government FY 2002
FY 2002 is President's proposal.
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The Appropriations Process

- President's budget = done
- Congressional budget = In process
- Cutting up the appropriations pie = \$602(B) allocations
- Letters to committee chairs
- Subcommittee bills and reports

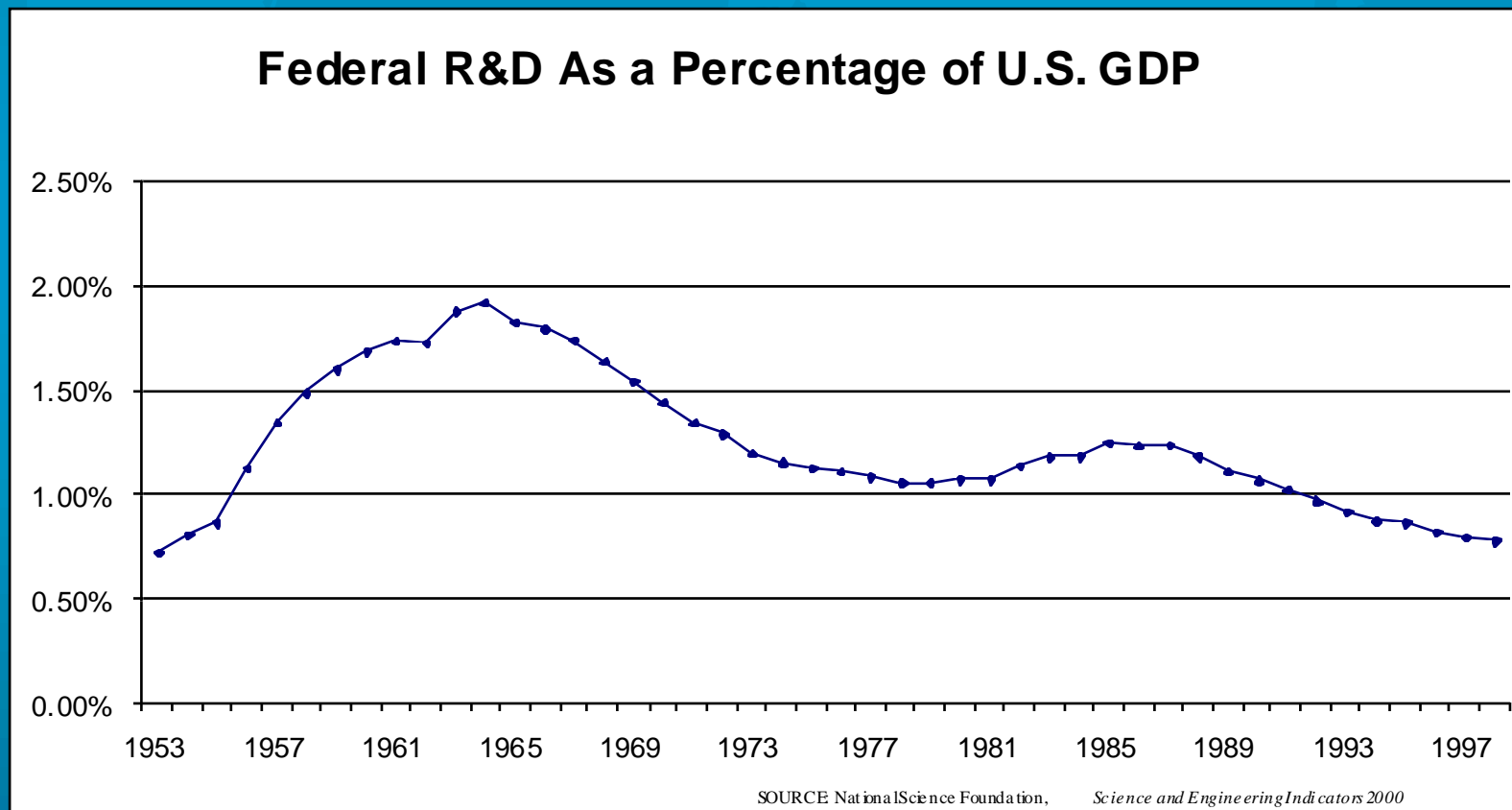


1) Federal R&D Funding Is Falling in Math and Physical Sciences.

2) Low Funding Contributes to Inadequate Future Workforce

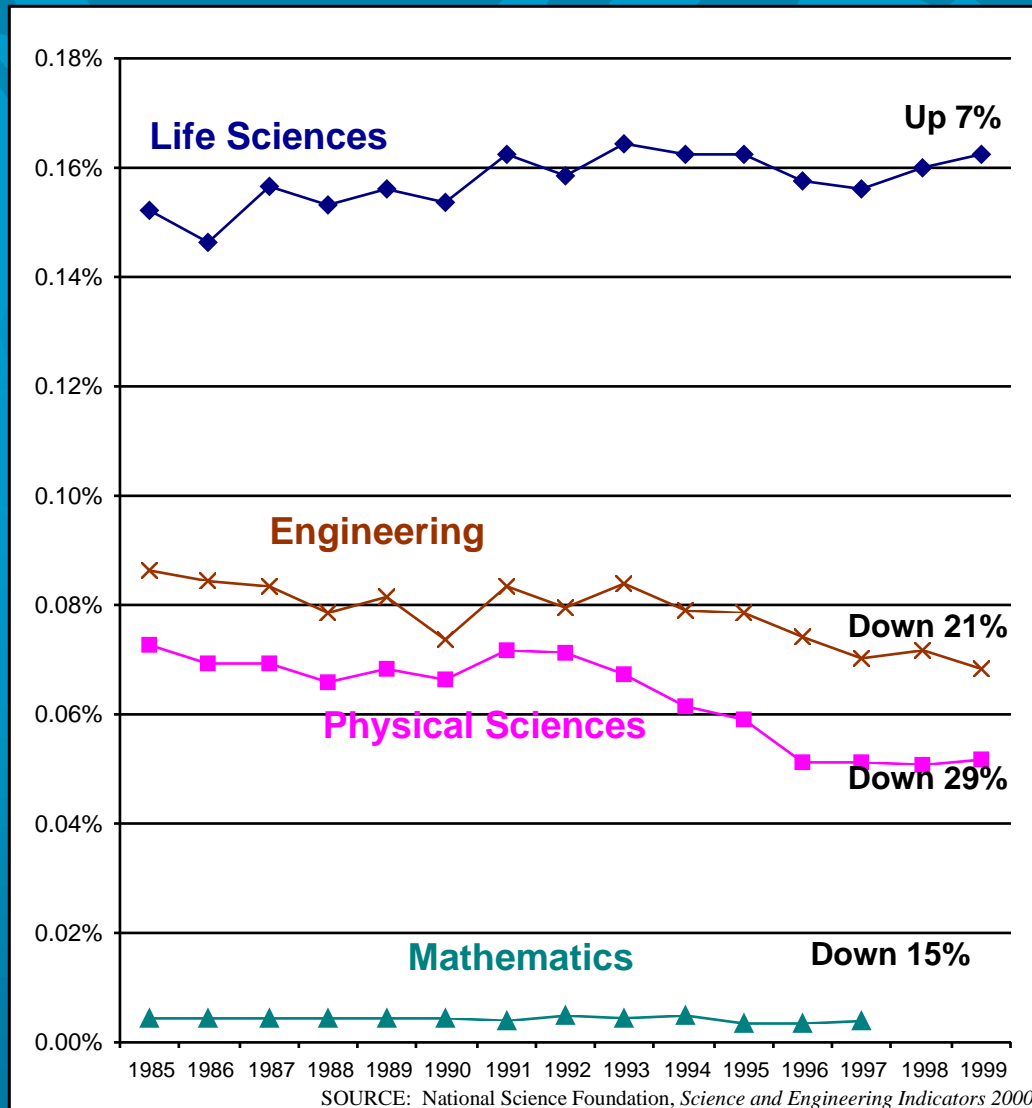
3) Low Funding & Workforce Shortages Occur As R&D Challenges Increase.

Federal R&D As a Percentage of GDP Is in Long Term Decline



Federal R&D As a Share of GDP

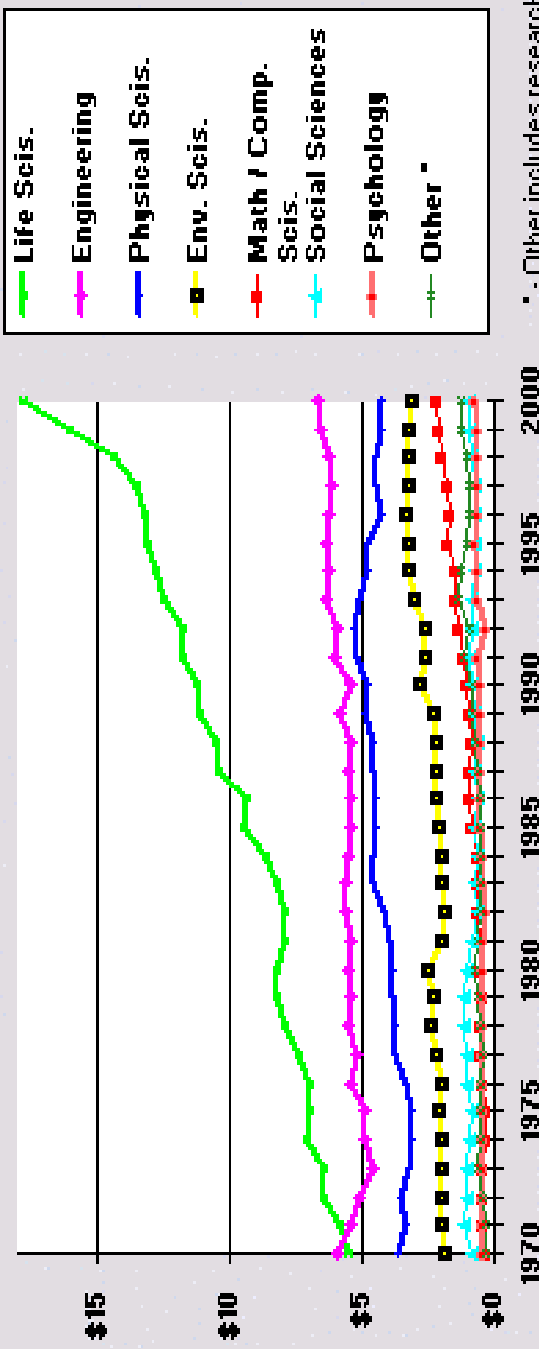
Life
Sciences
Up...



...Engineering,
Physical
Sciences,
and Math
Down

Trends in Federal Research by Discipline, FY 1970-2000

obligations in billions of constant FY 2001 dollars



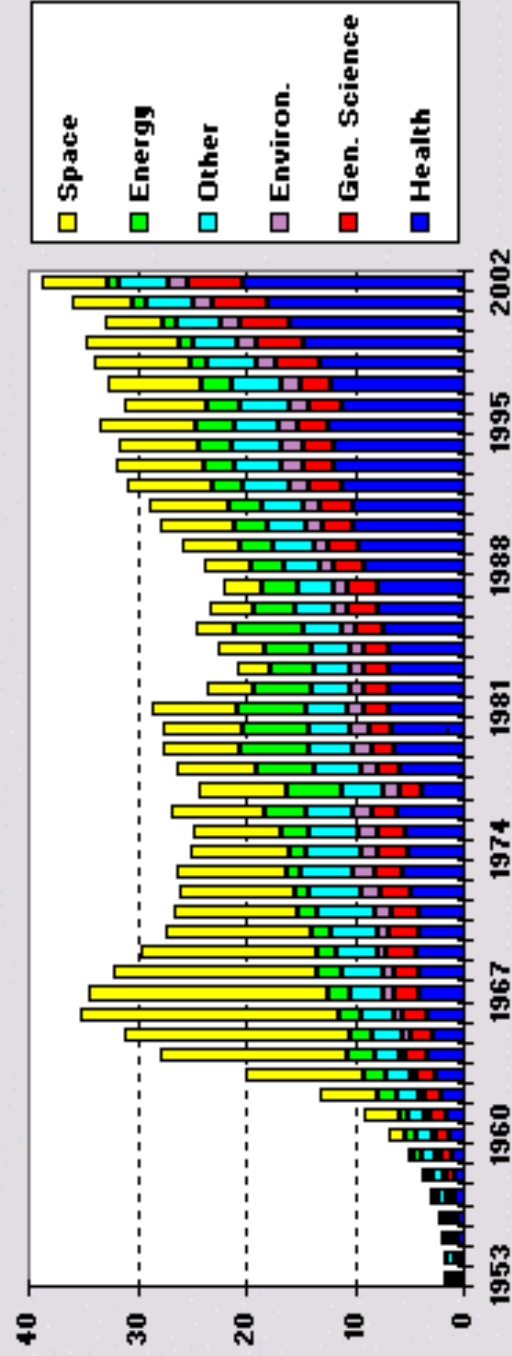
* - Other includes research not classified (includes basic research and applied research; excludes development and R&D facilities)

Source: National Science Foundation, *Federal Funds for Research and Development FY 1955, 2000, and 2001*, 2001. FY 2000 data are preliminary. Constant-dollar conversions based on OMB's GDP deflators. APRIL '01 © 2001 AAAS



Trends in Nondefense R&D by Function, FY 1953-2002

outlays for the conduct of R&D, billions of constant FY 2001 dollars




Source: AAAS, based on OMB Historical Tables in *Budget of the United States Government FY 2002*. Constant dollar conversions based on GDP deflators, FY 2002 is the President's request.

Note: Some Energy programs shifted to General Science beginning in FY 1998.

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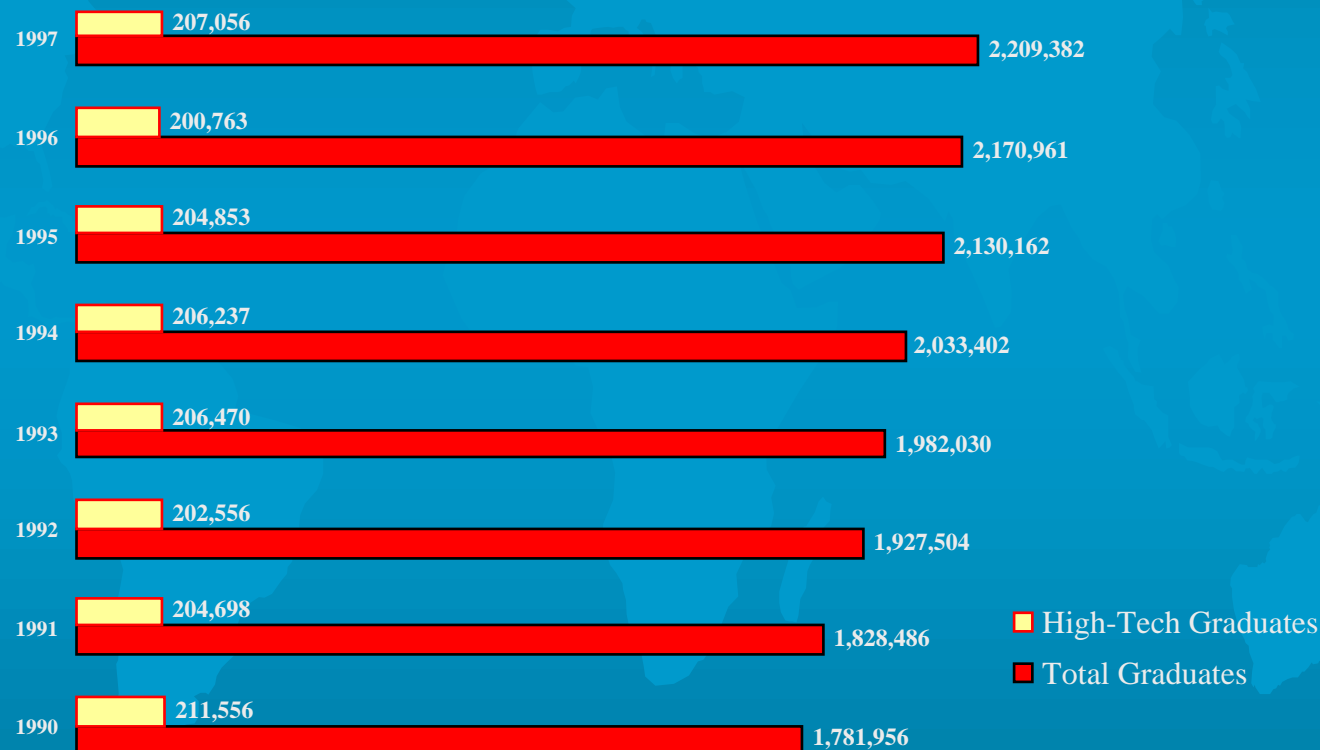
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**Low Funding Contributes to
Inadequate
Future Workforce**

Total Degrees V. High-tech Degrees

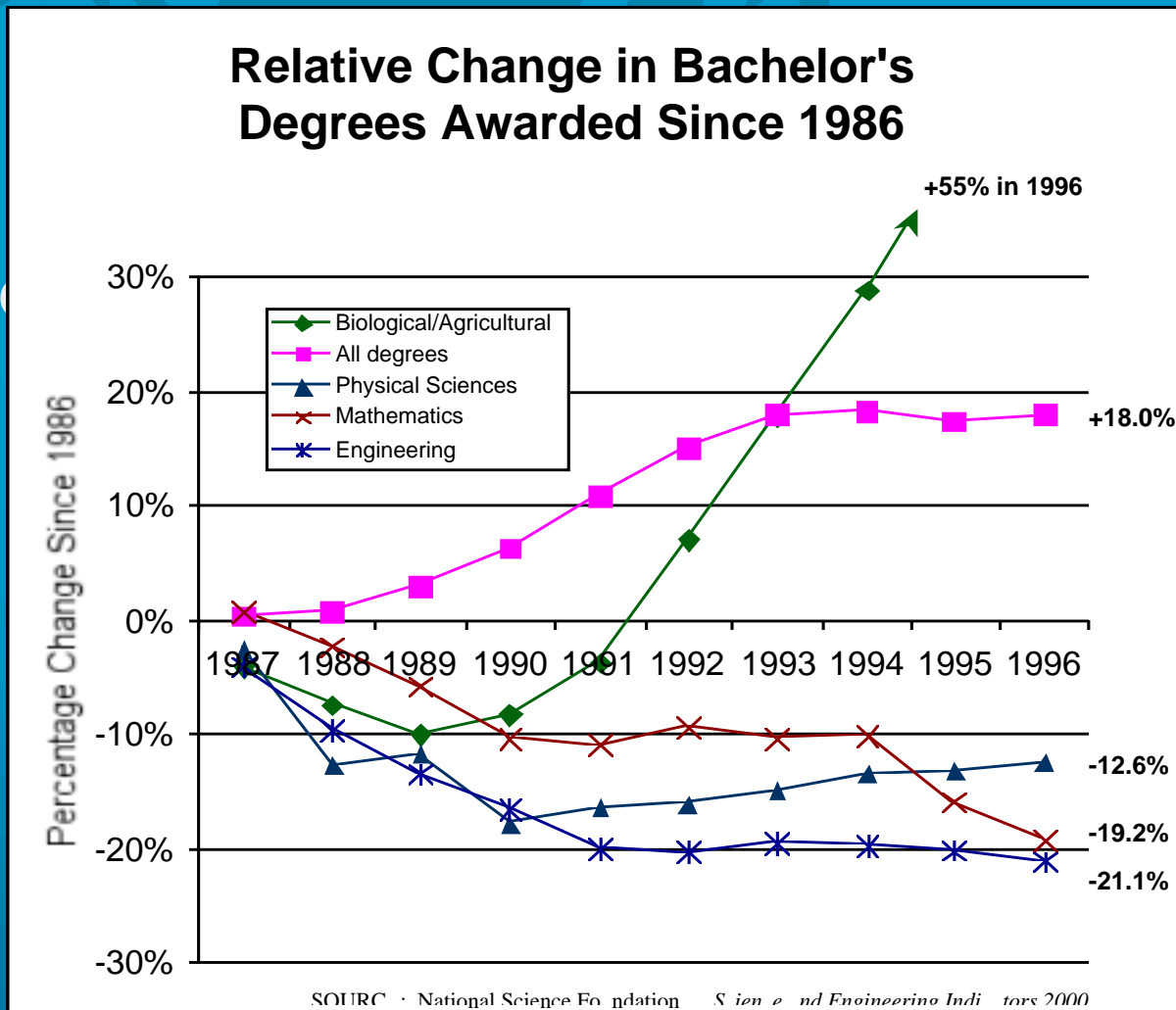
While the number of degrees earned since 1990 has increased 24%, the number of high tech degrees earned since 1990 has declined 2%



Source: U.S. Dept. of Education
National Center for Education Statistics

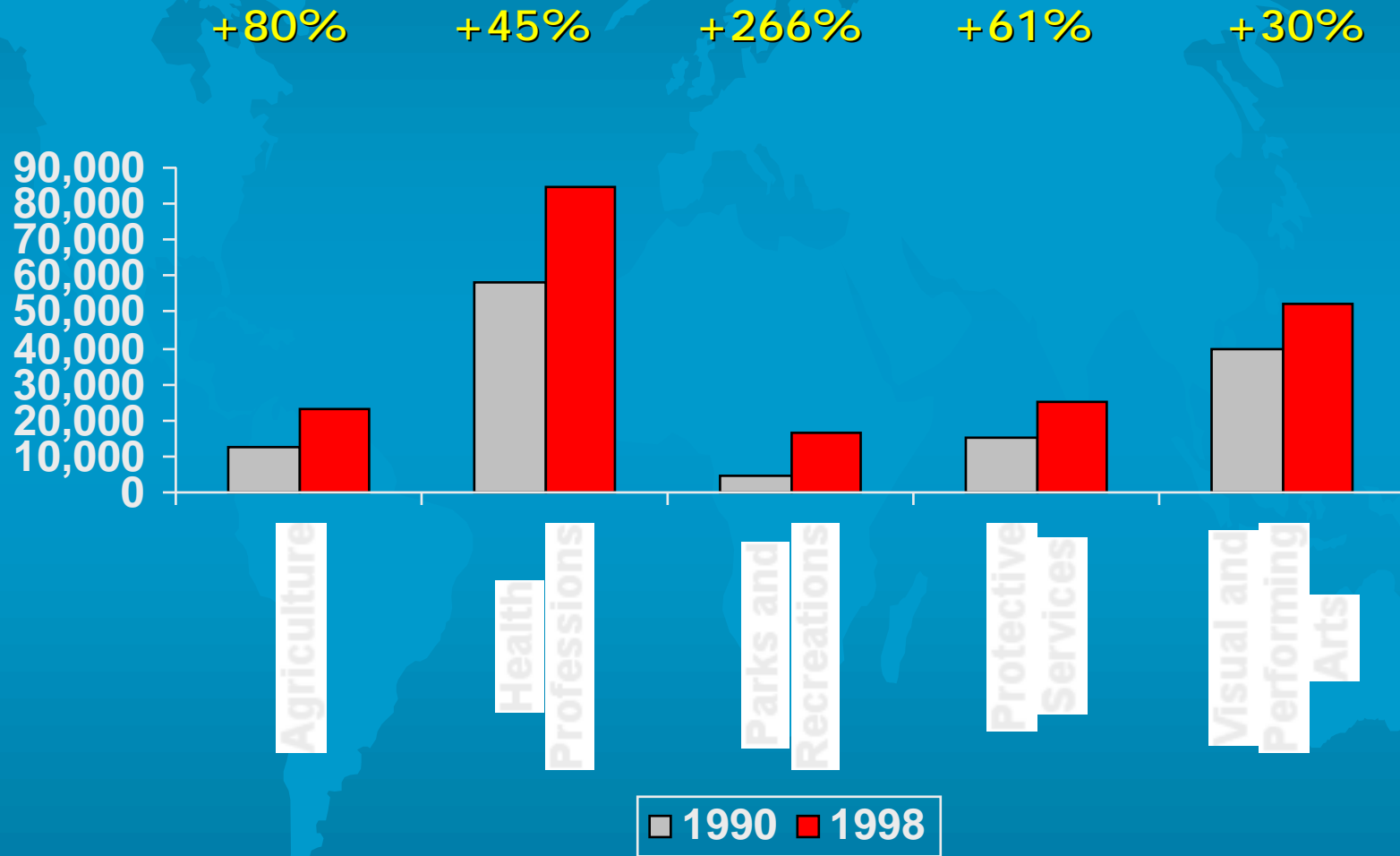
Bachelor's Degrees

Life
Science
Up...

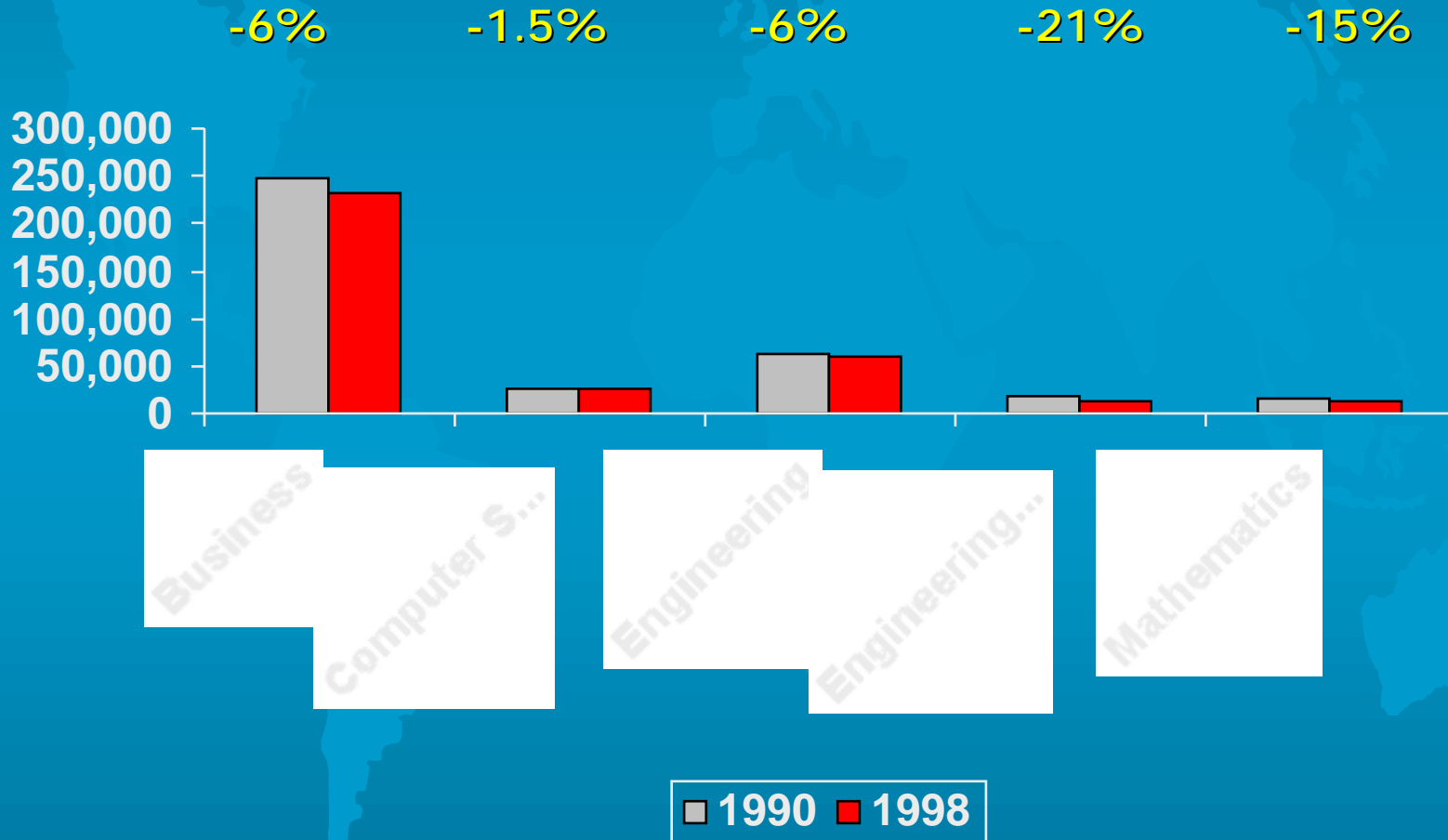


...Engineering,
Physical
Sciences,
and Math
Down

Bachelor Degree Comparisons 1990-98

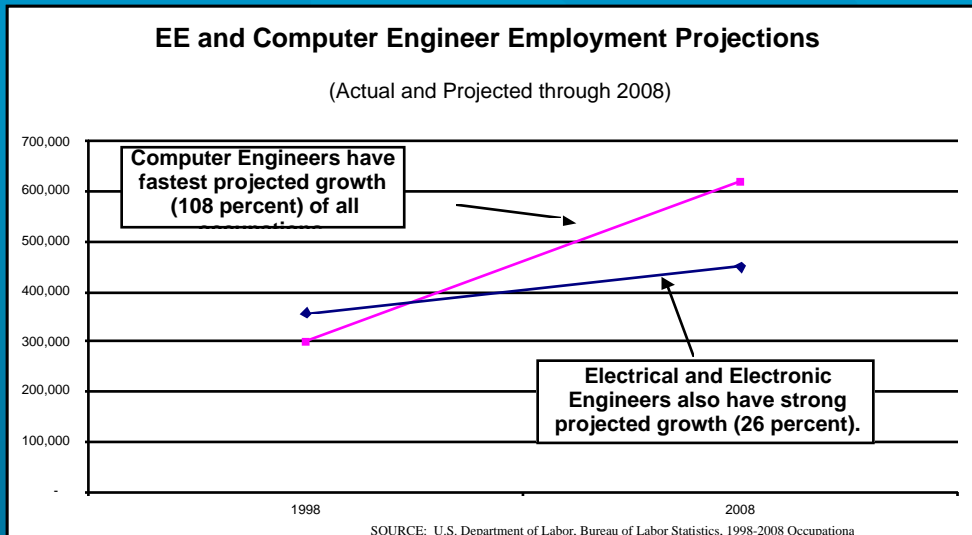
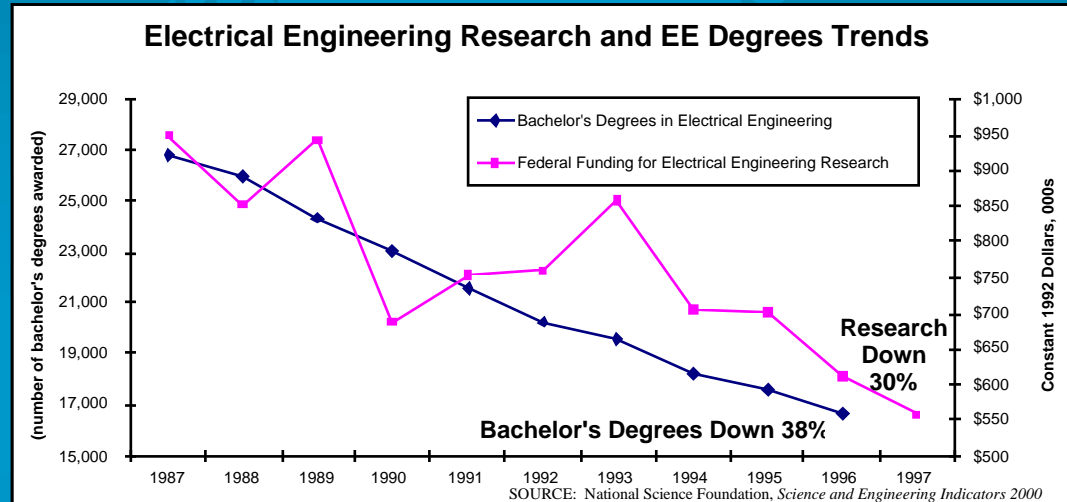


Bachelor Degree Comparisons 1990-98



Declining Federal Support for Research Exacerbates Decline in Production of Technically-trained Workers

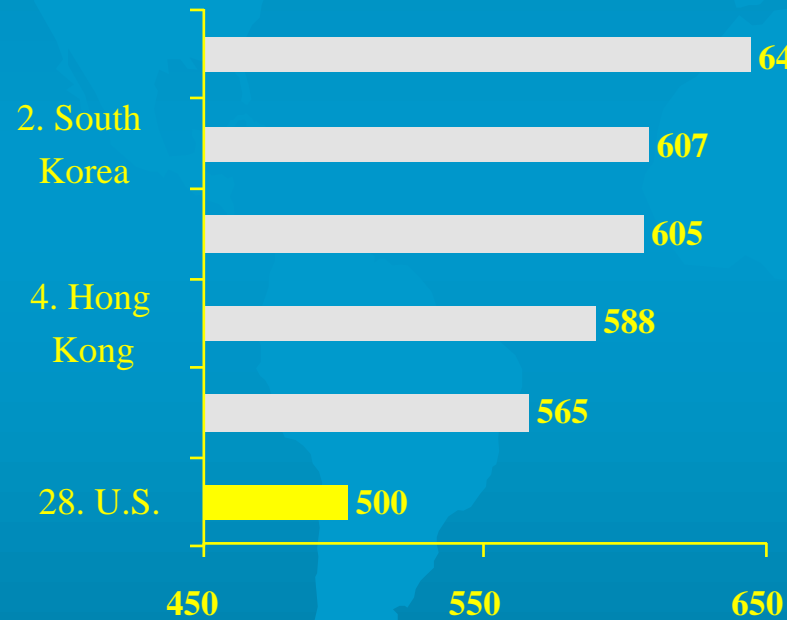
Electrical Engineering Research and EE Degree Production Are Down ...



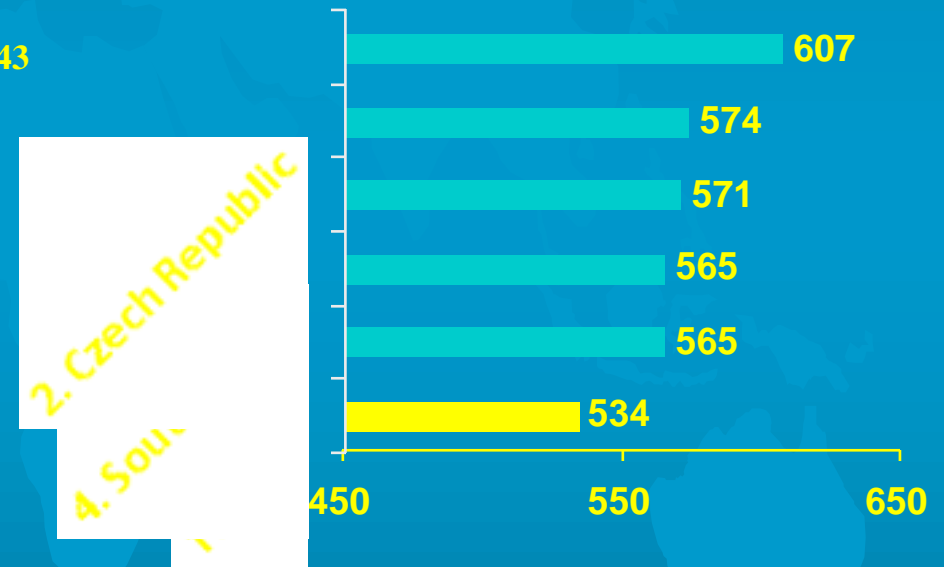
... While EE and Computer Engineer Employment is Projected to Increase Rapidly.

International Math and Science Proficiency Scores 8th Grade

Math



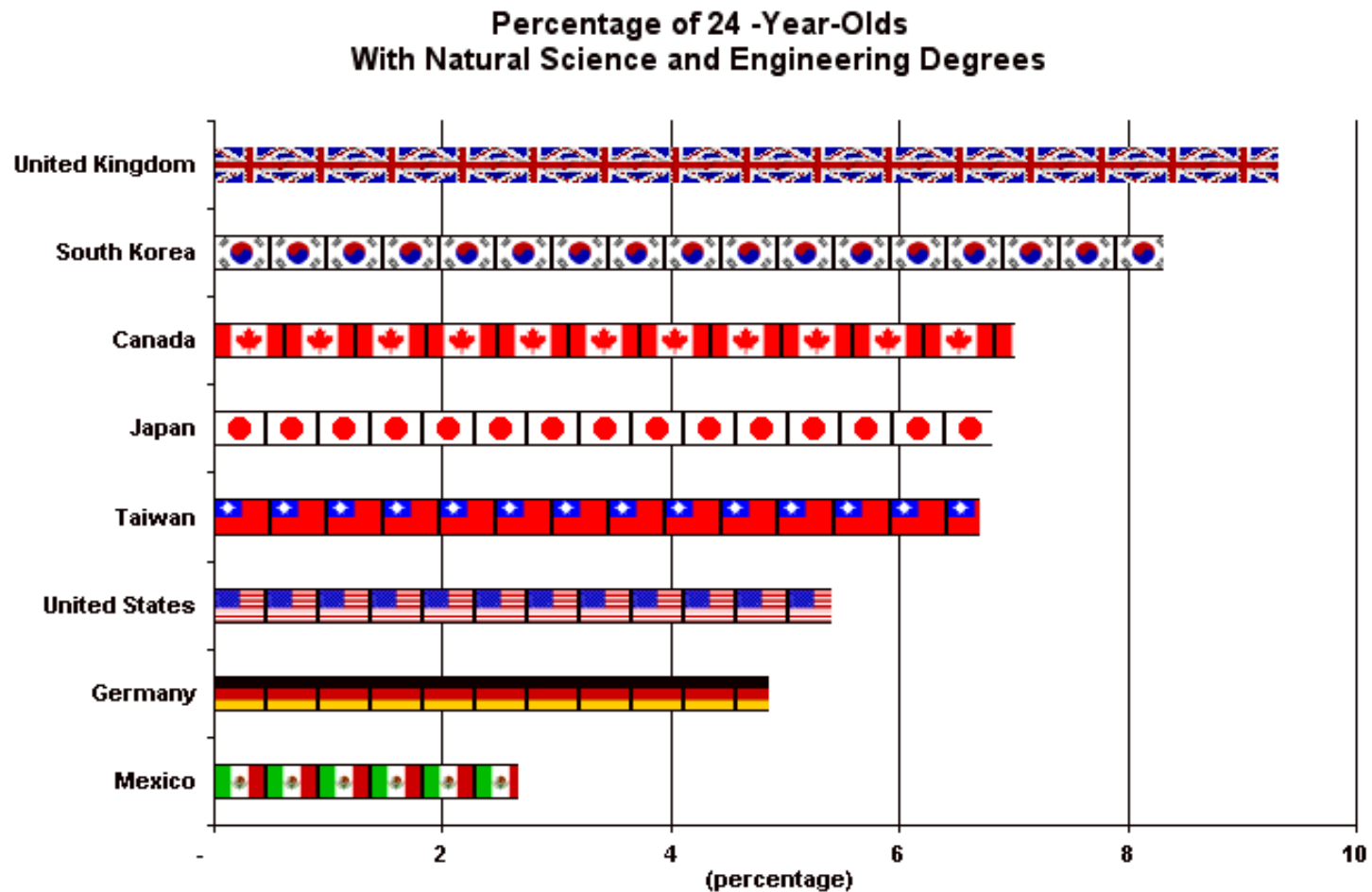
Science



Source: International Association for the Evaluation of Educational Achievement, Third International Mathematics and Science Study (TIMSS), 1994-95.

Global Competitiveness: Workforce

U.S. Lags Other Nations in Share of 24-year-olds With Natural Science, Engineering Degrees



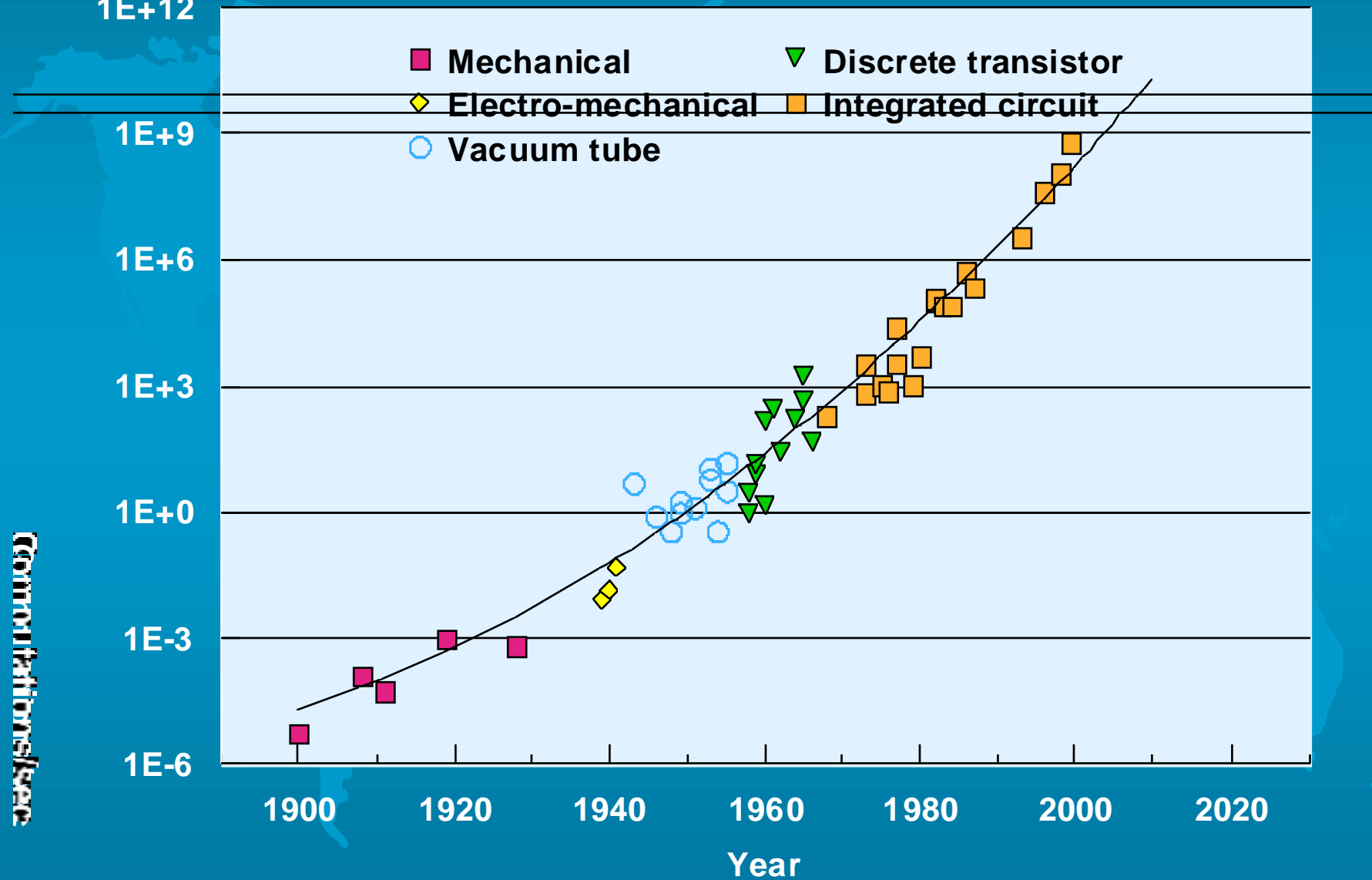
SOURCE: National Science Foundation, Science and Engineering Indicators 2000



**Your Story: Low Funding &
Workforce Shortages Occur As
R&D Challenges Increase.**

\$1000 Buys...

1E+12

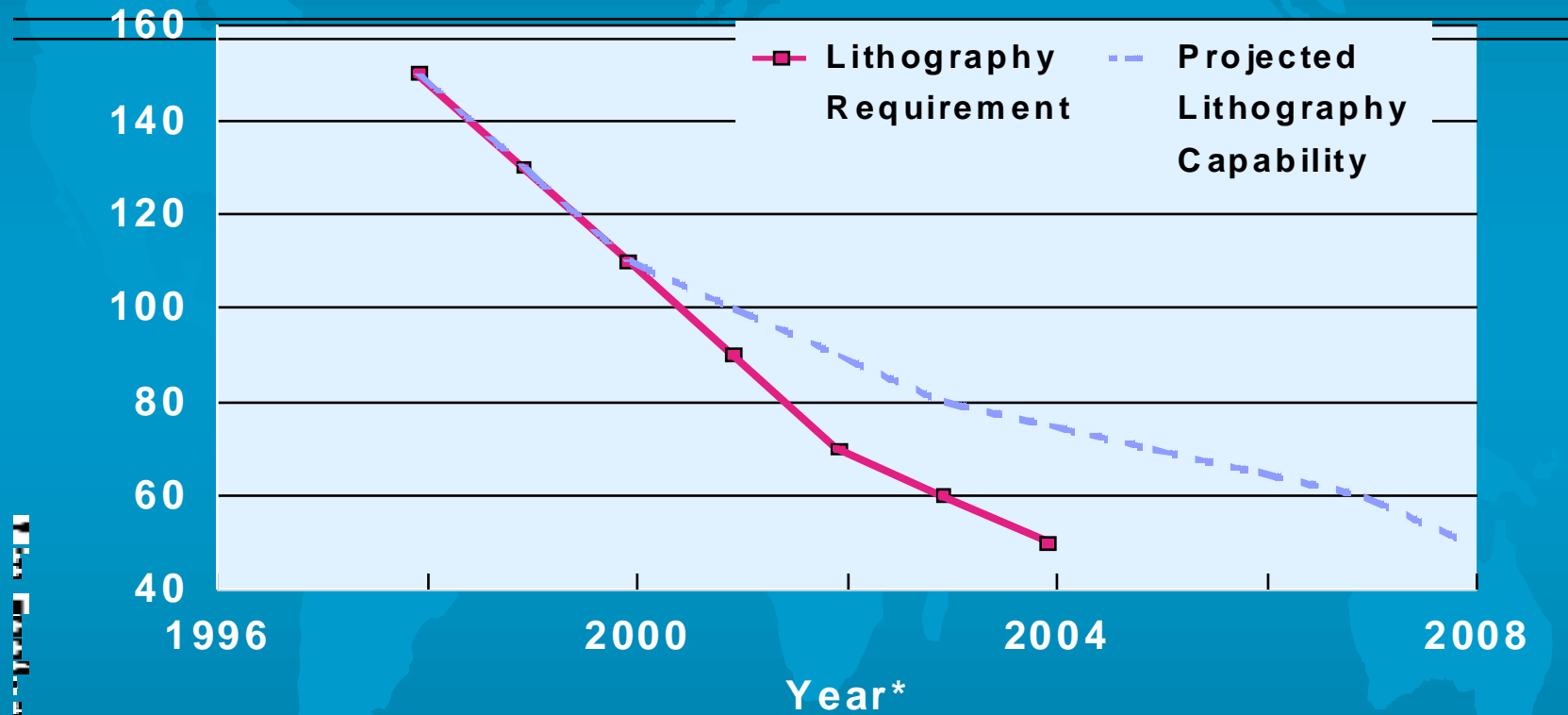


after Kurzweil, 1999 & Moravec, 1998

Components/cm²

Lithography Availability

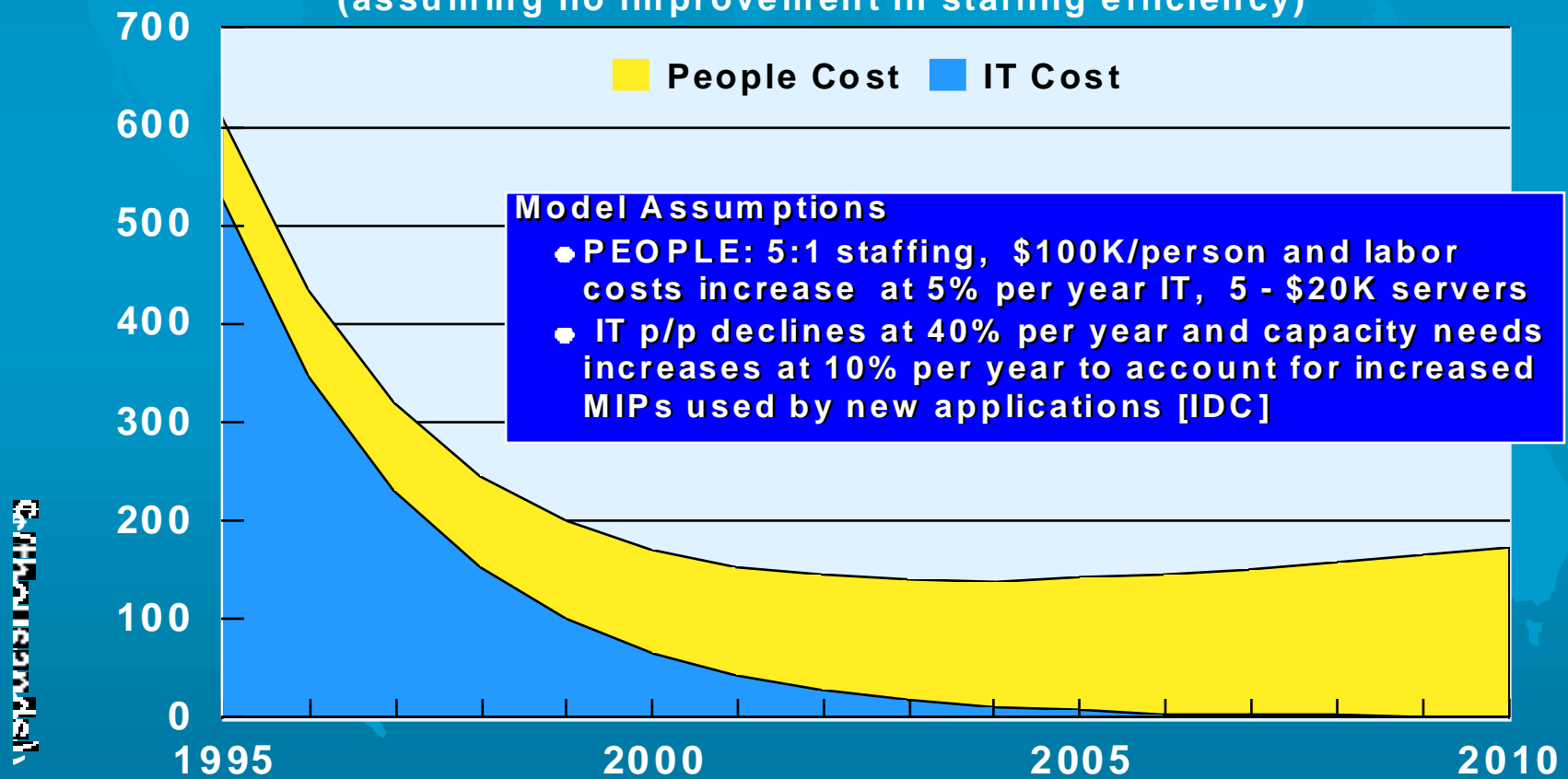
Lithography Availability Lags Requirements



*date required for development (T1 start)

Total Cost of Ownership of Applications / Servers

(assuming no improvement in staffing efficiency)



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- 1) Federal R&D Funding Is Falling in Math and Physical Sciences**
 - 2) Low Funding Contributes to Inadequate Future Workforce**
 - 3) Low Funding & Workforce Shortages Occur As Innovation Needs Increase**