Speakers:

**Daniel Reed**  
Chair, National Science Board (NSB)  
Presidential Professor of Computational Science and Professor of Computer Science and Electrical & Computer Engineering  
University of Utah

**Sylvia Butterfield**  
Acting Assistant Director  
Directorate for Social, Behavioral and Economic Science  
U.S. National Science Foundation

**Emilda Rivers**  
Director  
National Center for Science and Engineering Statistics

**Christina Freyman**  
Deputy Director  
National Center for Science and Engineering Statistics

**Maureen Condic**  
Chair, NSB Committee on National S&E Policy  
Associate Professor of Neurobiology and Anatomy  
University of Utah, School of Medicine
Science and Engineering Indicators

➢ The State of U.S. Science and Engineering: Talent, Discovery, and Translation

➢ Thematic reports on key topics

➢ State Indicators tool

National Science Board

https://ncses.nsf.gov/indicators
The U.S. performs more total R&D than any other country

But the nation’s global position is slipping, as countries in East and Southeast Asia, particularly China, increase their activities.

The nation's ability to compete in S&E depends on robust and sustained national investments in STEM talent, R&D-driven discovery, knowledge translation, and innovation.
# NCSES: Trusted Source of Objective Data on the S&E Enterprise

## A Variety of Data Sources

- NCSES official government statistics
  - University
  - Government
  - Business
  - Individuals
- Census, BLS, NCES, etc.
- International, OECD data
- Bibliometric data
- Patent data information

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[Image of NCSES official website]

[Image of NCSES publication cover: The State of U.S. Science & Engineering 2024]
Data From Across the Globe
Securely Liberating Data for You

Standard Application Process

National Secure Data Service
Discovery: Gross Domestic Expenditures on R&D

Gross domestic expenditures on R&D, by selected country or economy: 2000–21

- United States
- China
- Japan
- Germany
- South Korea
- United Kingdom
- France
- Taiwan

Billions of current PPP dollars

Year

S&E research publications, patents, and knowledge- and technology-intensive industry output are concentrated in the United States, East and Southeast Asia, and Europe.

China has significantly increased its share of global science, technology, and innovation capabilities over the last decade.
Translation: Publications

Figure 18. S&E articles, by selected region, country, or economy: 2003–22

- Rest of World
- China
- U.S.

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Translation: Highly Cited Publications

Highly cited article index, by selected country: 2003–20

- U.K.
- U.S.
- Germany
- China

Index

Publication year


China United States India Germany United Kingdom Japan
Translation: Global Network of AI Research Publishing
Translation: Patents

Patent Cooperation Treaty applications, by selected region, country, or economy: 2000–22

- China
- U.S.
Translation: Knowledge- and Technology-Intensive Industries

Value-added output of KTI industries, by selected region, county, or economy and by sector: 2012 and 2021

China: 33% ($2.4T) of global Knowledge and Technology Intensive manufacturing

U.S.: 39% ($1.3T) of global KTI services

Sector and year
- Rest of world
- Japan
- China
- EU-27
- United States
A globally competitive STEM education system equips Americans with the skills and knowledge needed to participate in the STEM workforce.

STEM workers with a broad range of educational credentials sustain the U.S. research enterprise and drive innovation in critical and emerging technologies, supporting the nation’s competitiveness in the global economy.
National Science Board: Vision for the Future

- Deliver Benefits From Research
- Expand the Geography of Innovation
- Foster a Global S&E Community
- Develop STEM Talent for America

https://www.nsf.gov/nsb/NSBActivities/vision-2030.jsp
The U.S. needs a robust, resilient STEM workforce for a strong economy and national security

But the nation is facing a STEM talent crisis

Strategic action is sorely needed across educational and workforce levels
Need for Robust, Resilient STEM Workforce

- STEM workforce: 37 million people
- With bachelor’s degree: 18 million
- Without bachelor’s degree (Skilled Technical Workforce): 19 million

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Leadership Risk: Talent Supply Chain

Foreign-born Share of Workers with a Bachelor’s Degree or Higher, by Highest Degree Level and Major Occupation: 2021

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Bachelor’s</th>
<th>Master’s</th>
<th>Doctorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All S&amp;E workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;E: Computer and Mathematical Scientists</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S&amp;E: Engineers</td>
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</table>
Leadership Risk: PreK-12 STEM Education

Average Scores of 8th Grade Students on the Main NAEP Mathematics Assessment, by Race, Ethnicity, and Eligibility for Free or Reduced School Lunch: 2022

**Eligible**
- Asian: 315
- White: 291
- Two or More Races: 288
- Native Hawaiian or Pacific Islander: 277
- American Indian or Alaska Native: 272
- Hispanic or Latino: 271
- Black or African American: 264

**Basic**
- Two or More Races: 262
- Hispanic or Latino: 257
- Native Hawaiian or Pacific Islander: 256
- American Indian or Alaska Native: 250
- Black or African American: 248

**Proficient**
- Asian: 289
- White: 268

National Assessment of Educational Progress (NAEP) mathematics assessment for 8th graders. NAEP achievement levels are defined as Basic: 262-298; Proficient: 299-332; Advanced: 333-500. NAEP is a congressionally mandated program administered by the National Center for Education Statistics and overseen by the National Assessment Governing Board.
Leadership Risk: the Missing Millions

Missing Millions: Closing the Diversity Gap in the S&E Workforce by 2030

Over the past decade, the United States has seen significant growth in underrepresented groups in the science & engineering (S&E) workforce. However, the National Science Board is urging an even swifter expansion to create a more diverse workforce that mirrors the U.S. population and meets the demands of 2030.

- S&E Workforce 2023
- Additional S&E Workers Needed by 2030

**Women**
- 1.8M
- 2.5M

**Hispanic or Latino**
- 1.1M
- 725K

**Black or African American**
- 662K
- 442K

**American Indian or Alaska Native**
- 51K
- 12K

**Persons With Disabilities**
- 31K
- 957K

*Visual (30%), Cognitive (29%), Hearing (26%), Lifting (8%), and Walking (7%) disabilities

Source: Estimates are based on projections from the U.S. Census and Bureau of Labor Statistics, together with data from the National Center for Science and Engineering Statistics, and assume that participation of these groups in the S&E workforce increases at current rates.
Opportunities for Action

People like me don't belong in STEM

I wish I could stay, but it's too hard to get a visa

College is too expensive

Our school only has one science teacher

I can't support my family on a grad student stipend
Strategic Action: Access to Higher Education

- Increase scholarships for low-income individuals (e.g., S-STEM)
- Initiate national service programs (e.g., Defense Civilian Training Corps)
- Increase Pell grant amounts to reflect the current cost of education
- Build out capacity at community colleges, Minority Serving Institutions (MSIs), and Emerging Research Institutions (ERIs)

For STEM Doctoral Students
- Expand graduate fellowship programs, with an emphasis on critical and emerging technologies
- Increase doctoral stipends & annually adjust for inflation
- Provide doctoral students with benefits
Strategic Action: Emerging Science Partners

International S&E Students on Visas Enrolled in U.S. Higher Education Institutions, by Level of Enrollment: 2012-22

- Associate's
- Bachelor's
- Master's
- Doctorate

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Strategic Action: Emerging Science Partners

Number of S&E Master's & Doctorate Students (Top Countries)

- India
- China
- Bangladesh
- South Korea
- Nigeria
- Iran
- Taiwan
- Canada
- Nepal
- Saudi Arabia
- Ghana
- Pakistan
- Turkey
- Vietnam
- Brazil
- Mexico
- Colombia
- Sri Lanka
- Egypt
- Japan
- Italy
- France
- United Kingdom

- Orange: Master's, Low and Middle-Income Countries
- Red: Doctoral, Low and Middle-Income Countries
- Blue: Master's, High-Income Countries
- Dark Blue: Doctoral, High-Income Countries
Strategic Action: Skilled Technical Workforce

THE SKILLED TECHNICAL WORKFORCE:
Crafting America’s Science & Engineering Enterprise
A Bedrock for the Nation’s R&D Enterprise

With a robust and concerted effort to close the STEM talent gap - preK-12, higher education, the Skilled Technical Workforce, international talent - the U.S. can fully lean into longstanding, strategic approaches to ensure it remains a global S&E discovery powerhouse.
A Bedrock for the Nation’s R&D Enterprise

- Invest in basic research
- Identify “under the radar” discoveries and opportunities
- Invest in critical and emerging technologies

National Science Board
Talent is the Treasure
Keep in Touch

https://www.nsf.gov/nsb/

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