2004
Annual Report

NATIONAL ACADEMY OF ENGINEERING

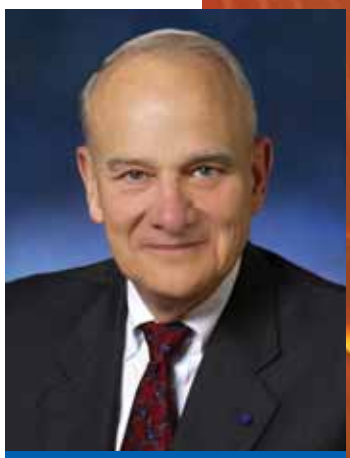




ENGINEERING THE FUTURE

NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

Letter from the President



Wm. A. Wulf

In 2004, the National Academy of Engineering (NAE) had a great opportunity to expand its focus on preparing to face ongoing and future challenges.

At the NAE annual meeting, we examined in depth a "mosaic" of engineering challenges and opportunities that must be addressed to continue to provide the nation with the best information and advice regarding our technological welfare. In addition to outsourcing, the definition and reliability of discipline-specific data, the importance of H1B visas, the need for more women and underrepresented minorities in the profession, the need for policy makers, journalists, and others who have tremendous influence to be technologically literate, and other important issues, we also reflected on one of the main underpinnings of our profession—engineering education. We must continue our commitment to change and to providing resources to support changes in engineering education, not only to keep up with new inventions and achievements, but also to meet the challenges of rapidly evolving societies and markets at home and abroad. We must use all of our technical resources, qualitative, diversified, and quantitative systems, and all of our human and imaginative resources to educate and prepare engineers to practice in a very different world. Otherwise, we will surely miss the mark of what engineering can and should achieve in building and sustaining our great nation.

We must use all of our resources, technical and human, to educate engineers for a very different world.

The achievements and advancements we have made in the arena of engineering education and other frontiers during 2004 reflect our firm commitment to this fundamental aspect of engineering. Interestingly enough, one of our finest achievements—the 20 Greatest Achievements Project *(www.greatachievements.org)*—would not have been possible without a strong, viable U.S. engineering education system that fostered and supported the inventions and achievements that improved the way people everywhere live and work. The book is now also a website portal we hope will inspire achievements of this magnitude and impact in the next 100 years.

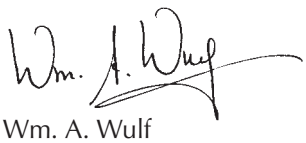
Another cornerstone of our efforts to change, perhaps even revolutionize, engineering education is the rapid expansion—and success—of the Center for the Advancement of Scholarship on Engineering Education (CASEE). Our activities in CASEE include sponsoring scholarship in engineering education, setting higher

standards for such scholarship, encouraging the implementation of results of that scholarship, and providing a web-based portal to the best available scholarship in engineering education.

But NAE has done more than advocate for change in engineering education. We are also working to educate the public about engineering issues that affect daily life and public policy. Take for example our "Media and the First Response" terrorism scenarios, which bring together journalists and other members of the media, government officials, and engineering experts to prepare them to communicate accurate and pertinent information in the crucial minutes and hours after a terrorist event or other catastrophe. As part of these scenario exercises, we have produced basic fact sheets on radiological, nuclear, biological, and chemical terrorism and distributed them to the media. These fact sheets are meant to give them a quick reference in the event of an incident.

These are but two of our current program activities. We also have ongoing projects, workshops, studies, and reports on technological literacy, the public understanding of engineering, engineering ethics, diversity in the engineering workforce, frontiers of engineering, and engineering and the environment. All of these programs are described briefly in this annual report.

NAE also continues to marshal the knowledge and insights of our members in the fields of bioengineering, computer science, aerospace, civil, industrial, and mechanical engineering, and others in service to the nation. We encourage you to review this year's annual report carefully and find a particular program or activity in which you can help us prepare to meet the needs of our communities and provide authoritative, independent information in areas of crucial importance to our national well-being.



Wm. A. Wulf
President

In Service to the Nation

Every day, our nation faces questions related to engineering and technology. How can we keep our nation safe from terrorism? How can we increase diversity in the engineering workforce? What role should citizens play in decisions about technology development? How can we help journalists and others in the media provide accurate, timely engineering and technology information? Answering these questions is becoming increasingly difficult as we advance technologically and become more involved in the global community.

Since 1964, the National Academy of Engineering (NAE) has provided independent, objective advice to the nation on engineering-related topics and policies. NAE operates under the same congressional act of incorporation that established the National Academy of Sciences, signed in 1863 by President Abraham Lincoln. Under this charter, NAE is directed "whenever called upon by any department or agency of the government, to investigate, examine, experiment, and report upon any subject of science or art."

NAE has more than 2,000 peer-elected members and foreign associates, approximately 47 percent from academia, 46 percent from industry, and 7 percent from nonprofit institutions and government. NAE members are drawn from bioengineering, computer science, aerospace, civil engineering, industrial engineering, and mechanical engineering. They serve as members of research and study committees, plan and conduct symposia and workshops, and assist in the work of the organization in many other ways. Areas of focus include working collaboratively at home and abroad to identify and solve technological problems, assessing the technological needs of the nation and sponsoring programs to meet those needs, advising Congress and government agencies on engineering-related matters of national importance, and recognizing and honoring outstanding engineers for their contributions to the well-being of the nation and the world.

NAE not only responds to requests from government, but also sponsors activities with foundations, industry, and state and local governments and funds projects through endowment funds supported by private contributions. Thus, NAE is a unique organization that brings together distinguished engineers for the purpose of improving the lives of people everywhere.

NAE is a unit of the National Academies, which also includes the National Academy of Sciences, Institute of Medicine, and National Research Council.

Mission Statement

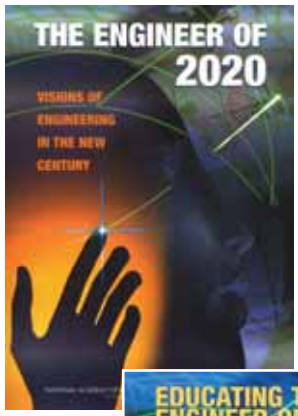
To promote the technological welfare of the nation by marshalling the expertise and insights of eminent members of the engineering profession.

NAE brings together distinguished engineers for the purpose of improving the lives of people everywhere.

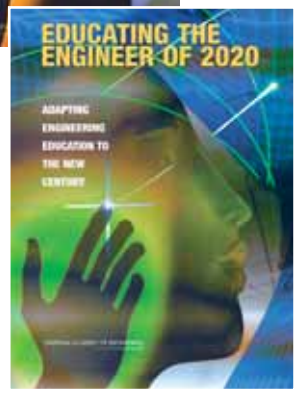
PROGRAM REPORTS

Engineering Education

The Committee on Engineering Education (CEE), a standing committee of the NAE Office of the President, is composed of leading thinkers and experts from the business, academic, and public sectors who have demonstrated a commitment to the advancement of education in engineering. The mission of CEE is to ensure quality, diversity, and quantity in engineering education by providing guidance and advice to policy makers, administrators, employers, and other stakeholders in the engineering education enterprise.



In 2004, CEE continued working on the two-phase Engineer of 2020 Project, which is designed to have a proactive influence on the preparation and practices of future engineers. The Phase 1 report, *The Engineer of 2020: Visions of Engineering in the New Century,* was published in May 2004 and has been very well received. Nearly 3,000 copies of the report were disseminated directly, and sales of more than 300 per month continued through January 2005. In response to continued interest in the report, NAP requested that another 2,000 copies be printed.

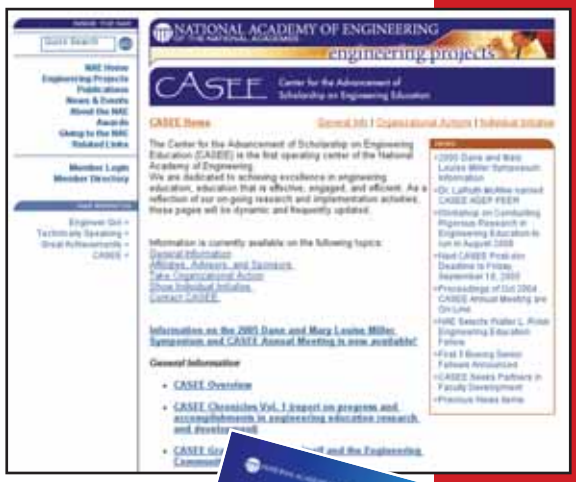


In July 2004, a summit on engineering education was held at the NAS building. The data and opinions that emerged from the summit are the basis for the upcoming report by the project steering committee. This second report, *Educating the Engineer of 2020: Adapting Engineering Education to the New Century,* which will be published in summer 2005, includes recommendations and provides examples of alternatives for revamping engineering education to ensure that the skills and attributes described in the Phase I report can be achieved.

Center for the Advancement of Scholarship on Engineering Education

The goal of the Center for the Advancement of Scholarship on Engineering Education (CASEE) is to make engineering education more relevant to the needs of employers, graduate schools, the students themselves, and society at large. This goal is being pursued through collaborative projects with different elements of the engineering community to take advantage of opportunities for improving engineering education.

In 2004, NAE appointed four Engineering Education Senior Fellows to work on three projects to increase diversity in the engineering workforce. The objective of the first project is to improve the understanding of engineering principles among non-engineering university students. The second project is focused on advancing the professional careers of current and future engineering faculty members from ethnic populations that are underrepresented in the profession. The purpose of the third project is to document perceptions of engineers around the world and develop ways to prepare students to practice in the global arena.



In October 2004, CASEE held the inaugural Dane and Mary Louise Miller Symposium as a showcase for innovative activities in engineering education research and development. The symposium is an affiliated activity of the Frontiers in Education Conference sponsored by the Institute of Electrical and Electronic Engineers and the American Society for Engineering Education. At the symposium, CASEE released volume 1 of the *CASEE Chronicles,* an update on progress by the 38 CASEE organizational affiliates.

CASEE has secured external support for six projects focused on community building, advancing knowledge about effective educational practices, and disseminating that knowledge in the engineering community. Grants received in 2004, mostly for multiyear projects, exceeded $4.76 million.

Technological Literacy

The purpose of the Program on Technological Literacy is to explore how Americans can become better prepared to navigate our technology-dependent society. What do informed citizens—adults and children—need to understand about technology, and how do we define it? What role should people play in deciding which technologies should be developed and for what purposes? What changes should be made in formal and informal education and in the policy arena to prepare citizens to participate in making these decisions?

The program, now in its eighth year, has contributed to the development of standards for the study of technology in elementary and secondary schools; undertaken a variety of activities to reach out to educators, policy makers, and the general public; sponsored a number of informational workshops; and overseen two consensus studies. The program's most visible published work is the 2002

report, *Technically Speaking: Why All Americans Need to Know More About Technology,* which puts forth a strong case for technological literacy. The report is accompanied by a companion website *(www.nae.edu/techlit).*

In 2004, NAE continued work on an NSF-funded study on assessing technological literacy. The lack of reliable information has been a major impediment to determining the effectiveness of interventions meant to increase the understanding of technology. The 16-member Committee on Assessing Technological Literacy, chaired by Elsa M. Garmire (NAE), Dartmouth College, is scheduled to publish a report on the subject in fall 2005. The project is being carried out in collaboration with the NRC Board on Testing and Assessment.

In the early spring, with funds provided by the U.S. Department of Education, NAE held a one-day event to reach out to state education leaders in mathematics, science, assessment, and curriculum. The one-day symposium, attended by more than 80 leaders from 40 states, was focused on the challenges and benefits of teaching technology and engineering in grades K–12. The event was a joint activity of NAE and NRC. Ronald Latanision (NAE), Massachusetts Institute of Technology, chaired the steering committee, and Dean Kamen (NAE), DEKA Research and Development Corporation, was a featured speaker.

Public Understanding of Engineering

NAE continues to strengthen and diversify its ties to media, government, community organizations, and individuals. These ties are essential to improving the public understanding of engineering (particularly how engineering affects our quality of life) and media coverage of engineering. Because of NAE's visibility and stature, the organization is in a unique position to sponsor and participate in collaborative public outreach/education activities.

Media Relations

NAE media/public relations workshops across the country have resulted in noticeably improved relations between NAE and journalists and news executives. The workshops have provided an opportunity for NAE to inform the media about the work of NAE, develop personal relationships with journalists and others in the media, and illustrate how engineering expertise can improve news coverage.

Panel discussion during the "super session" in Las Vegas. From left: moderator John McWethy, special correspondent, ABC News; NAE members Sig Hecker and Ruth David; Tim McAndrew, director, Las Vegas Office of Emergency Management; Robert Stephan, special assistant to the secretary, U.S. Department of Homeland Security; Kathy Walker, news director, KOA-AM, Denver.

In April, NAE helped develop and present a terrorism scenario exercise for a well attended "super session" at the 2004 Radio-Television News Directors Association (RTNDA) annual meeting in Las Vegas. During the exercise, panelists—journalists, government officials, and two NAE members—were asked to react to a fictional "dirty bomb" attack. The exercise was a vivid demonstration of the importance of reporting accurate scientific and technical information in the event of a catastrophe.

The National Academies, led by NAE media/public relations, held similar exercises as part of day-long workshops in five additional cities across the country during 2004. The News and Terrorism: Communicating in a Crisis series is co-organized with the U.S. Department of Homeland Security and the Radio-Television News Directors Foundation. The nature of the fictional scenarios, as well as the science and technology issues they raise, were customized for each city. Contact lists of local experts (including many NAE members) were provided to participants to encourage connections between journalists and engineers. The National Academies will hold workshops in five more cities in 2005.

Secretary Tom Ridge, U.S. Department of Homeland Security, addresses the workshop in Chicago

As part of the News and Terrorism Project, four-page fact sheets on radiological, chemical, biological, and nuclear threats were prepared to help journalists get "up to speed" quickly in the event of a terrorist attack. The fact sheets are meant to help the media provide accurate information and ask pertinent questions in the event of an emergency.

Public Relations

NAE continued to produce weekly radio segments highlighting engineering innovations and interesting stories. The reports were aired on WTOP Radio, the only all-news radio station in the Washington, D.C., area. The "Innovative Engineering" link in the features section of the WTOP website (www.wtop.com) has generated more than 11,000 visits to the NAE web page. The NAE website provides scripts, audio, and links to more information about each story.

Developing Effective Messages Project

A generous $40,000 grant from the Elizabeth and Stephen Bechtel Jr. Foundation provides funding for the Developing Effective Messages for Public Understanding of

Engineering (PUE) Program. This is a follow-on activity to an NAE-funded brainstorming session held in March 2003 to review the findings of *Raising Public Awareness of Engineering* (National Academies Press, 2002). The results of this project may lead to media/public relations activities.

The major activity of the Developing Effective Messages Project will be a half-day focus-group session, scheduled for April 2005. The participants will include advertising professionals, who will suggest ideas for communicating with target audiences about engineering. The results of the focus group will be used in further research, which might include a "message-testing" exercise to assess the effectiveness of messages with different audiences.

Great Achievements Website

In 2004, with proceeds from sales of the coffee-table book, *A Century of Innovation: Twenty Engineering Achievements That Transformed Our Lives* (National Academies Press, 2003), NAE began updating the very successful Great Achievements website *(www.greatachievements.org).* Launched in spring 2005, the new version of the site contains a richer and more complete text and timelines from *A Century of Innovation.* The original Great Achievements website, launched in 2000, was one of the most frequently visited NAE websites, and anecdotal evidence suggests it is being used as a classroom resource by teachers.

Engineering Ethics

NAE continues to encourage engineers to consider the ethical aspects of all work, research, and designs. A collection of papers from a workshop held by the Engineering, Economy, and Society Program was published in 2003. *Emerging Technologies and Ethical Issues,* which was disseminated to engineers and ethicists, may be a resource and an encouragement to engineers and ethicists to continue their dialogue on ethical issues that arise at the nexus of engineering and society.

NAE and Case Western Reserve University (CWRU) have made substantial progress on transferring the Online Ethics Center for Engineering and Science *(www.onlineethics.org)* to NAE. We have investigated the technology, support, and staff requirements for maintaining and expanding this outstanding website for engineering and science ethics. In 2005, we will continue working to secure funds to improve the accessibility and content of this unique resource.

Diversity in the Engineering Workforce

The goal of the NAE Program on Diversity in the Engineering Workforce is to ensure the health, vitality, and competitiveness of the national domestic engineering work-

force by increasing the participation of women and underrepresented minorities. The Committee on Diversity in the Engineering Workforce (CDEW), established in late 1999 as the primary vehicle for meeting this challenge, brings together influential stakeholders to share their knowledge, identify areas of need, design initiatives to leverage the strengths of NAE, and initiate actions to address identified needs.

In 2004, CDEW continued work on an innovation initiative begun in 2003 with the help of two Boston-based consulting firms. The goal of this initiative is to develop and implement activities that capitalize on NAE's ability to promote diversity in the engineering workforce in unique ways. During this "discovery" phase of the initiative, the committee reviewed information on approximately 500 benchmarked programs and brought together guest experts from the engineering education and outreach community as part of an information-gathering session. Based on this session, the committee developed guidelines for the next stage of the initiative. In late summer, members of the committee participated in eight focus-group-type meetings across the country with stakeholders from different groups in the engineering community (e.g., deans, potential coalition partners, industry leaders, etc.). After each meeting, staff and committee members met to synthesize the results.

In December, CDEW reconvened for an "invention session," (facilitated by consultants) to brainstorm on specific ideas for future activities. The summation of this process will be an implementation planning meeting with the NAE Executive Office and staff to create a road map for implementing ideas agreed upon by the committee. This meeting will be held in early 2005.

The *EngineerGirl!* website *(www.engineergirl.org),* which averages nearly 1,000 visits per day, continues to be an important part of the NAE web presence. We recently completed our annual essay contest, this year on ideas for saving beached dolphins. The names of the school children who submitted the best essays and ideas were announced on February 25, 2005.

FIRST PLACE

Erin Parrish
Dan Cunningham
Bethany Storella
Timberville, Virginia

Erin, Dan, and Bethany proposed using a rescue vehicle equipped with a tarp based on a "slip-'n-slide" concept. Their essay was well-researched and included a scholarly reference. They provided a detailed description of the vehicle and a very attractive illustration.

SECOND PLACE
Riannon Fowler

Riannon's idea, called the "gentle cycle," was to move dolphins off the beach via a lubricated platform and rollers. She included a design-to-cost estimate and a good engineering-design analysis. She also listed the pros and cons of her idea.

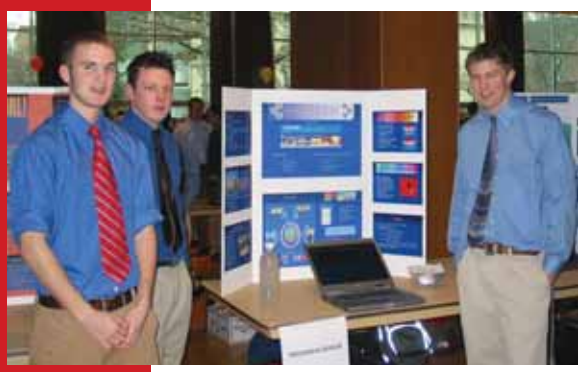
THIRD PLACE–TIE
Joey Lisa
Leesport, Pennsylvania

Joey's first-person essay described a realistic idea for using inflatable rafts, with the help of the Coast Guard, to save dolphins. Joey included step-by-step panel drawings.

Rachel Bradshaw
Eric Alderman
Christiansburg, Virginia

Rachel and Eric presented research showing that some stranded dolphins are sick. They presented a novel idea for using a generator to "steal" power from the ocean to charge an underwater scanner to check the health of passing dolphins. Sick dolphins would be called away by a sonar signal and treated so that their illnesses would not be passed to other animals. Another idea was for underwater cameras to be attached to the bottom of ships so that they could avoid running into dolphins. Besides being very professional and attractive, this presentation was based on solid engineering principles.

During the 2004 fall semester, NAE participated in an exciting project in collaboration with a team from Northrop Grumman's Electronic Systems Division, headed by Suzanne Jenniches (chair of the *EngineerGirl!* website advisory subcommittee), and the Penn State College of Engineering. More than 100 student teams in the freshman engineering-design class at Penn State were given an assignment to create website content that would appeal to middle-school girls, the target audience for *EngineerGirl!*. Projects were judged at a design exhibition in December 2004, and awards were given for best design communication, best design process, most innovative design, and best engineering design (see photo). The winning designs will be the first to be posted on the website, and the non-winners will provide an inventory of material for future use on the website.



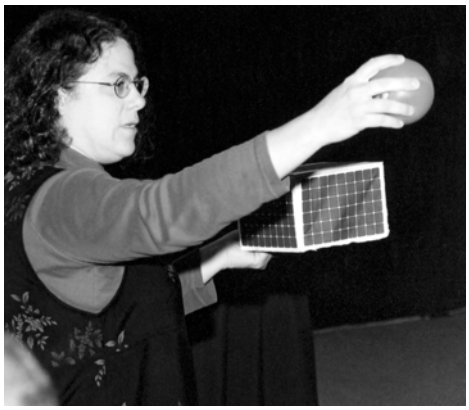
A design team at the Penn State EngineerGirl! *competition.*

In 2004, the NAE Program Office, in collaboration with the NRC Board on Health, Education, and Workforce, convened a workshop on improving the community-

college pathway to engineering careers; speakers highlighted exemplary approaches to the interface between two-year and four-year educational institutions and identified areas for future research. In panel discussions and poster sessions, representatives of 50 two-year and four-year institutions presented information about their programs and partnerships.

Frontiers of Engineering

Frontiers of Engineering (FOE) is a symposium series that brings together select groups of emerging engineering leaders from industry, academe, and government laboratories to discuss pioneering technical work and leading-edge research in various fields of engineering and industry sectors. The goals of the symposia are: (1) to introduce outstanding engineers (ages 30–45) to each other and promote the establishment of contacts among the next generation of engineering leaders; and, through this interaction, (2) to facilitate collaboration and the transfer of techniques and approaches across engineering disciplines.



Assistant Professor Laura Ray (Dartmouth) demonstrates the design rationale for scalable mobile robots for use on the Antartic plateau.

The annual U.S. Frontiers of Engineering (U.S. FOE) Symposium brings together approximately 100 engineers from across the country. Symposia for two bilateral programs—German-American Frontiers of Engineering (GAFOE) and Japan-America Frontiers of Engineering (JAFOE)—bring together approximately 30 engineers from each country. NAE's partner for the GAFOE program is the Alexander von Humboldt Foundation. The Japan Science and Technology Agency and the Engineering Academy of Japan are partners with NAE for the JAFOE program.

Three FOE symposia were held in 2004. In May, NAE hosted the GAFOE meeting in Washington, D.C. The topics for this year were engineering and art, the Internet, applications of quality management tools and methods, and bioengineering and the food industry. In September, the U.S. FOE symposium was held in Irvine, California. The topics this year were engineering for extreme environments, designer materials, multiscale modeling, and engineering and entertainment. The JAFOE symposium was held in November near Kyoto, Japan. The topics for the symposium were biomedical instrumentation and devices, IT for the elderly, optical communications, and hydrogen energy.

FOE encourages continuing interaction among participants in FOE symposia through ongoing outreach activities. Proceedings, such as *Frontiers of Engineering: Reports on Leading Edge Engineering from the 2003 NAE*

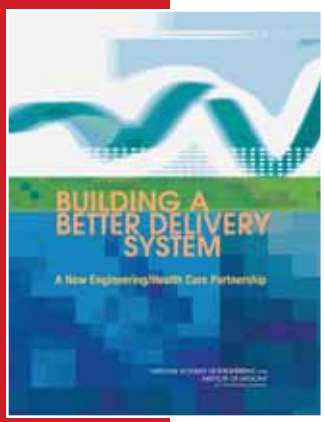
Symposium on Frontiers of Engineering, which was published in February 2004, are mailed to all past U.S. FOE participants. Other outreach activities include U.S. and bilateral FOE alumni newsletters, which enable alumni to keep in touch and share information about their work and current status, and an improved FOE website that now includes a searchable database, a directory of all FOE alumni, and access to presentations from the U.S. FOE meeting. The AvHumboldt Foundation provides support for ongoing collaborations among participants in GAFOE symposia.

Lillian M. Gilbreth Lectureships for Young Engineers

The Lillian M. Gilbreth Lectureships for Young Engineers, a related but independent program, selects outstanding engineers from among FOE speakers to give presentations at the NAE Annual Meeting in Washington, D.C., and the NAE National Meeting in Irvine, California. In 2004, Gilbreth lectures were presented by two FOE speakers. Dr. Melody Moore, director of the Brain Laboratory at Georgia State University, presented "Frontiers of Human-Computer Interaction: Direct-Brain Interfaces." Dr. Alan Russell, director of the McGowan Institute for Regenerative Medicine, University of Pittsburgh, presented "Using Biotechnology to Detect and Counteract Chemical Weapons."

Engineering and the Health Care System

NAE and the Institute of Medicine (IOM) are collaborating to identify engineering applications and research directions to address serious quality and cost/productivity challenges to U.S. health care delivery through system-wide improvements that will benefit all Americans. Specific goals of this project include: identification of engineering applications with the potential for significantly improving health care delivery in the short, medium, and long terms; assessment of factors that facilitate or inhibit the deployment of these applications; and identification of engineering and related research areas capable of contributing to rapid improvements in the safety, patient-centeredness, efficacy, and efficiency of health care in America.



The forthcoming consensus study, prepared by a distinguished committee of engineering and health care experts includes findings and recommendations aimed at building a sustainable platform for collaboration between engineers and health care professionals on challenges and opportunities in health care delivery. The consensus report focuses on two major areas of opportunity for application, research, and education: (1) systems-design, analysis, and control tools to understand health care processes and system interactions and improve/optimize dimensions of system performance within realistic constraints; and (2) information and communications technologies to improve information flow, connectivity, and coordination of health care delivery.

In addition to the committee's consensus report, the published study includes more than 30 edited, individually authored papers that were presented at three

fact-finding workshops for the study. The workshop presentations provide information on the operational challenges confronting the U.S. health care delivery system and focus on opportunities in the areas of information technology, including biosensors and wireless communications, remote monitoring, and systems engineering (e.g., human-factors engineering, financial engineering, supply-chain management, and modeling and simulation).

Building a Better Delivery System: A New Engineering/Health Care Partnership will be published in summer 2005.

Engineering and the Environment

Late in 2003, a workshop on air quality in Chinese cities was held in Beijing in cooperation with the Chinese Academies of Science and Engineering; the proceedings were published in summer 2004. This workshop provided the groundwork for the development of a full consensus study, *Urbanization, Energy, and Air Pollution in China: The Challenges Ahead,* which was published at the end of 2004. The goal of this study is to assist Chinese policy makers in addressing the serious energy/air-pollution challenges that affect urban areas in China. The study, a joint project of NAE and the NRC Policy and Global Affairs Division, examines in detail the energy profiles, air pollution, and alternative strategies for minimizing environmental and health effects in four cities, two in the United States and two in China.

The two U.S. cities, Los Angeles and Pittsburgh, are compared with Chinese cities with similar energy/ industrial/air-pollution trajectories. The full range of environmental history, energy use, regulatory regimes, and enforcement policies was examined by two panels, one from China and one from the United States, over a period of about 18 months. This comparative analysis is expected to provide guidance to Chinese urban policy makers based on U.S. experience over the past half-century in addressing domestic air pollution. The study also identifies opportunities for leapfrogging in technologies and policies.

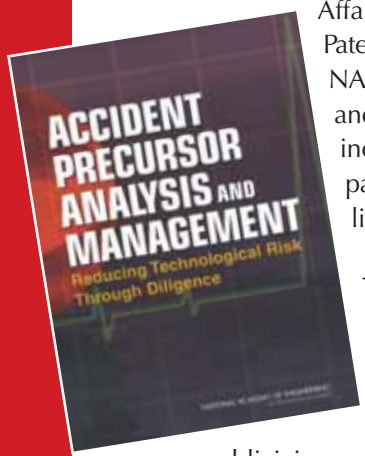
Accident Precursors

Many accidents are a result of a series of events—an accident chain—that occur in just the right, or more aptly, just the wrong way. In the aftermath of catastrophes, it is common to find prior indicators, missed signals, and dismissed alerts that, had they been recognized and appropriately managed before the event,

could have resulted in the undesired event being averted. These are typically called "precursors." Once precursors have been identified and understood, they can be mitigated to prevent accidents, catastrophes, and other extreme events, and industries have developed a number of risk-mitigation techniques, analytical techniques, and management approaches to detecting, modeling, and acting on precursor signals.

The project was focused on encouraging cross-industry sharing of approaches for analyzing and managing accident precursor signals. The participating industries included the nuclear, chemical, aviation, aerospace and health care industries. The project workshop brought together leading safety practitioners from all participating industries to share their knowledge of new precursor analysis and management approaches.

In 2004, NAE published *Accident Precursors Analysis and Management: Reducing Technological Risk Through Diligence.* Section I of the published report draws on the expertise and knowledge of the committee members and workshops participants and provides 11 recommendations. Section II includes papers from workshop keynote speakers James Bagian of the Department of Veteran Affairs' National Center for Patient Safety and Elisabeth Pate-Cornell, of Stanford University, who describes her research for NASA on shuttle safety, the findings of which were unfortunately and dramatically realized in the Columbia accident. Section III includes papers dealing with risk assessment; Section IV includes papers on risk management; and Section V includes papers on linking risk assessment and risk management.



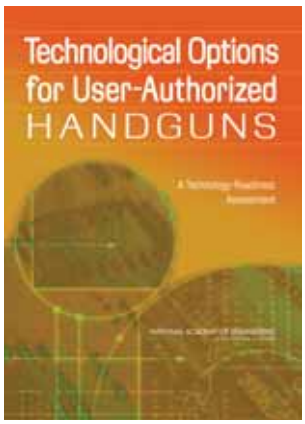
The committee recommends that high-risk industries establish an environment that encourages the reporting of problems and provide clear, understandable formal guidelines for collecting, analyzing, and sharing risk-related information; that management at all levels be committed to precursor programs and to publicizing resulting improvements in safety; that companies share risk-related information, both within their facilities and throughout their industries; and that government oversight agencies promote a dialogue on precursor management and support precursor-related research.

The report was disseminated to more than 100 safety leaders in the participating industries.

User-Authorized Handgun Technology

The primary method of preventing handgun misuse has been to encourage gun owners to store and handle handguns properly. In recent years, a user-authorized handgun has been investigated as a potential alternative. A user-authorized handgun would "recognize" the owner or other authorized user and fire only when

that individual, and no one else, uses the gun. A variety of sensor, electronic, mechanical, and other technologies might be used in the design of such a weapon.



In 2004, NAE continued gathering data for a study of the technical feasibility of developing such a firearm. The project is funded by the David and Lucille Packard Foundation and NAE. *Technological Options for User-Authorized Handguns: A Technology-Readiness Assessment* will be published in summer 2005. The 11-person Committee on User-Authorized Handguns is chaired by NAE Executive Officer Lance Davis and includes several other NAE members: T. Dixon Dudderar, Lucent Technologies (ret.); Larry Seifert, AT&T Wireless (ret.); and Marvin White, Lehigh University. This is a follow-on report to an NAE workshop in June 2002 on the technical, criminal, health, and legal issues related to user-authorized handguns. A report on the workshop, *Owner-Authorized Handguns—A Workshop Summary,* was published in 2003.

Assessing the Capacity of the U.S. Engineering Research Enterprise

With funding from the National Science Foundation, NAE convened a committee of engineering leaders during the summer of 2004 to conduct an assessment of (1) the past and potential future impact of the U.S. engineering research enterprise on the nation's economy, quality of life, security, and global leadership, and (2) the adequacy of public and private investment to sustain U.S. preeminence in basic engineering research. The committee documented and evaluated recent contributions of U.S.-based engineering research to critical national interests; assessed potential contributions to emerging national challenges and opportunities; and outlined a national strategy to ensure that the engineering research foundations of American global economic, military, scientific, and technological preeminence remain rock solid in the face of rapid, often disruptive, societal and global change. The committee's findings and recommendations will inform public-sector and private-sector decision making regarding the scale and composition of investments in engineering research, engineering research infrastructure, and education of the nation's engineering workforce. Implementation of the committee's recommendations should strengthen the U.S. engineering research enterprise and its contributions to future U.S. economic prosperity, national security, and global technological leadership. The report of the committee will be published in summer 2005, and the findings will be widely disseminated to leading stakeholders in the U.S. engineering enterprise from industry, academia, and government.

2004 NAE AWARDS RECIPIENTS

Charles Stark Draper Prize

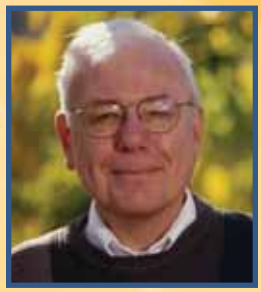
Recognized as one of the world's preeminent awards for engineering achievement, this prize honors an engineer or engineers whose contributions have significantly impacted society by improving quality of life, enabling people to live more freely and comfortably, or providing access to information. Presented annually, the prize carries a $500,000 cash award.

Alan C. Kay, Butler W. Lampson, Robert W. Taylor, and Charles P. Thacker "for the vision, conception, and development of the first practical networked personal computers."

Dr. Alan C. Kay

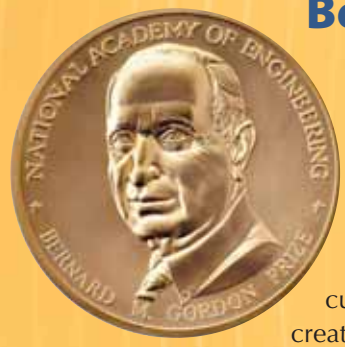
Dr. Butler W. Lampson

Mr. Robert W. Taylor



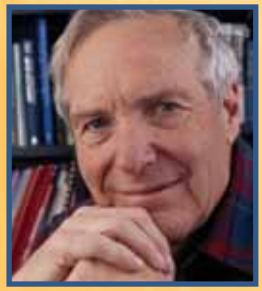
Mr. Charles P. Thacker

Bernard M. Gordon Prize



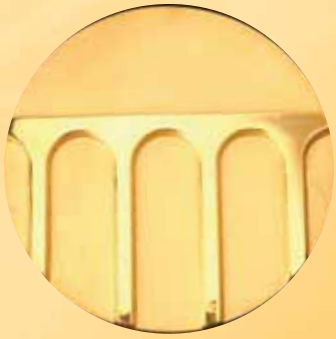
The Gordon Prize for Innovation in Engineering and Technology Education is a cash prize of $500,000 split equally between the nominated professor and his or her institution for the continuation of the award winning program. The Gordon Prize honors technology educators whose innovative programs have strengthened the engineering workforce by cultivating students' communication skills, creativity, and teamwork.

Frank S. Barnes for pioneering the Interdisciplinary Telecommunications Program (ITP) that educates leaders who can bridge engineering, social sciences, and public policy.

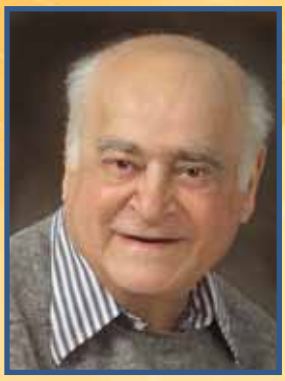


Dr. Frank S. Barnes

Founders Award



The Founders Award is conferred upon an NAE member or foreign associate who exemplifies the ideals and principles of NAE through professional, educational, and personal achievement and accomplishment. The Founders Award is presented during the NAE Annual Meeting in October.



Dr. Eli Ruckenstein

Dr. Eli Ruckenstein, Distinguished Professor of Chemical Engineering, State University of New York, Department of Chemical and Biological Engineering, "for leadership in modernizing research and development in key areas of chemical engineering."

Arthur M. Bueche Award

The Bueche Award is conferred upon an engineer who has been actively involved in determining U.S. science and technology policy, promoting U.S. technological development, and improving relations between industries, government, and universities. The award is presented each year during the NAE Annual Meeting.

Dr. John Brooks Slaughter

Dr. John Brooks Slaughter, President and CEO, National Action Council for Minorities in Engineering, "for support of engineering research and education in the National Science Foundation, many contributions to the development of science and technology policy, and lifelong dedication to increasing diversity in the disciplines of science and engineering."

For additional information about the NAE awards, please visit our website <www.nae.edu/awards>.

2004 NEW MEMBERS AND FOREIGN ASSOCIATES

In February, NAE elected 76 new members and 11 foreign associates, bringing the total U.S. membership to 2,174 and the number of foreign associates to 172. Election to the National Academy of Engineering is one of the highest professional distinctions that can be accorded to an engineer. Academy membership honors those who have made "important contributions to engineering theory and practice, including significant contributions to the literature of engineering theory and practice" and those who have been instrumental in "pioneering … new fields of engineering, making major advancements in traditional fields of engineering, or developing/ implementing innovative approaches to engineering education."

A list of the newly elected members and foreign associates follows, with their primary affiliations at the time of election.

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NATIONAL ACADEMY OF ENGINEERING FUND FINANCIAL REPORT

Governed by the National Academy of Engineering Fund (NAEF) Board of Trustees, the NAEF is the tax-exempt corporation (under section 501(c)(3) of the Internal Revenue Code) that serves as a holding entity for the independent assets and operating funds of the National Academy of Engineering (NAE). The NAE operates within the charter and framework of the National Academy of Sciences (NAS).

The table on page 27 summarizes both the NAEF and outside operating revenue and expenses as well as non-operation-related transactions for the NAE for 2004 and 2003. The information on the NAEF presented in this table has been extracted from the Fund's audited financial statements also contained in this report.

During 2004, contributions for the National Academy of Engineering were solicited as part of the overall fund-raising campaign for the National Academies (includes the NAE as well as the NAS, the Institute of Medicine, and the National Research Council). Contributions from corporations, NAE members, and private foundations, and contracts and grants from the federal government are a major source of support for the Academy's self-initiated programs, which are described in this report.

A second source of revenue for the Academy is the allocation from the overhead charge assessed on government and privately funded contracts for National Research Council (NRC) projects; the NRC is the operating arm of the NAE and the National Academy of Sciences. This allocation is used to offset expenses incurred in the oversight function and for such other administrative operations as NAE membership services and governance.

Under a policy established by the NAEF Board of Trustees, the Academy may use a certain percent of its unrestricted invested assets for operations each year. In 2004, 5 percent was allocated for normal operating expenses; an additional 1 percent was authorized for fund-raising expenses. This allocation, combined with annual meeting registration fees, membership dues, and investment earnings on current operating funds, make up the remainder of the Academy's operating revenue.

The Academy welcomes corporate and private gifts, which are used to help finance the research, education, and public information programs of the institution. The NAE does not, however, conduct proprietary studies for private clients or corporations.

NAE/NAEF Combined Summary of Revenues, Expenses, and Changes in Net Assets (Unaudited-Pro Forma)

(Thousands of Dollars)

	2004	2003
NET ASSETS, BEGINNING	**$64,786**	**$47,028**
CONTRIBUTIONS RECEIVABLE, NET	**1,996**	**11,968**
TOTAL ASSETS, BEGINNING	$66,782	$58,996
OPERATIONS		
Revenue		
Contributions (Unrestricted)	$973	$1,201
Dues (Annual), Fees, Miscellaneous	250	345
Indirect Allowance From Contracts and Grants	2,731	2,824
Award Specific Funds Allocation to Operations*	1,789	1,689
Program Specific Funds Allocation to Operations*	3,014	2,384
Unrestricted Allocation to Operations	2,121	3,005
Total Operations Revenue	**$10,878**	**$11,448**
Expenses		
Awards	$1,808	$1,699
Development	809	962
Management	1,901	1,721
Membership	1,047	1,140
National Academies Activities	305	352
Programs	4,821	5,276
Total Operations Expenses	**$10,691**	**$11,150**
OPERATIONS SURPLUS	**$187**	**$298**
NONOPERATIONAL TRANSACTIONS		
Allocation to Operations	($4,909)	($5,841)
Contributions to Reserves	1,540	15,289
Dues (Lifetime), Miscellaneous	105	10
Gain (loss) on Investments	3,306	6,538
Investment Earnings (Interest and Dividends)	1,878	1,679
Capital Campaign Settlement	(2,210)	0
Investment Fees	(277)	(215)
NONOPERATIONAL LOSS	**($567)**	**$17,460**
NET ASSETS, ENDING	**$64,406**	**$64,786**
CONTRIBUTIONS RECEIVABLE, NET	**1,398**	**1,996**
TOTAL ASSETS, ENDING	$65,804	$66,782

*Restricted funds are reported in this unaudited-pro forma report as operating revenue when earned

NOTE: The audited financial statements that follow record contributions as revenue the year in which the pledge is received in accordance with generally accepted accounting principles.

NATIONAL ACADEMY OF ENGINEERING FUND
December 31, 2004 and 2003

Report of Independent Certified Public Accountants

Board of Trustees
National Academy of Engineering Fund

We have audited the accompanying statements of financial position of the National Academy of Engineering Fund (the Fund) as of December 31, 2004, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Fund's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior-year summarized comparative information has been derived from the Fund's 2003 financial statements and, in our report dated March 25, 2004, we expressed an unqualified opinion on those financial statements.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America as established by the Auditing Standards Board of the American Institute of Certified Public Accountants. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Fund's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the National Academy of Engineering Fund as of December 31, 2004, and the changes in its net assets and its cash flows for the year then ended, in conformity with accounting principles generally accepted in the United States of America.

Grant Thornton LLP

Vienna, Virginia
March 24, 2005

NATIONAL ACADEMY OF ENGINEERING FUND

Statements of Financial Position

December 31,	2004	2003
Assets		
Current Assets		
Cash and cash equivalents	$ 442,392	$ 260,474
Short-term investments	250,691	102,088
Contribution receivable, net	585,349	993,566
Accounts receivable–other	—	174,121
Award medals and other assets	142,633	149,409
Total Current Assets	1,421,065	1,679,658
Non-current Assets		
Contribution receivable–long-term portion, net	812,905	1,002,620
Investments	66,116,058	64,540,699
Total Non-current Assets	66,928,963	65,543,319
Total Assets	$ 68,350,028	$ 67,222,977
Liabilities and Net Assets		
Liabilities		
Accounts payable–National Academy of Sciences	$ 2,545,709	$ 441,402
Commitments and Contingencies	—	—
Net Assets		
Unrestricted	31,985,655	33,473,059
Temporarily restricted	8,491,865	8,162,407
Permanently restricted	25,326,799	25,146,109
Total Net Assets	65,804,319	66,781,575
Total Liabilities and Net Assets	$ 68,350,028	$ 67,222,977

National Academy of Engineering Fund

Statements of Activities and Changes in Net Assets

Year ended December 31,

	2004				2003
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	Total
Revenue					
Interest and dividends	$ 980,350	$ 898,655	$ —	$ 1,879,005	$ 1,679,825
Realized gain (loss) on investments	1,049,248	950,958	—	2,000,206	(112,215)
Contributions	566,784	1,107,775	180,690	1,855,249	6,304,617
Membership dues	232,980	—	—	232,980	133,240
Registration fees	88,465	—	—	88,465	116,622
Miscellaneous revenue	27,451	—	—	27,451	95,234
Net assets released from restrictions:					
Satisfaction of program restrictions	3,011,765	(3,011,765)	—	—	—
Satisfaction of time restrictions	313,424	(313,424)	—	—	—
Total Revenue	6,270,467	(367,801)	180,690	6,083,356	8,217,323
Expenses					
Program services:					
Programs	2,607,335	—	—	2,607,335	3,716,632
Member programs	200,017	—	—	200,017	212,863
Support for NRC and NAS	305,180	—	—	305,180	352,143
Awards	1,807,719	—	—	1,807,719	1,699,003
Total program services	4,920,251	—	—	4,920,251	5,980,641
Supporting services:					
Fundraising	3,018,913	—	—	3,018,913	962,233
Operations	503,547	—	—	503,547	360,773
Total supporting services	3,522,460	—	—	3,522,460	1,323,006
Total Expenses	8,442,711	—	—	8,442,711	7,303,647
Change in Net Assets Before Unrealized Gain on Investments	(2,172,244)	(367,801)	180,690	(2,359,355)	913,676
Unrealized gain on investments	684,840	697,259	—	1,382,099	6,872,328
Change in Net Assets	(1,487,404)	329,458	180,690	(977,256)	7,786,004
Net Assets, beginning of year	33,473,059	8,162,407	25,146,109	66,781,575	58,995,571
Net Assets, end of year	$31,985,655	$ 8,491,865	$25,326,799	$65,804,319	$66,781,575

National Academy of Engineering Fund

Statements of Cash Flows

Year ended December 31,	2004	2003
Cash Flows from Operating Activities		
Change in net assets	$ (977,256)	$ 7,786,004
Adjustments to reconcile change in net assets to net cash (used in) provided by operating activities:		
Realized (gain) loss on investments	(2,000,206)	112,215
Unrealized gain on investments	(1,382,099)	(6,872,328)
Changes in assets and liabilities:		
Contributions receivable	597,932	9,971,727
Accounts receivable–National Academy of Sciences	—	409,570
Accounts receivable–other	174,121	(148,013)
Award medals	6,776	(85,230)
Accounts payable–National Academy of Sciences	2,104,307	441,402
Net Cash (Used in) Provided by Operating Activities	(1,476,425)	11,615,347
Cash Flows from Investing Activities		
Proceeds from sale of investments	81,118,356	120,507,116
Purchase of investments	(79,460,013)	(132,663,397)
Net Cash Provided by (Used in) Investing Activities	1,658,343	(12,156,281)
Net Increase (Decrease) in Cash and Cash Equivalents	181,918	(540,934)
Cash and Cash Equivalents, beginning of year	260,474	801,408
Cash and Cash Equivalents, end of year	$ 442,392	$ 260,474

NATIONAL ACADEMY OF ENGINEERING FUND

Notes to Financial Statements

December 31, 2004 and 2003

NOTE A—GENERAL INFORMATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

General Information

The National Academy of Engineering Fund (the Fund) is an independent non-profit organization established by the National Academy of Engineering (NAE) to collect and disburse funds for accomplishing the goals of NAE. NAE operates within the charter and framework of the National Academy of Sciences (NAS), which accounts for NAE's expenses. The operating expenditures of NAE are accounted for by offices of NAS, and are offset by reimbursement from funds received from the Fund and from contracts administered by NAS on behalf of the National Research Council (NRC), which is the operating arm of NAS and NAE. The net expenditures of NAE, except for the approved budgeted indirect costs, are paid by the Fund to balance accounts with NAS.

Basis of Accounting

The Fund's financial statements are prepared using the accrual basis of accounting.

Cash and Cash Equivalents

For purposes of the statement of cash flows, the Fund considers all investments purchased with an original maturity of three months or less to be cash equivalents, except for the cash in the investment portfolio, which will be reinvested on a long-term basis.

Short-term Investments

Temporary investments consist of money market funds that are used to fund normal operations of the Fund and are recorded at their readily determinable fair values as determined by quoted market prices.

Contributions Receivable

Unconditional promises to give are recognized as revenue and contributions receivable in the period the promises are made. Unconditional promises to give that are expected to be collected within one year are recorded at their net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using risk-free interest rates commensurate with the risk involved applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Conditional promises to give are not included as support until the conditions are substantially met.

Awards Medals

The Fund maintains gold medals for various awards, which are carried at cost.

Investments

Investments, consisting of cash and money market funds, federal agency securities, treasury securities, corporate debt securities, and equity securities, are recorded at readily determinable fair values determined by quoted market price.

Temporarily Restricted Net Assets

Temporarily restricted net assets consist of amounts that are subject to donor-imposed time or purpose restrictions and income earned on temporarily and permanently restricted net assets. The Fund is permitted to use or expend the donated assets in accordance with the donor restriction.

Permanently Restricted Net Assets

Permanently restricted net assets consist of assets whose use is limited by donor-imposed restrictions that neither expire by the passage of time nor can be fulfilled or otherwise removed by action of the Fund. The restrictions stipulate that resources be maintained permanently, but permit the Fund to expend the income generated in accordance with the provisions of the agreement. Permanently restricted net assets consist of the following:

Draper Prize–represents an endowment given by the donor for the purpose of establishing and awarding an annual prize in honor of the memory of Charles Stark Draper. It is the Fund's intention to use the investment earnings of the endowment to cover the expenses incurred in connection with administration of the prize and in providing the honorarium awarded with the prize.

Gordon Prize–represents an endowment given by the donor for the purpose of establishing and awarding an annual prize in honor of Bernard M. Gordon. It is the Fund's intention to use the

investment earnings of the endowment to cover the expenses incurred in connection with administration of the prize and in providing the honorarium awarded with the prize.

Capital Preservation and Hans Reissner–represent endowments requiring that the principal be invested and that only the income be used for general operations of NAE.

Hollomon–represents an endowment requiring that the principal be maintained in perpetuity and that the income be used to support the Hollomon Fellow.

Industry Scholar–represents an endowment to support fellowships for recently retired corporate executives to assist with strategy and management of program activities in NAE and NRC.

Senior Scholar–represents an endowment to support an outstanding member of industry or another field working as an advisor and assistant to the president of NAE in the management and execution of NAE's programmatic activities.

Young Engineer–represents an endowment to support programs aimed at engaging engineers at a younger age in the activities of NAE, and to provide an opportunity to identify nominees from industry for membership in NAE.

Restricted Support
The Fund reports gifts of cash and other assets as restricted support if they are received with donor stipulations that limit the use of the donated assets. When a donor restriction expires, i.e., when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

Allocation of Expenses
The costs of providing various programs and other activities have been summarized on a functional basis in the statement of activities. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Financial Instruments and Concentration of Credit Risk
Financial instruments, which potentially subject the Fund to concentrations of credit risk, consist principally of corporate debt securities, treasury securities and federal agency securities. The Fund places its investments with creditworthy financial institutions and investment firms. By policy, these investments are kept within limits designed to prevent risks caused by concentration. At December 31, 2004 and 2003, the Fund had no significant concentrations of credit risk related to financial instruments.

As of December 31, 2004, the Fund held cash in excess of the Federal Deposit Insurance Corporation insurable limit in the amount of $342,392. Management does not consider this to be a significant credit risk.

Income Taxes
The Fund is incorporated under the District of Columbia Non-profit Corporation Act and is exempt from income taxes under Section 501(c)(3) of the Internal Revenue Code. In addition, the Fund has been determined by the Internal Revenue Service not to be a private foundation. The Fund is required to remit income taxes to the federal government and the District of Columbia for unrelated business income. For the years ended December 31, 2004 and 2003, there was no unrelated business income and, consequently, no provision for income taxes has been made.

Use of Estimates
In preparing financial statements in conformity with accounting principles generally accepted in the United States of America, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements and revenue and expenses during the reporting period. Actual results could differ from those estimates.

Reclassifications
Certain 2003 amounts have been reclassified to conform to the 2004 presentation.

NOTE B—CONTRIBUTIONS RECEIVABLE

Contributions receivable consist of unconditional promises to give and are deemed fully collectible as follows at December 31, 2004:

	Unrestricted	Restricted	Total
Unconditional promises to give	$ 292,274	$ 1,129,523	$1,421,797
Less: unamortized discount	—	(23,543)	(23,543)
Net unconditional promises to give	$ 292,274	$ 1,105,980	$1,398,254
Amounts due in:			
Less than 1 year	$ 292,274	$ 293,075	$ 585,349
1 to 5 years	—	812,905	812,905
	$ 292,274	$ 1,105,980	$1,398,254

Contributions receivable consist of unconditional promises to give and are deemed fully collectible as follows at December 31, 2003:

	Unrestricted	Restricted	Total
Unconditional promises to give	$ 578,975	$ 1,500,704	$2,079,679
Less: unamortized discount	—	(83,493)	(83,493)
Net unconditional promises to give	$ 578,975	$ 1,417,211	$1,996,186
Amounts due in:			
Less than 1 year	$ 578,975	$ 414,591	$ 993,566
1 to 5 years	—	1,002,620	1,002,620
	$ 578,975	$ 1,417,211	$1,996,186

Net restricted contributions consist of $327,204 and $605,278 at December 31, 2004 and 2003, respectively, which is subject to time restrictions, and $778,776 and $811,933 at December 31, 2004 and 2003, respectively, which is subject to donor-imposed purpose restrictions.

NOTE C—INVESTMENTS

Investments at fair value consist of the following at December 31:

	2004	2003
Cash and money market	$ 3,527,845	$ 4,383,433
Federal agency securities	14,497,030	13,832,908
Certificate of deposit	876,215	—
Corporate debt securities	11,104,743	12,138,702
Equity securities	29,255,854	34,287,744
Managed futures	7,105,062	—
	66,366,749	64,642,787
Less: short-term investments	(250,691)	(102,088)
	$ 66,116,058	$ 64,540,699

Investments are further classified as follows at December 31:

Unrestricted	$ 33,885,279	$ 33,243,706
Temporarily restricted	7,541,313	6,793,200
Permanently restricted	24,940,157	24,605,881
	$ 66,366,749	$ 64,642,787

Investment return consists of the following at December 31:

Dividends and interest	$ 1,879,005	$ 1,679,825
Unrealized gain	1,382,099	6,872,328
Realized gain (loss)	2,000,206	(112,215)
	$ 5,261,310	$ 8,439,938

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETS

Permanently and temporarily restricted net assets consist of the following at December 31, 2004:

	Permanently Restricted	Temporarily Restricted
Draper Prize	$ 8,000,000	$ 2,713,277
Gordon Prize	13,438,250	1,876,714
Capital Preservation	2,240,046	892,280
Bechtel–Public Understanding	—	6,432
Hollomon	201,200	292,094
Great Achievements	—	165,337
Public Understanding	—	666,064
Technology and Environment	—	4,753
Frontiers Fund	—	16,250
Bueche Award	—	88,545
AT&T	—	9,508
CASEE	—	157,463
Russ Prize	—	52,619
Engineering Ethics Center	—	44,721
Diversity in the Engineering Work Force	—	64,537
PUE Messaging	—	37,986
Battelle	—	1,003
Grainger Prize	—	325,373
Hans Reissner	25,624	32,377
U.S./German American Frontiers	—	3,727
Information Technology	—	23,791
Engineering & Services	—	2,688
Homeland Security	—	7,594
Communication with Public in Crisis	—	21,669
Industry Scholar	353,038	80,547
Senior Scholar	300,000	41,327
Young Engineer	768,641	87,609
Media Relations Mettler	—	218,628
Noise Policy Development	—	60,000
Urban Infrastructure	—	60,226
Unrestricted contributions to be received in future years	—	327,204
Others	—	109,522
	$ 25,326,799	$ 8,491,865

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETSpContinued

Permanently and temporarily restricted net assets consist of the following at December 31, 2003:

	Permanently Restricted	Temporarily Restricted
Draper Prize	$ 8,000,000	$ 2,663,292
Gordon Prize	13,438,250	1,448,012
Capital Preservation	2,059,792	762,632
Bechtel–Public Understanding	—	119,062
Hollomon	201,200	255,407
Great Achievements	—	110,506
Public Understanding	—	621,097
Technology and Environment	—	4,578
Frontiers Fund	—	13,665
Bueche Award	—	98,170
AT&T	—	21,144
CASEE	—	176,748
Russ Prize	—	110,400
Engineering Ethics Center	—	51,436
Diversity in the Engineering Work Force	—	203,618
Pue Messaging	—	40,006
Battelle	—	6,482
Grainger Prize	—	500,056
Hans Reissner	25,624	30,662
U.S./German American Frontiers	—	38,302
Information Technology	—	21,472
Engineering & Services	—	2,676
Homeland Security	—	7,560
Communication with Public in Crisis	—	2,263
Industry Scholar	353,038	48,256
Senior Scholar	300,000	19,631
Young Engineer	768,205	24,633
Unrestricted contributions to be received in future years	—	605,278
Others	—	155,363
	$ 25,146,109	$ 8,162,407

NOTE E—DESCRIPTION OF PROGRAM AND SUPPORTING SERVICES

The following program and supporting services are included in the accompanying financial statements:

Programs–programs that address relevant issues in the engineering field including, but not limited to: *Education, Engineering Practice and the Engineering Workforce*; *Engineering and the Environment*; *Engineering, the Economy and Society*; *Information Technology and Society*; *National Security and Crime Prevention*; and *Public Policy and Program Reviews*.

Member Programs–organization and administration of the Annual Meeting and publication of NAE Memorial Tributes.

Support for NRC and NAS–contributions to joint activities of the National Academies, including, but not limited to, the NAS/NAE/IOM Committee on Human Rights, the NRC Office of Scientific and Engineering Personnel, and *Issues in Science and Technology*.

Awards–NAE presents five awards: the Bernard M. Gordon Prize, the Charles Stark Draper Prize, the Fritz J. and Dolores H. Russ Prize, the Arthur M. Bueche Award, and the NAE Founders Award. Activities include soliciting nominations, selection of the recipients, announcement of the recipients and presentation of the prizes.

Fundraising–provides the structure necessary to encourage and secure private financial support from individuals, foundations and corporations.

Operations–includes the functions necessary to provide an adequate working environment, provide coordination and articulation of the Fund's programs, secure proper administrative function of the Board of Trustees, maintain competent legal services for program administration, and manage the financial and budgetary responsibilities of the Fund.

NOTE F—RELATED-PARTY TRANSACTIONS

The National Academies Corporation

The National Academies Corporation (TNAC) is a non-profit corporation that was incorporated in January 1986 for the purpose of constructing and maintaining a study and conference facility, the Arnold and Mabel Beckman Center, in Irvine, California, to expand and support the general scope of program activities of NAS, NAE, the Institute of Medicine (IOM), and NRC. TNAC is organized as a tax-exempt supporting organization for NAS and the Fund. The Board of Directors and officers of TNAC include certain officers of the Fund. The Fund had no transactions with TNAC for the years ended December 31, 2004 and 2003.

National Academy of Sciences and National Research Council

The Fund reimburses NAS by making monthly payments based on NAE's estimated expenditures for the year. This resulted in a payable to NAS at December 31, 2004 and 2003 of $2,545,709 and $441,402, respectively. Payments made to NAS by the Fund for the Fund's allocated portion of the expenditures shared jointly by NAS, NAE and IOM were $1,168,901 and $1,314,376 for the years ending December 31, 2004 and 2003, respectively. The Fund made no payments to NRC for the years ended December 31, 2004 and 2003. See Note A for the relationship of related parties.

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*Indicates term ended June 30, 2004. Year in parentheses indicates the year term expires.

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NAE PUBLICATIONS

NAE reports can be purchased from the National Academies Press, <*www.nap.edu*> or (888) 624-8373, or from the National Academies Bookstore, 500 Fifth Street, N.W., Washington, D.C.

All reports can also be read online.

Program Reports for 2004:

Accident Precursor Analysis and Management: Reducing Technological Risk Through Diligence

The Engineer of 2020: Visions of Engineering in the New Century

Emerging Technologies and Ethical Issues in Engineering

Frontiers of Engineering: Reports on Leading Edge Engineering from the 2003 NAE Symposium on Frontiers of Engineering

Urbanization, Energy, and Air Pollution in China: The Challenges Ahead

The Bridge, the NAE quarterly journal, is available from the NAE Program Office or on the NAE website <*www.nae.edu*>.

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Advisers to the Nation on Science, Engineering, and Medicine

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

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