Role of the US National Academy of Engineering in Promoting the Engineering and Science Enterprise in the United States

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The Academy

- The National Academy of Sciences (NAS) was founded on March 3, 1863, at the height of the Civil War.
- The National Academy of Sciences had initially come into being with 50 charter members, who over the years would be joined by the election of the nation's most distinguished scientists with the purpose to investigate, examine, experiment, and report upon any subject of engineering and science.
- Over the years, the National Academy of Sciences has broadened its services to the US government. During World War I it became apparent that the limited membership—then numbering only about 150—could not keep up with the volume of requests for advice regarding military preparedness.

Expansion of National Academies

- National Academy of Sciences, 1863
- National Research Council, 1956
- National Academy of Engineering, 1964
- National Academy of Medicine, 1970

National Academy Goals

- Goal 1: Provide authoritative advice to the government (legislative and executive branches) and industry stakeholders.
- Goal 2: Address critical societal and global issues by inspiring bold scientific investigation and synthesizing data-driven evidence.
- Goal 3: Improve public understanding and appreciation of science and scientific methods.
- Goal 4: Improve the culture and practice of engineering and science. Scientific evidence as an important and unbiased basis for decision making will not be trusted if the research community is not vigilant about maintaining the highest standards of quality and integrity.

National Academy of Engineering (NAE)

- The NAE operates engineering programs aimed at meeting national needs, encourages engineering education and research, and recognizes the superior achievements of engineers.
- New NAE members are annually elected, by current members, based on their distinguished and continuing achievements in original research.
- NAE is autonomous in its administration and in the selection of its members, sharing with the rest of the National Academies the role of advising the federal government.
- NAE has elected 104 new members and 24 international members in 2022. This brings the total U.S. membership to 2,100 and the number of international members to 200.

Membership

- Formally, members of the NAE must be U.S. citizens.
- Election to NAE is considered to be among the highest recognitions in engineering fields, and it often comes as a recognition of a lifetime's worth of accomplishments.

دانش آموخته شریفی عضو فرهنگستان مهندسی ایالات متحده آمریکا شد

دانش آموخته ی دانشگاه صنعتی شریف و استاد معین دانشکده مهندسی برق این دانشگاه، به عنوان عضو فرهنگستان مهندسی ایالات متحده آمریکا (NAE) برگزیده شد.

به گزارش روابط عمومی؛ پروفسور [illegible] آمریکا (National Academy of Engineering) شد.

- Nomination for membership can only be done by a current member of the NAE for outstanding engineers with identifiable contributions or accomplishments in one or both of the following categories:
- Engineering research, practice, or education, pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education.

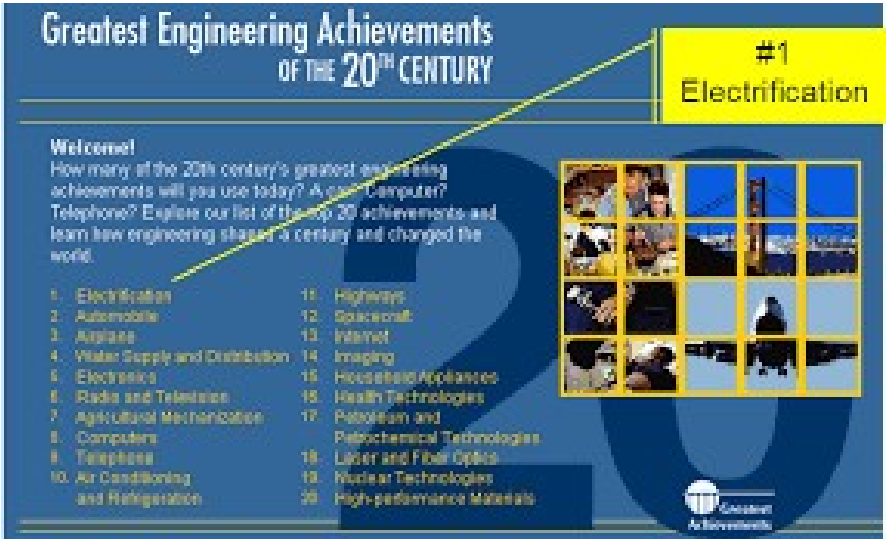
Examples of Academy Contributions

- Study on Panama Canal: The study group was commissioned by the United States Army Corps of Engineers. The report, submitted to President Wilson in November 1917, concluded that claims of repeated interruptions in canal traffic for years to come were unjustified.
- WWII: During this time, the United States confronted the prospect of war with Germany and the question of preparedness was raised. The Academy prepared a report in which it encouraged the increased use of scientific research in the development of American industries and the employment of scientific methods in strengthening the national defense to promote the national security and welfare.
- In 1971, the Academy advised the Port Authority of New York and New Jersey not to construct additional runways at JFK airport concerning the exiting roadways to the airport and health of those living near the airport. The Port Authority accepted the recommendations.
- In 1986, The NAE issued a report demanding the government to encourage foreign investments in the United States, calling for stronger Federal action.

Examples

- In 1986, the Academy member Robert W. Rummel, space expert and aerospace engineer, served on The Presidential Commission on the Space Shuttle Challenger Accident.
- In 1989, the Academy advised the Department of Energy on a site location for the then proposed Superconducting Super Collider from a number of States proposals.
- In 1995, the Academy reported that the American system of PhD education in science and engineering should be reshaped to produce more versatile scientists, rather than narrowly specialized researchers.
- In 2000, NAE returned to this education theme with its detailed studies of engineering education as part of its "Engineer of 2020 Studies" project. The reports concluded that engineering education must be reformed or American engineers will be poorly prepared for advanced engineering practice.
- Soon after, the American Society of Civil Engineers adopted a policy advocating for the reconstruction of the professional practice of civil engineering.

Greatest Engineering Achievements in 20th Century



- In February 2000, Neil Armstrong announced the 20 top engineering achievements having the greatest impact on the quality of life in the 20th century.
- The ranked list of the top 20 achievements in the 20th century was published as follows:

1. Electrification
2. Automobile
3. Airplane
4. Water Supply and Distribution
5. Electronics
6. Radio and Television
7. Agricultural Mechanization
8. Computers
9. Telephone
10. Air Conditioning and Refrigeration

10.Highways
12. Spacecraft
13. Internet
14. Imaging
15. Household Appliances
16. Health Technologies
17. Petroleum and Petrochemical Technologies
18. Laser and Fiber Optics
19. Nuclear Technologies
20. High-performance Materials

Development of Grand Challenges (2008)

- In 2008, the Academy announced 14 Engineering Grand Challenges fitting into four broad categories: energy, sustainability, and global climate change; medicine, health informatics and health care delivery systems; reducing vulnerability to natural and human threats; advancing the human spirit and capabilities.
- NAE later noted that a number of engineering schools had developed coursework based upon Grand Challenge themes.

The 14 Grand Challenges for Engineering developed by the NAE committee were to:

- Make solar energy economical
- Provide energy from fusion
- Develop carbon sequestration
- Manage the nitrogen cycle
- Provide access to clean water
- Restore and Improve urban infrastructure
- Advance health informatics
- Engineer better medicines
- Reverse-engineer the brain
- Prevent nuclear terror
- Secure cyberspace
- Enhance virtual reality
- Advance personalized learning
- Engineer the tools of scientific discovery.

Academy Fellows

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- The National Academy of Engineering hosts fellows through the Christine Mirzayan Science & Technology Policy Graduate Fellowship Program .
- The program is designed to engage fellows in the analytical processes. Fellows develop basic skills essential to working or participating at the federal, state, or local levels.
- The 12 week program is very competitive with less than 10% of applicants being accepted.
- Fellows have worked with their mentors on projects related to engineering education, energy, environment, ethics, technology and peace, media relations, public understanding of engineering, and engineering and healthcare

Outreach Efforts

- To publicize the work of both the profession and the NAE, the institution puts considerable efforts into outreach activities.
- A weekly radio spot produced by the NAE is broadcast on WTOP radio in the Washington, DC area and the file and text of the spot can be found on the NAE site. The NAE also distributes a biweekly newsletter focusing on engineering issues and advancements.

- Bridge publishes opinion and analysis on engineering research, education, and practice; science and technology policy; and the roles of engineering and technology in society. The intent is to inform and stimulate debate and dialogue among NAE members as well as policymakers, educators, business leaders, and other interested citizens.

NAE Publications on Sociotechnical, Political, and Economic Matters

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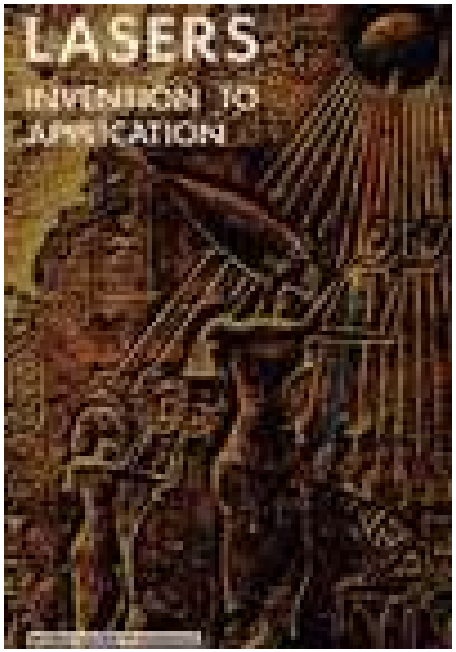
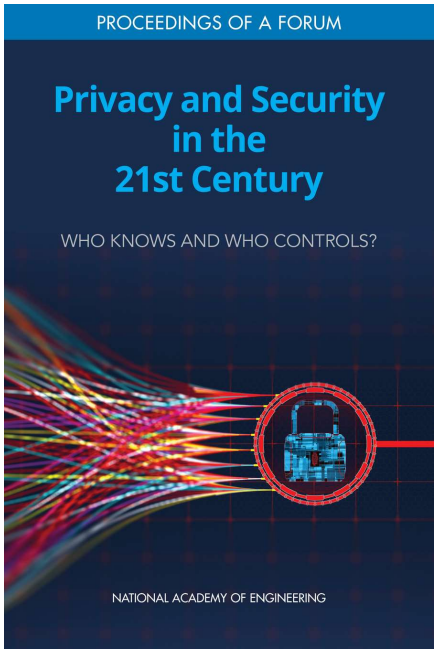
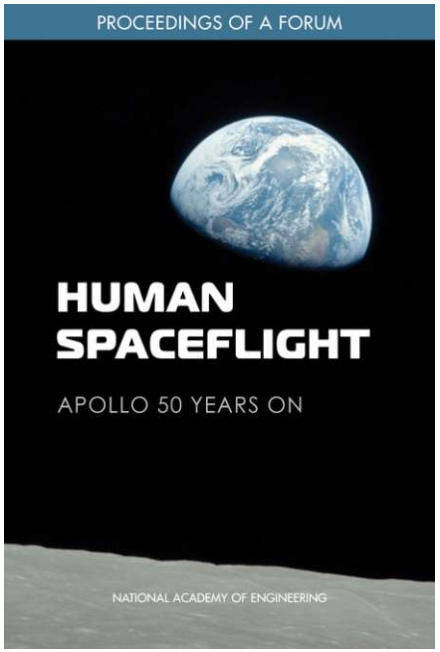
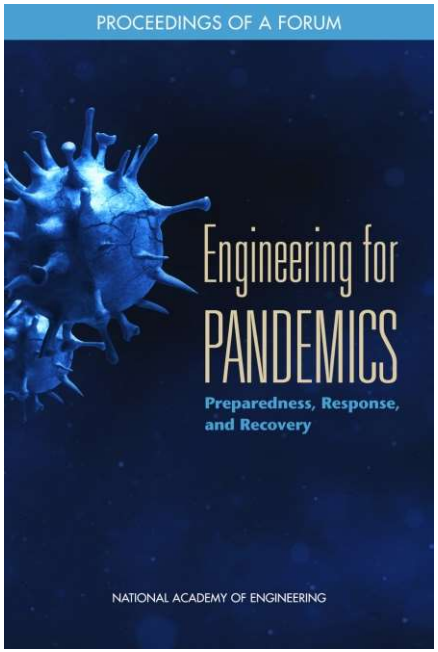
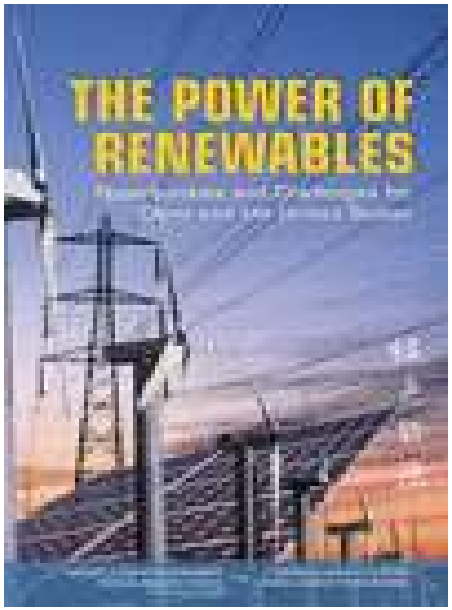
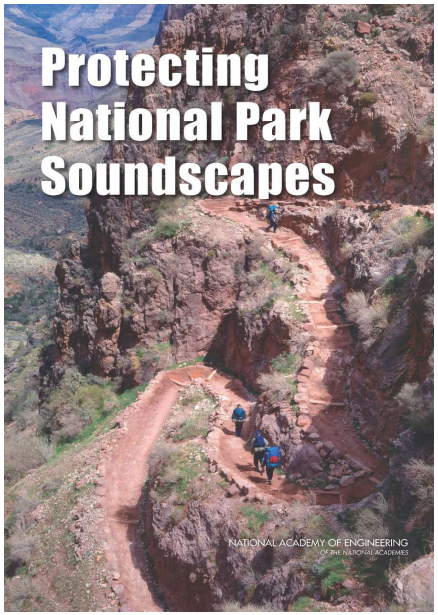


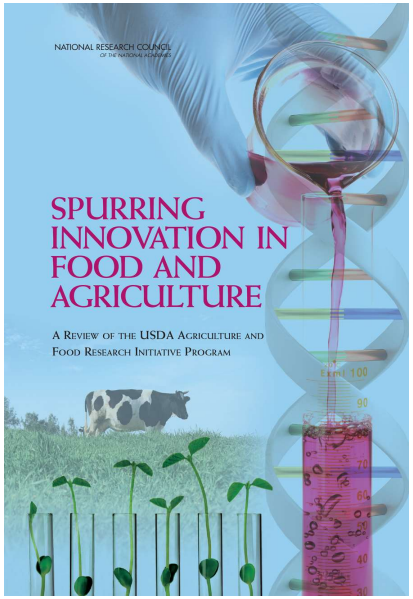


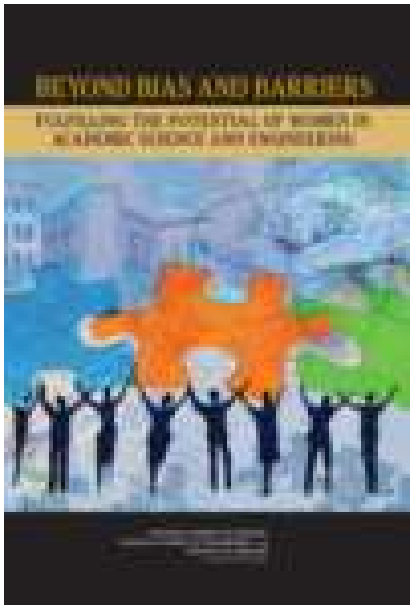












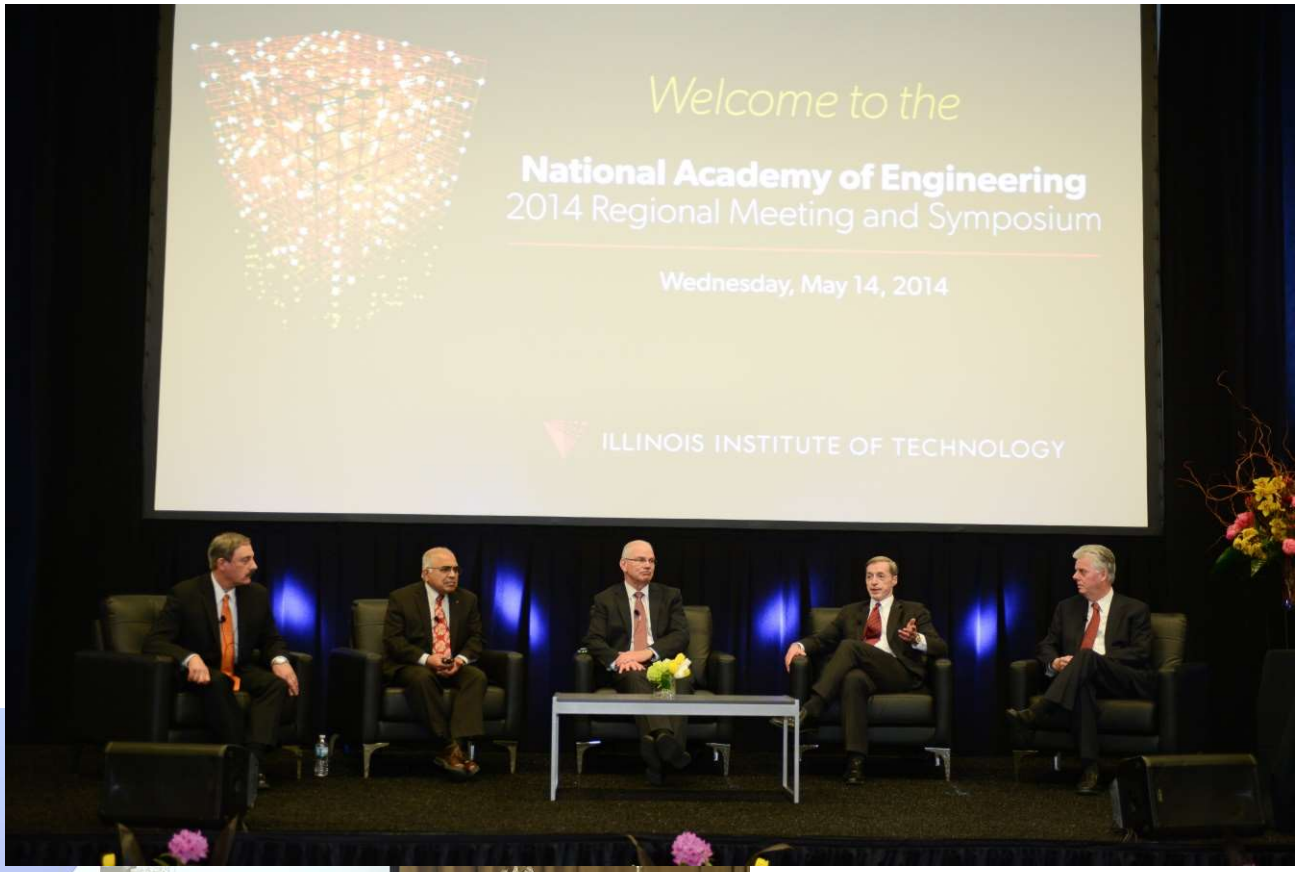
Awards and Recognitions

- The National Academy of Engineering salutes leaders in engineering for their lifetime dedication to their field and their commitment to advancing the human condition through great engineering achievement and/or through innovation in engineering and technology education.
- The NAE dedicates more than $1 million annually to recognize these leaders and to bring better understanding of the importance of engineering and engineering education to society.
- The NAE currently presents seven awards for engineering achievement - the Charles Stark Draper Prize for Engineering, the Fritz J. and Dolores H. Russ Prize, the Bernard M. Gordon Prize for Innovation in Engineering and Technology Education, the Simon Ramo Founders Award, the Arthur M. Bueche Award, the Gibbs Brothers Medal, and the J. C. Hunsaker Award in Aeronautical Engineering.

Social Issues in Engineering Workforce

- **Practices for Engineering Education and Research (PEER)** conducts extensive studies, workshops, and other activities focused on equitable and inclusive engineering workforce development, education, and research at higher education.
- PEER will bring together researchers and practitioners in engineering to publish, analyze, and guide, necessary changes in engineering education.
- This program will consider the entire educational system, contextual influences on that system, and how elements of the system affect each other.

NAE Regional Meetings



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