2003
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 October 2003 at the NAE annual meeting, we presented the Arthur M. Bueche Award to Dr. Robert A. Frosch for his outstanding contributions to U.S. science and technology policy. In his acceptance address, Dr. Frosch borrowed the term "complexifiers" from the late Senator Daniel Patrick Moynihan. "Increasingly, engineers must be 'complexifiers'—people, who can tell you how complex problems really are," Dr. Frosch said. "Engineers must not only recognize the complexities and ramifications of the problems we face today, but they must also invent ways to deal sensibly with these extremely complex problems."

Dr. Frosch spoke to one of the most important challenges facing NAE and engineers around the world in this time of rapid and constant change. The idea of complexifiers is at the heart of NAE's goal to provide independent, objective advice to the nation and at the heart of our participation in the global community of engineering professionals. Our determination to meet the challenges of the varied and intricate technological problems we face today and the ones we will face tomorrow is apparent in the projects we undertake and the reports and services we provide.

As leaders in our profession, we accept the challenges of anticipating the needs of our community and providing authoritative, independent information in areas of crucial importance to our national well-being.

In 2003, we published *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs.* The report, created in conjunction with the National Research Council (NRC) Board on Energy and Environmental Systems, focuses on the feasibility of, and technological requirements for, switching to a hydrogen-powered economy. The report, sponsored by the U.S. Department of Energy, provides a factual basis that can temper unrealistic enthusiasm for a quick transition and an authoritative basis for the development of future policies. In this area, as in so many others, engineers can provide crucial input to the formation of public policy.

NAE and the Institute of Medicine collaborated on a project to identify opportunities for a systems-engineering approach to improve health care delivery. The goals of the project are: to identify short-term and long-term engineering applications that could improve health care delivery; to identify the factors that could enhance or inhibit those engineering applications; and to determine areas for research that could improve the safety, effectiveness, and patient-focus of health care in the United States.

On the engineering education front, NAE completed the first phase of a two-part report, *The Engineer of 2020: Visions of Engineering in the New Century*, which addresses many questions. Can the engineering profession play a role in shaping its own future? What is the best way to educate engineers to balance the benefits and vulnerabilities of new technologies in terms of the well-being of society and humanity? Does (and will) the engineering profession reflect and celebrate the

diversity of our society? The answers to these and other questions are difficult to discern from our vantage point, but we do know that engineers will need a more creative mind-set, not only to adapt, but also to anticipate future possibilities.

The Center for the Advancement of Scholarship on Engineering Education (CASEE) is working toward its ultimate goal of continuous improvements in engineering education to ensure that we have a high-quality engineering workforce in the future. CASEE research has been focused on: how students learn; instructional effectiveness; and surveying instructional and institutional strategies for taking advantage of diversity among people, learning styles, and perspectives. CASEE is also expanding the Organizational Affiliates Program and initiating research for an on-line database that summarizes research on "best" and "promising" teaching practices.

Assessing technological literacy and finding ways to prepare people to negotiate our technology-dependent society is another NAE goal. In late 2003, NAE received funding to initiate a program to reach out to educators in mathematics, science, educational assessment, and curriculum development. This year, NAE /NRC will sponsor a workshop that brings together experts and practicing educators to explore the challenges and benefits of teaching technology and engineering in grades K-12.

Another highlight of 2003 was our first terrorism scenario exercise, "Media and the First Response." NAE hosted this one-day exercise for news media decision makers, reporters, federal/state/local public information officers, and science and technology experts. The focus was on the public communication of vital technical information during and after a catastrophic event. Participants took part in discussions about the processes and activities in responding to a crisis like the hypothetical terrorism scenario we created. The goals of the exercise were: to provide a better understanding of the role of each group; to gauge current preparedness; to provide technical information on potential threats and protective actions; and to establish regional relationships. The U.S. Department of Homeland Security (DHS) and the Radio-Television News Directors Association (RTNDA) are working with NAE to plan 10 similar exercises to be held across the country. Our goal is to prepare the media to report technical information accurately and effectively in emergency situations.

NAE continues to provide outstanding technical information and services to our nation. As leaders in our profession, we accept the challenges of anticipating the needs of our community and providing authoritative, independent information in areas of crucial importance to our national well-being. The following pages will give you an idea of the broad scope of our activities. You may call us complexifiers if you will in that we explain how complex problems really are. But we also contribute to finding creative solutions to these complex problems. As the following pages show, we are "engineering the future."

Wm. A. Wulf
President

In Service to the Nation

Everyday our nation is faced with questions that deal with issues of engineering and technology. How do we prepare our nation and its leaders to keep our societal infrastructures safe from terrorism? How do we face the ever-increasing need for a diversified engineering workforce? What role should citizens play in deciding which technologies are developed and for what purposes? In what ways can we continue to change our working relationships with journalists and the media to promote accurate and timely engineering and technology news reporting? These questions are not easily answered sometimes, and as our nation continues to strive to evolve and advance technologically within our global community, these questions become even more complex.

Since 1964, the National Academy of Engineering has provided independent, objective advice to the nation. NAE operates under the same congressional act of incorporation that established the National Academy of Sciences, signed in 1863 by President 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."

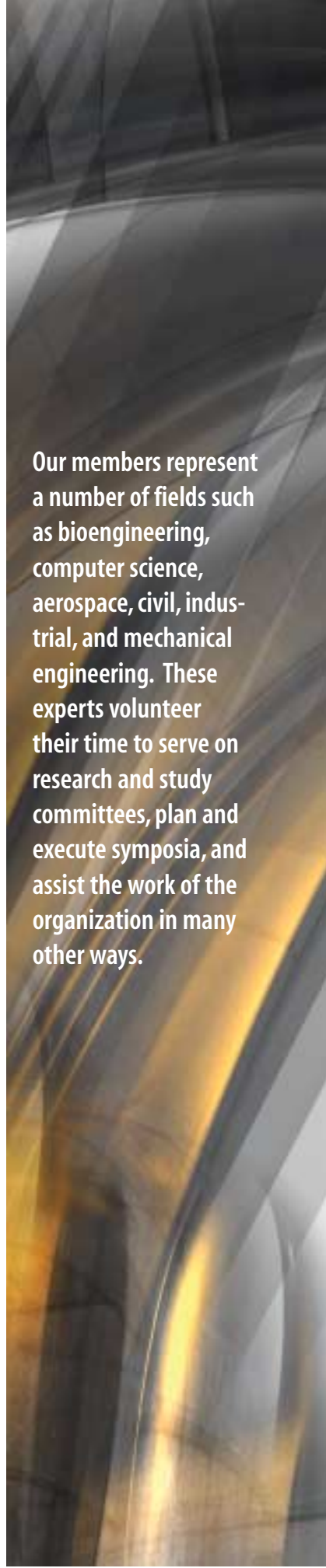
NAE has more than 2,000 peer-elected members and foreign associates. Approximately 47% are from academe, 46% from industry, and 7% from nonprofit institutions and the federal and state governments. Our members represent a number of fields such as bioengineering, computer science, aerospace, civil, industrial, and mechanical engineering. These experts volunteer their time to serve on research and study committees, plan and execute symposia, and assist the work of the organization in many other ways. Their focus is one that includes promoting and exercising communication and collaboration in the U.S. and abroad to identify and solve technological problems that affect societies; assessing the technological needs of the nation and sponsoring programs aimed at meeting those needs; advising congress and the nation on matters of national import pertinent to engineering; and recognizing outstanding engineering contributions made by national and international members of the engineering community.

NAE not only fulfills government requests, but has also sponsored activities with foundations, private industry, and state and local governments. In addition, we continue our efforts to increase our endowment funds with support through private contributions. All of these factors make our organization a unique blend of the world's most accomplished engineers dedicated to ensuring that special attention is focused on every project in order to provide quality objective engineering information for the betterment of our nation and the world.

NAE is a member of the National Academies, which includes NAE, the National Academy of Sciences (NAS), the Institute of Medicine (IOM), and the National Research Council (NRC) — which serves as the principal operating arm of the academies.

Mission Statement

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



Our members represent a number of fields such as bioengineering, computer science, aerospace, civil, industrial, and mechanical engineering. These experts volunteer their time to serve on research and study committees, plan and execute symposia, and assist the work of the organization in many other ways.

PROGRAM REPORTS

Engineering Education

The Committee on Engineering Education (CEE) is composed of thought leaders and experts from the business, academic, and public sectors that have a demonstrated commitment to the advancement of education issues in engineering. The mission of CEE is to insure quality, diversity, and quantity in engineering education by providing guidance and advice to policy makers, administrators, employers, and other stakeholders to the engineering education enterprise.

In 2003, CEE completed the first phase of its pivotal Engineer of 2020 project. The phase one report, *The Engineer of 2020: Visions of Engineering in the New Century*, depicts compelling visions of the future for engineering and engineers, and it lays out bold challenges to the engineering profession, including an overview of some dramatic implications for engineering education.

Another report, *Information Technology (IT)-Based Educational Materials: Workshop Report with Recommendations*, identifies three high priority areas for funding agencies, policy makers, and researchers – building community, creating organizational enablers, and coordinating change. At year end, CEE launched the second phase of its Engineer of 2020 project, and a new study, Enhancing Community College Pathways Into Engineering Careers. Reports for these two efforts are expected at the close of 2004.

Center for the Advancement of Scholarship on Engineering Education (CASEE)

The Center for the Advancement of Scholarship on Engineering Education (CASEE) seeks to increase the utility of an engineering education from the perspective of employers, graduate schools, the graduates themselves, and society-at-large. This goal is pursued by working collaboratively with diverse elements of the engineering community to leverage opportunities for continuous and significant improvements in engineering education.

In 2003, NAE appointed its first four Engineering Education Senior Fellows. Their individual work focuses on assessing how students learn and instructional effectiveness, learning how to apply to engineering education the management principles of W. Edwards Deming and the teaching-learning principles of Reuven Feuerstein, and surveying instructional and institutional strategies that value diversity among people, learning styles, and perspectives.

CASEE also started to create an extended set of Affiliates that will be tied into its research and analysis. Research Community Affiliates (currently numbering 13) will be campus-based education research centers pursuing their own efforts to enhance the quality of engineering education. Implementation Network Affiliates (currently numbering 10) will be academic and industrial entities willing to serve as testbeds for experiments and pilot projects in innovative approaches to engineering education.

CASEE's future plans include extending its reach into the ranks of the nation's almost 350 colleges of engineering by hosting or endorsing national and regional workshops to disseminate its research findings.

CASEE has also initiated the studies that will lead to the development of an online database summarizing the available research on asserted "best" and "promising" instructional practices in engineering education.

Technological Literacy

The NAE Program on Technological Literacy explores the question of how Americans can become better prepared to navigate our highly technology-dependent society. What should citizens—adults and children—understand about technology, broadly defined? What role should people play in helping decide what technology is developed, and for what purposes? What sorts of changes in formal and informal education and in the policy arena are needed to equip citizens to participate usefully in this process?

The program has contributed to the development of standards for the study of technology in elementary and secondary schools; executed a variety of outreach efforts to educators, policy makers, and the general public; sponsored a number of informational workshops; and overseen two consensus studies. In 2003, NAE continued work on a study examining approaches for assessing technological literacy. The lack of reliable information about what people know and can do with respect to technology is a major impediment to efforts to gauge the effectiveness of interventions meant to boost technological understanding. The Committee on Assessing Technological Literacy's report is expected to be published in 2004. The

project is being carried out in collaboration with the National Research Council's (NRC's) Board on Testing and Assessment.

Late in 2003, the U.S. Department of Education provided support for NAE to undertake an ambitious outreach effort to state education leaders in mathematics, science, assessment, and curriculum. One hundred educators will have the opportunity to come to Washington, D.C., in 2004 for an all-day workshop session that will explore the challenges and benefits of teaching technology and engineering in grades K-12. This workshop is also a joint effort between NAE and NRC.

Public Understanding of Engineering

NAE has continued to strengthen and diversify its connections to media, government, community organizations, and individuals. These relationships are essential to enhance public understanding of engineering (particularly how engineering impacts our quality of life) and to improve media coverage of engineering. The unique resources of NAE provide special opportunities for collaboration and mutual assistance.

Media Relations

NAE media/public relations builds relationships with journalists by pitching ideas and assisting reporters in accurately covering engineering. When a story involving engineering breaks, we find knowledgeable engineers and then pitch their expertise and perspective to appropriate reporters. As news of the 2003 electrical blackout in the northeast United States broke, NAE experts were ready to explain how the system works and to provide historical context. Their interviews were broadcast on such national outlets as ABC News television programs *PrimeTime, World News Tonight with Peter Jennings,* and *Nightline.* NAE members provided lengthy comments on CNN's morning news program, Washington's all news radio station, and numerous print publications. The number of journalists who have requested information for more than one story has increased along with our growing collection of news clippings. News reporters are learning that NAE is a valuable and reliable resource.

In 2003, we conducted a first-of-its-kind terrorism scenario exercise, *Media and the First Response* at NAE headquarters in Washington, D.C. The event brought people together from government, business, news media, and the science/engineering/medical communities to focus on effective communication of vital technical information

to the public before, during, and after a catastrophic event. NAE is working with the U.S. Department of Homeland Security (DHS) and the Radio-Television News Directors Association (RTNDA) to conduct similar exercises in 10 cities across the country.

Public Relations

An opinion piece by NAE Senior Program Officer for Media Relations Randy Atkins, "The News Media Could Be Our Weakest Link," was published in *The Washington Post* on Sunday, January 26. The piece stimulated a great deal of interest in journalism and counterterrorism circles. The NAE media relations office also helped place in the *Post* a member-authored op-ed on the effects of radiation from dirty bombs. It is an example of how NAE can inject technical aspects of controversial topics into public discourse without jeopardizing its reputation for impartiality and balance.

NAE launched a new project with WTOP Radio, the only all-news radio station in the Washington, D.C., region. It provides weekly 45-second radio segments highlighting engineering innovations and stories that add technical richness to current issues in the news. With 634,800 listeners, WTOP Radio has the largest listening audience in the Washington, D.C., area. WTOP Radio has added an "Innovative Engineering" link in the features section of its website <www.wtop.com>. This link brings visitors to an NAE web page that provides scripts, audio, and links to sites with additional information about the engineering stories.

Developing Effective Messages Project

"Developing Effective Messages for Public Understanding of Engineering (PUE) Programming" is a new project undertaken by NAE. This activity is a follow-up to a brainstorming session held in 2003 to review the findings of the report publication *Raising Public Awareness of Engineering* (2002).

The central activity of the 10-month Developing Effective Messages Project will be a one-day workshop, which will feature some of the nation's most creative advertising and public relations professionals. A summary of the workshop will be published on the NAE website.

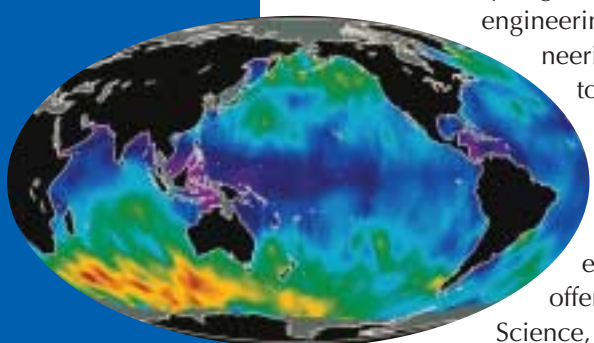
A Century of Innovation: Twenty Engineering Achievements That Transformed Our Lives

In 2003, the Joseph Henry Press published *A Century of Innovation: Twenty Engineering Achievements That Transformed Our Lives*, based on a list developed by NAE in collaboration with the American Association of Engineering Societies (AAES), and twenty-seven professional engineering societies (see www.greatachievements.org). This coffee-table book has provided a rare opportunity to reach the public with information about engineering and its wide-ranging impact in a colorful, entertaining format. The companion website has proven to be one of the most frequently visited NAE websites, and evidence suggests it is being used as a classroom resource by teachers.

Engineering Ethics

As we learned from technological innovations from the 20th century, many inventions are used in ways that their inventors never imagined. With the quickening pace and wider reach of current technological development, the need for addressing the ethical implications of new technologies' diverse applications is more urgent than ever. NAE has begun a dialogue among ethicists and engineers to encourage them to consider the ethics of their work and designs before they become reality. We are searching for ways to make ethical considerations a larger part of the engineering process.

In 2003, the Engineering, Economy, and Society program held the *Emerging Technologies and Ethical Issues* workshop. Engineers and ethicists heard presentations from leaders in the rapidly evolving fields of sustainability (or earth systems engineering), nanotechnology, neurotechnology, and energy. The workshop addressed different approaches to resolving ethical dilemmas, by examining a situation's factual, conceptual, application, and moral aspects; applying academic theories; analyzing issues using new tools; and following the ethics codes of engineering societies. It also addressed ways to incorporate engineering ethics into the training of new engineers and methods to build awareness of ethical issues among practicing engineers. The proceedings of the workshop will be published in 2004.

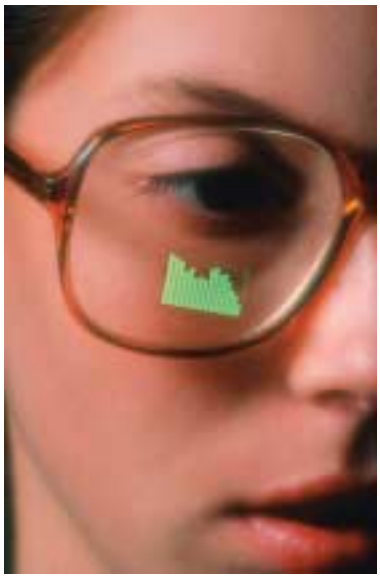


In response to NAE's demonstrated interest in engineering ethics, Case Western Reserve University (CWRU) has offered to transfer its Online Ethics Center for Engineering and Science, <www.onlineethics.org>, the most extensive online resource of case study material in the area of engineering ethics, to NAE. NAE has embraced the opportunity to provide a permanent home for this valuable on-line resource, and both NAE and CWRU hope to pursue this endeavor further.

Diversity in the Engineering Workforce

The NAE's Program on Diversity in the Engineering Workforce works to ensure the health, vitality, and competitiveness of the national domestic engineering workforce through its goal of increasing the participation of women and underrepresented minorities. The Committee on Diversity in the Engineering Workforce (CDEW), established in late 1999 to be the primary vehicle through which NAE can tackle this challenge, convenes influential stakeholders to share knowledge, identify areas of need, design initiatives that leverage the strengths of NAE, and initiate actions to address those needs.

In 2003, CDEW launched an innovation initiative aimed at finding new approaches to overcoming barriers to engineering's diversity challenge. NAE has advanced the first two tracks of this three-track initiative (defining goals, assessing capabilities,



surveying the landscape, building partnerships, and preparing a white paper on the issue). The third and final "discovery" track of this important initiative is now underway. It is designed to engage a broad spectrum of stakeholders and perspectives relevant to the diversity challenge in order to identify new approaches and new opportunities for forward momentum through NAE leadership.

The *EngineerGirl!* website <www.engineergirl.org> remains an important part of the NAE's diversity program. The purpose of this site is to attract young girls to engineering at a time in their lives – middle school – when they are making important educational decisions. The site offers "hot projects," the *Gallery of Women Engineers, "*fun facts," and information about careers in engineering among its features. In 2003, the *EngineerGirl!* Website Advisory Subcommittee of CDEW launched an evaluation of the site. Focus groups with middle-school girls provided important information for the evaluation. The website also hosted the essay contest "Engineering is a Dream Career," which elicited nearly 100 entries. Ideas for "dream" inventions that would change our lives in the future included eliminating congestion and pollution caused by travel by inventing a way to travel via brainwaves. Another essay contest idea from a student who has a non-English speaking friend was a hearing aid that provides translation from one language to another.

Frontiers of Engineering

Frontiers of Engineering (FOE) is a symposium series that brings together a select group of the nation's emerging engineering leaders from industry, academe, and government labs to discuss pioneering technical work and leading edge research in various engineering fields and industry sectors. The goals of the symposia are to introduce outstanding engineers (ages 30-45) to each other, and through this interaction facilitate collaboration in engineering, the transfer of new techniques and approaches across fields, and the establishment of contacts among the next generation of engineering leaders. The U.S. Frontiers of Engineering (U.S. FOE) Symposium annually brings together approximately 100 engineers from across the country. Two bilateral programs—German-American Frontiers of Engineering (GAFOE) and Japan-America Frontiers of Engineering (JAFOE)—involve approximately 30 engineers from each country in annual meetings. NAE partners with the Alexander von Humboldt Foundation for the GAFOE program and the Japan Science and Technology Agency and the Engineering Academy of Japan for the JAFOE program.

In 2003, three FOE symposia were held. In May, the German-American Frontiers of Engineering meeting was held in Ludwigsburg, Germany. Optical technologies, micro-manufactured systems, biomedical sensors, and information technology were the topics covered. In September, the U.S. Frontiers of Engineering meeting was held in Irvine, California, where participants discussed developments in environmental engineering, fundamental limits of nanotechnology, counterterrorism technologies and infrastructure protection, and biomolecular computing. In November, NAE hosted the Japan-America Frontiers of Engineering meeting in Irvine, California. The topics for the symposium were: large-scale civil systems; electric power systems, generation, and storage; systems biology and biological engineering; and multimedia networking.

NAE President Wm. A. Wulf speaks with FOE participant Dr. Karen J. L. Burg, Associate Professor, Department of Bioengineering, Clemson University.

NAE also works to facilitate the continuing interaction of those who have attended FOE symposia. Proceedings, such as *Frontiers of Engineering: Reports on Leading Edge Engineering from the 2002 NAE Symposium on Frontiers of Engineering*, published in 2003, were mailed to all past U.S. FOE participants. Other outreach activities included an FOE alumni newsletter—a mechanism for alumni to keep in touch and share information about their work and current status; an enhanced FOE website, including searchable data and a directory of *all* FOE alumni; and regional dinners for U.S. Frontiers alumni. In addition, the AvHumboldt Foundation provided support for ongoing collaboration between participants at the GAFOE meeting.

Lillian M. Gilbreth Lectureships for Young Engineers

A related but independent NAE activity is the Lillian M. Gilbreth Lectureships for Young Engineers program, which recognizes outstanding young engineers by selecting individuals from among Frontiers of Engineering speakers to give presentations on their work at the NAE Annual Meeting in Washington, D.C., and the NAE National Meeting in Irvine, California. In 2003, Gilbreth lectures were presented by Dr. Roy Want, Principal Researcher, Intel Research, who presented *Personal Servers: Pushing the Limits of Personal Computing,* and Dr. Steven van Enk, Research Department, Bell Laboratories, Lucent Technologies, who presented *Quantum Cryptography*.

Engineering and the Health Care System

When the average person thinks of health care, his/her thoughts probably turn to doctors and nurses – the health care practitioners who will care for their patients. Most often, the average person doesn't put much thought into the engineering behind the health care systems that allow health care professionals to do their job

successfully. NAE and the Institute of Medicine (IOM) are collaborating in a research and analysis activity to identify opportunities for engineering applications and research avenues to improve health care delivery through system-wide improvements that will affect 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 improvement in the safety, patient-centeredness, efficacy, and efficiency of health care in America.

A 14-member study committee composed of engineering and health care experts from NAE and IOM are preparing a consensus report with findings and recommendations. The committee has focused on two major opportunity sets for application, research, and education: 1) information and communications technologies to enhance information flow, connectivity, and coordination; and 2) system design, analysis, and control tools to understand health care processes and system interactions, and improve/optimize dimensions of system performance in the face of constraints.

Two workshops were held in 2003 to inform the committee's deliberations. The first of these provided background information on the many operational challenges that confront the U.S. health care delivery system, and focused on opportunities in the areas of information technology and operations research. The second workshop covered human factors engineering, financial engineering, biosensors and wireless communications, remote monitoring, supply chain management, and modeling. Presentations from both workshops will be appended to the committee's consensus report. The committee will finalize, publish, and widely disseminate its consensus report findings in 2004.

Engineering and the Environment

Engineering and the natural environment are inexorably linked. In the past, the engineering profession has often been associated with causing environmental harm, usually in relation to large-scale infrastructure projects. However, this paradigm no longer holds. Today, the engineering profession is at the forefront in efforts to mitigate negative environmental impacts, and is providing policy and technical guidance to government, the private sector, and the public on ways to create a more environmentally sustainable future.

In 2003, the Engineering and Environment Program (in conjunction with NRC Board on Mathematical Sciences) sponsored a planning workshop on Computer Modelling and Uncertainty in response to concerns on how well modelling outputs

are interpreted by users, primarily in government and the private sector. Many government decision-makers increasingly rely on modelling for their policy and quantitative analysis work through the use of specially designed software. As computers become cheaper, the reliance on models increases. However, with models there come uncertainties and errors, which can often multiply as models become increasingly complex. Therefore a fuller understanding of the modelling process and supporting mathematics and coding is important in the interpretation of results. Attendees at the workshop included a broad spectrum of computer users, decision-makers, and modelers.

The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs was also completed by NAE, in conjunction with the NRC Board on Energy and Environmental Systems. The report found that transformation of the entire U.S. energy system to a hydrogen economy would prove difficult due to cost and efficiency of fuel cells and the required infrastructure. It also found that a transition to a hydrogen economy would take a considerable amount of time and it is best to start with small, on-site distribution rather than large, centralized facilities. Finally, the impact of using renewable energy sources for hydrogen production is likely to be modest in the short term. The report provides a thorough base for policy development because of the extensive data and spreadsheet analysis supplied in the appendices.

Another workshop was held in 2003 by NAE and the Chinese Academies of Sciences and Engineering, which addressed China's continuing urban air pollution crisis. A host of papers were presented outlining the changing nature of air pollution in Chinese cities from the presence of large particulate and sulfur dioxide to much finer particulate and vehicle associated emissions. A presentation was presented on air toxics, which are now the centerpiece of concern at U.S. power plants, but are of interest to the Chinese as well. In addition, concerns which were voiced by the participants included mercury pollution, typically associated with the burning of coal, trans-boundary air pollution issues with Japan, the sampling and analysis of air pollutants, and the promise of new energy systems, such as distributed power. It is clear that dealing more seriously with air pollution is a very high priority for the Chinese Academies. However, with coal as the dominant fuel in China for stationary combustion, the emphasis will continue to be on managing particulate and sulfur dioxide. There are expectations of carrying out a full consensus study pending financial support. Proceedings from this workshop will be available in 2004.

Personal Cars and China

China has experienced unprecedented economic growth over the last 20 years since its global opening in the early 1980s. Today, an emerging Chinese middle class is demanding modern technologies including personal-use automobiles. In its recent five-year plan, the Chinese government has singled out the automobile industry as one of the major forces that drive its new economy. It hopes to increase private automobile ownership as well as export automobiles to neighboring countries. The government also calls for massive restructuring of the sector to provide a more efficient, low cost, and positive atmosphere for investment. With these goals in mind, the Chinese Academy of Engineering, NAE, and NRC concluded its report, *Personal Cars and China*, on the future of the industry.

The report addresses issues such as the impact of thousands of new automobiles already crowding dense Chinese cities; structure and capability of the Chinese automobile industry; technologies and R&D capability; energy and environmental impacts; social impacts; and the role of the Chinese government. It is clear that the addition of many thousands of new personal-use cars will require regulatory policies that build on what has been successful in the U.S., Europe, and Japan. This report is one of several publications that address the issue of cars in China and is suggested reading for Chinese policymakers.

Improving Cybersecurity

The nation's critical infrastructure, such as the electric power grid, air traffic control system, financial system, and communication networks, depends upon networked information systems (NISs) for their operation. However, these NISs presently possess vulnerabilities that can be exploited by terrorists and hackers because there is an inadequate understanding of what makes them vulnerable to attack, how best to reduce these vulnerabilities, and how to transfer cybersecurity knowledge to actual practice. In short, it appears that our nation's dependence on NISs has grown faster than our ability to address vulnerabilities.

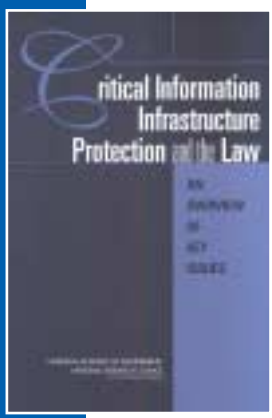
In 2003, NAE created the Committee on Improving Cybersecurity Research in the United States in cooperation with the NRC Computer Sciences and Telecommunications Board to address these issues. The committee's study, in response to PL 107-305, the Cyber Security Research and Development Act, will

address research topics traditionally associated with cybersecurity, as well as those related to improving the trustworthiness of networked information systems, with a focus on achieving fundamental strength rather than pursuing reactive approaches. This study will also seek to identify and explore models and technologies that are not traditionally associated with cybersecurity or computer system trustworthiness that, nevertheless, may generate ideas leading to revolutionary—not incremental—advances in cybersecurity research.

The committee's future report will be published in both regular book length and a shorter version. Briefings on the report's findings will be made to government leaders and members of the information technology research communities, as well as to members of interested industry and application domain groups.

Critical Information Infrastructure Protection and the Law

September 11, 2001, significantly increased the nation's awareness of the interdependencies of critical infrastructures and heightened the government's sense of urgency regarding the need for increased private sector and public sector information sharing, with respect to cyber and physical threats. All critical infrastructures (transportation, finance, electric power, water, etc.) are increasingly dependent on the evolving information infrastructure (public telephone network, the Internet, etc.) for a variety of information management, communications, and control functions. In response to the need, NAE, in conjunction with the NRC Computer Sciences and Telecommunications Board, assembled a committee that wrote the report *Critical Information Infrastructure Protection and the Law: An Overview of Key Issues,* which examines the range of legal issues associated with information infrastructure protection. The report has been widely disseminated, including briefings to the White House, FBI InfraGard, numerous financial institutions, congressional staff, and the FCC Technical Advisory Committee. This report considers separately different aspects of information sharing and liability—recognizing that there is a tension between these approaches that strategies for critical information infrastructure protection (CIIP) must ultimately resolve.



Trust among those sharing information is one of the most important prerequisites for successfully protecting the nation's critical information infrastructures. To build sufficient trust between the public sector and the private sector, the government should clearly and consistently explain to the private sector what its objectives are for CIIP, how it has organized itself to accomplish those objectives, what the information flows are, what kind of information should be shared and in what form, what the government is willing to share with the private sector, and why all of this is important (i.e., what the threat is and how the proposed actions will address that threat). A clear and consistent message from the government to the private sector

will go a long way toward building the trust that is necessary to protect the nation's critical information infrastructures.

Accident Precursors

Many accidents are a result of a series of events—an accident chain—with events occurring 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 typically can be called "precursors." Once precursors have been identified and understood, industries can mitigate against accidents, catastrophes, and other extreme events. To further this understanding, industries have developed a number of risk-mitigation techniques, analytical techniques, and management approaches to detecting, modelling, and acting on precursor signals.

In 2003, NAE brought together 50 participants with expertise in the field of risk and precursor analysis from multiple industries, academia, and government for a one-and-a-half day workshop at which eleven papers were presented and discussed on this topic. Following the workshop, the steering committee began preparing a consensus report on the workshop including findings and recommendations, which is being prepared for final publication in 2004.

User-Authorized Handgun Technology

The primary method of preventing handgun misuse has been to encourage gun owners to properly store and handle handguns. In recent years, technology has offered a potential alternative solution: the user-authorized handgun. A user-authorized handgun "recognizes" the owner or other authorized user and will fire only when that individual, and no one else, wants the gun to fire. A variety of sensor, electronic, mechanical, and other technologies might be used in the design of such a weapon.

In 2003, NAE began a one-year study of the technological feasibility of developing such a firearm. The first steps were taken to convene knowledgeable committee members to undertake the study. The committee's first meeting will take place in 2004. The project follows a June 2002 NAE workshop that examined the technical, criminal, health, and legal issues surrounding user-authorized handguns.

2003 NAE AWARDS RECIPIENTS

Charles Stark Draper Prize

2003 Charles Stark Draper Prize Recipients Bradford W. Parkinson and Ivan A. Getting

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 the quality of life, providing the ability to live freely and comfortably, or permitting the access to information. Presented annually, the prize carries a $500,000 cash award.

Dr. Bradford W. Parkinson, Edward C. Wells Professor of Aeronautics and Astronautics Emeritus, Stanford University, and Dr. Ivan A. Getting*, President Emeritus, The Aerospace Corporation "for pioneering the concept and development of a Global Positioning System (GPS)."

Fritz J. and Dolores H. Russ Prize

The Russ Prize recognizes outstanding achievement in an engineering field of critical importance (currently bioengineering) that, through widespread use, contributes to improving the human condition or impacts significantly upon society. Presented biennially, the prize carries a $500,000 cash award.

Dr. Willem J. Kolff, distinguished professor of surgery and medicine, emeritus, University of Utah, "for his pioneering work on artificial organs, beginning with the kidney."

2003 Fritz J. and Dolores H. Russ Prize Recipient Willem J. Kolff

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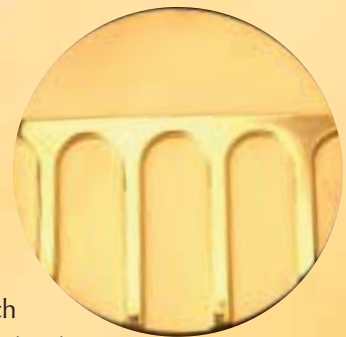
Founders Award



This 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. The Founders Award is presented each year during the NAE Annual Meeting in October.

2003 Founders Award Recipient Carver A. Mead

Dr. Carver A. Mead, Gordon and Betty Moore Professor of Engineering and Applied Science, Emeritus, California Institute of Technology "for visionary contributions in the field of microelectronics, including VLSI technology and computational neural systems."

Arthur M. Bueche Award

The Bueche Award recognizes an engineer who has been actively involved in determining U.S. science and technology policy, promoting technological development, and contributing to the enhancement of the relations between industries, government and universities. It is presented each year during the NAE Annual Meeting in October.

2003 Arthur M. Bueche Award Recipient Robert A. Frosch

Dr. Robert A. Frosch, Senior Research Fellow, Belfer Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University "for a career of advances in aerospace and automotive technology, and industrial ecology; and for administration of R&D in industry, government, and academia."

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

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NATIONAL ACADEMY OF ENGINEERING FUND FINANCIAL REPORT

Governed by the National Academy of Engineering Fund (NAEF) Board of Trustees, 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). NAE operates within the charter and framework of the National Academy of Sciences (NAS).

The table on page 26 summarizes both NAEF and outside operating revenue and expenses as well as non-operation-related transactions for NAE for 2003 and 2002. The information on NAEF presented in this table has been extracted from the Fund's audited financial statements also contained in this report.

During 2003, contributions for the National Academy of Engineering were solicited as part of the overall fund-raising campaign for the National Academies (includes 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; NRC is the operating arm of NAE and NAS. 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 2003, 5 percent was allocated for normal operating expenses; an additional 2 percent was authorized for program support and 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. 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)

	2003	2002
NET ASSETS, BEGINNING	**$47,028**	**$52,326**
CONTRIBUTIONS RECEIVABLE, NET	**11,968**	**11,990**
TOTAL ASSETS, BEGINNING	$58,996	$64,316
OPERATIONS		
Revenue		
Contributions (Unrestricted)	$1,201	$1,534
Dues (Annual), Fees, Miscellaneous	345	221
Indirect Allowance From Contracts and Grants	2,824	2,638
Award Specific Funds Allocation to Operations*	1,689	1,488
Program Specific Funds Allocation to Operations*	2,384	1,974
Unrestricted Allocation to Operations	3,005	3,686
Total Operations Revenue	**$11,448**	**$11,541**
Expenses		
Awards	$1,699	$1,505
Development	962	990
Management	1,721	1,896
Membership	1,140	1,311
National Academies Activities	352	307
Programs	5,276	4,953
Total Operations Expenses	**$11,150**	**$10,962**
OPERATIONS SURPLUS	**$298**	**$579**
NONOPERATIONAL TRANSACTIONS		
Allocation to Operations	($5,841)	($6,390)
Contributions to Reserves	15,289	2,287
Dues (Lifetime), Miscellaneous	10	109
Gain (loss) on Investments	6,538	(2,823)
Investment Earnings (Interest and Dividends)	1,679	1,102
Investment Fees	(215)	(162)
NONOPERATIONAL LOSS	**$17,460**	**($5,877)**
NET ASSETS, ENDING	**$64,786**	**$47,028**
CONTRIBUTIONS RECEIVABLE, NET	**1,996**	**11,968**
TOTAL ASSETS, ENDING	$66,782	$58,996

*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, 2003 and 2002

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, 2003, 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 2002 financial statements and, in our report dated March 28, 2003, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides 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, 2003, 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

Grant Thornton LLP
Vienna, Virginia
March 25, 2004

National Academy of Engineering Fund

Statements of Financial Position

December 31,	2003	2002
Assets		
Current Assets		
Cash and cash equivalents	$ 260,474	$ 801,408
Short-term investments	102,088	679,570
Contribution receivable, net	993,566	10,678,306
Accounts receivable–National Academy of Sciences	—	409,570
Accounts receivable–other	174,121	26,108
Award medals and other assets	149,409	64,179
Total Current Assets	1,679,658	12,659,141
Non-current Assets		
Contribution receivable–long-term portion, net	1,002,620	1,289,607
Investments	64,540,699	45,046,823
Total Non-current Assets	65,543,319	46,336,430
Total Assets	$ 67,222,977	$ 58,995,571
Liabilities and Net Assets		
Liabilities		
Accounts payable–National Academy of Sciences	$ 441,402	$ —
Commitments and Contingencies	—	—
Net Assets		
Unrestricted	33,473,059	31,423,171
Temporarily restricted	8,162,407	6,664,027
Permanently restricted	25,146,109	20,908,373
Total Net Assets	66,781,575	58,995,571
Total Liabilities and Net Assets	$ 67,222,977	$ 58,995,571

National Academy of Engineering Fund

Statements of Activities and Changes in Net Assets

Year ended December 31,

	2003				2002
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	Total
Revenue					
Interest and dividends	$ 988,254	$ 691,571	$ —	$ 1,679,825	$ 1,107,695
Realized (loss) gain on investments	(262,306)	150,091	—	(112,215)	157,165
Contributions	831,956	1,226,805	4,237,736	6,296,497	3,926,219
Membership dues	133,240	—	—	133,240	227,600
Registration fees	116,622	—	—	116,622	86,275
Miscellaneous revenue	95,234	8,120	—	103,354	9,378
Net assets released from restrictions:					
Satisfaction of program restrictions	2,994,209	(2,994,209)	—	—	—
Satisfaction of time restrictions	485,614	(485,614)	—	—	—
Total Revenue	5,382,823	(1,403,236)	4,237,736	8,217,323	5,514,332
Expenses					
Program services					
Programs	3,716,632	—	—	3,716,632	3,937,529
Member programs	212,863	—	—	212,863	366,681
Support for NRC and NAS	352,143	—	—	352,143	307,336
Awards	1,699,003	—	—	1,699,003	1,504,891
Total program services	5,980,641	—	—	5,980,641	6,116,437
Supporting services					
Fundraising	962,233	—	—	962,233	989,720
Operations	360,773	—	—	360,773	651,561
Total supporting services	1,323,006	—	—	1,323,006	1,641,281
Total Expenses	7,303,647	—	—	7,303,647	7,757,718
Change in Net Assets Before Unrealized Gain (Loss) on Investments	(1,920,824)	(1,403,236)	4,237,736	913,676	(2,243,386)
Unrealized gain (loss) on investments	3,970,712	2,901,616	—	6,872,328	(3,077,436)
Change in Net Assets	2,049,888	1,498,380	4,237,736	7,786,004	(5,320,822)
Net Assets, beginning of year	31,423,171	6,664,027	20,908,373	58,995,571	64,316,393
Net Assets, end of year	$33,473,059	$8,162,407	$ 25,146,109	$ 66,781,575	$ 58,995,571

National Academy of Engineering Fund

Statements of Cash Flows

Year ended December 31,	2003	2002
Cash Flows from Operating Activities		
Change in net assets	$ 7,786,004	$ (5,320,822)
Adjustments to reconcile change in net assets to net cash provided by (used in) operating activities:		
Realized loss (gain) on investments	112,215	(157,165)
Unrealized (gain) loss on investments	(6,872,328)	3,077,436
Changes in assets and liabilities:		
Contributions receivable	9,971,727	21,671
Accounts receivable–National Academy of Sciences	409,570	113,733
Accounts receivable–other	(148,013)	3,892
Award medals	(85,230)	7,033
Accounts payable–National Academy of Sciences	441,402	—
Net Cash Provided by (Used in) Operating Activities	11,615,347	(2,254,222)
Cash Flows from Investing Activities		
Proceeds from sale of investments	120,507,116	310,956,774
Purchase of investments	(132,663,397)	(308,485,064)
Net Cash (Used in) Provided by Investing Activities	(12,156,281)	2,471,710
Net (Decrease) Increase in Cash and Cash Equivalents	(540,934)	217,488
Cash and Cash Equivalents, beginning of year	801,408	583,920
Cash and Cash Equivalents, end of year	$ 260,474	$ 801,408

National Academy of Engineering Fund

Notes to Financial Statements

December 31, 2003 and 2002

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 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, 2003 and 2002, the Fund had no significant concentrations of 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, 2003 and 2002, 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 2002 amounts have been reclassified to conform to the 2003 presentation.

NOTE B—CONTRIBUTIONS RECEIVABLE

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

Contributions receivable consist of unconditional promises to give and are deemed fully collectible as follows at December 31, 2002:

	Unrestricted	Restricted	Total
Unconditional promises to give	$ 122,117	$ 12,084,936	$ 12,207,053
Less: unamortized discount	—	239,140	239,140
Net unconditional promises to give	122,117	11,845,796	11,967,913
Amounts due in:			
Less than 1 year	122,117	10,556,189	10,678,306
1 to 5 years	—	1,289,607	1,289,607
	$ 122,117	$ 11,845,796	$ 11,967,913

Net restricted contributions consist of $605,278 and $1,040,123 at December 31, 2003 and 2002, respectively, which is subject to time restrictions, and $811,933 and $10,805,673 at December 31, 2003 and 2002, respectively, which is subject to donor-imposed purpose restrictions.

NOTE C—INVESTMENTS

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

	2003	2002
Cash and money market	$ 4,383,433	$ 4,143,376
Treasury securities	—	5,667,473
Federal agency securities	13,832,908	10,143,996
Corporate debt securities	12,138,702	5,152,249
Equity securities	34,287,744	20,619,299
	64,642,787	45,726,393
Less: short-term investments	102,088	679,570
	$ 64,540,699	$ 45,046,823

Investments are further classified as follows at December 31:

Unrestricted	$ 33,243,706	$ 31,605,672
Temporarily restricted	6,793,200	3,446,709
Permanently restricted	24,605,881	10,674,012
	$ 64,642,787	$ 45,726,393

Investment return consists of the following at December 31:

Dividends and interest	$ 1,679,825	$ 1,107,695
Unrealized gain (loss)	6,872,328	(3,077,436)
Realized (loss) gain	(112,215)	157,165
	$ 8,439,938	$ (1,812,576)

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETS

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
Committee on Diversity	—	122,606
Engineering Education	—	38,411
Bueche Award	—	98,170
Futures Fund	—	116,952
AT&T	—	21,144
CASEE	—	176,748
Russ Prize	—	110,400
Engineering Ethics Center	—	51,436
Forum on Diversity	—	81,012
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
	$ 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

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETS Continued

Permanently and temporarily restricted net assets consist of the following at December 31, 2002:

	Permanently Restricted	Temporarily Restricted
Draper Prize	$ 8,000,000	$ 2,062,209
Russ Prize	—	820,068
Capital Preservation	1,960,829	525,516
Great Achievements	—	501,324
Public Understanding	—	469,379
Bechtel–Public Understanding	—	282,142
Hollomon	201,200	211,262
Committee on Diversity	—	181,749
Gordon Prize	9,318,967	151,113
Futures Fund	—	113,404
Bueche Award	—	96,609
Forum on Diversity	—	76,768
AT&T	—	64,050
U.S./German American Frontiers	—	43,356
Engineering Education	—	31,222
Frontiers Fund	—	27,299
Hans Reissner	25,624	25,998
Communication with Public in Crisis	—	24,976
Battelle	—	9,207
Homeland Security	—	6,542
Information Technology	—	3,380
Engineering & Services	—	2,670
Bechtel Inventory	—	(122)
Technology and Environment	—	(2,479)
Industry Scholar	353,038	(4,652)
Senior Scholar	291,670	(9,326)
Young Engineer	757,045	(89,760)
Unrestricted contributions to be received in future years	—	1,040,123
	$ 20,908,373	$ 6,664,027

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, 2003 and 2002.

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, 2003 of $441,402 and a receivable as of December 31, 2002 of $409,570. Payments made to NAS by the Fund for the Fund's allocated portion of the expenditures shared jointly by NAS, NAE and IOM were $1,314,376 and $1,297,056 for the years ending December 31, 2003 and 2002, respectively. The Fund made no payments to NRC for the years ended December 31, 2003 and 2002. See Note A for the relationship of related parties.

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*Indicates term ended June 30, 2003. Year in parentheses indicates the year his/her term will expire.

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