NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

2013–2014

CALL FOR NOMINATIONS

DRAPER • RUSS GORDON • FOUNDERS • BUECHE

NAE AWARDS

Charles Stark Draper Prize

Fritz J. and Dolores H. Russ Prize

Bernard M. Gordon Prize

Founders Award

Arthur M. Bueche Award

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

The National Academy of Engineering . . . Recognizing the Engineers Behind the Achievements

The National Academy of Engineering (NAE) serves the United States government and the engineering community by advising on technology issues that impact society.

Each year the NAE 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 five awards for engineering achievement and innovation—the Charles Stark Draper Prize, the Fritz J. and Dolores H. Russ Prize, the Bernard M. Gordon Prize for Innovation in Engineering and Technology Education, the Founders Award, and the Arthur M. Bueche Award.

How to Complete the Online Nomination Submission

Inside this packet you will find information on submitting an online nomination for any of NAE's awards. ***There are no restrictions on who may nominate candidates, but self-nominated entries are not accepted.***

To complete the online nomination, simply follow the Award Guide to select the appropriate award that best suits your nomination. Eligibility information is specific to each award and is printed on the following pages.

In addition to completing the online nomination cover form and additional requested materials, at least three supporting letters must accompany the nomination, as well as the candidate's curriculum vitae of **no more** than two pages per candidate. Though not required, you may also choose to submit the candidate's bibliographical listing and/or a list of patents of no more than two pages.

The nominator is responsible for soliciting supporting letters. Supporting letters may be addressed to the nominator or selection committee chair.

Highly competitive nominations from previous years will be considered again this year. The NAE will notify the original nominator that the nomination will be eligible and request the submission of updated material.

How to Submit an Online Nomination

To submit a nomination, please go online at **www.naeawardsonline.com**. There you will find the links to the NAE awards. To register, click on the appropriate awards link. The system will then prompt you to create a user name and password.

If you have any questions, please contact the NAE Awards Office at (202) 334-1266 or e-mail at awards@nae.edu

Nominations must be received by April 1, 2013.

For more information on the NAE Awards, go to **www.nae.edu/awards**.

Award Guide

Use this guide to select the best award suited to your nomination.



Charles Stark Draper Prize

$500,000 Cash Award

Recognized as one of the world's preeminent awards for engineering achievement, this prize honors an engineer whose accomplishment has significantly impacted society by improving the quality of life, providing the ability to live freely and comfortably, and/or permitting the access to information. The Draper Prize is awarded annually and recognizes achievements in all engineering disciplines.



Fritz J. and Dolores H. Russ Prize

$500,000 Cash Award

Awarded biennially, the Russ Prize recognizes a bioengineering achievement in widespread use that improves the human condition. This achievement should help the public better understand and appreciate the contributions of engineers to our health, well-being and quality of life. An auxiliary purpose of the Russ Prize is to encourage collaboration between the engineering and medical/biological disciplines and professions.



Bernard M. Gordon Prize for Innovation in Engineering and Technology Education

$500,000 Cash Award

The intent of the Gordon Prize, which is awarded annually, is to recognize new modalities and experiments in education that develop effective engineering leaders. The focus is on innovations such as curricular design, teaching methods, and technology-enabled learning that strengthen students' capabilities and desire to grow into leadership roles.



Founders Award

This annual award honors an outstanding NAE member or foreign associate who has upheld the ideals and principles of the NAE through professional, educational, and personal achievement and accomplishment.



Arthur M. Bueche Award

The honor of this annual award is bestowed on an engineer who has shown dedication in science and technology, as well as active involvement in determining U.S. science and technology policy, promoting technological development, and contributing to the enhancement of the relationship between industries, government, and universities.

Charles Stark Draper Prize

In 1989 the National Academy of Engineering established the Charles Stark Draper Prize, endowed by The Charles Stark Draper Laboratory, Inc., Cambridge, Mass., to recognize achievement specifically directed to the advancement of society and its ability to sustain a certain quality of life and freedom.

About Charles Stark Draper

The Draper Prize honors Charles Stark "Doc" Draper, the "father of inertial navigation." Charles Stark Draper evolved the theory, invented and developed the technology, and led the effort that brought inertial navigation to operational usage in aircraft, space vehicles, and submarines. Founder of The Charles Stark Draper Laboratory and institute professor at the Massachusetts Institute of Technology (MIT), he stands as a pioneer among aircraft engineers. Draper was elected to membership in the NAE in 1965 and died in 1987.

About the Draper Prize

Presented annually during National Engineers Week in February, the recipient receives a $500,000 cash award, commemorative medallion, and hand-scribed certificate.

The Draper Prize is awarded for a specific achievement or for a series of achievements in any engineering discipline, and may be awarded to an individual or a group of individuals contributing to the same achievement. *The Draper Prize is not awarded posthumously.* NAE members and non-members worldwide are eligible to receive the Draper Prize.

Draper Prize Selection Criteria

The narrative description of the achievement that accompanies the nomination form and additional materials should provide qualitative and quantitative evidence that the following criteria are met:

- **Benefit:** Describe the success of the achievement or innovation in terms of estimates of the number of people actually or potentially benefited and the extent of this benefit.
- **Novelty:** Describe the demonstrated novelty, originality, and fundamental character of the technical idea or concept underlying the innovation or achievement.
- **Removal of fundamental barriers:** Demonstrate that the innovation or achievement has removed fundamental barriers or constraints to subsequent incremental improvement and refinement, or that it embodies wholly new scientific or engineering principles.
- **Technical ramifications and application:** Describe the demonstrated richness of the technical ramifications of the new concept or invention, and its applicability in different areas of application far removed from each other.
- **Follow-through:** Describe the extent of follow-through on the part of the originating individual or team. Excellence in design, execution and management of the innovation, and commercialization or "operationalization" of a new idea should be demonstrated, in addition to the ingenuity and novelty of the original technical conception of "proof of principle."
- **Economic impact:** Document the economic impact, actual or potential, of the innovation or achievement. Economic impact would include estimates of gross revenues generated by a new product or process, cost savings made possible by a new process, reductions in environmental impact, or benefits to health and safety in the workplace or of consumers.

Online Nomination Materials

The following information constitutes a complete nomination:

- A completed nomination cover form.
- A narrative description of the achievement that addresses the selection criteria and each candidate(s)'s contribution.
- The candidate's curriculum vitae (no more than two (2) pages per candidate).
- A selected bibliography of publications relevant to the innovation (no more than two (2) pages)—optional.
- At least three (3) and not more than six (6) supporting letters.

To submit a nomination, please go online at **www.naeawardsonline.com/DRAPER/**.

Previous Recipients and Achievements

1989: Jack S. Kilby and Robert N. Noyce—monolithic integrated circuit.

1991: Sir Frank Whittle and Hans J. P. von Ohain—turbojet engine.

1993: John Backus—FORTRAN, the first widely used, general purpose, high-level computer language.

1995: John R. Pierce and Harold A. Rosen—communication satellite technology.

1997: Vladimir Haensel—chemical engineering process of platforming.

1999: Charles K. Kao, Robert D. Maurer, and John B. MacChesney—fiber optics.

2001: Vinton G. Cerf, Robert E. Kahn, Leonard Kleinrock, and Lawrence G. Roberts—the foundations of the Internet.

2002: Robert Langer—biocompatible polymer technologies that control the release of medicine over time.

2003: Ivan A. Getting and Bradford W. Parkinson—Global Positioning System (GPS).

2004: Alan C. Kay, Butler W. Lampson, Robert W. Taylor, and Charles P. Thacker—the first practical networked personal computers.

2005: Minoru S. "Sam" Araki, Francis J. Madden, Edward A. Miller, James W. Plummer, Don H. Schoessler—for the design, development, and operation of Corona, the first space-based Earth observation system.

2006: Willard S. Boyle and George E. Smith—for the invention of the Charge-Coupled Device, a light-sensitive component at the heart of digital cameras and other widely used imaging technologies.

2007: Timothy J. Berners-Lee—for developing the World Wide Web.

2008: Rudolf Kalman—for the development and dissemination of the optimal digital technique (known as the Kalman Filter) that is pervasively used to control a vast array of consumer, health, commercial, and defense products.

2009: Robert H. Dennard—for his invention and contributions to the development of the Dynamic Random Access Memory (DRAM), used universally in computers and other data processing and communication systems.

2011: Frances H. Arnold and Willem P. C. Stemmer—for directed evolution, a method used worldwide for engineering novel enzymes and biocatalytic processes for pharmaceutical and chemical products.

2012: George H. Heilmeier, Wolfgang Helfrich, Martin Schadt and T. Peter Brody—for the engineering development of the Liquid Crystal Display (LCD) utilized in billions of consumer and professional devices.

2013: Official announcement will be made in February. Visit **www.nae.edu/awards** for more information.

Fritz J. and Dolores H. Russ Prize

The National Academy of Engineering established the Fritz J. and Dolores H. Russ Prize in 1999 to recognize an outstanding bioengineering achievement in widespread use that improves the human condition. This achievement should help the public better understand and appreciate the contributions of engineers to our health, well-being and quality of life. An auxiliary purpose of the Russ Prize, which was endowed by the Russes through Ohio University in Athens, Ohio, is to encourage collaboration between the engineering and medical/biological disciplines and professions.

Examples include widely-recognized groundbreaking achievements, innovations, new technologies, and/or product development in such areas as biomedical instrumentation, separation, and control systems; diagnostic technologies; applied genetics engineering; pharmaceutical processing; prosthetic technologies; biomolecular engineering; and applied physiological systems.

About Fritz J. and Dolores H. Russ

Fritz J. and Dolores H. Russ committed a lifetime to the advancement of engineering. They founded one of Ohio's leading engineering businesses, Systems Research Laboratories, and their generosity led to the development of state-of-the-art engineering facilities at such educational institutions as Ohio University, Athens, and Wright State University, Dayton, Ohio. Fritz J. Russ died in 2004 and Dolores H. Russ died in 2008.

About the Russ Prize

Presented biennially during National Engineers Week in February, the recipient receives a $500,000 cash award, commemorative medallion, and hand-scribed certificate.

The Russ Prize is awarded for a specific achievement or for a series of achievements in bioengineering, and may be awarded to an individual or a group of individuals contributing to the same achievement(s). *The Russ Prize is not awarded posthumously.* Recipients of the Charles Stark Draper Prize are not eligible for the Russ Prize. NAE members and non-members worldwide are eligible to receive the Russ Prize.

Russ Prize Selection Criteria

The narrative description of the achievement should provide qualitative and quantitative evidence that the following criteria are met:

- **Benefit:** Describe the nature, extent and success of the achievement or innovation in improving the health, well-being, and quality of life of individuals, and document the number and distribution of people actually benefiting.
- **Novelty:** Describe the novelty, originality, and fundamental character of the technical idea or concept underlying the achievement or innovation.
- **Removal of fundamental barriers:** Demonstrate that the achievement or innovation has removed fundamental barriers or constraints to subsequent incremental improvement and refinement, or that it embodies wholly new scientific principles.
- **Technical ramifications and application:** Describe the demonstrated richness of the technical ramifications of the new achievement or innovation, and its applicability in many different areas far removed from each other.
- **Follow-through:** Describe the extent of follow-through on the part of the originating individual or team. Excellence in design, execution and management of the achievement or innovation, and commercialization or "operationalization" should be demonstrated, in addition to the ingenuity and novelty of the original technical conception of "proof of principle."
- **Economic impact:** Document the economic impact, actual or potential, of the achievement or innovation. Economic impact would include gross revenues generated by a new product or process, cost savings made possible by a new process, reductions in environmental impact, or benefits to health and safety in the workplace or of consumers.
- **Public understanding:** Describe how recognizing the achievement or innovation with the Russ Prize will help increase the public understanding of the contributions that engineers make to improve the human condition.
- **Teamwork:** Describe how recognizing the achievement or innovation with the Russ Prize will encourage the engineering and medical/biological disciplines to work more closely together.

Online Nomination Materials

The following information constitutes a complete nomination:

- A completed nomination cover form.
- A narrative description of the achievement that addresses the selection criteria and each candidate(s)'s contribution.
- The candidate's curriculum vitae (no more than two (2) pages per candidate.
- A selected bibliography of publications relevant to the innovation (no more than two (2) pages)—optional.
- At least three (3) and not more than six (6) supporting letters.

To submit a nomination, please go online at **www.naeawardsonline.com/RUSS/**.

Previous Recipients and Achievements

2001: Earl E. Bakken and Wilson Greatbatch—the implantable cardiac pacemaker.

2003: Willem J. Kolff—artificial organs, beginning with the kidney.

2005: Leland C. Clark, Jr.—bioengineering membrane-based sensors.

2007: Yuan-Cheng "Bert" Fung—for the characterization and modeling of human tissue mechanics and function leading to prevention and mitigation of trauma.

2009: Elmer L. Gaden—for pioneering the engineering and commercialization of biological systems for large-scale manufacturing of antibiotics and other drugs.

2011: Leroy E. Hood—for automating DNA sequencing that revolutionized biomedicine and forensic science.

2013: Official announcement will be made in February. Visit **www.nae.edu/awards** for more information.

Bernard M. Gordon Prize for Innovation in Engineering and Technology Education

Inaugurated in 2001 by the National Academy of Engineering (NAE), the intent of the Gordon Prize is to recognize new modalities and experiments in education that develop effective engineering leaders. The focus is on innovations such as curricular design, teaching methods, and technology-enabled learning that strengthen students' capabilities and desire to grow into leadership roles.

About Bernard Gordon

Considered a pioneer for his contributions in analog-to-digital conversion, tomography, and medical and other high-precision instrumentation, Bernard Gordon is chairman of NeuroLogica Corporation, Danvers, Massachusetts. He is also founder and chairman of the board of Analogic Corporation. Prior to Analogic, Mr. Gordon served as president and co-founder of Epsco, Incorporated, and president of Gordon Engineering. Mr. Gordon has more than 200 worldwide patents on record. In 1986, he received the National Medal of Technology, and in 1991, he was elected a member of the NAE. Bernard Gordon and his wife, Sophia, reside in Manchester, Massachusetts.

About the Gordon Prize

Presented annually during National Engineers Week in February, the Gordon Prize carries a cash award of $500,000, half awarded to the recipient as a prize and the remainder granted to the recipient's institution to support the continued development, refinement, and dissemination of the recognized innovation. The recipient also receives a commemorative medallion and hand-scribed certificate.

The recipient will present a public lecture during the NAE's Annual Meeting in October following the presentation of the prize. Within one year after the receipt of the prize, the recipient will submit a report to the NAE concerning use of the grant portion of the prize.

The prize will be awarded to an individual or small group of individuals contributing to the same innovation. All recipients must be United States citizens or permanent residents of the United States who currently are and have been substantially engaged in their engineering and scholastic work in institutions within the United States. *The Gordon Prize is not awarded posthumously.*

Gordon Prize Selection Criteria

The narrative description of the teaching innovation that should provide qualitative and quantitative evidence that the following criteria are met:

- **Educational paradigm** for building future engineering leaders: Describe how the paradigm creates and develops engineering leadership skills and attitudes with particular reference to areas such as communication skills, teamwork, hands-on experience, innovative capacity, inventiveness and drive, interdisciplinary focus, and the ability to share, access, and interpret large volumes of information.
- **Paradigm execution:** Its quality and impact on the home institution. Comment as possible concerning demonstrated effect on students, (e.g., active engagement in elective student design opportunities, student retention in the engineering degree program, leadership exhibited within and with the program, proportion of students who pursue advanced engineering education, and proportion of students pursuing careers in industry), student evaluations, formal and informal assessments, the results of fund-raising and student enrollment efforts, the extent of diffusion within the home institution, and peer recognition of the paradigm, its uniqueness, and its excellence of execution.
- **Transferability and diffusion** of the innovation to other institutions: Describe the nature and extent of adaptation or diffusion at other institutions.
- **Success in producing engineering leaders:** Describe the demonstrated success in producing engineering leaders; the Nominators should identify individuals who have benefited from the innovation, and include their past and present positions. New programs take note: it takes several years after the first graduating class to generate evidence for this criterion.
- **Use of prize:** Describe the potential of the nominee(s)' institution to utilize the grant half of the prize to further enhance the design or execution of their educational paradigm, and to share their ideas and experience with other academic institutions.

Online Nomination Materials

The following information constitutes a complete nomination:

- A completed nomination cover form.
- A narrative description of the teaching innovation that addresses the selection criteria. *Nominators are are encouraged to be explicit when writing the narrative description regarding the nominated engineering education program, by focusing on how it specifically promotes engineering leaders and leadership skills through curricula and/or individual projects.*
- Current curriculum of the nominated engineering education program, with an emphasis on courses that provide leadership skills training (no more than five (5) pages).
- The candidate's curriculum vitae (no more than two (2) pages per candidate).
- A selected bibliography of publications relevant to the innovation (no more than two (2) pages)—optional.
- At least three (3) and not more than six (6) supporting letters (no more than one-third of which may be from current and/or previous students and/or colleagues at the institution where the innovation was developed).

To submit a nomination, please go online at **www.naeawardsonline.com/GORDON/**.

Previous Recipients and Innovations

2002: Eli Fromm—the Drexel University E^4 Project and the Gateway Engineering Education Coalition.

2004: Frank S. Barnes—the Interdisciplinary Telecommunications Program (ITP) at the University of Colorado, Boulder.

2005: Edward J. Coyle, Leah H. Jamieson, and William C. Oakes—the Engineering Projects in Community Service (EPICS) program, Purdue University, IN.

2006: Jens E. Jorgensen, John S. Lamancusa, Lueny Morell, Allen L. Soyster, and Jose Zayas-Castro—for creating the Learning Factory at Pennsylvania State University.

2007: Harold S. Goldberg, Jerome E. Levy and Arthur W. Winston—for the development of a multi-disciplinary graduate program for engineering professionals at Tufts University.

2008: Jacquelyn F. Sullivan and Lawrence E. Carlson—the Integrated Teaching and Learning Program at the University of Colorado, Boulder.

2009: Thomas H. Byers and Tina L. Seelig—the Stanford Technology Ventures Program at Stanford University.

2011: Edward F. Crawley—the CDIO (Create-Design-Implement-Operate) Initiative, Massachusetts Institute of Technology.

2012: Clive L. Dym, M. Mack Gilkeson, and J. Richard Phillips—Harvey Mudd College Engineering Program.

2013: Official announcement will be made in February. Visit **www.nae.edu/awards** for more information.

Founders Award

The NAE's oldest award, the Founders Award was established in 1965 to honor an outstanding NAE member or foreign associate who has upheld the ideals and principles of the NAE through professional, educational, and personal achievement and accomplishment.

About the Founders Award

Presented annually during the NAE Annual Meeting in the fall, the recipient receives a commemorative medal.

Though only NAE members or foreign associates are eligible to receive the Founders Award, founding members of the National Academy of Engineering are not eligible. *The Founders Award is not awarded posthumously.*

Founders Award Selection Criteria

Demonstrated outstanding professional, educational and personal achievement and accomplishment to the benefit of the people of the United States.

Online Nomination Materials

The following information constitutes a complete nomination:

- A completed nomination cover form.
- A narrative description of the achievement that addresses the selection criteria.
- The candidate's curriculum vitae (no more than two (2) pages per candidate).
- A selected bibliography of publications relevant to the innovation (no more than two (2) pages)—optional.
- At least three (3) and not more than six (6) supporting letters.

To submit a nomination, please go online at **www.naeawardsonline.com/FOUNDERS/**.

Previous Recipients

1966: Vannevar Bush
1967: James Smith McDonnell
1968: Vladimir K. Zworykin
1969: Harry Nyquist
1970: Charles S. Draper
1971: Clarence L. Johnson
1972: Edwin H. Land
1973: Warren K. Lewis
1974: J. Erik Jonsson
1975: James B. Fisk
1976: Manson Benedict
1977: John R. Pierce
1978: George M. Low
1979: David Packard
1980: Hoyt C. Hottel
1981: Jacob P. Den Hartog
1982: Kenneth H. Olsen
1983: Harold E. Edgerton
1984: John Bardeen
1985: Willis M. Hawkins
1986: John R.Whinnery
1987: Arnold O. Beckman
1988: Gordon E. Moore
1989: John S. Foster
1990: Neal R. Amundson
1991: George W. Housner
1992: George H. Heilmeier
1993: William R. Hewlett
1994: Ralph Landau
1995: Ernst R. G. Eckert
1996: John W. Morris
1997: Mario Salvadori
1998: Yuan-Cheng B. Fung
1999: Stephen D. Bechtel, Jr.
2000: Charles H. Townes
2001: Chang-Lin Tien
2002: Stuart W. Churchill
2003: Carver A. Mead
2004: Eli Ruckenstein
2005: C. Dan Mote, Jr.
2006: Shu Chien
2007: Stanford (Sol) Penner
2008: Robert M. Nerem
2009: John R. Casani
2010: Robert Langer
2011: David Atlas
2012: Nicholas A. Peppas

Arthur M. Bueche Award

The National Academy of Engineering established the Arthur M. Bueche Award in 1982 to recognize statesmanship in science and technology, as well as active involvement in determining U.S. science and technology policy, promoting technological development, and contributing to enhancement of the relationship between industries, government, and universities.

About Arthur M. Bueche

Arthur M. Bueche was senior vice president for corporate technology at General Electric and a member of the NAE Council who spoke out for the advancement of technology. He was elected to membership in the NAE in 1974 and died in 1981.

About the Bueche Award

Presented annually during the NAE Annual Meeting in the fall, the recipient receives a commemorative medal. NAE members and non-members are eligible to receive the Bueche Award. *The Bueche Award is not awarded posthumously.*

Bueche Award Selection Criteria

Demonstrated statesmanship in science and technology, as well as active involvement in determining U.S. science and technology policy, promoting technological development, and contributing to the enhancement of the relationship between industries, government, and universities.

Nomination Materials

The following information constitutes a complete nomination:

- A completed nomination cover form.
- A narrative description of the achievement that addresses the selection criteria.
- The candidate's curriculum vitae (no more than two (2) pages per candidate).
- A selected bibliography of publications relevant to the innovation (no more than two (2) pages)—optional.
- At least three (3) and not more than six (6) supporting letters.

To submit a nomination, please go online at **www.naeawardsonline.com/BUECHE/**.

Previous Recipients

1983: Simon Ramo
1984: Edward E. David, Jr.
1985: Jerome B.Wiesner
1986: W. O. Baker
1987: Lewis M. Branscomb
1988: Dale R. Corson
1989: James C. Fletcher
1990: Solomon J. Buchsbaum
1991: Norman R. Augustine
1992: Ruben F. Mettler
1993: Ralph E. Gomory
1994: Robert C. Seamans, Jr.
1995: Roland W. Schmitt
1996: William J. Perry
1997: Erich Bloch
1998: John H. Gibbons
1999: H. Guyford Stever
2000: Charles M. Vest
2001: Ian M. Ross
2002: No recipient
2003: Robert A. Frosch
2004: John B. Slaughter
2005: Leo Young
2006: Chauncey Starr
2007: Jordan J. Baruch
2008: G. Wayne Clough
2009: Sheila E. Widnall
2010: Anita K. Jones
2011: Charles Elachi
2012: James J. Duderstadt