

# FRONTIERS OF ENGINEERING EDUCATION

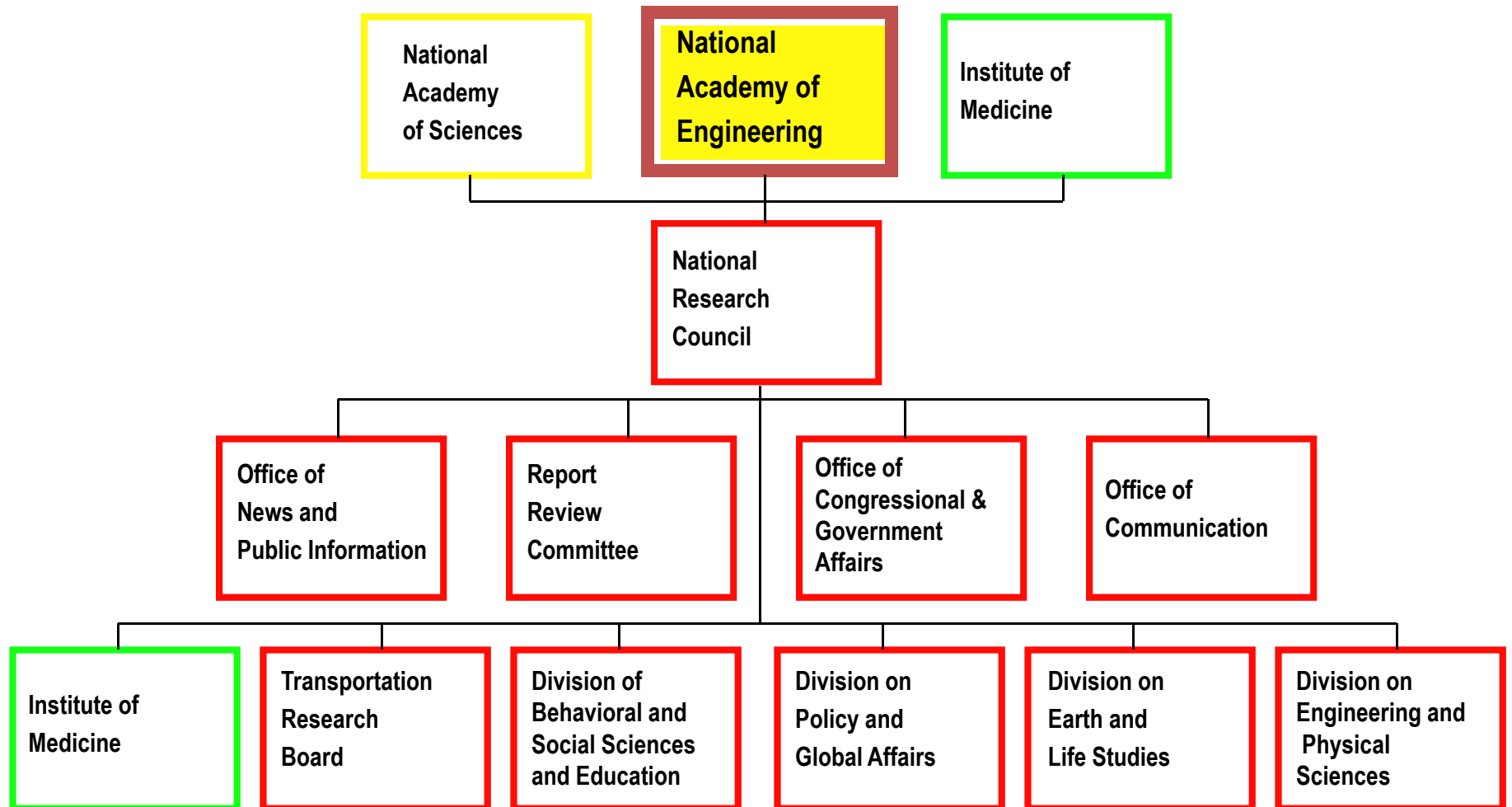
*Creating Opportunity in a Changing  
and Uncertain World*

**Charles M. Vest**  
**President, U.S. National Academy of Engineering**

Beckman Center  
Irvine, CA  
Nov. 14, 2011

Who are we?

# National Academies Organization



# National Academies Scale

National  
Academy  
of Sciences

National  
Academy of  
Engineering

Institute of  
Medicine

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Members: 2136  
Foreign Assoc.: 400

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**Members: 2220**  
**Foreign Assoc.: 193**

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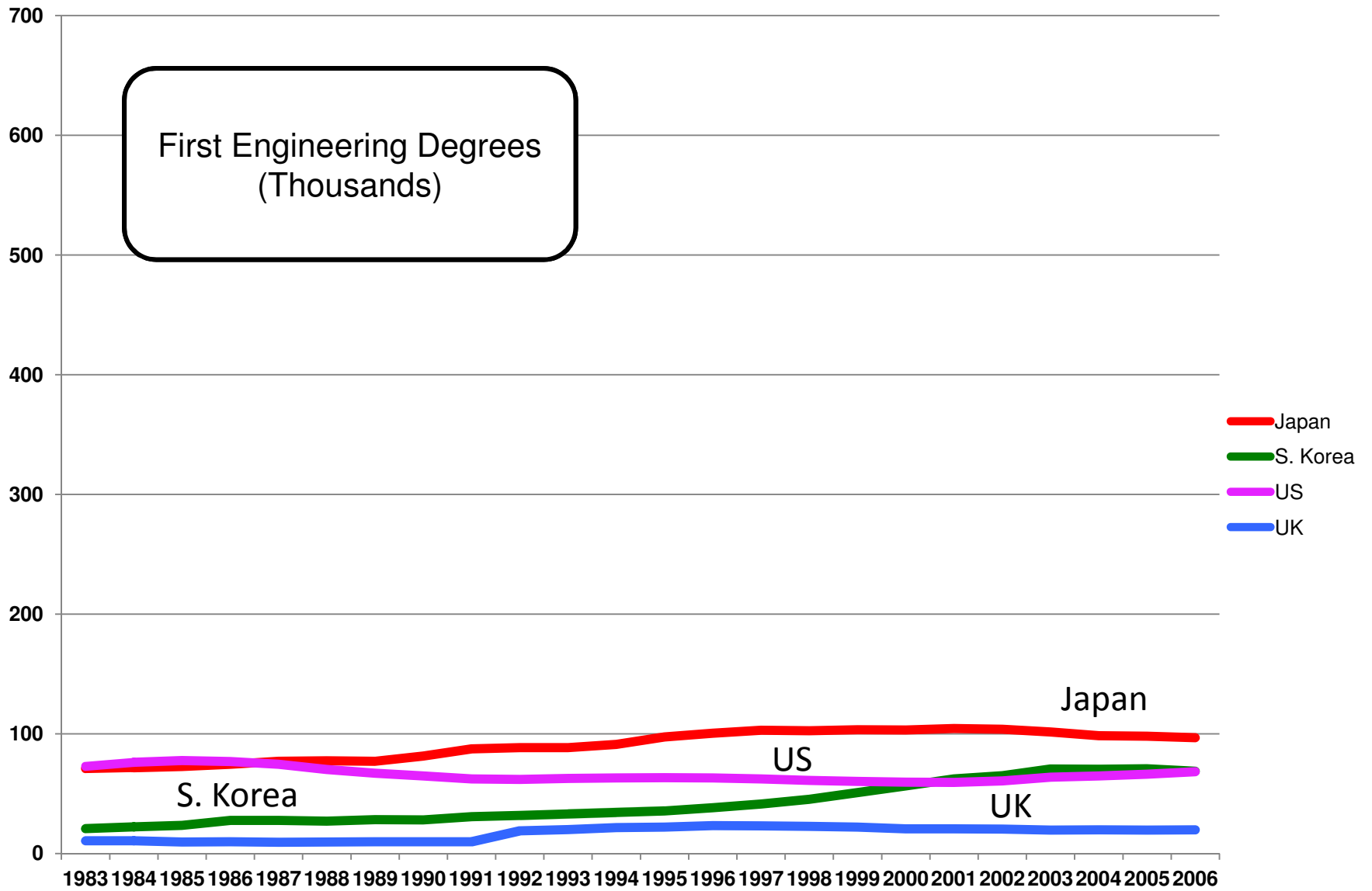
Members: 1722  
Foreign Assoc.: 97

National  
Research  
Council

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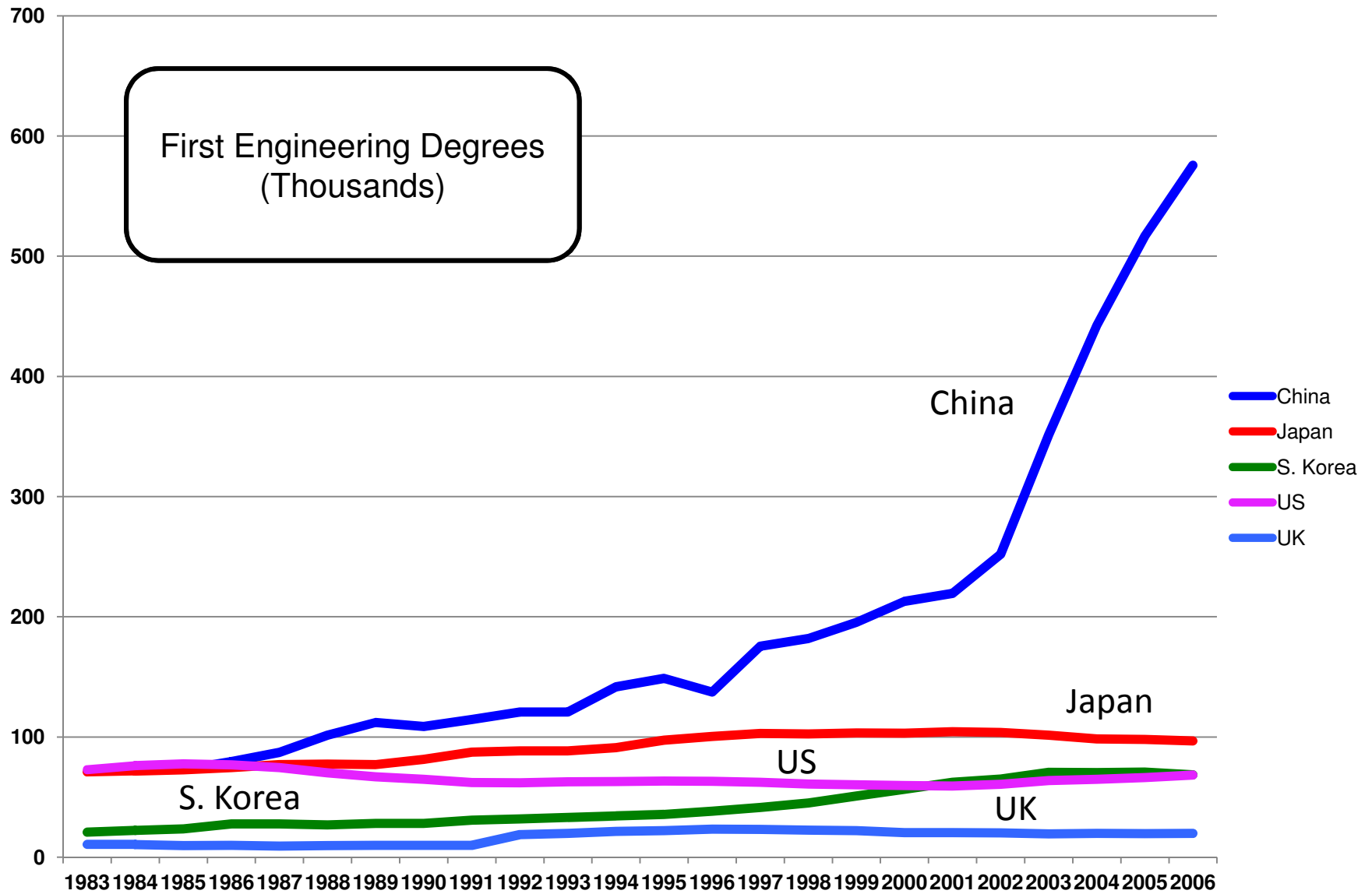
Committees: 614  
Volunteers: 6477  
Reports: 234

Why are we here?



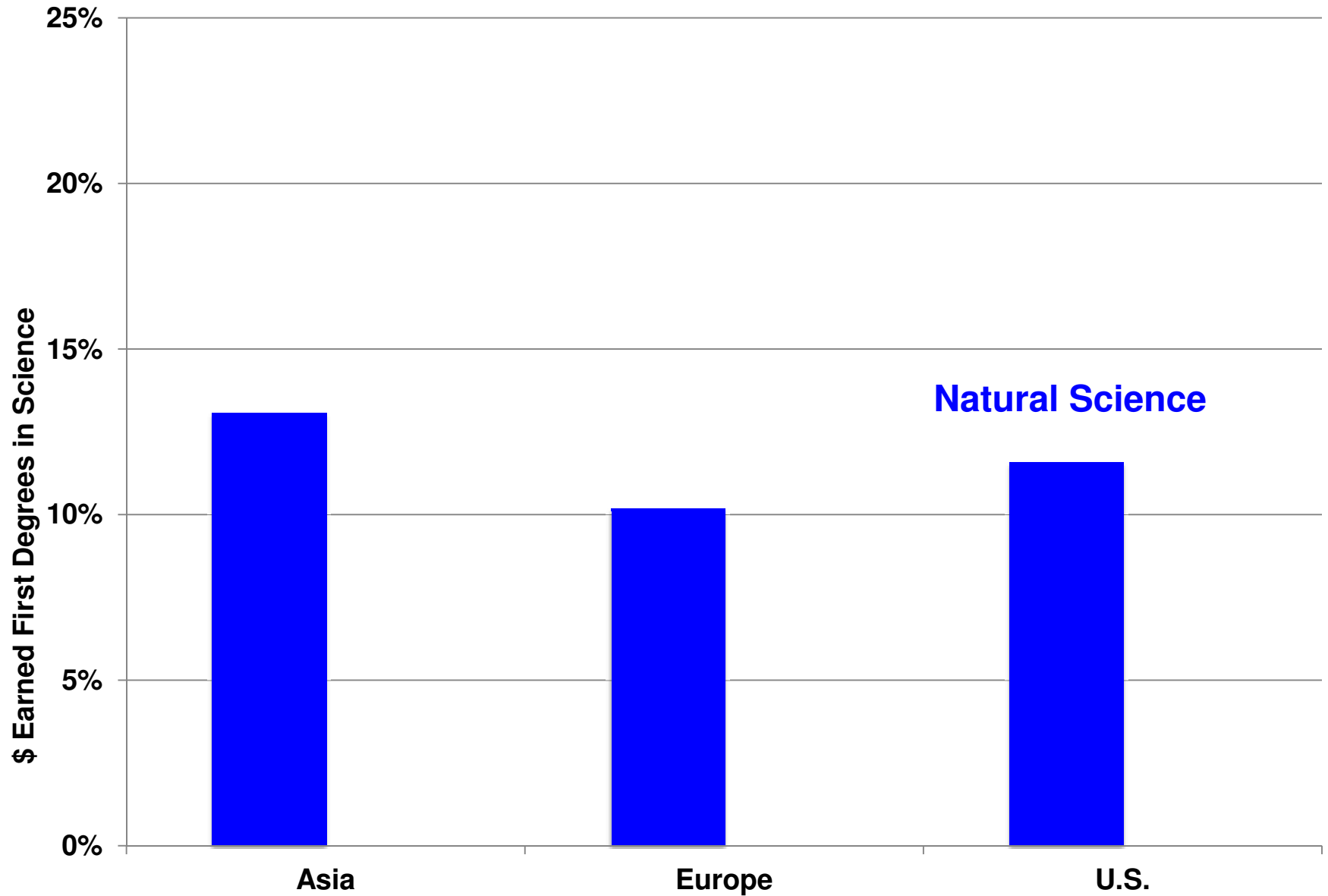
Source: NSF Science and Engineering Indicators, 2010

# China Rises



Source: NSF Science and Engineering Indicators, 2010

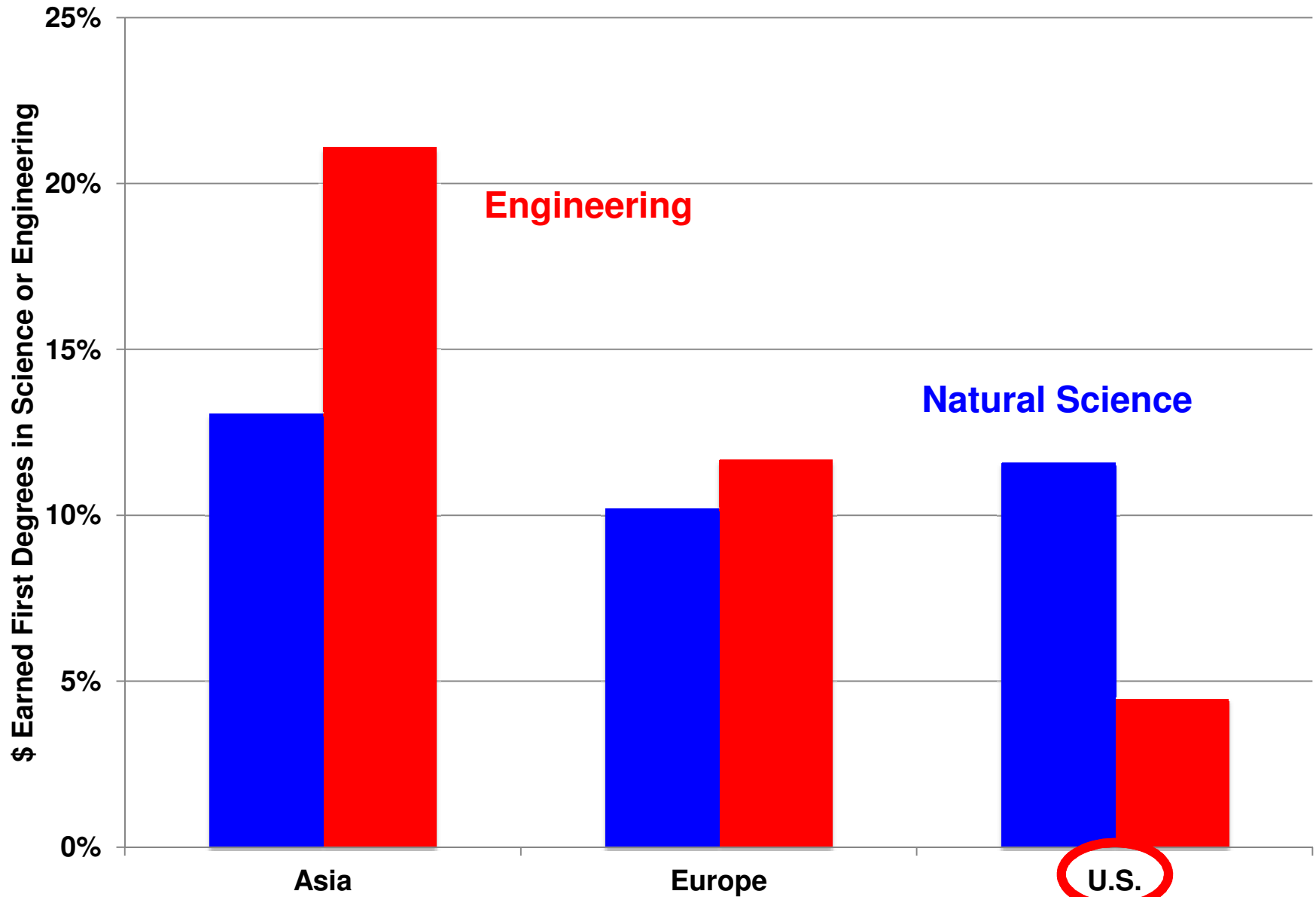
# Fraction of First Earned Degrees in S&E



Source: NSF Science and Engineering Indicators, 2010

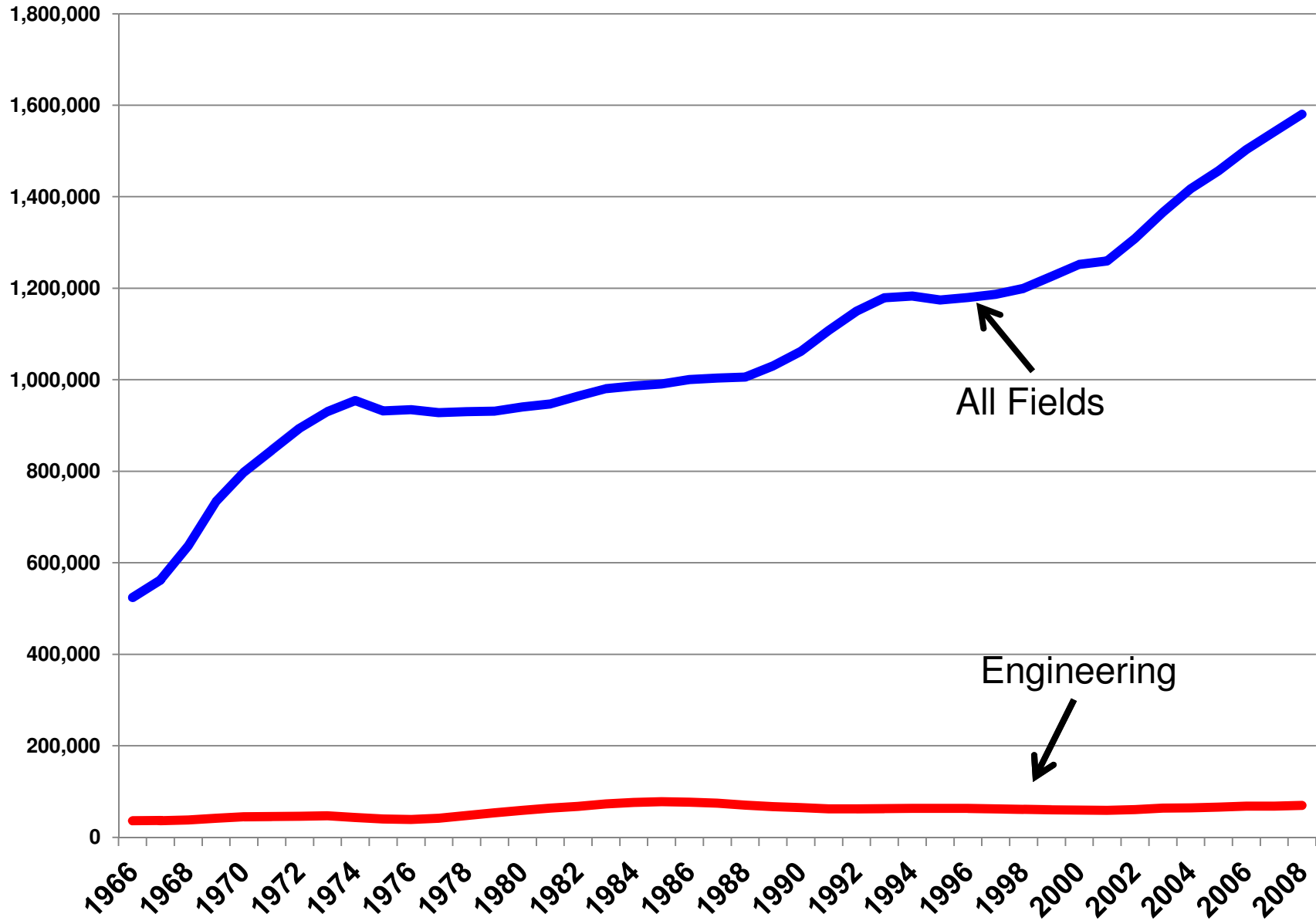


# Fraction of First Earned Degrees in S&E



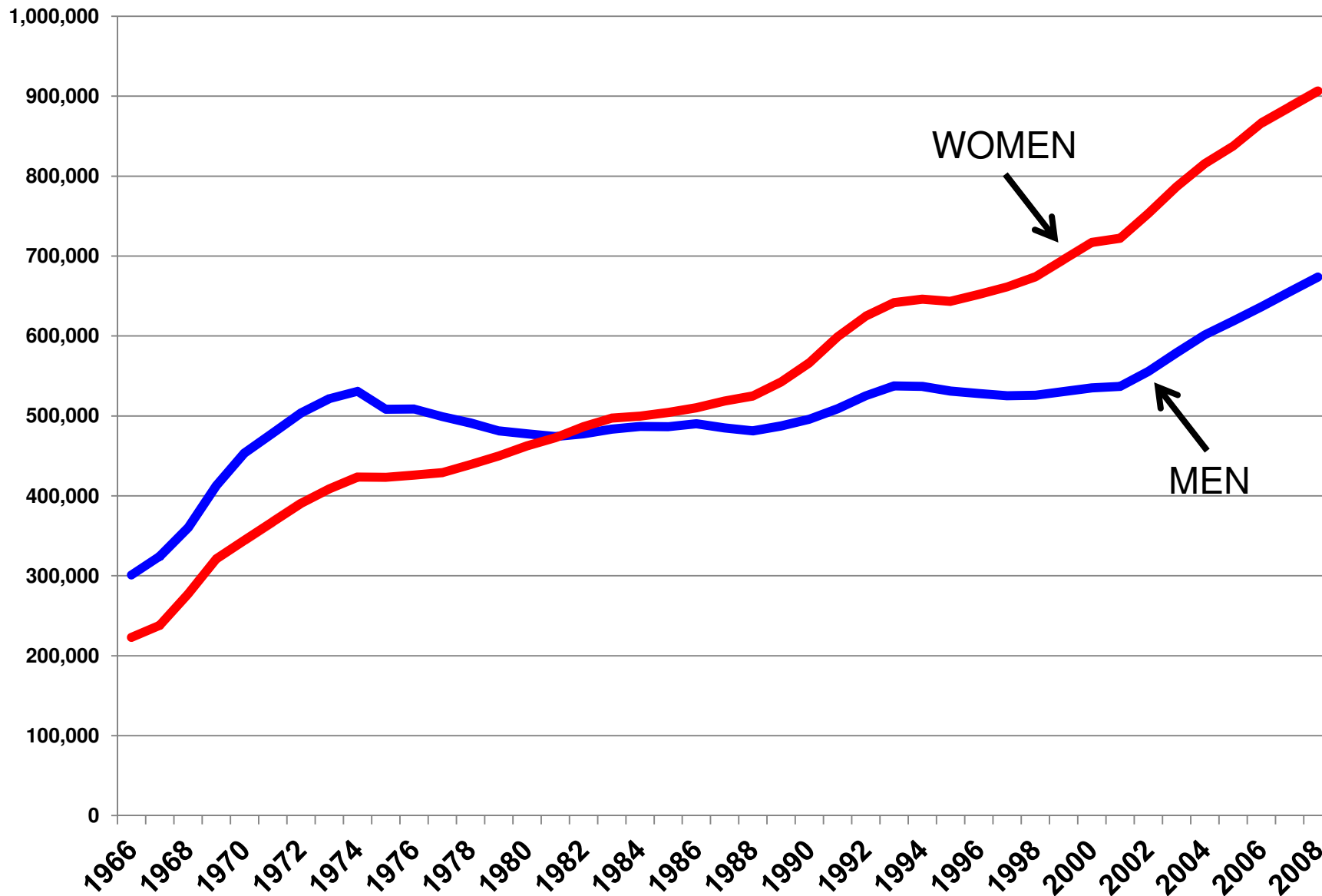
Source: NSF Science and Engineering Indicators, 2010

# U.S. Bachelors Degrees Awarded



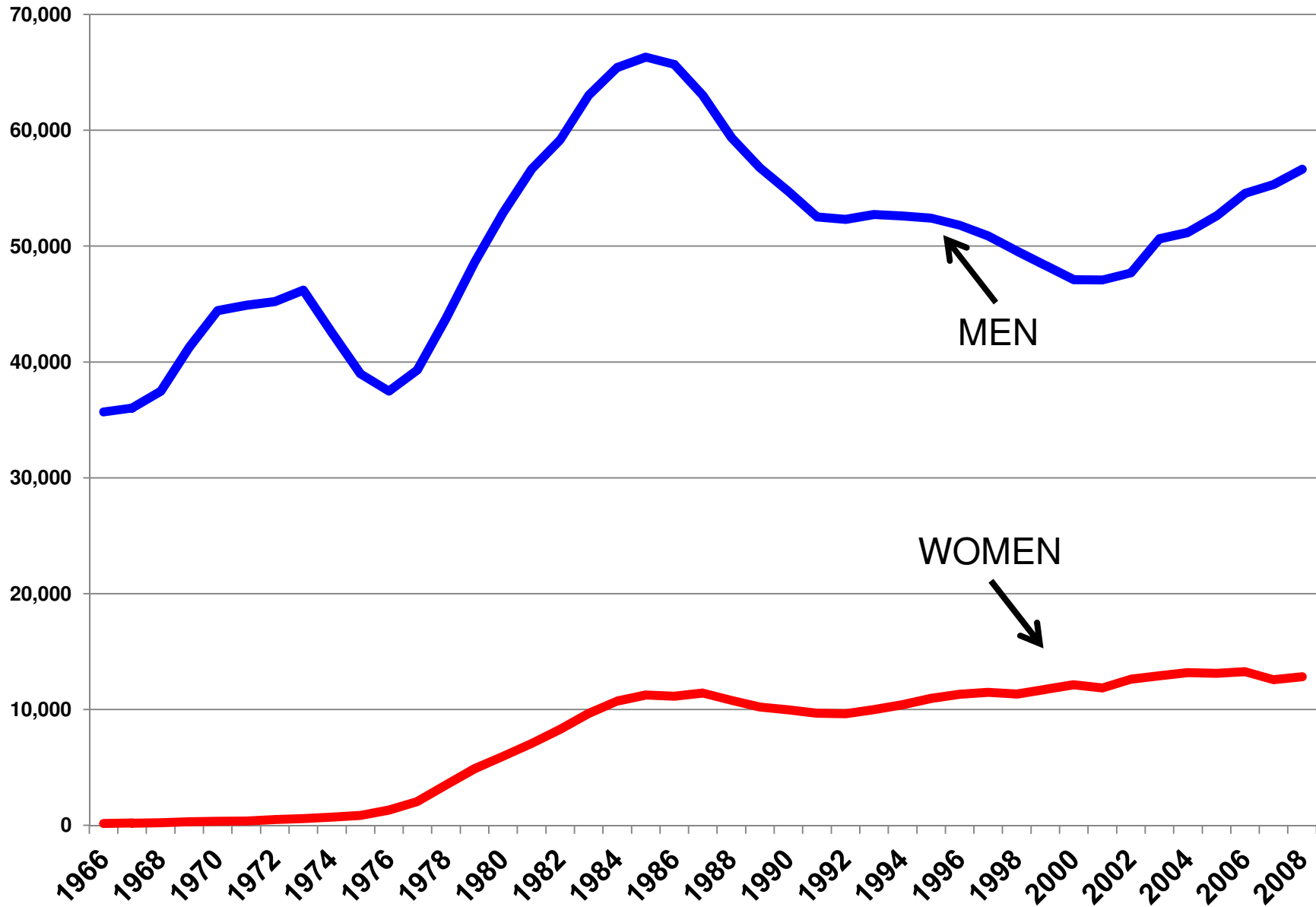
Source: S&E Degrees: 1966-2008, NSF 11-316, June 2011

# U.S. Bachelors Degrees Awarded ALL FIELDS



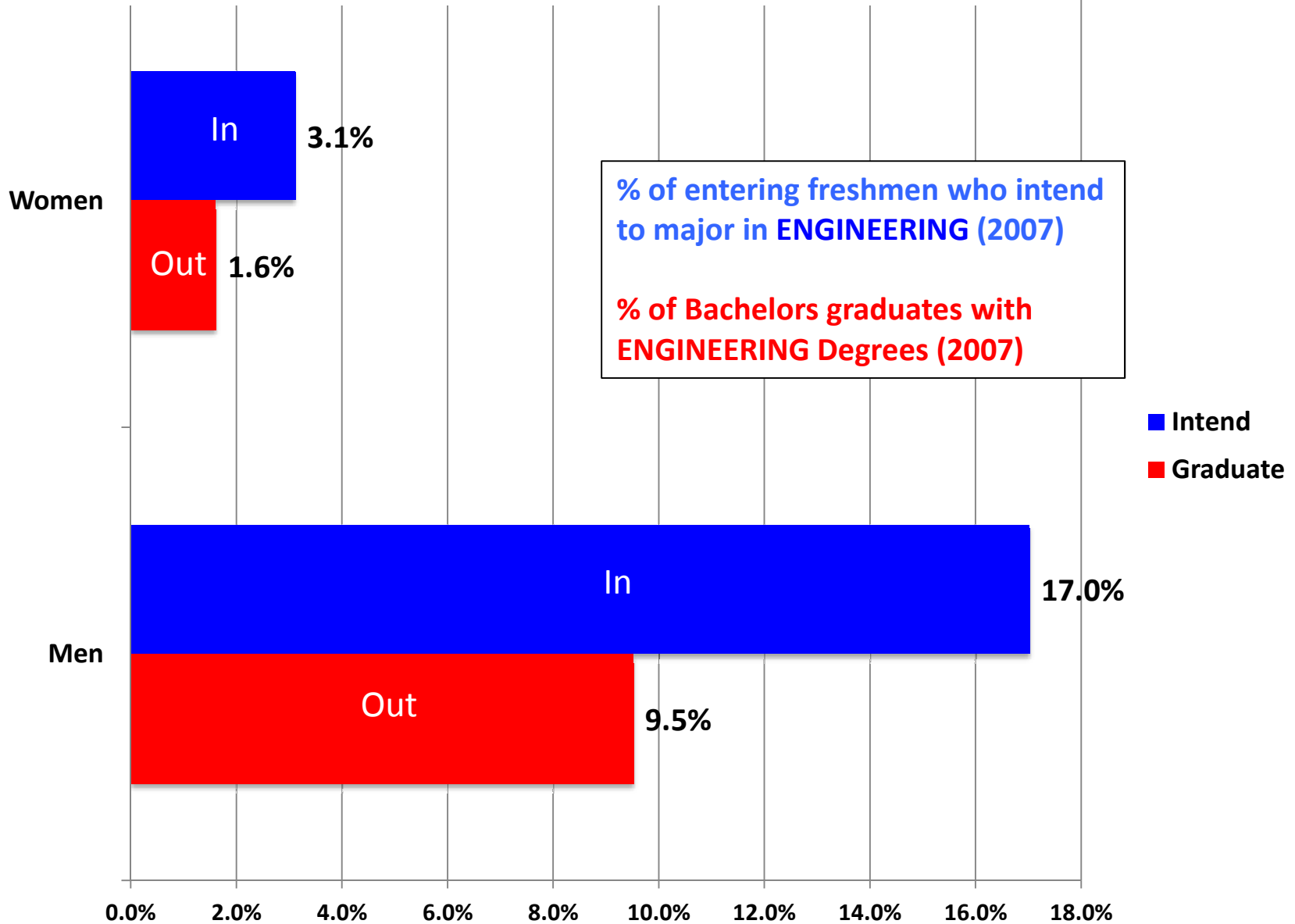
Source: S&E Degrees: 1966-2008, NSF 11-316, June 2011

# U.S. Bachelors Degrees Awarded ENGINEERING



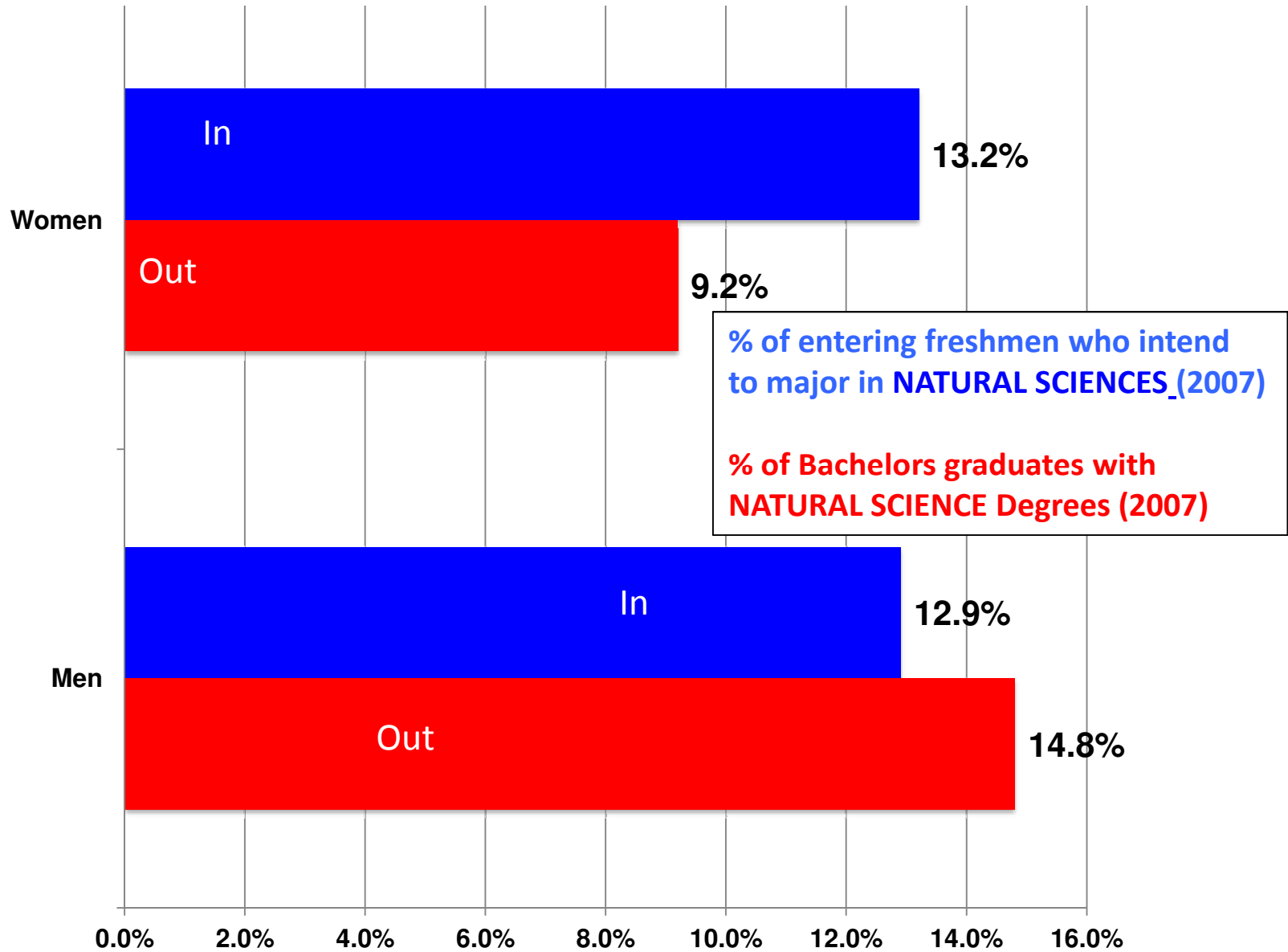
Source: S&E Degrees: 1966-2008, NSF 11-316, June 2011

# U.S. Universities: Undergraduate Education, ENGINEERING



source: NSF S&E Indicators 2010 and US Dept. of Education Digest of Educational Statistics 2008

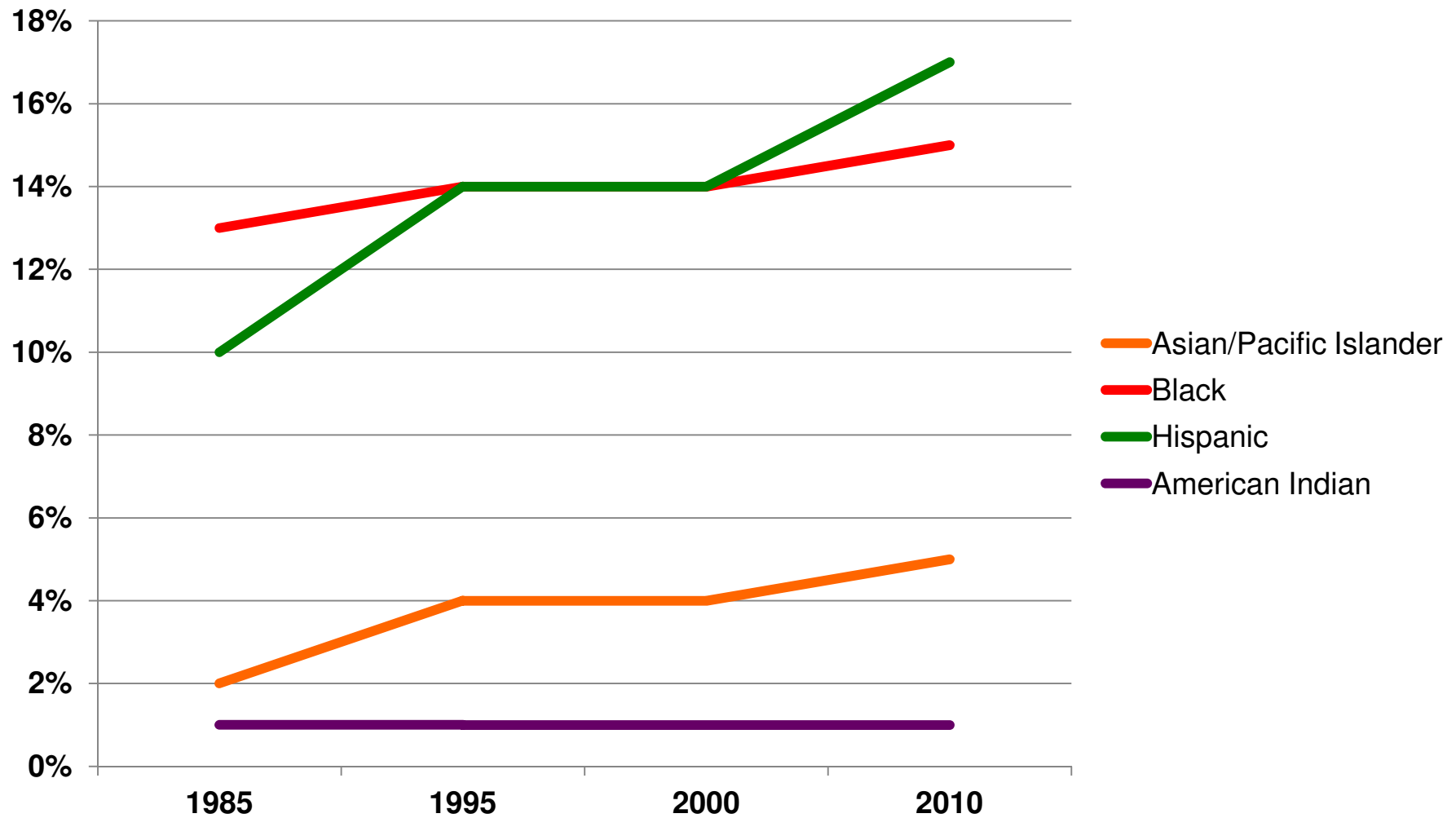
# U.S. Universities: Undergraduate Education, NATURAL SCIENCES



source: NSF S&E Indicators 2010 and US Dept. of Education Digest of Educational Statistics 2008

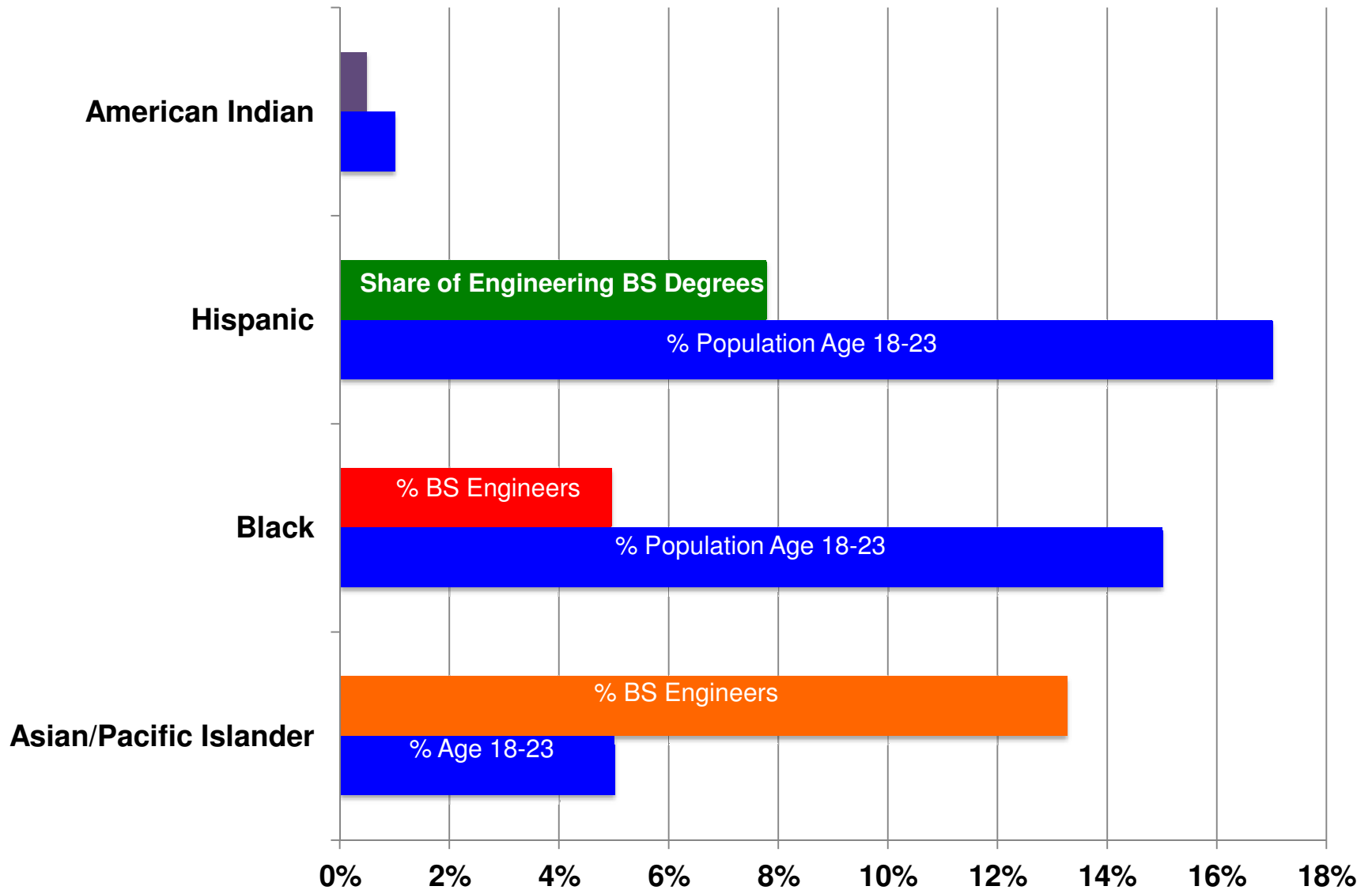
# Our Minority Population is Growing.

## U.S. Population Aged 18-23



Source: U.S. Census Bureau, 2011

# This is a Workforce Train Wreck.



Source: NSF Science and Engineering Indicators, 2010; U.S. Census Bureau, 2011



# The Good News



Force  
Size  
Modulus  
Temperature

Speed  
Tolerance  
Voltage  
Precision

Listen to the language of engineering.



**BASIC  
ENGINEERING**



**Scale  
State  
Integration  
Resilience  
Affordability**

**Scope  
Complexity  
Architecture  
Evolution  
Social Context**

BASIC  
ENGINEERING

ENGINEERING  
SYSTEMS

Cellular Circuitry  
Adaptive Immunity  
Reprogramming Bacteria  
Synthetic Biology  
Natural Adhesives  
Bacteria-Laced Concrete  
Integrated Cancer Research  
Neuroprosthetics

**BASIC  
ENGINEERING**

**ENGINEERING  
SYSTEMS**

Engineers are creative problem solvers.

Engineers make a world of difference.

Engineers help shape the future.

Engineering is essential to our health,  
happiness, and safety.

Engineers can meet the Grand Challenges of  
the 21<sup>st</sup> century.

**CONVERGENCE  
(Biological  
Engineering)**



The diagram consists of four rounded rectangular boxes arranged in a diamond shape, each with a different color and a pointer pointing towards the center. The top-left box is blue and contains the text 'BASIC ENGINEERING'. The top-right box is red and contains 'ENGINEERING SYSTEMS'. The bottom-left box is purple and contains 'CHANGING THE CONVERSATION'. The bottom-right box is green and contains 'CONVERGENCE (Biological Engineering)'. The boxes are interconnected by their central pointers, suggesting a relationship or convergence between these four concepts.

BASIC  
ENGINEERING

ENGINEERING  
SYSTEMS

CHANGING THE  
CONVERSATION

CONVERGENCE  
(Biological  
Engineering)

Onward and upward!